Bioenvironmental Engineering Site Assessment I

Unit 3: OEHSA (Occupational and Environmental Health Site Assessment)

Unit Description: In this unit you will be operating at Nigel AFB in North Pole, Alaska. After completing your training assignment, you'll be able to describe the Occupational and Environmental Health Site Assessment (OEHSA) process and how it correlates to the Health Risk Assessment (HRA) process. You will also participate in site selection and discover how site selection considerations influence OEHSA.

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Lesson 1: OEHSA Process

Lesson Description

In this lesson, which is structured IAW AFMAN 48-153, you will learn about the Occupational and Environmental Health Site Assessment (OEHSA) process, including how it correlates to the Health Risk Assessment (HRA) process.

Lesson Overview (Page 1 of 15)

Occupational and Environmental Health Site Assessment (OEHSA) is the key operational health tool to produce data and information used for Health Risk Assessment (HRA) and to satisfy Occupational and Environmental Health (OEH) surveillance requirements.

As you complete your training assignment, you will:

- Identify the steps in the OEHSA process.
- Correlate OEHSA to the HRA process.

Audio Script

NCOIC: Good to see you this afternoon. I have an assignment for you, but before you complete it, I need to make sure you have a good understanding of what OEHSA is. Read over these training materials, and when you report back, make sure you can tell me how OEHSA correlates to the HRA process.

OEHSA Objectives (Page 2 of 15)

The OEHSA process standardizes the OEH framework for developing sampling strategies, selecting monitoring equipment, and collecting samples. The six primary objectives of an OEHSA are listed below.

Identify Threats

Identify OEH threats or hazards and potential adverse health effects.

Collect Data

Collect and document OEH exposure data, including demographic and occupational data, for the service member's longitudinal exposure record (LER).

Inform Commanders

Inform commanders of health threats and risk mitigation options through HRA.

Reduce Risks

Reduce or eliminate health risks and maximize operations.

For example, you would use the OEHSA process when you receive complaints about the environment to determine if dust in the air is causing coughing or Upper Respiratory Infections (URIs). You would use the data from your air sampling to create a plan of action on how to deal with the problem.

Prevent Interference

Mitigate encroachment on mission capability.

Our role is to conduct OEH surveys and recommend measures to help ensure the health and well-being of the worker, thereby preventing a negative impact on the mission.

Support Surveillance

Support OEH surveillance activities in both home station and expeditionary settings, including exposure monitoring and health surveillance for Force Health Protection (FHP).

By grouping personnel into SEGs when we conduct OEHSAs, we note any common exposures and, in those exposures, look for any irregularities based on previous data.

The OEHSA Process (Page 3 of 15)

The OEHSA process is practiced on both large and small-scale site assessments. For example, you will use the OEHSA process when establishing a bare base or when conducting a routine assessment of health threats at a given shop on base.

An OEHSA is executed as soon as operationally feasible and is dependent on whether the location is in a **permissible** or **non-permissible** environment. A preliminary assessment should be made during the planning phase or prior to deployment to identify any unique resource requirements.

The OEHSA process is divided into 6 steps, as shown below:

1. Predeployment / Baseline Activities
2. Site Identification / Sectoring
3. Site Reconnaissance
4. Conceptual Site Model
5. Initial / Specialized Surveillance
6. Reassessment

Predeployment and Baseline Activities (Page 4 of 15)

The Predeployment / Baseline Activities step is the first step of the OEHSA process, and is focused on considering information that is already known about a site. This step allows you to identify activities that may have occurred in that area previously and also to collect data regarding current potential health risks. Before an OEHSA may be initiated, certain **required data** must be gathered. This baseline information can be obtained from a variety of sources.

- **Home Station Documentation**
- **Intelligence Sources**
  - **DIA**
  - **NCMI**
  - **NGIC**
  - **MEDIC CD**

- **USACHPPM**
- **Airfield Surveys**
- **VAs**
- **AARs**
- **DOS**
- **EPA**
- **DOE**

Required Data

The information necessary to initiate an OEHSA includes:

- Known hazardous waste sites.
- Known contamination and pollution in air, water, and soil.
- Typical climate conditions including normal and extreme temperatures, seasonal precipitation, and seasonal prevalent wind directions and velocities.
- Known agricultural, industrial, institutional, commercial, and/or residential uses of the site, whether historical or current.
- Known property use including type of infrastructure such as existing buildings, transportation networks, water treatment and distribution systems, wastewater collection and treatment systems, and known power generation and transmission systems.
- Maps, topographic, and geological information relevant to the deployment area.
- Data on worldwide diseases and environmental health risks. This can be accessed using the MEDIC CD.

Home Station Documentation

Established CONUS and OCONUS bases have substantial documentation regarding OEH threats, hazards, and exposures in relation to weapon systems and base operations. This data is critical in determining potential exposures and forwarding to Unit Type Codes (UTCs) for use in deployed settings.

Intelligence Sources Established

Health information can be found in various intelligence products. Intelligence can assist in identifying unique threats to a deployed area. In addition, intelligence updates should be requested on a periodic basis to determine whether the threats have decreased, increased, or remained the same. If specific intelligence is not available, the BE should consult the base or local intelligence officer and submit a "Request for Information." Be sure to allow sufficient time for this system to work (e.g., 2-3 weeks). Do not limit the request to a specific agency since this may reduce opportunities for broader information to meet operational health requirements. Also, request the proper classification level for your intelligence needs.

Defense Intelligence Agency (DIA)

The Defense Intelligence Agency (DIA) provides pertinent operational intelligence that includes counterproliferation, facilities, and regional information. Information provided from DIA addresses chemical, biological, radiological, and nuclear-related current and emerging threat information and regional politics.

This intelligence provides a better understanding about the chemical and biological threats specific to countries of interest. You can obtain this information from the installation intelligence officer or Office of Special Investigation.

National Center for Medical Intelligence (NCMI)

Medical intelligence is provided through the National Center for Medical Intelligence (NCMI), formerly known as the Armed Forces Medical Intelligence Center (AFMIC). As part of the DIA, NCMI produces medical intelligence for global force protection and homeland health protection to safeguard U.S. interests worldwide.

In addition to medical intelligence assessments, NCMI produces forecasts and databases on:

- Foreign military and civilian health care capabilities and trends.
- Worldwide infectious disease risks.
- Global environmental health risks.
- Militarily significant life science issues, including biotechnology and advances in nuclear, biological and chemical medical defense.

National Ground Intelligence Center (NGIC)

The National Ground Intelligence Center (NGIC) provides a better understanding of ground and operational threats as well as information on protective and defensive measures specific to countries of interest.

Medical Environmental Disease Intelligence and Countermeasure (MEDIC) CD

The Medical Environmental Disease Intelligence and Countermeasure (MEDIC) CD is an important intelligence product that forms the cornerstone of the deploying unit's intelligence assessment. It provides information about worldwide diseases and environmental health risks hyperlinked to the Joint Service-approved countermeasure recommendations. Additionally, the MEDIC CD furnishes:

- Military and civilian health care delivery capabilities.
- Operational information.
- Disease vector ecology information.

United States Army Center for Health Promotion and Preventive Medicine (USACHPPM)

The United States Army Center for Health Promotion and Preventive Medicine (USACHPPM) has specific information for industrial bases, possibly near deployed force locations, to include types of industry and hazard assessments.

Airfield Surveys

These survey reports, available through AMC on the web, can provide orientation to the site location and help identify areas of concern, geographic features, hazards, and other pertinent information.

Vulnerability Assessments (VAs)

Vulnerability Assessments (VAs) collect valuable information regarding health threats and complement the HRA process.

Refer to the following policy documents for more information regarding VA requirements:

- AFI 10-245, AF Antiterrorism Standards.
- AFI 10-246, Food and Water Protection Program.
- AFI 41-106, Unit Level Management of Medical Readiness Programs.
- AFI 48-144, Safe Drinking Water Surveillance Program.

You should ensure VA data and information are integrated into the Core Vulnerability Assessment Management Program (CVAMP), as applicable.

Previous After Action Reports (AARs)

After Action Reports (AARs) can identify issues with a location and lessons learned during past deployments. These reports provide information regarding industry types and problems identified. In a sustained operation, it gives the deploying unit continuity on past practices, issues, and problems.

Department of State (DOS)

The Department of State (DOS) is responsible for US diplomats abroad. Additionally, the DOS provides advisories to US travelers abroad. This may be useful information for OCONUS locations in particular, regarding contact information for embassies and consulates.

Embassies and consulates can provide useful local information such as medical capabilities, host nation sources, state and local agencies, foreign intelligence threats, and local threats. Since each embassy has a military attaché, it is important to establish contact and derive current intelligence from this source. Additionally, the embassy may be the conduit by which units expedite requests to the host nation. This contact may be facilitated through an intelligence officer.

Environmental Protection Agency (EPA) Industry Information

The Environmental Protection Agency (EPA) has compiled information regarding major industries and the typical chemicals used, materials produced as waste, and most common emissions. Some other countries (e.g., European Union members and Japan) provide similar industry information that can be used at overseas bases or deployed locations, if available.

Department of Energy (DOE)

The Department of Energy (DOE) has developed extensive information regarding radiological contamination areas to include overseas locations.

Site Identification and Sectoring (Page 5 of 15)

Site Identification and Sectoring is step two in the OEHSA process, and defines the area of responsibility (AOR), area of operations (AO), and missions - which include the personnel and equipment executing those missions. Through this step, the **delineation and segregation of workplaces** takes place.

If Site Identification and Sectoring is occurring in a garrison situation, delineation of the AO may be complete, and association of processes into workplaces would be an administrative exercise.

If sectoring in accordance with counter-chemical, biological, radiological, nuclear, and high-yield explosive zones needs to be completed, you should contact Civil Engineering Emergency Management for the current grid and further guidance. The initial grid breakout is for sampling and analysis and may be sufficient depending on potential threat identification.

Delineation and Segregation of Workplaces

Mission activities should be associated to each other by similarity and by geographical proximity. Similar Exposure Groups (SEGs) may be determined based on proximity of activity or similarity of tasks.

Site Reconnaissance (Page 6 of 15)

Site Reconnaissance is step three in the OEHSA process, and is used to verify what you recognized and gathered during the Predeployment and Baseline step. This is preferably accomplished through visual confirmation of the findings by observing the perimeter and area throughout the camp or base.

Interviews with military, the host nation, and local personnel may reveal important data and information about the site. The data and information collected should clearly define potential and actual threats and hazards. Visual clues also help identify signs of **potential hazards within an AO**, **potentially hazardous facilities**, or **extremely hazardous operations.**

Potential Hazards Within an AO

Potential hazards within an AO can be identified through:

- Industries in the area.
- Stained soils.
- Debris piles.
- Lagoons.
- Pits.
- Ponds.
- Unnatural topography.
- Stressed vegetation.
- Sick animals.
- Drums.
- Local resident information.

Potentially Hazardous Facilities

The area within a twenty-mile radius of a potentially hazardous facility should be considered in the vulnerability analysis. Potentially hazardous facilities can include:

- Industrial facilities.
- Manufacturing facilities.
- Waste reclamation and disposal facilities.
- Medical facilities.

Extremely Hazardous Operations

Consider a radius greater than twenty miles in your analysis for extremely hazardous operations. Examples of extremely hazardous operations include:

- Weapons storage facilities.
- Nuclear power plants.

Appraisal (Page 7 of 15)

Audio Script

Narrator: As you are reading over the training materials provided by your NCOIC, you stop to make sure you understand what you are reading about the steps of an OEHSA.

Match each description with the associated step in the OEHSA process by marking the appropriate block in the table.

Description	Predeployment and Baseline Activities	Site Identification and Sectoring	Site Reconnaissance
Defines the AOR, AO, and missions, including personnel and equipment.			
Used to verify the data and information that has already been gathered.			
Focused on considering information that is already known about a site.			

Conceptual Site Model (Page 8 of 15)

The Conceptual Site Model (CSM), step four in the OEHSA process, articulates the health threats and exposure pathways based on everything that is known about the site. In order for a threat to be listed as a risk, an exposure pathway must be present. An exposure pathway includes a threat and the opportunity for the population to come into contact with the threat.

The development of the CSM begins when data and information is gathered during the Predeployment and Baseline Activities step.

Using the CSM, you can develop and prioritize sampling strategies based on the assessment of threats.

Initial and Specialized Surveillance (Page 9 of 15)

Initial (Routine) Assessment, or screening, is step 5 in the OEHSA process, and is used to detect or identify ambient threats that pose potential health risks. Your primary objective when conducting initial surveillance is to perform sampling and analysis for contaminants of concern (COCs) and potential hazards. In order to do this, you will use portable equipment designed to analyze threats at appropriate levels of detection.

When conducting your analysis, you should focus on promptness and accuracy in order to provide adequate data to decision-makers.

Screening during the initial assessment step should include analysis of the following pathways:

- **Air and soil.**
- **Surface water.**
- **Drinking water.**
- **Hazardous waste.**

If you identify COCs through your analysis, additional **specialized assessments** may be required to better assess the health risk.

Air and Soil

Screening air and soil is critical to assist with beddown decisions in the expeditionary setting. It is also the focus at established bases in completing the OEHSA and determining OEH risks in the workplace.

The primary concern for this type of screening is to ensure that all health threats generated from industrial-type operations, or due to geographic location, are immediately assessed to determine potential and actual pathways and exposures. Health threats include physical hazards such as noise, radiation, and thermal stress as well.

Surface Water

Initial surface water screening starts with sampling of waters located within the perimeter of the site or base. Sampling then proceeds to other areas such as surface waters, streams, and ditches that personnel or equipment may come into contact with during operations.

Surface water screening should be conducted as environmental and weather conditions change or as the size of the AO changes. This sampling is important because surface water may be used as a drinking water source.

Drinking Water

You should assess all water sources prior to use to determine whether they would be good sources of water for the base. The data collected during the initial surveillance will be used to establish the long-term monitoring plan to maintain force health protection. In addition to the traditional sampling methods, field analysis of the source water can be conducted to determine whether the source is treatable.

Drinking water quality is evaluated on both source water and product water (i.e., after treatment). Bottled water plants should be sampled and inspected if the plant is not currently approved for use by the US Army Veterinary Command.

Quality standards for potable water vary depending on force structure and duration of use. You should identify, document, and evaluate all drinking water sources prior to use and at regular intervals throughout the operation. This is done to ensure that the hazard profiles have not changed.

Hazardous Waste

Unknown hazardous materials or waste residues remaining from industrial operations or other operations may exist at the site. If wastes creating potential health risks are encountered, you should collect samples and analyze them or send them to the laboratory for further analysis.

Specialized Assessment

Specialized assessment sampling is conducted when initial screening detects or identifies a COC, screening is inconclusive, or another trigger (e.g., exposure-induced illness) drives you to perform additional sampling.

Reassessment (Page 10 of 15)

Reassessment of health risks is the sixth step in the OEHSA process, and involves determining whether previous data and assumptions remain true or have changed.

If the assumptions have changed, the data may need to be recollected and assessed. You should conduct reassessments intermittently and whenever changes have occurred in the AOC.

Communicating health information is an important part of OEHSA. Information regarding reassessment of health risks should be provided during and after each reassessment.

Appraisal (Page 11 of 15)

Following are several questions to check your knowledge of the steps of the OEHSA process. Select the correct answer for each question.

Audio Script

Narrator: Your NCOIC stops by to check on your progress. Can you answer her questions?

Which one of the following steps in the OEHSA process begins when data and information is gathered during the Predeployment and Baseline Activities step?

A Conceptual Site Model

B Initial Assessment

C Reassessment

Which one of the following steps in the OEHSA process determines whether previous data and assumptions remain true or have changed?

A Conceptual Site Model

B Initial Assessment

C Reassessment

Which one of the following steps in the OEHSA process is used to detect or identify ambient threats or hazards that pose potential health risks?

A Conceptual Site Model

B Initial Assessment

C Reassessment

How OEHSA Relates to HRA and ORM (Page 12 of 15)

The majority of an OEHSA is conducted through the first two steps of the HRA process and concludes as controls are recommended. The reassessment step of OEHSA marks the beginning of a new cycle as the HRA process comes to a close and the process starts again.

OEHSA is an important tool for quantifying the health risks for **Operational Risk Management (ORM)** through the HRA process.

Operational Risk Management (ORM)

Operational Risk Management (ORM) is a systematic process of identifying hazards, assessing risks, analyzing risk control options and measures, making control decisions, implementing control decisions, accepting residual risks, and supervising/reviewing the activity for effectiveness.

OEHSA and ORM

Another important concept surrounding OEHSA is its relationship to Operational Risk Management (ORM). OEHSA, through the HRA process, provides information that enables the commander's ORM decision-making. OEHSA supports ORM by providing health-related data and information that may impact the commander's goals and prioritization of mission objectives.

OEHSAs are required for both garrison and deployed operations, further supporting its relationship with ORM by providing data and information to define health risks in the context of a mission's operational risks.

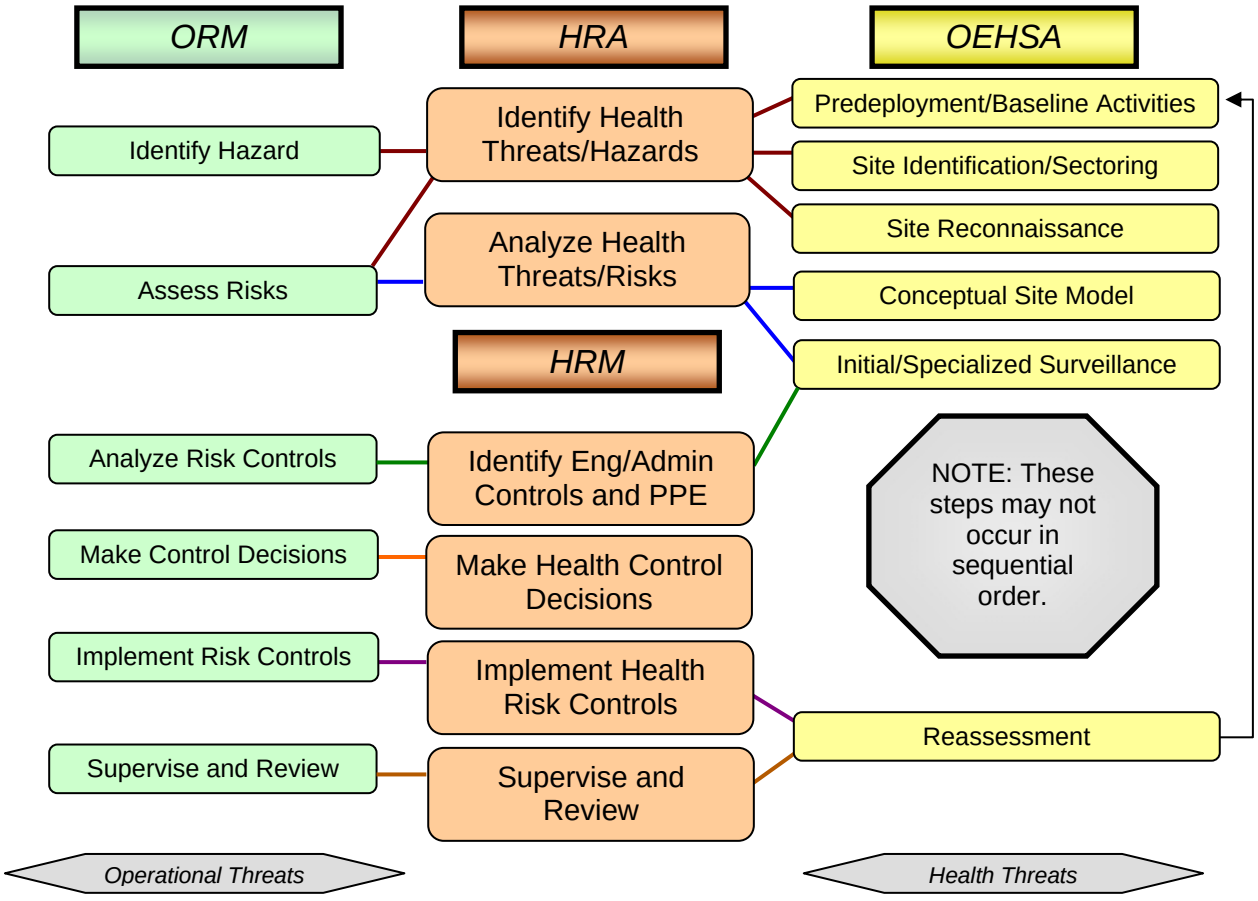
OEHSA and HRA

OEHSA is the key operational health tool for producing data or information used for health risk assessments (HRA) and to satisfy Occupational and Environmental Health (OEH) surveillance requirements.

Keep in mind that HRA is the "big picture" and is all-encompassing when it comes to assessing health risks. OEHSA is the portion of the HRA process that focuses on the quantification of health risks.

HRA, OEHSA, and ORM Steps (Page 13 of 15)

The graphic below shows the steps in the HRA process to help you learn how they correlate with OEHSA and ORM.



Appraisal (Page 14 of 15)

Audio Script

Narrator: You're almost finished with the training, but before you report back to your NCOIC, you want to make sure understand how OEHSA and HRA are related.

What is OEHSA's relationship to the HRA process?

A OEHSA is the portion of ORM that focuses on the communication of operational risks.

B OEHSA is a qualitative tool that determines the operational risk controls for ORM.

C OEHSA is the overarching process which includes HRA and focuses on the quantification of health risks.

D OEHSA is the portion of the HRA process that focuses on the quantification of health risks.

Lesson Summary (Page 15 of 15)

You have completed the training assignment that will prepare you for implementing the OEHSA process.

Keep in mind that OEHSA is the key operational health tool to produce data and information used for HRA and satisfy OEH surveillance requirements.

In this lesson you described the OEHSA process by:

- Identifying the steps in the OEHSA process.
- Correlating OEHSA to the HRA process.

Audio Script

NCOIC: I'm impressed with how much you've learned about OEHSA. That's good – I think you're ready for your assignment.

Lesson 2: Site Selection Considerations

Lesson Description

In this lesson you will learn that site selection is an important part of the OEHSA process. Specifically, you will learn about the role that you play and the things that should be considered when selecting a site. In addition, you'll see how site selections considerations influence the OEHSA process.

Lesson Overview (Page 1 of 13)

When site selection is performed as part of an OEHSA, BE helps identify and analyze the health risks personnel could be exposed to if a particular site is chosen. To fulfill this role, you could be involved with assessing health risks associated with potential beddown locations or facility placement, for instance.

As you work through your mission to recommend the most appropriate location for the MTF, you will:

- Recall BE roles in the site selection process.
- Summarize site selection considerations.
- Match site selection considerations to the OEHSA process.

Audio Script

NCOIC: I've received word from the Base Commander that there are plans to build a new medical facility on base. He's requested that we provide recommendations on the most appropriate location for the site. Some preliminary information has already been gathered. It's over at the CE Office.

Site Selection Roles (Page 2 of 13)

Your overall role in the site selection process is to help assess what health risks personnel could be exposed to if a particular site is chosen. The site selection process remains similar for garrison, deployed, and bare base locations.

When selecting a site for a specific purpose, there are several factors that impact its effectiveness and appropriateness. As part of the site selection process, BE's role may include:

- Assisting Civil Engineering (CE).
- Finding the best site to meet health, hygiene, and sanitation requirements.
- Minimizing environmental impacts.
- Conducting water vulnerability assessments.
- Recommending the location of facilities.

Site Selection Considerations (Page 3 of 13)

The site selection process is focused on obtaining information from a variety of sources to make a determination about the appropriateness of a site or issues that may affect a site. Below are items you should consider when evaluating a site, whether in garrison or at a deployed location.

Soil Composition

Soil composition is an important factor overall because the soil impacts many operations on the site. Composition of the soil can affect the digging of pit latrines and garbage trenches and the use of soakage pits, in addition to how well the soil holds tent stakes and absorbs liquid wastes.

The primary concern with soil composition from a BE perspective is how the composition affects exposure pathways for health threats. You should examine soil for existing contamination and the ability to transport chemicals or release vapors because of its composition and the activities that will be conducted on the site.

Prevailing Winds

Prevailing winds have the potential to cause several issues with a site. For example, it's always a best practice to keep the waste and decontamination sites downwind.

Climate / Season

You should always consider how the climate and season affect a site. For example, selection of a beddown location may be influenced if a certain area floods frequently during monsoon season. Remember, for locations below the equator, seasons are reversed.

Geography / Topography

Geography and topography are important considerations in terms of a site. For example, mountains and hills can help keep heat off personnel and facilities. When considering topography you should place assets upgrade from a pollution source.

Water Sources

Water sources are a key factor in the selection of a site. In addition to the need for potable water, you should consider whether the type / location of water present can cause a situation for bacterial or viral infections to spread.

The availability of surface water vs. groundwater is also an important consideration for site selection. You should determine if source water is or can be made potable.

When selecting a site, base your recommendations regarding water on the sources' quantity, quality, accessibility, and vulnerability.

Existing Field Contamination

When selecting a site, you may encounter the following signs of field contamination:

- Evidence of stressed vegetation.
- Dead or stressed animals.
- Sheens on or sludge deposits in water.
- Excessive algae growth.
- Obviously contaminated soils, such as oil slicks.

Sources of Pollution

Pollution can cause a variety of health risks to personnel and can thus adversely affect the mission of a site. Sources of pollution may include:

- Landfills.
- Agricultural or livestock waste.
- Industrial waste discharges.
- Domestic sewage discharge points.
- Storm runoff discharge points.

Potential Industrial Health Threats

You should avoid selecting sites in close proximity to industrial facilities that produce toxic or hazardous substances, as well as those facilities that use large quantities of hazardous substances. In addition to posing health threats to personnel through emissions exposure or accidental spills, these types of industrial facilities are often targets for bombing or sabotage.

Typical operations of concern include:

- Fertilizer plants.
- Oil refineries.
- Chemical plants.
- Nuclear power plants.
- Metal processing plants.

Noise Pollution

Noise pollution is an important consideration in site selection. When making recommendations for a site, you should try to allow separation of cantonment and flightline or industrial activities. Utilize distance, terrain, or foliage buffers to reduce the potential for noise pollution.

Habitat for Pests and Rodents / Vector Breeding Areas

Pests and rodents can cause a variety of health risks to personnel. Selecting a site that minimizes these risks is important.

You should determine if there are any potential vector-breeding areas nearby such as swamps, ponds, marshy areas, or standing water.

Tall grass and thick underbrush are often the breeding ground for ticks and fleas and should be avoided. Dumps and landfills which attract flies and rodents should also be avoided.

If you discover any of these potential health risks, you should inform Public Health.

Appraisal (Page 4 of 13)

Which of the following items is NOT a BE role during site selection?

Choices	**Answer**
Construct facilities	_____
Conduct water vulnerability assessments	
Assist Civil Engineering	
Determine best site to meet sanitation requirements	
Minimize environmental impacts	
Recommend the location of base facilities	

Facility Placement Recommendations (Page 5 of 13)

While considering the selection of a site for new facilities, placement can be a key factor. At a minimum, when determining the site and/or placement of facilities on a given site you should consider the health and hygiene consequences of placing certain entities too near, downwind, or downgradient from other entities. For instance, in a garrison setting, you would want to place waste dumpsters downwind and as far away from base housing as feasible, while still being useful to residents. When considering site selection in a deployed setting, facility placements should meet predetermined health, hygiene, and sanitation guidelines provided in the BE Field Manual so the risk of adverse effects will be minimized.

Below are specific facility guidelines for deployed locations.

Medical Facilities

Medical facilities should be located so they are easily accessible to patients and not close to tactical targets. In addition, they should be located upwind from industrial / environmental liabilities, such as the decon site or flightline.

Food Facilities

Food facilities should be located at least 100 yards uphill, upwind, and upstream from latrines and 30 yards from waste disposal areas.

Latrines and Showers

Keep latrines a minimum of 100 yards downwind, downhill, and downstream from the food facility, 100 feet from water sources, and at least 50 feet from living/sleeping areas.

Adequate showers with appropriate soakage pits promote good personal hygiene. Because hand washing is key to disease prevention, you should locate hand washing stations, at a minimum, near latrines, food facilities, and medical facilities.

Waste Disposal Areas

Waste disposal areas should be at least 30 yards from water sources and food facilities.

Sleeping Areas

The sleeping areas should be located a minimum of 50 feet from latrines. In addition, they should be placed away from flightline noise.

Watering Points

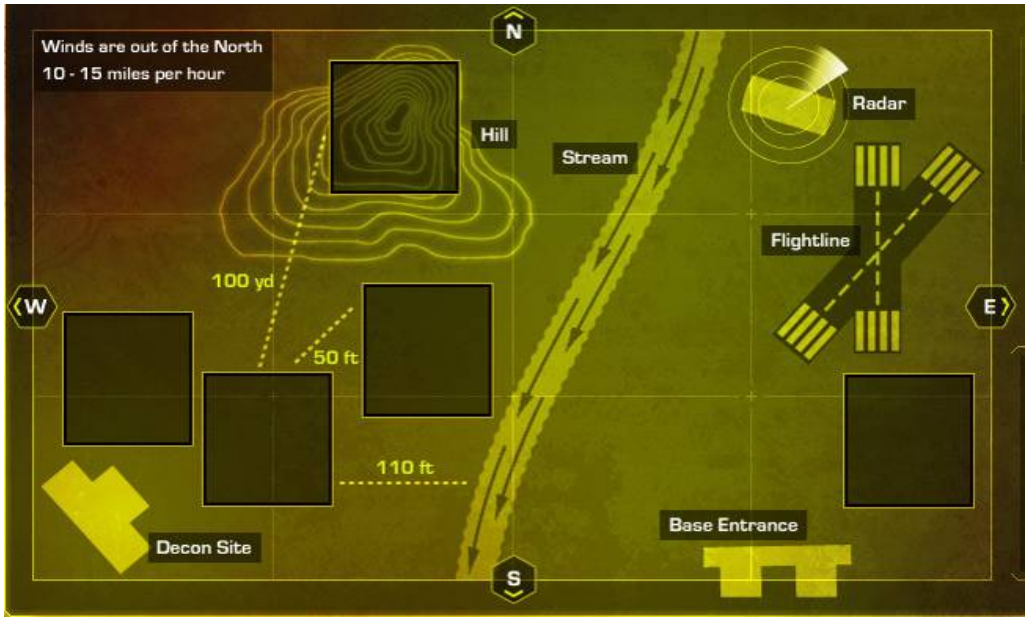
Watering points should be upstream from all waste sites, and storage tanks should be located at least 50 feet from the sewage disposal system.

Facility Placement Recommendations (Page 6 of 13)

Match the facilities or areas to their most appropriate placements for this sample deployed location.

Facilities
Food Facility
Waste
Latrines
Sleeping Area
Medical Facility

	Placements
_____	On the hill
_____	South of the flightline
_____	Bottom of the hill, closest to the stream
_____	100 yds from the facility on the hill
_____	Bottom of the hill, to the far West



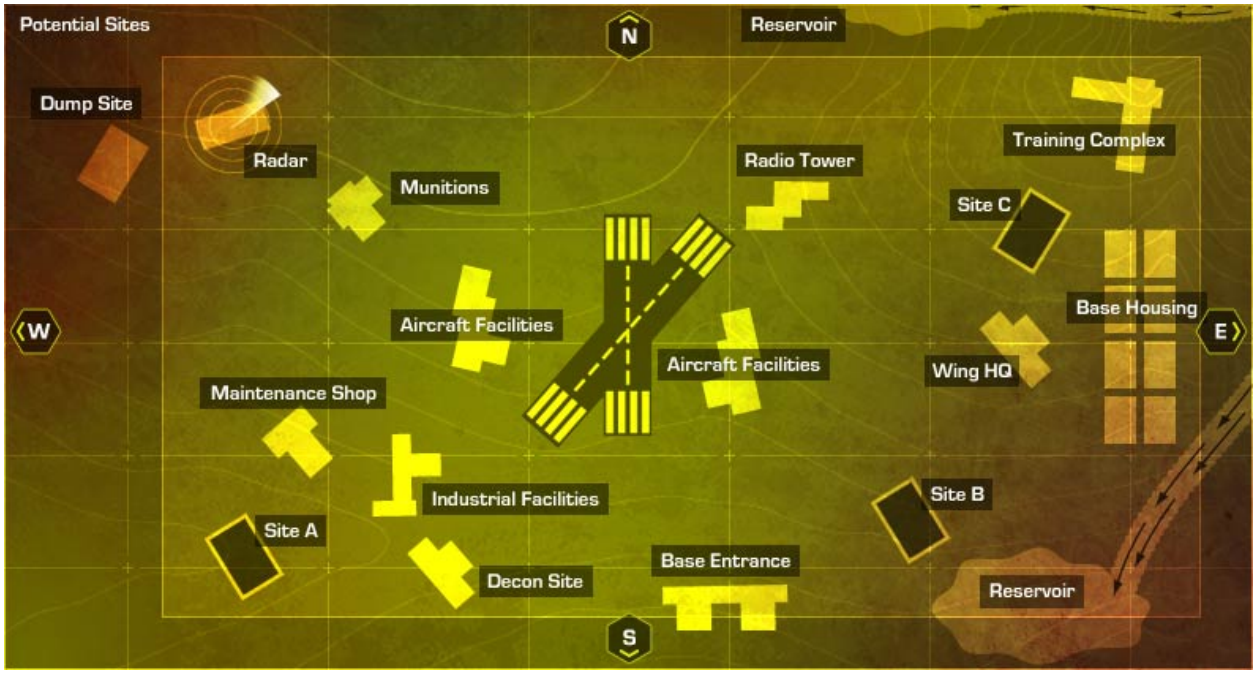
Nigel AFB Scenario (Page 7 of 13)

You're ready to begin the site selection process for the new medical facility at Nigel AFB. You begin by reviewing documentation about past efforts to expand the base to identify what issues or considerations were accounted for in those projects. In addition, you review a current map of the base to gain a general idea of the geography and topography of the area.

Nigel AFB has recently added a mission supporting overseas humanitarian operations using cargo aircraft. Due to this expansion, many of the previously available sites are being used to build hangars and other warehouse facilities to support this mission.

After reviewing the base expansion documentation and the current map of the base, you initially identify several **potential site**s you want to review further.

Potential Sites



Nigel AFB Scenario (Page 8 of 13)

Given that the base is established, many of the off-base site considerations have already been identified. The nearest industrial facility that could pose an issue is a chemical plant which produces pesticides. It's located a half-mile outside the base perimeter, just north of the Training Complex. The base is located in a very cold and remote location, lessening many industrial and existing field contamination health threats.

Audio Script

CE Officer: I heard you're trying to find a location for the new medical facility. Site selection can be tricky here, considering that the flightline is right in the middle of the base. We had to move about a thousand residents from the end of the flightline about a year ago because the noise levels were too high.

That flightline was sort of an afterthought, really. Believe it or not, this base didn't always support aircraft operations. It was originally used for supplying weather data to ships in the Pacific. So when we started supporting cargo aircraft, a larger flightline had to be built, and that's the only site they had available.

You know, it might be helpful for you to know a little bit about the weather conditions here. We normally get winds out of the north at about 5 to 10 miles per hour. They can get stronger in the winter. Just what we need when the temperatures drop to 40 below – stronger wind!

Well, I hope this information helps you choose a site for the MTF. Good luck!

Nigel AFB Scenario (Page 9 of 13)

After reviewing present and past external factors that could be potentially harmful to personnel, you decide to review how the base is set up and what boundaries currently exist. You work with CE and identify an area of the base near Site A, one of the proposed medical facility locations, which is in a flood plain. You decide to interview an individual who works in the maintenance shop closest to that area.

Audio Script

BE Tech: I'm checking out a few areas on base to try to find the best location for a new medical facility. Do you have time to answer a few questions?

Shop Worker: Sure, how can I help?

BE Tech: I've been told this area is subject to flooding. Have you ever noticed any problems?

Shop Worker: You bet! In about four or five months, when all the snow and ice melts, that field outside the shop will be a pool of water. Happens every year. About May or June, CE comes to pump out the water. So yeah, it's always been an issue.

BE Tech: Do you know of any other issues in this area?

Shop Worker: No, I can't think of any – just the flooding.

BE Tech: Okay, thanks for your help.

Nigel AFB Scenario (Page 10 of 13)

Audio Script

Narrator: You continue your reconnaissance by driving around the perimeter of the base. After stopping at the bottom of a hill just outside the base, you exit the vehicle and walk to the top. Standing on the hill allows you to obtain a good view of the layout of the base. Because you're making recommendations for a medical facility, you know that you must identify a site that is easily accessible to patients, not close to tactical targets, and located

upwind from the decon site. Based on all the information gathered to this point and the available locations, it looks like Site B is your best option.

Scenario Challenge Point (Page 11 of 13)

As you make your way back inside the base, you begin to organize the various health risks related to the selection of the site. Which one of the following OEHSA steps organizes a site's Areas of Concern (AOCs), media pathways, potential pathway from media to receiver, activity or points of exposure, exposure routes, and Similar Exposure Groups (SEGs)?

A Predeployment and Baseline Activities

B Site Identification and Sectoring

C Site Reconnaissance

D Conceptual Site Model

Site Selection and OEHSA (Page 11a of 13)

OEHSA plays an important role in the site selection process. Recommendations for site selection are developed through the first five steps of the OEHSA process. More information about each step is provided below.

Tab: Predeployment and Baseline Activities

During the Predeployment and Baseline Activities step, you'll collect and document pertinent site information that deals with potential hazards. Your objective is to identify present and past external factors that could have adverse health effects on personnel. This will allow you to recommend the option for a particular site or facility location that minimizes health risks. As you may remember from the previous lesson, when performing this step relating to site selection, you should consider:

- Known hazardous waste sites.
- Known contamination and pollution in air, water, and soil.
- Typical climate conditions including normal and extreme temperatures, seasonal precipitation, and seasonal prevalent wind directions and velocities.
- Known property use including type of infrastructures (e.g., buildings, transportation networks, water treatment and distribution systems, wastewater collection and treatment systems, and known power generation and transmission systems).
- Historical and current property use of site/base (e.g., agricultural, industrial, commercial and/or residential use).
- Maps, topographic and geological information relevant to the area.
- Data on worldwide diseases and environmental health risks. This can be accessed using the MEDIC CD.

Tab: Site Identification and Sectoring

This step in the OEHSA process relates to site selection by defining the overarching boundaries of the site beginning with the area of responsibility (AOR), area of operations (AO), missions, equipment, and personnel executing those missions.

Tab: Site Reconnaissance

Site Reconnaissance is used to validate the information collected during the Predeployment and Baseline Activities step. It also allows you to determine whether there is acceptable distance from particular AOCs.

During this step in site selection you should:

- **Review Predeployment and Baseline Activities.**
- **Investigate the area immediately around the site.**
- **Conduct interviews.**
- **Conduct air, soil, and water reconnaissance.**
- **Investigate on-base industrial sources.**
- **Investigate off-base industry.**

For example, if a site was a former nuclear test facility, you would sample to determine if there is contamination present, visually identify any evidence of contamination in the soil or vegetation, and determine if the site could pose health risks to personnel. If current conditions make soil sampling or visual confirmation of the findings unfeasible, appropriate site reconnaissance may be conducted by relying on worker reports and the intelligence provided by base personnel.

Review Predeployment and Baseline Activities

When reviewing Predeployment and Baseline Activities you should specifically look to refute or confirm preliminary hazard analysis.

Investigate the Area Immediately Around the Site

As appropriate, when investigating the area immediately around the site, you should:

- Seek an elevated location (e.g., a hill or rooftop) to observe the site and surrounding area.
- Drive or walk the perimeter of the site.
- Identify onsite potential or possible environmental releases, and/or other environmental conditions that might compromise the beddown site.
- Identify potential hazardous radioactive material or waste sources including source types, dimensions, locations and evidence of poor containment. Estimate the area or volume of these sources.
- Identify any potential environmental conditions that may require the use of PPE.

- Look for evidence of hazardous/radioactive material migration on or from the site, including stressed vegetation, areas of visibly stained soil, or outfalls.
- Identify potential breeding sites and/or other evidence of pest infestation.

Conduct Interviews

Seek approval to interview the U.S. Embassy Defense Attaché, host nation military liaison, health officials, local fire brigade, emergency responders, site workers, and occupants of adjacent properties.

Ask questions regarding waste disposal practices and any known or suspected environmental problems such as spills in the area, problems with contaminated wells, health problems in site workers, complaints from adjacent properties, odors, communicable and/or infectious diseases, and use of pesticides, herbicides and fertilizers.

Conduct Air, Soil, and Water Reconnaissance

As appropriate, when conducting air, soil, and water reconnaissance, you should consider the:

- Identification of an actual or potential source and location of contaminants.
- Delineation of release areas.
- Topographical features including hills, gradients, and surface vegetation or pavement.
- Surface geology including soil types and characteristics, outcrops, faulting, and other features.
- Subsurface geology including stratigraphy, continuity, connectivity, and other characteristics.
- Surface water drainage.
- Hydrogeologic information identifying water-bearing zones, hydrologic parameters, and impermeable strata.

Investigate On-base Industrial Sources

When investigating on-base industrial sources, you may decide to:

- Measure the distance between facilities and processes.
- Identify sewer systems, utilities, and solid waste units.
- Identify truck or railcar loading/unloading areas.

Investigate Off-base Industry

When investigating off-base industrial sources, you may consider:

- Municipal water and sewer treatment.
- Raw materials used and waste disposal.
- All industrial facilities within a 20-mile radius of the base.
- All discharges such as industrial plumes or wastewater discharges.

Tab: Conceptual Site Model (CSM)

You'll use the information gathered through the first three steps of OEHSA to develop the Conceptual Site Model.

Example of a Conceptual Site Model for a Source Release and the Associated Exposure Pathways

#	Area of Concern	Potential Source of Release	Media Pathway	Activity or Point of Exposure	Exposure Route	SEG Affected
1	Local dump site (off base)	Leaching into ground water	Drinking Water	Drinking water dining facility	Ingestion	All personnel
2	Flightline	Industrial emissions	Air	Dust generation & volatization	Inhalation & contact	Flightline operations personnel
3	Burn pit	Air emission	Air/Soil deposition	Downwind/ digging operations	Inhalation & contact	All personnel, CE ground, COM

Table 1-2 from the BE Field Manual, January 2008 based on ASTM E2318-03, Standard Guide for Environmental Health Site Assessment Process for Military Deployments

Tab: Initial and Specialized Surveillance

Sampling and analysis of air, soil, surface water, drinking water, or hazardous waste may be required to identify ambient threats that pose potential heath risks to personnel at a given site.

Initial surveillance is performed to identify if further analysis, or specialized surveillance, is needed to quantify the health risks and/or support recommendations regarding the site selection.

Nigel AFB Scenario (Page 12 of 13)

After organizing your information, you meet with the base commander and your NCOIC to present your recommendation for the site.

Audio Script

Base Commander: I see you've been busy. What do you have for me?

BE Tech: I've reviewed all the site considerations and placement requirements for a medical facility, and I think the best location would be Site B on this map.

Base Commander: All right. Why is that the most appropriate location? What's wrong with A and C?

BE Tech: Well, if we choose Site A, we'd be locating the MTF in a flood plain. Site C is fairly close to a chemical plant.

Site B is near the base entrance and base housing, which will make it easily accessible. It'll also be upwind from the decon site.

NCOIC: We haven't found any other health risk issues at or around that area, so I agree with the recommendation to use Site B for the new MTF.

Base Commander: Thank you both for your assistance. I'll take your recommendation into consideration.

NCOIC: Thank you, Sir.

Lesson Summary (Page 13 of 13)

You've found that site selection is an important component of the OEHSA process and that your overall role in site selection is to help assess what health risks personnel could be exposed to if a particular site is chosen.

You've learned about the many factors which must be considered when selecting a site, including geological or environmental features and the potential for pollution or other health threats in the area. At a minimum, the site and/or placement of facilities on a given site should meet predetermined health, hygiene, and sanitation guidelines so the risk of adverse effects will be minimized.

In this lesson, you:

- Recalled BE roles in the site selection process.
- Summarized site selection considerations.
- Matched site selection considerations to the OEHSA process.

Audio Script

NCOIC: The Base Commander has accepted your recommendation, and construction for the new medical facility is underway. Nice work!

Resources

- AFMAN 48-154, Occupational and Environmental Health Site Assessment
- Bioenvironmental Field Manual, 2008
- ASTM E 2318-03, Chap 7

Answer Key: Appraisals / Scenario Challenge Points

Lesson 1: OEHSA Process

Page 7 of 15

Match each description with the associated step in the OEHSA process by marking the appropriate block in the table.

Description	Predeployment and Baseline Activities	Site Identification and Sectoring	Site Reconnaissance
Defines the AOR, AO, and missions, including personnel and equipment.		X	
Used to verify the data and information that has already been gathered.			X
Focused on considering information that is already known about a site.	X		

Rationale: The Predeployment and Baseline Activities step focuses on considering information that is already known about the site. The Site Identification and Sectoring step defines the area of responsibility (AOR), area of operations (AO), and missions which include the personnel and equipment executing those missions. The Site Reconnaissance step is used to verify what you anticipated and information gathered during the Predeployment and Baseline step.

Page 11 of 15

Following are several questions to check your knowledge of the steps of the OEHSA process.

Which one of the following steps in the OEHSA process begins when data and information is gathered during the Predeployment and Baseline Activities step?

A Conceptual Site Model

Which one of the following steps in the OEHSA process is used to detect or identify ambient threats or hazards that pose potential health risks?

B Initial Assessment

Which one of the following steps in the OEHSA process determines whether previous data and assumptions remain true or have changed?

C Reassessment

Rationale: The Conceptual Site Model step of the OEHSA process process begins when data and information is gathered during the Predeployment and Baseline Activities step. The Initial Assessment step is used to detect or identify ambient threats or hazards that pose potential health risks. In the Reassessment step, you will determine whether previous data and assumptions remain true or have changed.

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What is OEHSA's relationship to the HRA process?

D OEHSA is the portion of the HRA process that focuses on the quantification of health risks.

Rationale: OEHSA is the portion of the HRA process that focuses on the quantification of health risks. HRA is the "big picture" and is all-encompassing when it comes to assessing health risks.

Lesson 2: Site Selection Considerations

Page 4 of 13

Which of the following items is NOT a BE role during site selection?

Choices	Answer
Construct facilities	**Construct facilities**
Conduct water vulnerability assessments	
Assist Civil Engineering	
Determine best site to meet sanitation requirements	
Minimize environmental impacts	
Recommend the location of base facilities	

Rationale: Assisting Civil Engineering (CE); finding the best site to meet health, hygiene, and sanitation requirements; minimizing environmental impacts; conducting water vulnerability assessments; and recommending the location of facilities are all BE roles in site selection. Constructing facilities and minimizing environmental impacts are not BE roles.

Page 6 of 13

Match the facilities or areas to their most appropriate placements for this sample deployed location.

Facilities	Placements
Food Facility	On the hill
Waste	South of the flightline
Sleeping Area	Bottom of the hill, closest to the stream
Latrines	100 yds from the facility on the hill
Medical Facility	Bottom of the hill, to the far West

Rationale: While there are several ways these facilities could be placed, the answers displayed represent best practices by accounting for personnel safety requirements and access considerations. When selecting a site, you should ensure medical facilities are located so they are accessible to patients and not close to tactical targets. In addition, they should be located upwind from industrial / environmental liabilities, such as the decon site or flightline. Food facilities should be located at least 100 yards uphill, upwind, and upstream from latrines and 30 yards from waste disposal areas. Latrines should be kept a minimum of 100 yards downwind, downhill, and downstream from the food facility, 100 feet from water sources, and at least 50 feet from living / sleeping areas. Waste disposal areas should be 30 yards from water sources and food facilities. The sleeping areas should be located a minimum of 50 feet from latrines and away from flightline noise.

Page 11 of 13

As you make your way back inside the base, you begin to organize the various health risks related to the selection of the site. Which one of the following OEHSA steps organizes a site's Areas of Concern (AOCs), media pathways, potential pathway from media to receiver, activity or points of exposure, exposure routes, and Similar Exposure Groups (SEGs)?

D Conceptual Site Model

Rationale: The Conceptual Site Model (CSM) organizes a site's Areas of Concern (AOCs), media pathways, potential pathway from media to receiver, activity or points of exposure, exposure routes, and Similar Exposure Groups (SEGs) related to the selection of a site. Predeployment and Baseline Activities, Site Identification and Sectoring, and Site Reconnaissance are the steps taken to gather the information for the Conceptual Site Model (CSM).

Course Glossary

Acronyms

AAR
After Action Report

ACADA
Automatic Chemical Agent Detection Alarm

AFI
Air Force Instruction

AFMIC
Armed Forces Medical Intelligence Center

AFMS
Air Force Medical Service

AFMSA
Air Force Medical Support Agency

AFOSH
Air Force Occupational and Environmental Safety, Fire Prevention and Health

AFRRAD
Air Force Radiation and Radioactive Recycling and Disposal

ALARA
As Low As Reasonably Achievable

AMC
Aerospace Medicine Council

amu
Atomic Mass Unit

AO
Area of Operations

AOC
Area of Concern

AOR
Area of Responsibility

BE
Bioenvironmental Engineering Flight

CBRN
Chemical, Biological, Radiological, Nuclear

CE
Civil Engineering

COA
Course of Action

COC
Contaminant of Concern or Constituent of Concern

CONUS
Continental United States

CSM
Conceptual Site Model

CV
Coefficient of Variability

DIA
Defense Intelligence Agency

DF
Duty Factor

DOD
Department of Defense

DOE
Department of Energy

DOS
Department of State

DOT
Department of Transportation

D_{pel}
Estimated Hazard Distance

DRI
Direct Reading Instruments

EHF
Extremely High Frequency (Occurs between 30 and 300 GHz)

EMR
Electromagnetic Radiation

EPA
Environmental Protection Agency

EPD
Electronic Personal Dosimeters

FPWG
Force Protection Working Group

G_{abs}
Absolute Gain

HF
High Frequency (Occurs between 3 and 30 MHz)

HRA
Health Risk Assessment

HRE
Health Risk Estimate

HRM
Health Risk Management

IATA
International Air Transport Association

IPE
Individual Protection Equipment

LCL
Lower Confidence Limits

LET
Linear Energy Transfer

LF
Low Frequency (Occurs between 30 and 300 kHz)

MAJCOM
Major Command

MEDIC CD
Medical Environmental Disease Intelligence and Countermeasure CD

MIO
Medical Intelligence Officer

MF
Medium Frequency (Occurs between 300 and 3,000 kHz (3MHz))

MOPP
Mission Oriented Protection Posture

MPE
Maximum Permissible Exposure

MSP
Mission Support Plan

NFB
Near-Field Boundary

NGIC
National Ground Intelligence Center

NHZ
Nominal Hazard Zone

NIOSH
National Institute for Occupational Safety and Health

NOHD
Nominal Ocular Hazard Distance

NRC
Nuclear Regulatory Commission

OCONUS
Outside the Continental United States

OEH
Occupational and Environmental Health

OEHSA
Occupational and Environmental Health Site Assessment

OEL
Occupational Exposure Limits

OEL-C
Occupational Exposure Limits-Ceiling

OEL-STEL
Occupational Exposure Limits-Short Term Exposure Limit

OEL-TWA
Occupational Exposure Limits-Time Weighted Average

OH
Occupational Health

ORM
Operational Risk Management

OSHA
Occupational Safety and Health Administration

OSI
Office of Special Investigation

P_{avg}
Average Power

PEL
Permissible Exposure Limit

PH
Public Health

P_p
Peak Power

PPBS
Planning, Programming and Budgeting System

PPE
Personal Protective Equipment

PPM
Parts per million

PRF
Pulse Repetition Frequency

PW
Pulse Width

RFR
Radio Frequency Radiation

RSO
Radiation Safety Officer

S
Main-Beam Power Density

SAR
Specific Absorption Rate

S_{avg}
Power Density Average

SEG
Similar Exposure Group

SHF
Super High Frequency (Occurs between 3 and 30 GHz)

SLM
Sound Level Meter

S_{max}
Maximum Power Density

SPL
Sound Pressure Level

TLD
Thermoluminescent Dosimeters

TWG
Threat Working Group

UHF
Ultra High Frequency (Occurs between 300 and 3,000 MHz)

USACHPPM
United States Army Center for Health Promotion and Preventive Medicine

UTC
Unit Type Code

VA
Vulnerability Assessments

VHF
Very High Frequency (Occurs between 30 and 300 MHz)

VLF
Very Low Frequency (Occurs between 3 and 30 kHz)

Definitions

Absolute Gain (G_{abs})
The ratio of the power that would be required at the input of an ideal isotropic radiator to the power actually supplied to the given antenna, to produce the same radiant intensity in the far-field region.

Action Level
An airborne exposure level that dictates active air monitoring, medical monitoring, and employee training. The Action Level is one-half the Occupational Exposure Limit for time-weighted average (OEL-TWA) exposures, except where 29 CFR 1910 Subpart Z designates a different concentration or where the statistical variability of sample results indicates that a lower fraction of the OEL should be used as the Action Level.

Activity
The number of disintegrations or transformations of radioactive material per unit of time (usually expressed in seconds).

Antenna
The point on an RFR emitter where RFR energy radiates into free space.

Asbestos
A natural material that is made of tiny threads or fibers. The fibers can enter the lungs as a person breathes. Asbestos can cause many diseases, including cancer. Asbestos was used to insulate houses from heat and cold. It has also been used in car brakes and for other purposes. Some old houses still have asbestos in their walls or ceilings.

Asbestosis
A lung disease caused by breathing asbestos fibers over a period of time. The fibers eventually scar the lungs and make breathing difficult. Symptoms are similar to asthma.

Atomic Mass Unit (amu)
Approximately equal to the mass of a proton or a neutron and is used to describe the mass of an atom.

Becquerel (Bq)
The international standard for the unit of measurement for activity.

Breathing Zone
The location where exposure is measured in air sampling. The breathing zone is located forward of the shoulders within 9 inches of the nose and mouth. Breathing zone measurements are taken beneath a welder's helmet or face piece but outside of any respiratory protective devices.

Bremsstrahlung
An interaction that causes a form of x-ray production in which high-speed beta particles penetrate the electron cloud and interact with the nucleus.

Carcinogens
Hazardous materials that stimulate the formation of cancer.

Ceiling Limit (OEL-C)
The limit for an employee's exposure which shall not be exceeded during any part of the work day. If instantaneous monitoring is not feasible, the OEL-C will be evaluated during the worst-case 15-minute exposure period.

Chrysotile
The most common asbestos type. Chrysotile asbestos fibrils may appear crinkled, like permed or damaged hair, under plane-polarized light.

Coefficient of Variation (CV)
For an air sampling method, the CV is the standard deviation of the sampling and analytical error divided by the mean of the sample results. The CV is used to calculate the confidence limits for sampling. OSHA uses the term sampling and analytical error (SAE) to account for the total variation or error in the method.

Compton Scatter
A gamma/x-ray interaction which takes place between a photon and an outer electron where the photon has more energy than the electron can accept, so it imparts only a portion of its energy to the electron.

Conceptual Site Model (CSM)
Articulates the health threats and exposure pathways and begins when data or information is gathered during Predeployment and Baseline Activities.

Confidence Limits
The upper confidence limit (UCL) and lower confidence limit (LCL) are the boundaries for a single sample or a series of samples that have a specified probability (usually 95 percent) of including the true value of the level of exposure.

Controlled Environments
An area where personnel are aware of the potential for RFR exposures associated with their employment or duties.

Counts per minute (cpm)
The amount of radiation detected by an instrument each minute.

Diffuse Reflection
Situations where a laser beam is bounced off a dull or uneven surface that breaks the beam apart.

Disintegration per minute (dpm)
The number of atoms that decay or transform in a given amount of material per minute.

Disintegration per second (dps)
The number of atoms that decay or transform in a given amount of material per second.

Dose
The quantity of radiation absorbed.

Dose Rate
The quantity of radiation absorbed per unit of time.

Duty Factor (DF)
A unit-less number which only applies to pulsed wave systems that describes the ratio of time an RFR emitter is on to the total operating time.

Electromagnetic Radiation (EMR)
Waves of energy that can travel through space and matter.

Electromagnetic Spectrum
The entire frequency range of electromagnetic waves, or wave radiation.

Energy
The ability to do work.

Estimated Hazard Distance (D_{pel})
The distance from the antenna to the point where the power density equals the permissible exposure limit (PEL).

Excitation
Occurs when there is an addition of energy to an atomic system, changing the atom from a "ground" state to an excited state.

Exposure
Exposure occurs when an employee is subjected to a hazardous material through any of these routes: inhalation, ingestion, skin contact, or skin absorption. Airborne exposures are specified as the duration and concentration of hazardous materials measured in the breathing zone of an individual worker without regard for personal protective equipment used by the worker.

Exposure Assessment
An exposure assessment is a process of estimating or calculating potential exposure of a health threat for an individual or population at risk. The assessment includes professional judgment, calculations based on estimates or models, actual measurements, collection and analysis of samples, and statistical evaluation.

Exposure Pathway
Includes a threat and the opportunity for the population to come into contact with the threat.

f
Algebraic express that means, "a function of."

Fission
The splitting of the nucleus of an atom into nuclei of lighter atoms, accompanied by the release of energy.

Frequency
A value of how often a wavelength cycle occurs in a second.

Gain
The antenna's ability to concentrate its energy in a certain direction.

Hazardous materials
Materials that pose a hazard and require a Material Safety Data Sheet as defined in FED-STD 313, Federal Standard, Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Governmental Activities.

Health Risk
The health risk equals threat "combined with" vulnerability (health risk = (threat) + (vulnerability)). A health risk is an identified health threat and the vulnerability of the population at risk of coming into contact (i.e., completion of an exposure pathway) with the health threat.

Health Risk Assessment (HRA)
Health risk assessment is the process of identifying and analyzing or evaluating (exposure and toxicity assessments) OEH threats in populations or at locations over time (HRA = f [(health risk) "+" (HRE) "+" (COA)]). The HRA "product" is the validated health threat, qualified by the HRE, and the COA which includes overall mission impact, recommended control options, associated uncertainties, risk mitigation estimate(s), and a cost-benefit analysis if applicable.

Health Risk Communication
Health risk communication is the process of effectively communicating potential health effects, outcomes, and control measures to all stakeholders (i.e., commanders, supervisors, AF personnel, military, families, and the public). It provides detailed information about the HRA and should occur throughout the HRA process.

Health Risk Estimate (HRE)
Health Risk Estimate is the probability and severity of loss from exposure to the health threat. The HRE is a function of probability and severity when either or both increase the Health Risk Estimate increases. The HRE is also referred to as a health risk level.

Health Risk Management (HRM)
Health risk management is a decision-making process to evaluate and select COAs, minimize OEH risks, and maximize benefits for operations and missions. HRM is the health component of the ORM process and health risk management recommendations and decisions are integrated into the commander's ORM decision-making.

Health Threat
A health threat is a potential or actual condition that can cause short or long-term injury, illness, or death to personnel. A health threat can be occupational or environmental in origin; internal or external to the installation; or continuous, intermittent, or transient; and includes enemy capability and intent.

Ionization
Occurs when beta particles interact with nearby atoms causing an electron to be removed, creating an ion pair.

Ionizing Radiation
Radiation which has enough energy to change the atomic structure of matter.

Isotope
Elements with the same number of protons, but a different number of neutrons.

Kinetic Energy
Energy of motion.

Laser
Light amplification by stimulated emission of radiation.

Linear Energy Transfer (LET)
Energy lost by particles along the path through which they are traveling.

Mass
Description of how much matter there is present in an object.

Maximum Permissible Exposure (MPE)
The level of laser radiation to which a person may be exposed without hazardous effects or adverse biological changes in the eyes or skin.

Mesothelioma
Cancer that generally occurs in the chest, abdominal region, and areas surrounding the heart. It is typically associated with exposure to asbestos.

n
Algebraic express that means, "Number of samples."

Nominal Hazard Zone (NHZ)
The area within a laser workplace in which the exposure from direct beam, specular reflection, and diffuse reflection could exceed the Maximum Permissible Exposure (MPE).

Nominal Ocular Hazard Distance (NOHD)
The distance along the laser beam beyond which the exposure is not expected to exceed the appropriate Maximum Permissible Exposure (MPE).

Non-aqueous Phase Liquids (NAPLs)
Non-aqueous phase liquids are liquids that are sparingly soluble in water. Because they do not mix with water, they form a separate phase. For example, oil is an NAPL because it does not mix with water, and oil and water in a glass will separate into two separate phases. NAPLs can be lighter than water (LNAPL) or denser than water (DNAPL). Hydrocarbons, such as oil and gasoline, and chlorinated solvents, such as trichloroethylene, are examples of NAPLs.

Non-ionizing Radiation
Radiation which does not have enough energy to change the atomic structure of matter.

Nuclear Stability
Describes the certain combinations of neutrons and protons within a nucleus of an atom which are required for that atom to be considered stable.

Occupational and Environmental Health Site Assessment (OEHSA)
The key operational health tool for producing data or information used for health risk assessments (HRA) and to satisfy Occupational and Environmental Health (OEH) surveillance requirements.

Occupational Exposure Limit (OEL)
The limit for the airborne concentrations of a specified substance for a specified time. Employees will not be exposed to concentrations greater than the OEL. The term OEL includes all OEL-TWAs, OEL-STELs, OEL-Cs, and acceptable ceiling concentrations, that apply to a specific substance. For each hazardous material, the OELs are the most stringent limits found in the latest edition of the TLV Booklet published annually by the American Conference of Government Industrial Hygienists, in 29 CFR 1910 Subpart Z, and in AFOSH Standards for specific substances. OELs apply to occupational exposures for each individual worker for a single 8-hour work shift except where 29 CFR 1910 Subpart Z allows 40-hour averages. Exposure during work shifts that exceed 8 hours must be adjusted before applying an OEL.

Operational Risk Management (ORM)
A systematic process of identifying hazards, assessing risk, analyzing risk control options and measures, making control decisions, implementing control decisions, accepting residual risks, and supervising/reviewing the activity for effectiveness.

Optical Cavity
The component that houses the laser.

Pair Production
Occurs when a photon disappears in the vicinity of a nucleus, and an electron and positron appear in its place.

Particulate Radiation
Fast-moving atomic or subatomic particles that may be charged positively or negatively or not at all.

Peak Power (P_p)
The maximum power density during the on time for a pulsed wave system.

Permissible Environment
Operational environment in which host country military and law enforcement agencies have control as well as the intent and capability to assist operations that a unit intends to conduct.

Permissible Exposure Limit (PEL)
The value to which an individual may be exposed without exhibiting damaging biological effects and is based on the emitter's frequency.

Photochemical Reaction
A chemical reaction which is induced by the absorption of energy in the form of visible, infrared, or ultraviolet radiation.

Photoelectric Effect
An "all or none" energy loss where gamma rays impart all of their energy into an electron.

Pleural Effusion:
When too much fluid collects between the lining of the lung and the lining of the inside wall of the chest.

Positron
Created when a proton changes into a neutron and a positron because there are too many protons in the n:p ratio.

Potential Energy
Energy of position.

Pulse Repetition Frequency (PRF)
The number of times the signal is on per unit of time.

Pulse Width (PW)
The length of time the signal is on for a pulsed wave system.

Quality Factor (Q)
A dimensionless quantity assigned to each type of radiation that allows doses to be normalized in relation to each other.

Radiation
Energy in the form of waves or moving subatomic particles emitted by an atom or other body as it changes from a higher energy state to a lower energy state.

Radiation Absorbed Dose (RAD)
The amount of radiation absorbed by the tissue.

Radioactive Decay
The spontaneous disintegration or transformation of an atom in an attempt by that atom to reach a stable state.

Radioactive Material (RAM)
Material which contains unstable (radioactive) atoms that give off radiation as they decay or transform.

Radioactivity
The spontaneous emission of matter or energy from the nucleus of an unstable atom.

Radioisotopes
Unstable isotopes that, in an attempt to become a stable atom, emit energy in the form of radiation.

Regulated Area
An area under the supervisor's control where entry and exit are restricted and controlled to prevent exposure to hazards. An area shall be established when a requirement in 29 CFR 1910 or 29 CFR 1926 exists, or when BE determines that employees entering the area might be exposed to a hazard unless access is controlled.

Short Term Exposure Limit (OEL- STEL)
A time-weighted exposure for a 15 minute (or shorter) period which shall not be exceeded during the work day. The definition of STEL is different in 29 CFR 1910.1000 (a) (5) (ii) and in the TLV Booklet. The definition must correspond to the reference being cited. As with other OELs, OEL-STELs are the most stringent limits found in the latest TLV Booklet, in 29 CFR 1910 Subpart Z, and in AFOSH Standards for specific substances.

Short-Term Public Emergency Exposure Guideline (SPEGL)
An acceptable peak concentration for unpredicted, single, short-term emergency exposures of the general public. These limits do not apply to occupational exposures.

Specific Absorption Rate (SAR)
An expression of how much RFR energy is imparted to each kilogram of biological body mass per second. SAR is expressed in units of watts per kilogram (W/kg).

Specular Reflection
Situations where a laser beam is reflected from shiny, mirror-like surfaces.

Spontaneous Fission
Spontaneous fission is a natural mode of decay in which nuclei disintegrate.

Stakeholders
Any individual who is affected by the content of the communication and/or will be making decisions based on the information provided.

Stratigraphy
The layering of rock or ice strata, from which information on succession, age relations, and origin can be deduced.

Threshold Limit Values—(TLVRs)
Exposure guidelines published annually by the American Conference of Governmental Industrial Hygienists (ACGIH) in Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. TLVRs are employed as OELs when they are more stringent than the OSHA PELs.

Time-Weighted Average (OEL-TWA)
Eight-hour average concentration for which the average is mathematically adjusted for the duration of exposure. The method for calculating OEL-TWAs is shown in 29 CFR 1910.1000 (d) and in the TLV Booklet.

Toxicology Assessment
Process of estimating the human toxicological impact of a specific material based on published and unpublished literature sources and taking into consideration: uptake, metabolism/biotransformation, transport and storage, and excretion including acute (short-term) and chronic (long-term) human health endpoints.

Transmission Line
Carries the RFR signal from the transmitter to the antenna.

Transmitter
The part of an RFR emitter that generates the RFR signal.

Uncontrolled Environments
An area where exposures may be incurred by people who have no knowledge or control of the hazard.

Wavelength
The distance from one peak of a wave to the next peak of a wave.