

EXECUTIVE SUMMARY

E.0.0.0.1 An Engineering Evaluation/Cost Analysis (EE/CA) was completed for the East Elliott portion of Camp Elliott, a former United States Marine Corps (USMC) weapons training center that was active in the 1940s and 1950s. This EE/CA was prepared under the Defense Environmental Restoration Program (DERP) - Formerly Used Defense Sites (FUDS). A FUDS is a facility or site that was under the jurisdiction of the Secretary of Defense and owned by, leased to, or otherwise possessed by the United States at the time of actions leading to contamination.

E.0.0.0.2 Montgomery Watson was contracted by the U.S. Army Engineering and Support Center, Huntsville (USAESCH) to prepare the EE/CA under Contract No. DACA-87-92-D-0019, Delivery Order 0019. The USAESCH, more commonly known as the U.S. Army Corps of Engineers, Huntsville Center (CEHNC), has been designated as U.S. Army Corps of Engineers (USACE) Center of Expertise (CX) and Design Center for ordnance and explosive (OE)-related activities, and is responsible for the design and successful implementation of all Department of the Army OE remedial activities required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), including those associated with FUDS. OE consists of abandoned, unserviceable, or excess ordnance and explosives (i.e., munitions).

E.0.0.0.3 In accordance with *Removal Action Planning for Ordnance and Explosive Waste Sites Procedural Document* (CEHNC, 1995), an EE/CA must be completed for all non-time-critical removal actions (i.e., those requiring a response no sooner than 6 months after a determination has been made that a response is necessary). The EE/CA process described in the CEHNC Removal Action Planning guidance is in substantial compliance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (USEPA, 1993a). The purposes of the EE/CA are to characterize the site; to assess potential risks associated with the site; to identify removal action alternatives; to evaluate the alternatives based on the criteria of effectiveness, implementability, and cost; and to propose the selected alternative. The EE/CA process is particularly applicable to sites with potential OE contamination because presumptive

remedies exist. Removal action alternatives typically include institutional controls, physical removal of the OE-related hazard, or detonation in place. Detonation in place can be selected if it can be shown that the residual debris resulting from the detonation will not constitute a risk to public health or the environment.

E.0.0.0.4 East Elliott is a 3,200-acre (5-square-mile) area approximately 12 miles northeast of downtown San Diego. The site is bordered by Marine Corps Air Station (MCAS) Miramar to the north and west, Sycamore Canyon to the east, the City of Santee to the east and south, and State Highway 52 and Mission Trails Regional Park to the southwest. Current land use at East Elliott consists of undeveloped open space and the Sycamore Canyon Landfill, a 170-acre Class III privately operated sanitary landfill. Present-day ownership within East Elliott consists of 165 individual parcels, owned by more than 85 private property owners; the cities of San Diego and Santee, California; several land development firms; two school districts; and a public utility company. Mast Boulevard and West Hills High School are in the southeast corner of the site.

E.0.0.0.5 The majority of East Elliott is undeveloped at present, and unrestricted access along its southern boundary makes it attractive for a variety of recreational uses, including hiking, mountain biking, jogging, motor biking, horseback riding, and off-road vehicle (ORV) use. Rock climbers also use several clusters of large boulders near the southeast corner of the site ([Walker, pers. comm., 1997](#)). Several dirt roads and trails are along the ridges and canyons (Oak Canyon, Spring Canyon, and Little Sycamore Canyon).

E.0.0.0.6 The City of San Diego Planning Department has evaluated the biological resources of East Elliott in the context of its draft regional plans for open space and habitat protection. Of particular concern is the Multiple Species Conservation Program (MSCP), which seeks to preserve endangered habitat such as the coastal sage habitat that serves as home to the California gnatcatcher, a federal threatened species and California species of special concern. East Elliott is included within a “core resource area,” which is defined as an area with a “high concentration of sensitive biological resources which, if lost, could not be replaced or mitigated elsewhere” ([Ogden Environmental, 1996](#)). Over 65 percent of the habitat within East Elliott is

considered to be of “very high” value. In addition to the California gnatcatcher, sensitive species identified in the vicinity of East Elliott include willow monardella, San Diego ambrosia, and least Bell’s vireo.

E.0.0.0.7 Three probable future land use scenarios have been identified for East Elliott: 1) dedicated open space (i.e., undeveloped) with habitat preserves and continued recreational use; 2) landfill construction; and 3) residential construction, consisting of a mix of single family residential, institutional, and open space land uses. The County of San Diego plans to continue expanding the Sycamore Landfill to encompass 500 acres. The City of San Diego has also proposed the area between Oak and Spring canyons as the location of a new 700-acre landfill for which construction would begin in 2005. In addition, the continued population growth and development of the San Diego area may result in increased pressure to develop privately owned parcels.

E.0.0.0.8 In recent years, considerable attention has been focused on OE investigations within the Tierrasanta and Mission Trail areas of former Camp Elliott located south and southwest of East Elliott. The pivotal event that drove these investigations and subsequent ordnance cleanups in Tierrasanta and Mission Trail was the death of two young boys in the Tierrasanta community in 1983 after finding an unexploded 37 millimeter (mm) high-explosive (HE) projectile while playing in the open space adjacent to their homes. Considerable public attention was brought to bear on OE hazards associated with former Camp Elliott following this accident. These events also provided the impetus for continued evaluation and active remediation of OE hazards in the area from 1984 to the present.

E.0.0.0.9 Site workers at East Elliott found unexploded ordnance (UXO) in several locations in the 1980s and 1990s. Also, there are anecdotal reports of detonations during brush fires in the area. Investigations at East Elliott were conducted by explosive ordnance disposal (EOD) teams in 1984 and 1994. OE found during these investigations primarily consisted of 37-millimeter (mm) and 75-mm high explosive (HE) shell fragments; no UXO was found.

E.0.0.0.10 Montgomery Watson prepared an *Archives Search Report* for East Elliott in 1995 that addressed the past uses of ordnance at various portions of the former Camp Elliott, with special emphasis on East Elliott. The archives search assembled historical records and available field data, assessed potential ordnance presence, and recommended OE follow-up actions. Based on all the information gathered during the archives search, the following known or suspected firing points and ranges that may have resulted in ordnance contamination at East Elliott were identified:

- Possible tank firing area in the southeast corner of East Elliott
- Jacques Farm, located approximately 6.4 miles southwest of East Elliott
- Main Camp Elliott firing point, located approximately 6.3 miles west of East Elliott
- Anti-tank range, located approximately 2 miles west of East Elliott

E.0.0.0.11 To evaluate the nature and extent of ordnance contamination at East Elliott, an OE investigation in the East Elliott area was conducted by CMS Environmental, Inc. (CMS) from September through December 1996 (CMS, 1997). The investigation approach consisted of dividing East Elliott into four sectors for the purposes of evaluating risk and developing recommendations for each area. The sectors are described below:

- **Sector 1:** Approximately 750 acres in the northwest quadrant of East Elliott in the area of the proposed City landfill between Oak and Spring Canyons.
- **Sector 2:** Approximately 650 acres in the northern central portion of East Elliott in the area that will eventually be occupied by the existing county landfill in Little Sycamore Canyon.
- **Sector 3:** Approximately 750 acres in the southwest quadrant of East Elliott, south of the proposed City landfill and north of State Highway 52.
- **Sector 4:** Approximately 1,050 acres in the eastern portion of East Elliott, including the area that is most frequently used for recreational activities.

E.0.0.0.12 A statistical computer program, SiteStats/GridStats, was used to aid in the characterization of OE in each sector. Eighty-nine survey grids, each measuring 100 by 200 feet, were established within the four sectors. Brush was thinned and OE was cleared from the surface within the entire area of each survey grid, which was then swept using a magnetometer. All anomalies were mapped and flagged. When all subsurface anomalies were mapped within a survey grid the GridStats module of SiteStats/GridStats was used to randomly select which subsections within the larger survey grids would have subsurface anomalies excavated and identified. As these anomalies were excavated, GridStats determined how many and which anomalies within the grid should be sampled. SiteStats was then used to predict the ordnance density for each sector.

E.0.0.0.13 OE was detected and removed from survey grids in all four sectors of East Elliott; however, only three UXO items were found during the OE investigation. In addition, one UXO item was found by a brush-clearing crew outside a grid in Sector 2. The largest concentration of OE was in Sector 4 and the western portion of Sector 2. All but one of the HE projectiles discovered during the investigation were found pointing westward, indicating that the projectiles were likely fired from points at the southeast corner of East Elliott. All UXO found was destroyed at the site.

E.0.0.0.14 Using data from the 1996 OE investigation, a deterministic risk assessment was conducted for East Elliott using the Ordnance and Explosives Cost-Effectiveness Risk Tool (OECert) (CEHNC, 1996). OECert provides a means of determining the estimated number of exposures to UXO at a site given different levels of removal action or no action for various land uses. Land uses evaluated include both current and future recreational use, current and future landfills, and future residential construction. Based on the risk assessment and the 1996 investigation data, baseline UXO risks are present in Sectors 1, 2, and 4. No exposures were predicted for Sector 3 because no UXO was found in this area; however, due to inherent limitations to OE sampling and the risk assessment tool, it should not be assumed that there is no risk in Sector 3. Removal action alternatives were evaluated for each of the four sectors in East Elliott to achieve an acceptable level of risk to human health and the environment from potential

exposure to UXO based on current and future land uses. OECert also provided an estimate of the expected annual exposures to UXO and associated risk reduction for each of the removal actions considered.

E.0.0.0.15 Removal action alternatives can generally be grouped into the following categories: no action, institutional controls, treatment technologies, containment technologies, and removal technologies. Removal action alternatives for East Elliott were screened by considering CERCLA guidance objectives, presumptive remedies at other UXO sites, site-specific characteristics, the conceptual model of potential exposure risk, and current and future land use and ownership. The removal action alternatives retained for East Elliott include the following:

- Alternative 1: No Action
- Alternative 2: Institutional Controls, including warning signs, display boards, and awareness training designed to modify the behavior of people who encounter UXO
- Alternative 3: Surface Clearance, including inspection of the ground surface and removal and/or destruction of any OE and UXO encountered
- Alternative 4: Surface and Subsurface Clearance to a Depth of 1 Foot, including investigation of magnetic anomalies and removal and/or destruction of any OE and UXO encountered up to 12 inches below the ground surface
- Alternative 5: Construction Support, including surface and subsurface clearance of OE to support grading and construction up to a depth of 3 feet below the ground surface

E.0.0.0.16 The remedial alternatives were then evaluated on the basis of three criteria to determine their suitability for application. These criteria include:

- Effectiveness - The ability of the proposed removal action to achieve the removal action objectives, to comply with applicable or relevant and appropriate requirements (ARARs), and to reduce the exposure risk to the public. The most

important effectiveness criterion for East Elliott is the long-term ability of the proposed removal action to protect the public and reduce the risk of an encounter with UXO.

- Implementability - The technical and administrative feasibility of a removal action, the availability of necessary equipment and services, and the potential for community acceptance of the removal action alternative.
- Cost - The 30-year present worth analysis of estimated direct and indirect capital costs, and recurring or post-removal site control (PRSC) costs including long-term monitoring, reporting, and maintenance activities.

E.0.0.0.17 Based on the above analysis, Surface Clearance (Alternative 3) is the recommended removal action alternative for the approximately 750 acres of Sector 1. Surface Clearance significantly reduces risk for recreation users, who are the most likely to be exposed, at an estimated cost of \$5,757,000 (Table ES-1). Construction Support (Alternative 5) for the proposed landfill in Sector 1 was also considered. However, the proposed City of San Diego landfill is still in the pre-planning stages, so the risk reduction for recreational users would not occur for 20 to 50 years.

E.0.0.0.18 Surface Clearance (Alternative 3) is the recommended removal action alternative for Sector 2. Because the landfill, including the current expansion, occupies approximately 170 acres, clearance operations will only be performed in the remaining 480 acres of Sector 2. Surface Clearance will result in a significant reduction of risk for recreational users and construction workers at a cost of \$3,546,000 (Table ES-1). Periodic monitoring activities required for this alternative will include investigation and disposal, if warranted, of any subsurface OE encountered during landfill construction.

E.0.0.0.19 Human Factors Applications, Inc. (HFA) conducted OE removal operations for construction support during the 1998 expansion of the Sycamore Canyon Landfill. Construction support activities included surface and subsurface removal of OE encountered up to a depth of 3 feet below ground surface (bgs). These activities were conducted over a 53-acre area on the north side of the existing landfill. During construction support, 24 UXO items and 64 pounds of OE scrap were found. No UXO was found deeper than 24 inches bgs, and most of the OE items

TABLE ES-1

**SUMMARY OF RECOMMENDED ACTIONS
FORMER CAMP ELLIOTT (EAST ELLIOTT)**

Priority^a	Description of Recommended Action	Initial Cost of Recommended Action	Total Cost of Recommended Action Over 30 Years^b
1	Sector 4: Surface and Subsurface Clearance ^c	\$6,844,000	\$15,413,000
2	Sector 2: Surface Clearance ^d	\$1,055,000	\$3,546,000
3	Sector 1: Surface Clearance	\$1,606,000	\$5,757,000
4	Sector 3: Institutional Controls ^e	\$212,000	\$377,000
5	All Sectors: Residual Risk Management Measures	\$719,000	\$1,396,000
Total Costs for Recommended Actions at East Elliott:			\$26,489,000

^a Based on relative risks for each sector.

^b Total initial and recurring costs based on net present worth calculated over 30 years.

^c Costs include those for the recently completed time-critical removal action.

^d Does not include clearance operations already completed within the existing landfill and recent expansion (170 acres).

^e Implementation of this alternative may be combined with residual risk management measures. Installation of warning signs for all sectors should be completed as soon as possible.

were found on the ground surface. Following identification, these UXO items were destroyed on-site. The resulting inert OE and OE scrap were then recycled at the Sycamore Canyon Landfill. Based on the number of UXO items encountered during the 1998 removal action HFA recommended that OE construction support be provided during all expansion activities for the Sycamore Canyon Landfill (HFA, 1999).

E.0.0.0.20 Institutional Controls (Alternative 2), which include the use of warning signs and display boards to modify the behavior of people who encounter OE, is the recommended removal action alternative for the approximately 750 acres of Sector 3. Because the potential for UXO exposures appears very unlikely, clearance activities were eliminated from further consideration for this area. However, because OE-related scrap was encountered in Sector 3, there is a possibility that UXO may be present; in addition, people may access other areas of East Elliott from Sector 3. Institutional Controls will cost-effectively reduce the risk of a hazardous encounter (considering the inherently low risk present in Sector 3) and focus on informing the limited sector of the public who may choose to enter the area of the potential hazard present. The total cost for these Institutional Controls in Sector 3 is \$377,000 (Table ES-1).

E.0.0.0.21 Surface and Subsurface Clearance (Alternative 4) is the recommended removal action alternative for the approximately 1,050 acres of Sector 4. This alternative will result in the greatest reduction of risk for recreational users, including local residents. Sector 4 has the highest level of risk compared to other sectors at East Elliott because this area is relatively accessible and attractive to recreational users. Therefore, selection of a removal action alternative is warranted. Surface Clearance would result in the greatest reduction of risk at a lower cost than other removal alternatives; therefore, this alternative results in the greatest cost-benefit to the community. However, because the risk associated with OE in Sector 4 is approximately five times that for other sectors, a more stringent removal action is warranted even though this alternative is more costly. The total cost for Surface and Subsurface Removal of OE in Sector 4 is approximately \$15,413,000 (Table ES-1).

E.0.0.0.22 In late 1998 and early 1999, HFA conducted surface clearance as a Time-Critical Removal Action in Sector 4 in response to the risk assessment results ([Appendix C](#)), which were originally presented in the draft version of this EE/CA dated January 1998. During the 1996 OE investigation, Sector 4 was found to contain the largest concentration of UXO and OE scrap ([CMS, 1997](#)). Based on this concentration of OE, the proximity to local residents, and the large number of recreational users in this area, a Time-Critical Removal Action was implemented due to the immediate threat of public exposure to OE with the risk of serious injury or death.

E.0.0.0.23 The Time-Critical Removal Action was conducted in Sector 4 between July 1998 and February 1999. Surface OE removal operations were conducted over 900 acres of roads, trails, and open space. Surface clearance was not conducted in areas of heavy brush, which covers approximately 150 acres of Sector 4. The costs for the Time-Critical Removal Action are included in the above estimate.

E.0.0.0.24 Twenty-four UXO items and approximately 1,250 pounds of OE scrap were discovered during the Time-Critical Removal Action. The UXO items consisted primarily of 37-mm and 75-mm rounds. The majority of the UXO were discovered in the southern portion of the northwest quadrant and the northern portion of the southwest quadrant of Sector 4. Based on information discovered during the archive search ([Montgomery Watson, 1995](#)), this area appears to have been the primary target area for the tank firing area formerly located in the southeast corner of East Elliott.

E.0.0.0.25 During the Time-Critical Removal Action, numerous subsurface anomalies were identified. However, because the Time-Critical Removal Action was limited to surface OE removal, these anomalies were not excavated. Based on this information and the amount of OE found in the southern portion of Sector 4, HFA recommended that subsurface clearance be conducted in the southern and northwest areas of Sector 4 ([HFA, 1999](#)). This recommendation is consistent with recommendations made by CMS after the 1996 investigation ([CMS, 1997](#)).

E.0.0.0.26 The remaining non-Time-Critical Removal Action in Sector 4 will therefore clear the surface areas that were not addressed by the Time-Critical Removal Action. Because no OE, including scrap, was discovered in Sector 4 north and east of Quail Canyon, a reduction in the scope of the proposed overall removal action is recommended to eliminate clearance of OE in this area. The remaining removal action includes surface and subsurface removal of OE in areas of heavy brush not included in the Time-Critical Removal Action, and subsurface removal of OE within roads, trails, and open areas south and west of Quail Canyon.

E.0.0.0.27 Because the removal actions will not completely eliminate the possibility of encountering UXO and will take up to five years to fully implement, it is also recommended that residual risk management measures be implemented in all sectors of East Elliott. These residual risk management measures will be similar to the institutional control alternative, but will include additional public awareness activities and long-term monitoring. Residual risk management measures will include the following activities:

- use of signs and display boards to describe the potential hazards and to provide information on what to do if OE is encountered;
- continuation of public meetings to describe the removal actions taken at the site and what risks may remain;
- implementation of public education programs aimed at people who are most likely to use the site, such as recreational users, landfill employees, and high school students;
- notification of property owners and local residents with regular fact sheets, newsletters, brochures, and internet sites;
- compliance with California Real Estate disclosure laws by establishment of deed notification for each parcel at East Elliott; and
- notification about potential subsurface hazards through the building permit system.

E.0.0.0.28 In addition, East Elliott will be included in a long-term monitoring program designed to assess the continued effectiveness of the removal action alternative. The monitoring

will include a visual inspection of the site, a review of any additional OE found after the alternative is implemented, an assessment of the continued land use patterns, maintenance of the residual risk management measures, and community feedback. Reviews will be performed every five years after completion of the removal action. During the removal action, a baseline for monitoring erosion will be established to see if subsurface OE not included in the removal action may become exposed. The baseline will include a general map of drainages, landslides, and other areas of erosion, along with a series of photographs taken from designated locations for comparison through time. In addition, areas of East Elliott will be inspected for exposed ordnance as needed following major storm events or wild fires. Monitoring activities will be documented in a report issued every five years.

E.0.0.0.29 To implement these recommendations, memoranda of agreement will be developed between CEHNC and individual parties participating in the overall risk management plan. These memoranda will outline the specific authorities and responsibilities of each agency participating in the action. The total cost of residual risk management measures is approximately \$1,396,000 ([Table ES-1](#)).

E.0.0.0.30 As shown in [Table ES-1](#), the total cost of all recommended alternatives at East Elliott including the time critical removal actions is approximately \$26,489,000. Based on the reduction in annual exposures to UXO for each proposed alternative, it is recommended that the removal actions for each sector be implemented in the order listed in [Table ES-1](#).