



Headquarters Marine Corps

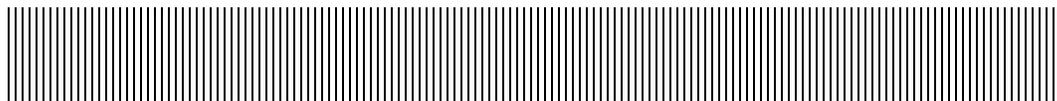
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FINAL

Range Environmental Vulnerability Assessment

Marine Corps Air Station Miramar

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Report Prepared By:

Malcolm Pirnie, Inc.

1700 West Loop South
Suite 1450
Houston, TX 77027-3005
713-840-1511

6285-024

**MALCOLM
PIRNIÉ**

Executive Summary

The United States (U.S.) Marine Corps (Marine Corps) Range Environmental Vulnerability Assessment (REVA) program meets the requirements of the current Department of Defense (DoD) Directive 4715.11 *Environmental and Explosives Safety Management on Operational Ranges within the United States* and DoD Instruction 4715.14 *Operational Range Assessments*.

The purpose of the REVA program is to identify whether there is a release or substantial threat of a release of munitions constituents (MC) from the operational range or range complex areas to off-range areas. This is accomplished through a baseline assessment of operational range areas and, where applicable, the use of fate and transport modeling of the REVA indicator MC based upon site-specific environmental conditions at the operational ranges and training areas. Indicator MC selected for the REVA program include trinitrotoluene (TNT), cyclotetramethylene tetranitramine (HMX), cyclotrimethylene trinitramine (RDX), perchlorate, and lead.

This report presents the assessment results for the operational ranges at Marine Corps Air Station (MCAS) Miramar, San Diego, California. This report is the first comprehensive report on MC associated with the operational ranges at MCAS Miramar and serves as the baseline of environmental conditions and potential vulnerabilities of the operational ranges. Subsequent vulnerability assessments will be conducted on operational ranges at MCAS Miramar on a five-year cycle or when significant changes are made to existing ranges that potentially affect the determinations made during this baseline assessment, as described in the *REVA Reference Manual*.

Military Munitions Training and Operations

MCAS Miramar is the Marine Corps' primary west coast air station, comprising approximately 23,015 acres of land. The installation is located 13 miles north of downtown San Diego. Its primary mission is to provide and maintain facilities and services to support operations of the Third Marine Aircraft Wing, Marine Aircraft Group 46, Reserve Support Unit, and Combat Logistics Company 11.

The U.S. military has been operating on the land at MCAS Miramar since the early part of the twentieth century. The U.S. government initially obtained nearly 13,000 acres in the region in 1917 and established Camp Kearny, a U.S. Army National Guard infantry training area. Though the camp was closed in 1920, the government retained the property and operated it as an airfield for military and civilian use and received lighter-than-air ships in the early 1930s (USACE, 2001a). Camp Elliott, a 32,000-acre Combat Training



Area, was established in 1940. It was located in the hills east of the runways and support elements and was designated as Naval Auxiliary Air Station (NAAS) Camp Kearny in 1943. Dating to 1934, approximately 19,000 acres of Camp Elliot had been used for military training as part of a facility known as Camp Holcomb (Anteon, 2004). The camp was used extensively throughout World War II (WWII) for infantry combat training prior to deployment overseas. Following the conclusion of WWII, MCAS Miramar was converted to NAAS Miramar (1947) and then Naval Air Station (NAS) Miramar (1952). NAS Miramar absorbed a large section of Camp Elliott in 1960. The Navy operated the installation until 1997, when the Marine Corps took over the facility.

MCAS Miramar is subdivided into three general functional regions: Main Station, South/West Miramar, and East Miramar. Main Station and South/West Miramar contain the administrative and operational facilities for MCAS Miramar. East Miramar consists of approximately 15,585 acres of land, defined as all of the installation area east of Kearny Villa Road. All of East Miramar has been designated as operational range lands, with the exception of several non-contiguous tracts of land which are considered to be unavailable for training. These areas, totaling approximately 1,274 acres, have or will be put to a new use that is incompatible with range activities. The remaining East Miramar area that is available for military range training activities is comprised of approximately 14,311 acres. For the purposes of this document, the operational range lands in which training may occur will be referred to as the East Miramar Range Complex.

The East Miramar Range Complex can be divided into areas containing (1) fixed ranges/training areas and (2) other areas that are considered operational range lands but are currently not being used for training purposes. The former group consists of five designated training areas used for maneuver and land navigation training, eight small arms ranges (SARs) used for weapon proficiency training, and an explosive ordnance disposal (EOD) range used for training and emergency destruction of ordnance. The latter group represents all of the other remaining areas within the East Miramar Range Complex. These areas, while not currently being used for a specific training purpose, may be used or “activated” at any time for range/training activities.

The EOD range currently is not used for training purposes, although it is used on an infrequent basis for emergency destruction of munitions. There are no high explosive (HE) fixed ranges or impact areas currently located at MCAS Miramar. The ranges and training areas are managed by Range Operations. Because no live-fire training utilizing HE munitions currently is conducted at MCAS Miramar, expenditure data were not available to use in the MC loading process. Therefore, the Training Analysis Method was utilized, as described in the *REVA Reference Manual*, to estimate MC loading at the EOD range and at historical use MC loading areas.

Conceptual Site Model



Main Station and South/West Miramar, which contain the developed portions of the installation west of Kearny Villa Road and U.S. Highway 163, are located on the eastern edge of Kearny Mesa, part of the Pacific Coastal Plain. This area is relatively flat, gently sloping marine terrace of the Lindavista Formation (NAVFACSW, 2001; MCAS Miramar INRMP, 2006). The mesa is cut by several canyon valleys, which run laterally in an east-to-west direction. The undeveloped terrain in East Miramar, part of the Peninsular Range physiographic province, is characterized by steep, rugged hills separated by deep alluvial valleys that are typically dry throughout the majority of the year.

There are no perennial water features within MCAS Miramar, although numerous ephemeral drainages may be found throughout the installation and, in particular, in East Miramar. The installation receives an average of approximately 10 inches of precipitation per year. During a significant rainfall event, water flows into the main drainage channels of a number of subwatersheds present within MCAS Miramar. Water eventually flows off the installation to the south and southwest. Ephemeral ponding may occur in hummocky areas underlain by a shallow hardpan that restricts infiltration. This may lead to the creation of vernal pools, which are ecological habitat areas that can support rare, threatened, and endangered flora and fauna. These pools are hydrologically isolated wetlands that predominantly receive water from direct precipitation or runoff from the immediate surrounding area.

Limited information is available regarding local and regional groundwater beneath MCAS Miramar. Groundwater in the alluvial units found in the canyon bottoms is generally close to the surface. It has been measured at depths between 2 and 10.5 feet. However, this shallow groundwater exists only intermittently after heavy rainfall or after a series of wet years. Most investigations of groundwater in the older units indicate a depth to groundwater of approximately 200 feet, just above bedrock. Perched groundwater may also be found at shallow depths approximately 10 to 30 feet below ground surface where a well-cemented conglomerate layer underlies an unconsolidated layer.

Currently, live-fire training utilizing HE munitions is prohibited at MCAS Miramar due to the potential for starting wildfires in the arid terrain within the East Miramar Range Complex. Use of HE is restricted to the occasional use of the EOD range for emergency destruction of munitions. Therefore, the current EOD range is the only location where REVA indicator MC may be presently deposited. However, due to past training activities in this area during World War I (WWI) and WWII, REVA indicator MC may also have been deposited at additional locations within the East Miramar Range Complex area. While historical use ranges outside of the operational range boundaries are not assessed under REVA (i.e., other-than-operational ranges), the potential MC loading due to historical use areas that coincide with current operational range lands is part of the scope

of REVA. As such, historical training activities that previously occurred within the area now defined as the East Miramar Range Complex were evaluated in this report.

Using information collected from the installation, five locations where potential MC deposition attributed to current or historical use of HE munitions were identified within the East Miramar Range Complex:

- Current EOD Range MC loading area
- Former EOD Range / Defense Special Weapons Agency [DSWA] MC loading area
- South MC loading area
- Range C MC loading area
- Range G MC loading area

Erosion and subsequent transport of MC via surface water runoff is the primary transport mechanism at MCAS Miramar, despite the ephemeral nature of surface water at the installation. Leaching to groundwater and subsequent groundwater flow potentially could serve as another MC transport mechanism, though such transport is likely limited by relatively high evaporation rates and the depth to groundwater.

Potential receptors for MC dissolved in surface water include users of the nearby Santee Recreational Lakes and ecological receptors with habitat within or near a subwatershed where an MC loading area is located. In addition to vernal pools and potential threatened/endangered species located within them, sensitive species documented at MCAS Miramar include the threatened California gnatcatcher and the endangered least Bell's vireo, Del Mar manzanita, and willowy monardella. However, the Cedar Fire of 2003, which severely scorched most of East Miramar, adversely affected many of these sensitive species. The San Diego Region Basin Plan identifies watersheds within East Miramar as having a number of existing beneficial uses, including industrial, agricultural, recreational, and ecological uses. However, no potential human receptors from consumption of water were identified given the ephemeral nature of surface water at the installation; neither surface water nor groundwater resources near the MC loading areas are used for potable, industrial, or agricultural purposes. No ecological groundwater receptors were identified, primarily due to the depth of regional groundwater and lack of defined groundwater discharge points (CRWQCB, 1994).

Estimated MC loading rates for current and historical training activities within the operational East Miramar Range Complex were examined, along with the known migration pathways and possible receptors identified in the conceptual site model. Degradation of key MC constituents was also considered, specifically with regard to historical MC loading attributed to WWI and WWII activities. The results of this analysis indicate that a potential exists for MC to be transported via surface runoff from

the Current EOD Range MC loading area to potential ecological receptors located off the installation, as well as human receptors at the Santee Recreational Lakes.

Screening-Level Surface Water Transport Analysis

Fate and transport analysis of potential MC migration via surface water was conducted as part of the vulnerability assessment for MCAS Miramar. The fate and transport analysis was conducted through screening-level transport analysis for the Current EOD Range MC loading area. This methodology was selected to provide conservative estimates of the dissolved-phase concentrations of MC reaching the exposure endpoints for this MC loading area (i.e., Santee Recreational Lakes). MC concentrations in surface water were estimated under three scenarios:

1. At the edge of the MC loading area
2. At the edge of the operational range (East Miramar Range Complex) / installation boundary, accounting for down gradient mixing
3. At the final discharge locations (i.e., the Santee Recreational Lakes), accounting for down gradient mixing

The screening-level analysis estimated that the average annual concentration of RDX would exceed the REVA trigger value in runoff at the edge of the Current EOD Range MC loading area (Table ES-1). However, the estimated post-mixing concentrations of RDX exiting the installation and further downstream entering the Santee Recreational Lakes are predicted to be below the REVA trigger value. Edge-of-loading area and post-mixing concentrations of TNT and perchlorate were predicted to remain below their respective REVA trigger values. HMX was not included in the surface water transport analysis as it was not a component of the military munitions used in the MC loading process for this range.

Table ES-1: Estimated Concentrations of MC from Surface Water Screening-Level Analysis: Current EOD Range MC Loading Area to the Santee Recreational Lakes

MC	Trigger Value	Current EOD Range MC Loading Area		
		Edge of MC Loading Area	West Sycamore Canyon at MCAS Miramar Boundary	Post-Mixing at the Santee Recreational Lakes
RDX	0.16	0.18	0.002	0.0008
TNT	0.08	0.03	0.0003	0.0001
HMX	0.08	n/a	n/a	n/a
Perchlorate	0.98	0.60	0.01	0.0025

Note: All concentrations are provided in µg/L (micrograms per liter).

n/a – not applicable (HMX is not a constituent in the munitions types used in the MC loading process.)

Shading and bold indicate that the predicted concentration exceeds the REVA trigger value.

The state-approved San Diego Region Basin Plan does not include regulatory criteria for the MC associated with military munitions that might reach surface water bodies. Although the basin plan lists the intermittent drainages between MCAS Miramar and the Santee Recreational Lakes area as being suitable for various uses (agricultural supply, industrial service supply, contact and noncontact water recreation, warm freshwater habitat, cold freshwater habitat, wildlife habitat, and preservation of rare, threatened, or endangered species), there are no documented uses of the surface water in these areas (CRWQCB, 1994). Therefore, no further action is warranted to address potential MC releases from the Current EOD Range MC loading area.

SAR Assessments

The primary REVA MC of concern at SARs is lead because it is the most prevalent (by weight) potentially hazardous constituent associated with small arms ammunition. Modeling parameters for lead fate and transport are contingent upon site-specific geochemical data that are generally unavailable during a baseline assessment. Therefore, SARs are qualitatively assessed under the REVA program to identify factors that influence the potential for lead migration.

Six of the eight SARs at MCAS Miramar (Ranges 5, 6, 7, B, C, and D) are adjacent to Training Area 5 and are used primarily by non-Marine units (Army, Navy, San Diego County Sheriff's Department). The two remaining SARs, Ranges 100 and 101, are located east of Training Area 4.

The analysis of the eight SARs at the installation resulted in Minimal surface water concern rankings for Ranges 100 and 101 and Moderate surface water concern rankings for Ranges 5, 6, 7, B, C, and D. Minimal groundwater concern rankings were found for all eight SARs. Generally, the Minimal and Moderate scores are primarily due to the low, intermittent precipitation rate; deep groundwater; and limited human and ecological receptors, all of which limit potential lead migration and impacts.

To view the complete report, please go to:

http://www.miramar.usmc.mil/ems/environmental_programs/rev/default.htm