

**A STUDY OF ORDNANCE RELATED CIVILIAN ACCIDENTS
OCCURRING ON FORMERLY USED DEFENSE SITES**

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INTRODUCTION. QuantiTech, Inc., was tasked with developing a database for ordnance related civilian accidents occurring in association with Formerly Used Defense Sites (FUDS), using data primarily furnished by the St. Louis and Rock Island Districts of the U.S. Army Corps of Engineers. This study included a review and compilation of the pertinent civilian Munitions and Explosives of Concern (MEC) accident statistics, a spreadsheet summary of the resulting data, an analysis of the data, conversion of the database to Access, generation of charts and graphs summarizing the important findings, and a quality assurance check of the accident reports. The purpose of the study was to develop MEC related civilian accident information that may be used to assist in management of risk and to enhance risk communication to the public and stakeholders at various ordnance sites.

METHODOLOGY. Most of the accident data that contributed to the development of the database came from Archives Search Reports (ASRs) compiled or contracted by the St. Louis and Rock Island Corps Districts. In June 2002, the districts were asked to provide accident information from among 1,121 ASRs completed out of 2,280 identified MEC sites. (In many cases, multiple ASRs were completed on the same MEC property due to several ranges or Areas of Interest being present. Therefore, the total number of properties will be considerably less than the 2,280 MEC sites. Also, a few of the ASRs studied pertained to Base Realignment and Closure [BRAC] sites.) Additional data came from Rochelle R. Hance of the St. Louis Corps District and Robert E. Hoffman of the Rock Island District, a QuantiTech report on accidents developed in 1998, a list of accidents compiled by the Department of Defense Explosives Safety Board (DDESB), and the Corps' Project Information and Retrieval System (PIRS) on the Internet, and other sources. 148 additional ASRs have been prepared between June 2002 and October 2004 (after the initial accident study), and have been reviewed. Additional accident data has been added to the database. QuantiTech then sifted through this data, re-checked ASR information when available, and extracted relevant accident statistics and information, placing the results in Excel spreadsheet format with the following 34 columns:

1. Incident Number
2. Site Name
3. State in which site is located
4. Property Number
5. Program under which site is classified (FUDS or BRAC)
6. Year Site Closed
7. Site Acreage (approximate)
8. Historical Site Use (when under military control)
9. Past Clearance Action Information
10. Site Location Description (county in which site is located)
11. Year ASR Completed
12. Population in ASR (population density in persons/square mile around site)
13. Year Accident Occurred
14. Item Picked Up? (i.e., did accident involve a person moving the MEC item?)
15. Location of Accident (i.e., on site or off site)
16. Who Controlled Land? (e.g., private owner, government entity)
17. Land Use at Time of Accident (e.g., house, business)
18. Accident Cause/Circumstance
19. MEC Class Involved in Accident (e.g., fuze, mortar shell)
20. MEC Type Involved in Accident (e.g., 105mm mortar)
21. Item Surface or Subsurface (when discovered)
22. Total Number of Victims involved in incident
23. Number of Fatalities in incident
24. Victim ID Number (if more than one fatality, Victim 1, Victim 2, etc.)
25. Victim's Age (C - child, A - adult; also specific age if known)
26. Sex of Victim (M or F)
27. Number of Injuries in incident
28. Victim ID Number per injury
29. Victim's Age (same as #25 above except pertaining to injury)

30. Sex of Victim (same as #26 above except pertaining to injury)
31. Injury Type (specific if known)
32. Source of Accident Information
33. Accident Confirmed
34. Reason for not Including in Data Analysis

The spreadsheet summarizing this information is shown in Appendix A of this report. Not all columns in the spreadsheet could be completed due to lack of information. There were also a few accidents reported by DDESB for which no corroboration could be found. These were omitted from the database. However, at the end of the database is a group of accidents that occurred, as closely as could be determined, while the site or a portion of the site was still active. These are not included in the charts and graphs which follow because the dates of the accidents preceded the determination of the respective sites as FUDS properties.

In order to statistically analyze the accident data, it was appropriate to convert the spreadsheet information to Access, thereby allowing queries to be developed. After this was accomplished, it was possible for various charts to be generated. These included charts showing a summary of historical civilian ordnance accidents by date of occurrence, by MEC class, and by cause and age of the victims. These are shown in Figures 1-7.

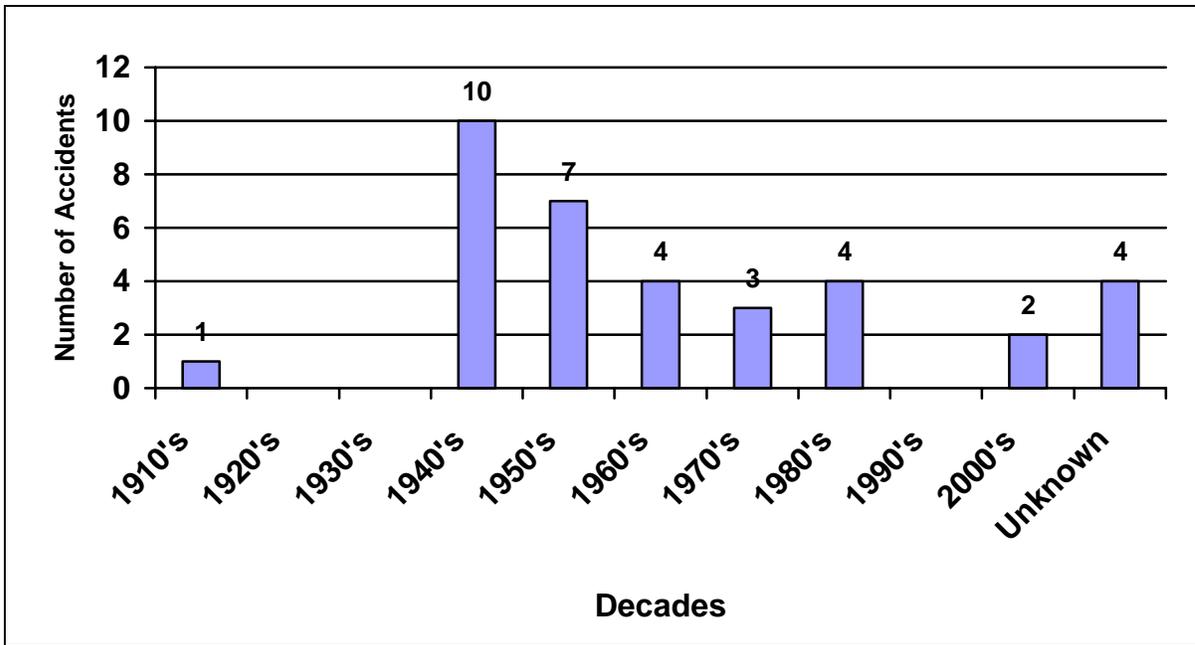


Figure 1. Number of MEC Accidents* by Decade

*(Each accident may involve multiple deaths/injuries)

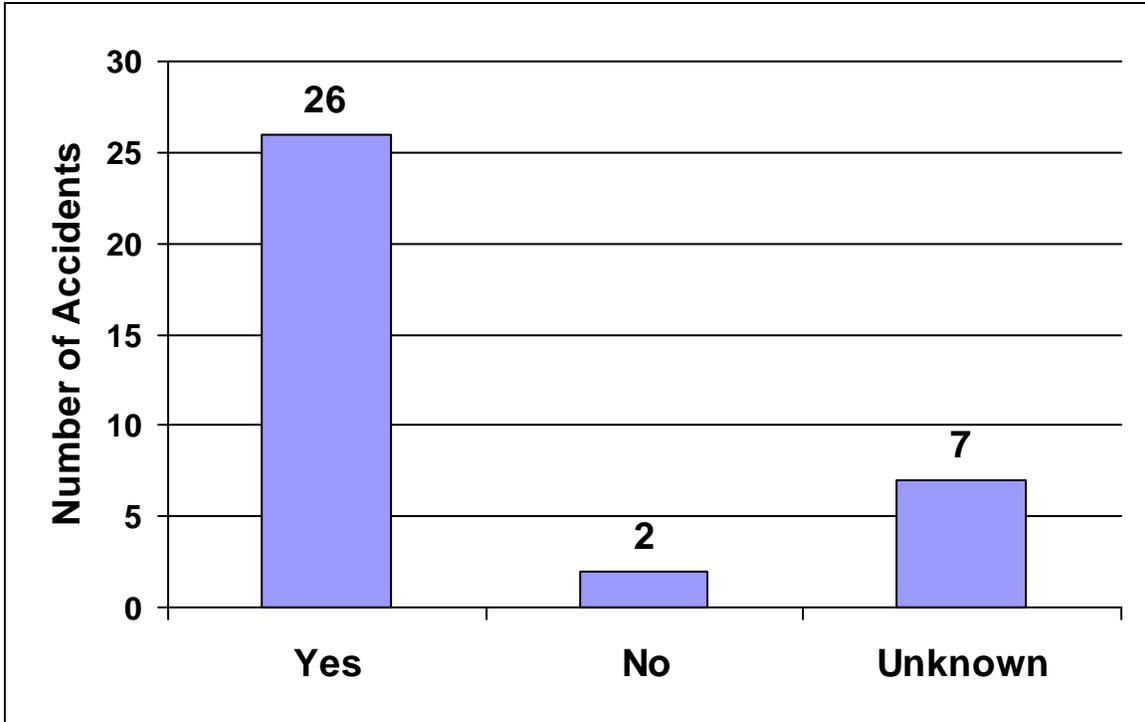


Figure 2. Number of Accidents Where MEC Item Was Picked Up (Yes/No)

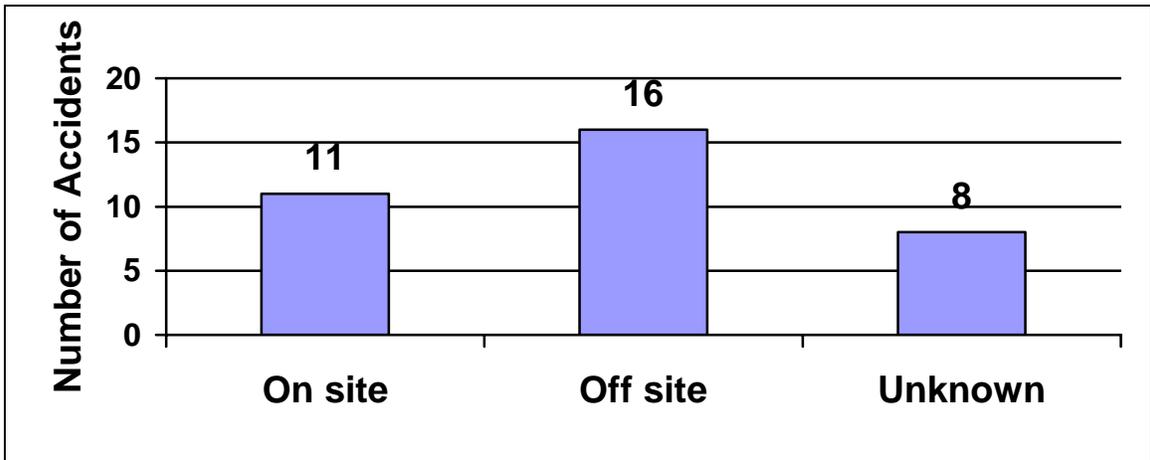


Figure 3. Number of Accidents that Occurred On or Off Site

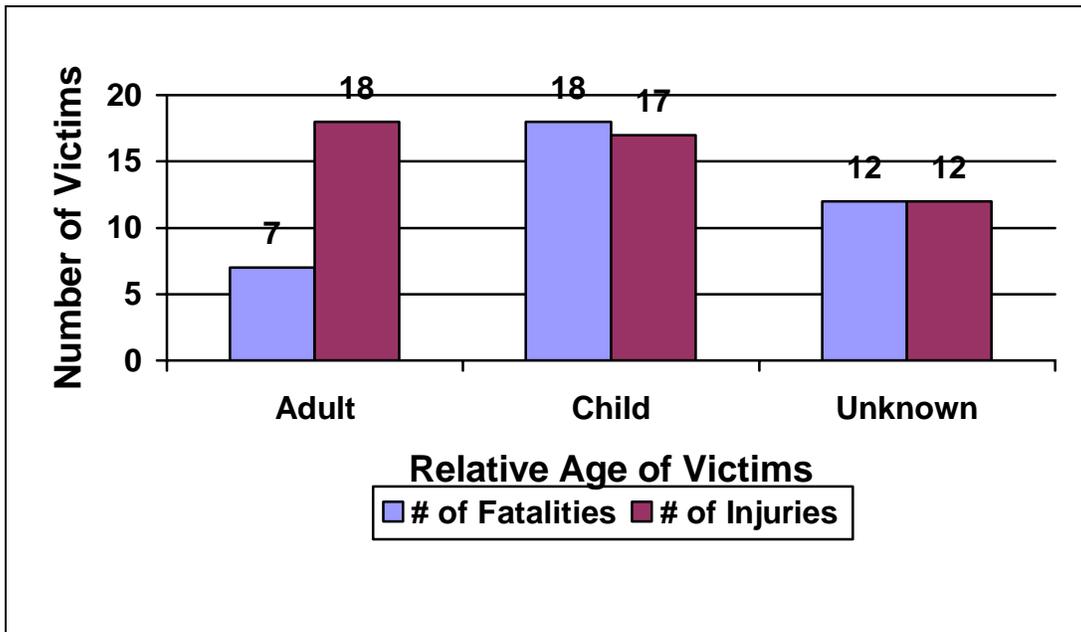


Figure 4. Number of Victims by Relative Age

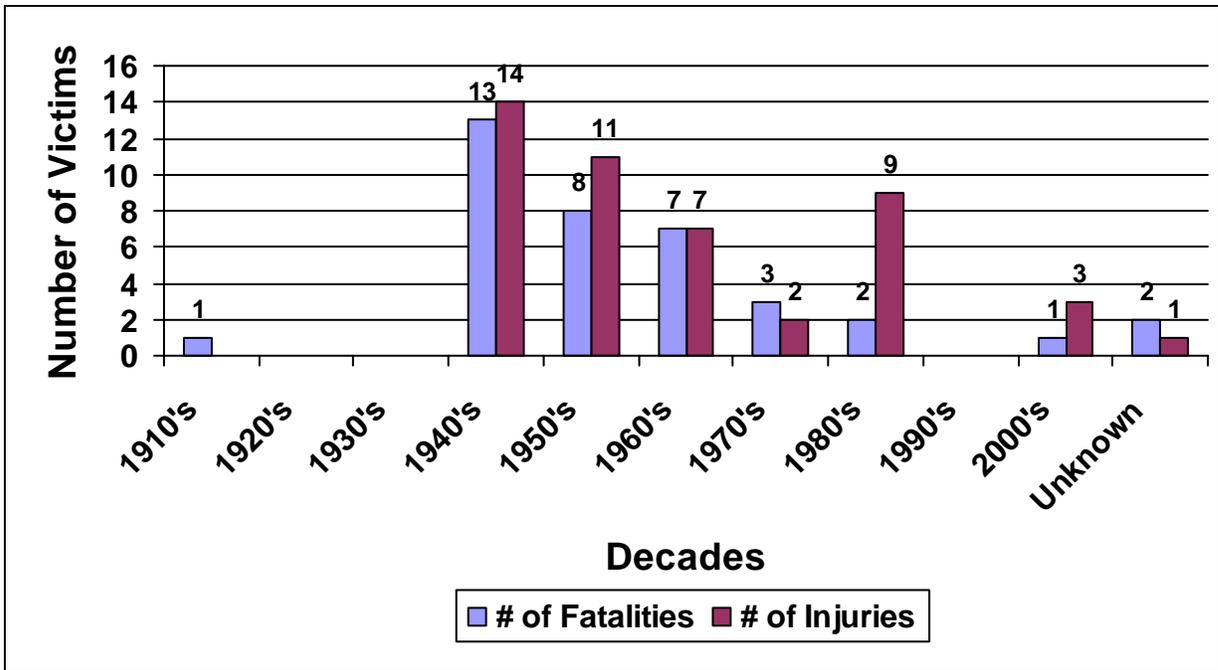


Figure 5. Number of Victims by Decade

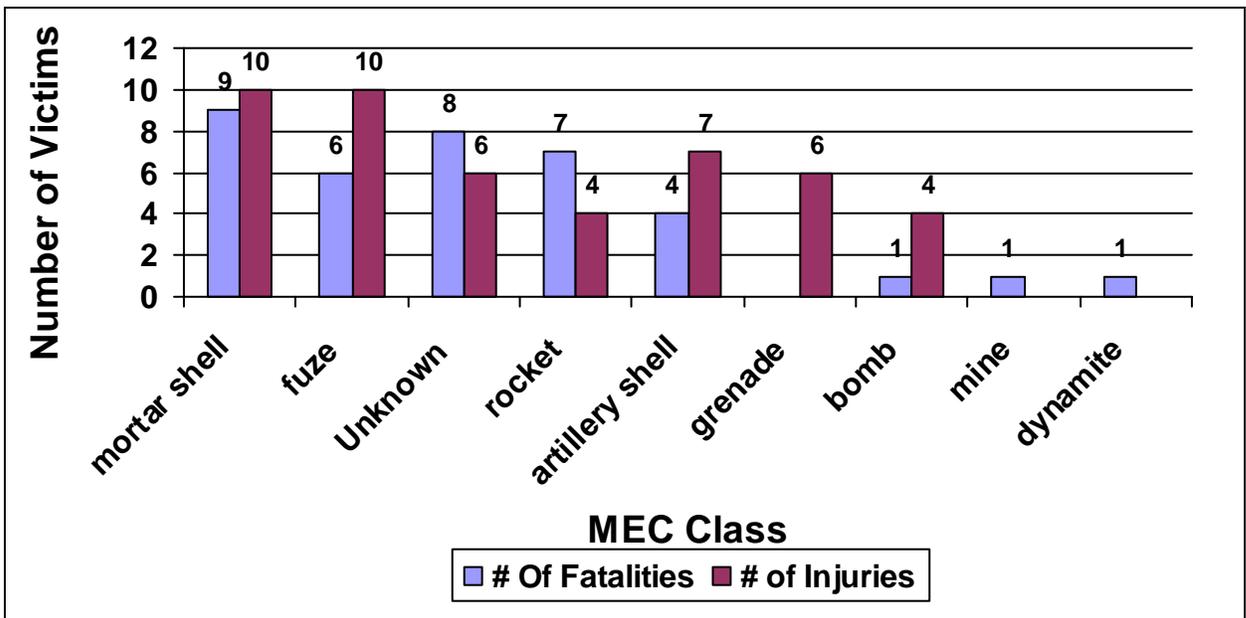


Figure 6. Number of Victims by MEC Class

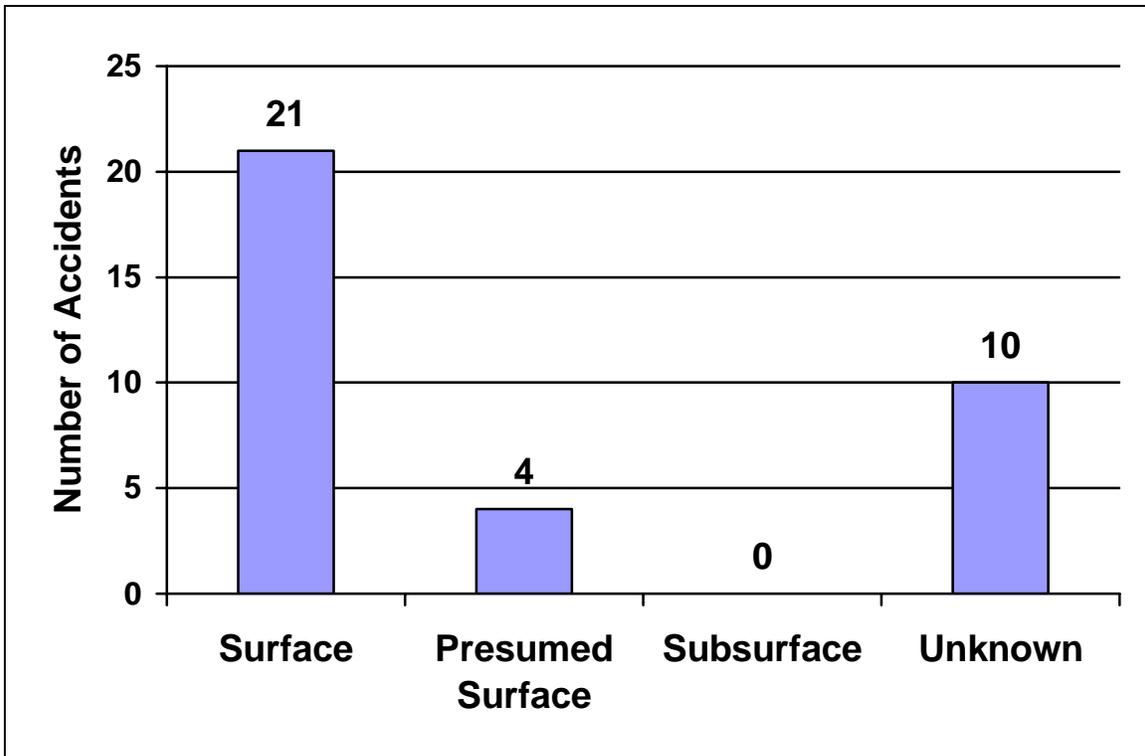


Figure 7. Number of Accidents by Surface/Presumed Surface* / Subsurface

*Based on historical information regarding accident

Finally, a quality assurance check was performed on the original accident data to verify accuracy, detect discrepancies, and update the database if necessary.

DATABASE RESULTS. As of October 2004, 1,269 ASRs had been completed by the Rock Island and St. Louis Districts. Although not all properties have ASRs developed to date, the study nevertheless revealed several important facts. The earliest documented civilian accident occurred in 1913 at Sabine Pass in Texas. Including that accident, there have only been 35 documented ordnance related incidents involving civilians among 31 closed Formerly Used Defense Sites scattered around the 50 United States, Virgin Islands, and Puerto Rico. There were 84 victims (since several incidents affected more than one individual), including 37 who died and 47 who were injured. 58% of the victims were children, in the incidents where ages were known. Where accident dates were known, approximately 49% of the incidents occurred in the 1940s and 1950s,

in the years immediately following site closure. The causes of these incidents were categorized as to whether or not the item was picked up (in 93% of the cases it was). The MEC classes contributing to the largest number of victims were mortar shells and fuzes. In all cases for which complete information was available, the MEC item contributing to the accident was located on the surface of the ground.

QUALITY ASSURANCE. A quality assurance (QA) check was performed on the original accident information provided by the Rock Island and St. Louis Districts. This check consisted of reviewing a sample of the ASRs that had been completed to June 2002 for any information pertaining to a civilian ordnance accident. A minimum sample size of 10% of the ASRs compiled was chosen for review. The ASRs chosen were picked randomly from a list of the 1,121 ASRs completed as of June 2002.

Forty-one of the 408 ASRs compiled by Rock Island District were reviewed (approximately 10%). No additional information documenting civilian MEC accidents was found. Seventy-one of the 713 ASRs compiled by St. Louis District were reviewed (approximately 10%). During this review, a MEC incident that occurred at Carlsbad Precision Bombing Range #11 in the late 1940s was discovered. Because information about an additional accident was discovered during the QA, an additional 5% of the ASRs compiled by the St. Louis District were reviewed. This resulted in a total of 112 (approximately 15.7%) ASRs compiled by St. Louis District that were reviewed with no additional information on accidents found during the second QA.

DATABASE TRENDS. The main trends noted that should greatly influence responses conducted at the sites include the facts that none of the accidents found are known to be the result of subsurface ordnance, and that 26 of the 35 accidents resulted when the item was picked up.

Appendix A

Spreadsheet of Ordnance Related Civilian Accidents