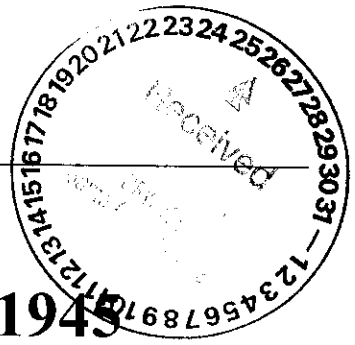

# Final Report
# Operational History 1941-1945
# Rialto Ammunition Back-Up Storage Point

## RIALTO, CALIFORNIA

*Prepared for*
**U.S. Army Corps of Engineers**
**Los Angeles District**


*Prepared by:*
**Science Applications International Corporation**
**18350 Mt. Langley Suite 210**
**Fountain Valley, California 92708**
**(714) 964-6926**


An Employee-Owned Company


**Contract No.: GS-10F-0076J**
**Task Order: 9T3N154PG**


**January, 2004**

Disclaimer

The findings, opinions and conclusions contained in this report are solely those of SAIC. These findings, opinions, and conclusions do not necessarily reflect the position of the United States of America, or any of its departments or agencies. This report is a privileged and confidential attorney work product and may not be released except at the direction of an attorney for the U.S. Army Corps of Engineers with authority to waive the privilege.

**DEPARTMENT OF THE ARMY**
LOS ANGELES DISTRICT, CORPS OF ENGINEERS
P.O. Box 532711, Los Angeles, CA.90053-2325

## Statement of Limited Waiver of Attorney Work Product Privilege

## Final Operational History 1941-1945 Rialto Ammunition Backup Storage Point, Rialto, CA, January, 2004

In August 2002, United States Army Corps of Engineers (USACE) and the United States Department of Defense (DoD) were made aware of potential litigation threatened from parties impacted by perchlorate releases in the vicinity of the Formerly Used Defense Site (FUDS) known to the USACE as Rialto Ammunition Storage Point (Rialto ASP). As a result, USACE, at the direction of its attorneys, undertook a detailed body of research into the history of operations at the former Rialto ASP during WWII. This research was and is attorney work product. The research and any documents, compilations, statements, or reports produced as a result of the research were and are privileged from disclosure or discovery as attorney work product.

Subsequently, the United States Environmental Protection Agency (EPA) requested that the Corps of Engineers produce all records it held on the former Rialto ASP facility under CERCLA § 104(e). As those records then extant were publicly available and would have been produced to any requesting party under the Freedom of Information Act, USACE complied with the 104(e) request. At the time of compliance with the EPA 104(e) request, USACE notified EPA that it was conducting the research described in the paragraph immediately above, as attorney work product.

More or less contemporaneously, the Santa Ana Regional Water Quality Control Board (Regional Board) ordered USACE to conduct an investigation into the Rialto ASP facility. The USACE declined to do this investigation, citing lack of waiver of sovereign immunity. The USACE advised the Regional Board, however, that it was conducting the research described above, as attorney work product.

The research described above has now been completed. This research constitutes a major portion of pretrial preparation in the event of litigation over the Rialto ASP facility. Moreover, one of the parties affected by the perchlorate contamination in the vicinity of Rialto ASP has filed suit. Thus the potential litigation anticipated when the research was commenced is now actual litigation.

The research has produced a document called Final Operational History 1941-1945 Rialto Ammunition Backup Storage Point, Rialto, CA, dated January 2004. In addition to this document, a substantial body of notes and other records has been prepared. Under existing case

law all of these materials are privileged and need not be disclosed under the Freedom of Information Act nor may discovery of these the materials be compelled.

The perchlorate contamination in the vicinity of former Rialto ASP has had a substantial impact on the public water supply and water providers in that area. Moreover, concern over the potential that such contamination will continue to impact even more of the water supply of the region has generated a very high level of public interest in the problem. This public interest is reflected, *inter alia*, in the regulatory requests for information received by USACE. This public interest is further reflected by the EPA and Regional Board requests for documentation produced by USACE as privileged Attorney Work Product.

Therefore, based upon the unique circumstances applicable to this matter, it has been determined that the attorney work product privilege is hereby waived as to the Final Operational History 1941-1945 Rialto Ammunition Backup Storage Point, Rialto, CA, January, 2004. This waiver is expressly limited to the specific document itself and does not include any electronic version or copy of the document nor does the waiver include any research, notes, memoranda, or other documents or materials assembled in the course of pre-litigation preparation for the potential litigation, which is now extant. Copies of the document will be provided to the to requesting regulatory agencies.

This waiver is a limited and narrow exception to the universal practice by the U.S. Army Corps of Engineers to assert and defend the attorney-client privilege and the attorney work product privilege as it relates to information developed in anticipation of potential litigation.

Point of Contact for this statement and the underlying document is Allan Curlee. He may be reached at 916-557-5296.

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## LIST OF ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| aka | also known as |
| asl | above sea level |
| bgs | below ground surface |
| Cal EPA | California Environmental Protection Agency |
| C-AMA | California-Arizona Maneuver Area |
| CBI | China-Burma-India Theater of War |
| CON/HTRW | Containerized hazardous, toxic, and radioactive wastes |
| cu yd | cubic yard |
| CR | Contact Reference |
| DERP | Defense Environmental Restoration Program |
| DOD | Department of Defense |
| DTC | Desert Training Center |
| DTSC | Department of Toxic Substances Control |
| E | East |
| EPA | Environmental Protection Agency |
| FSU | Field Storage Unit |
| FUDS | Formerly Used Defense Sites |
| GSA | General Services Administration |
| I | Interview Reference |
| INPR | Inventory Project Report |
| LAPE | Los Angeles Port of Embarkation |
| MCL | Maximum Contaminant Level |
| MIDAS | Munitions Items Disposition Action System Database |
| N | North |
| P | Photograph Reference |
| ppb | parts per billion |
| ppm | parts per million |
| PRG | Preliminary Remediation Goal |
| PRP | Potentially Responsible Party |
| RABSP | Rialto Ammunition Back-Up Storage Point |
| RCRA | Resource Conservation and Recovery Act |
| RPHL | Recommended Public Health Level |
| RWQCB | Regional Water Quality Control Board |
| S | South |
| SAIC | Science Applications International Corporation |
| SOP | Standard Operating Procedure(s) |
| sq ft | square foot |
| TNT | Trinitrotoluene |
| UCLA | University of California at Los Angeles |
| U.S. | United States |
| USACE | United States Army Corps of Engineers (Corps) |
| USGS | United States Geologic Survey |
| UST | Underground Storage Tank |
| W | West |
| WWII | World War II |
| yd | yard |
| yr | year |

# FINAL REPORT

# OPERATIONAL HISTORY 1941-1945

# RIALTO AMMUNITION BACK-UP STORAGE POINT
**Rialto, San Bernardino County, California**

## EXECUTIVE SUMMARY

Rialto Ammunition Back-Up Storage Point, Formerly Used Defense Site (FUDS) No. J09CA057200, was established within 2,822.15 acres of undeveloped land acquired by the U. S. Army, primarily in 1941 and 1942, in a remote, unincorporated area of San Bernardino County, California. The Army established within this site a temporary storage facility for ordnance-loaded railcars. The facility comprised 20 igloos, 40 bunkers for storage of the ordnance-loaded railcars, and four fuze and powder magazines. The site was served by the Pacific Electric Railway and the Atchison, Topeka, and Santa Fe Railroad, which linked it to the Los Angeles Port of Embarkation at Long Beach, California.

During World War II, the Rialto Ammunition Back-Up Storage Point was operated by the Army Service Forces, Ninth Command, Transportation Corps, as a sub-depot of the Los Angeles Port of Embarkation at Long Beach. The Rialto Ammunition Back-Up Storage Point served as an inspection and temporary storage facility for ordnance-loaded railcars in transit from depots across the United States to Victory Pier at the Los Angeles Port of Embarkation (LAPE), where ordnance was loaded onto ships sailing for the China-Burma-India (CBI) Theater of War. Through Rialto Ammunition Back-up Storage Point's mission as a back-up storage facility, the number of ordnance-loaded railcars at Victory Pier was kept to a minimum. For example, the Captain of the Port permitted only two railcars loaded with 500-pound bombs at Victory Pier at the same time. Additional ordnance-loaded railcars would be stored on tracks at the Rialto Ammunition Back-Up Storage Point until dispatched to Victory Pier.

Of the 3.5 million tons of ordnance shipped from the Los Angeles Port of Embarkation, most was directly shipped from the depots to the port, with less than ten percent shipped via the Rialto Ammunition Back-Up Storage Point.

Operation of the Rialto Ammunition Back-Up Storage Point, which began in December 1942 and ended in September 1945, was conducted according to the stringent safety requirements developed by the Army. That a total of 320,820 long tons of ordnance was shipped through Rialto Ammunition Back-Up Storage Point without one accidental fire or explosion, suggests that Los Angeles Port of Embarkation and Army safety requirements were met. In addition to serving as a temporary back-up facility for ordnance-loaded railcars en route to the Los Angeles Port of Embarkation, the igloos and magazines were used in 1943 by the 622$^{nd}$ Ordnance Ammunition Company to store small arms ammunition for the combat training of troops of the Army Ground Forces. The training was conducted in the Desert Training Center (DTC), which had headquarters at Camp Young near Indio, California.

After cessation of operations in September 1945, the storage area was subsequently sold to companies that could make beneficial use of the explosive storage facilities. Military improvements that have been beneficially used by nonmilitary entities include the water well, igloos, railcar storage bunkers, and two bomb shelters. Most of the property is currently zoned as industrial and occupied by various businesses, including pyrotechnic companies.

As perchlorate, which is a constituent of certain munitions and explosives, has been detected above Action Levels in municipal water supply wells located downgradient of the former Rialto Ammunition Back-Up Storage Point, the California Regional Water Quality Board, Santa Ana Region, issued a Perchlorate Investigation Order to the U.S. Army Corps of Engineers on 24 October 2002. Similar orders were issued to other entities that subsequently used the site: Goodrich (formerly BF Goodrich), American Promotional Events, Mid-Valley Sanitary Landfill, Aerojet, Denova Environmental, PyroSpectaculars, Emhart Industries, Zambelli Fireworks Manufacturing Company, General Dymanics, and Raytheon Company.

Research for this report was undertaken to determine whether a release of perchlorate-containing material occurred at the site during the period of Army operation, 1941 to 1945. No evidence was found through interviews and in review of historic records that at the Rialto Ammunition Back-Up Storage Point any activity occurred other than inspection and temporary storage of ordnance-loaded railcars, and small arms ammunition storage for the Desert Training Center (DTC). Evidence reviewed indicated that ordnance was not manufactured, treated, or disposed of by open burning or open detonation at the site during the period of Army operation from 1941 to 1945.

This report concludes that the principal activity of the Rialto Ammunition Back-Up Storage Point was inspection and storage of railcars loaded with ordnance, either on the tracks or in bunkers, and coordination with the Los Angeles Port of Embarkation as to when to dispatch the railcars to Victory Pier. The standard practice was to leave the ordnance in the sealed railcars during their temporary storage at Rialto Ammunition Back-Up Storage Point. A secondary use of the facility was storage of small arms ammunition for use by troops of the Army Ground Forces undergoing desert warfare training in the Mojave Desert area of the DTC.

Perchlorate-containing munitions - flares and some incendiary bombs - made up less than five per cent on a weight basis of all munitions shipped to the Los Angeles Port of Embarkation; perchlorate was not a component of the small arms ammunition stored for the training of troops in the DTC. Thus, given the low frequency of handling munitions and that perchlorate was a minor munitions constituent, the probability is virtually zero that perchlorate was released to the environment as a result of operations at the Rialto Ammunition Back-Up Storage Point during its period of operation from 1941 to 1945.

# FINAL REPORT

# OPERATIONAL HISTORY 1941-1945

# RIALTO AMMUNITION BACK-UP STORAGE POINT
**Rialto, San Bernardino County, California**

## 1.0 INTRODUCTION

### 1.1 Project Background

Under Contract No. GS-10F-0076J, Task 9T3N154PG, the U.S. Army Corps of Engineers, Los Angeles District, requested the assistance of Science Applications International Corporation (SAIC) in researching the operational history of the Rialto Ammunition Back-Up Storage Point, Formerly Used Defense Site (FUDS) No. J09CA057200, an Army facility for temporary storage of ordnance-loaded railcars, during the period of its operation, 1941 to 1945.

During its operation, the Rialto Ammunition Back-Up Storage Point was known by other names, and the names reflect the understanding of its use by the Army Service Forces and the Army Ground Forces. Personnel at the Los Angeles Port of Embarkation referred to the facility as the Rialto Ammunition Back-Up Storage Point or RABSP; personnel associated with the Desert Training Center operated by the Army Ground Forces knew the facility as the Fontana Ammunition Storage Point for the Los Angeles Port of Embarkation (I-1, I-2, I-3). Other names include:

Fontana Ordnance Back-Up Storage,
Ammunition Back-Up Storage Facility, Fontana,
Ammunition Back-Up Storage Facility, Rialto,
Los Angeles Ammunition Back-Up Storage Facility,
Los Angeles Back-Up Ammunition Depot,
Los Angeles Ordnance Depot,
Los Angeles Back-Up Storage Facility, Ammunition Back-Up Storage, and
Rialto Military Reservation.

The 2,822.15-acre property, located in an unincorporated area near the City of Rialto, California, was acquired by the U.S. Army in December 1941 and early 1942 from several different landowners, through direct purchase or declaration of taking. The U.S. Army developed about 740 acres of this site as the Rialto Ammunition Back-Up Storage Point to support the Los Angeles Port of Embarkation as a back-up ordnance storage facility. Military improvements to the property included 20 igloos, 40 bunkers for storage of ordnance-loaded railcars, four magazines for storage of fuzes and explosives, two bomb shelters, and various administrative and support structures. Additional installations included perimeter and security fencing, 16 watchtowers, 23.5 miles of rail track, a sewage plant, and a water supply well.

At Victory Pier, Los Angeles Port of Embarkation, ordnance was loaded from the railcars onto ships supplying the China-Burma-India Theatre of War. The number of ordnance-loaded railcars at the port at any given time was limited based on explosive content. Additional ordnance-loaded railcars were held on the tracks at the Rialto Ammunition Back-Up Storage Point until needed by the Port. Less than ten percent of the ordnance carried by rail to the Los Angeles Port of Embarkation was routed through the Rialto Ammunition Back-Up Storage Point. In addition to temporary storage of ordnance-loaded railcars, the facility provided storage for small arms ammunition used by troops of the Army Ground Forces training at the Desert Training Center in the Mojave Desert. This small arms ammunition was stored in the igloos at Rialto Ammunition Back-Up Storage Point during 1943.

Operations ceased in September 1945; on 13 November 1945, the property was declared surplus. It was transferred on 9 July 1946 to the custody of the Farm Credit Administration for disposal. From 1950 to 1957, the West Coast Loading Company, a division of Kwikset Locks Corporation, owned and operated 160 acres of the property for the manufacture of pistol and parachute flares. Subsequently, from 1957 to 1964, BF Goodrich owned and operated the 160-acre site. BF Goodrich performed solid rocket propellant research for the

Air Force and Navy. Other property owners have included American Promotions and government contractors such as Hughes Missile Systems and Ordnance Associates.

Most of the property is currently zoned industrial and occupied by a sanitary landfill (Mid-Valley) and various businesses, including pyrotechnics companies. Some portions of the property have been developed for residential use. Military improvements that have been beneficially used by others include the water well, the igloos, and the railcar bunkers.

In 1997 and 1998 the City of Rialto, the City of Colton, and West San Bernardino County Water District sampled groundwater from municipal supply wells in the Rialto Groundwater Sub-basin. Laboratory analyses indicated that perchlorate was present in seven wells, with the level in two wells exceeding an interim Action Level. More than 22 groundwater production wells owned by the cities of Rialto and Colton, the Fontana Water Company, and the West San Bernardino County Water District have subsequently been shut down because of contamination with perchlorate.

Since perchlorate, which is a constituent of certain munitions, has been detected in municipal water supply wells located downgradient of the former Rialto Ammunition Back-Up Storage Point, the California Regional Water Quality Board, Santa Ana Region, issued a Perchlorate Investigation Order to the U.S. Army Corps of Engineers on 24 October 2002. Similar orders were also issued to other entities, including Goodrich (formerly BF Goodrich), American Promotional Events, Mid-Valley Sanitary Landfill, Aerojet, General Dynamics, Denova Environmental, PyroSpectacular, Emhart Industries, Zambelli Fireworks Manufacturing Company, and Raytheon Company.

The U.S.Army Corps of Engineers' counsel was advised of the state regulatory order and was notified by several parties of their intent to file legal actions against the Army and the United States with respect to groundwater contamination in the general vicinity of the former Rialto Ammunition Back-Up Storage Point. As a result, counsel determined that there was a need for a consultant to gather and analyze historic operational information for the former Rialto Ammunition Back-Up Storage Point so as to assist counsel for the U.S. Army Corps of

Engineers and the United States in preparation for legal actions. SAIC was contracted to provide historical research and analysis of whether the standard operating procedures used and activities that occurred at the Rialto Ammunition Back-Up Storage Point during its period of operation, 1941 to 1945, were protective of the environment, whether there is evidence of ordnance or explosive release, for example through burning, detonation, or burial, and whether and to what extent perchlorate was a constituent of the types of munitions handled and stored there.

## 1.2 Research Strategy

SAIC initiated this research through a review of existing documents concerning the site: *Archives Search Report, Ordnance and Explosive Waste, Chemical Warfare Materials, Rialto Ammunition Storage Point, San Bernardino County, California, Project J09CA057201,* August 1995; Inventory Project Research Report (INPR) for the Rialto Ammunition Storage Point, Site No. J09CA057200, dated 28 September 1992 and signed 20 January 1993; and Supplemental INPR for Rialto Ammunition Storage Point, Site No. J09CA057200, dated 23 March 1999. The Supplemental INPR identified an additional project for removal of underground storage tanks; this project was completed in 2000.

SAIC identified as a potential significant resource Record Group 336, Office of the Chief of Transportation, with records on the Los Angeles Port of Embarkation, which operated in conjunction with the Rialto Ammunition Back-Up Storage Point. This Record Group and additional Record Group 156, Records of the Office of the Chief of Ordnance, and Record Group 287, Publications of the Federal Government, yielded extensive records on the operation of Rialto Ammunition Back-Up Storage Point. Inspection of these records was made at the National Archives and Records Administration, Laguna Niguel and Washington D.C. Local resources accessed included the California Room, San Bernardino Library, the Rialto Historical Society, the Santa Ana Regional Water Quality Control Board, and the files of the U.S. Army Corps of Engineers.

Aerial photograph research was conducted at UCLA (the Spence Collection), Whittier College (The Fairchild Collection), Rupp Aerial Photographs, Inc., the Army Corps of Engineers, El Monte, and through the United States Geologic Survey. As the records indicated that restrictions were enforced on photographing military facilities during World War II, the lack of aerial photographs available for the period of operation of Rialto Ammunition Back-Up Storage Point was anticipated.

Attempts to contact former employees of the Rialto Ammunition Back-Up Storage Point were mainly unsuccessful, as the men had passed away and surviving spouses were unfamiliar with the facility. Three important exceptions were Mr. R. K. Weyand, former Officer in Charge of the Safety and Ammunition Inspection Branch at the Office of the Port Ordnance Officer, Los Angeles Port of Embarkation, and Mr. Ralph V. Thompson, Staff Sergeant, and Mr. Aaron P. Holt, Tech Sergeant, E-7, both of the 622nd Ordnance Ammunition Company.

Mr. Weyand, who served from July 1943 until March 1946, was responsible for munitions supply to the CBI Theater of War. Mr. Holt and Mr. Thompson were associated with the Desert Training Center (DTC) where troops of Army Ground Forces were trained in desert warfare in the Mojave Desert. As members of the 622nd Ordnance Ammunition Company, they were responsible for supply of small arms ammunition to troops training at the DTC. The 622nd Ordnance Ammunition Company was relocated to the Rialto Ammunition Back-Up Storage Point for nine months in 1943, where the Company was responsible for storage of ammunition in the igloos and issuance of ammunition to the troops training at the DTC. Interviews of these three persons, who together provide a comprehensive understanding of operations at Rialto Ammunition Back-Up Storage Point, are provided in Appendix D. Analysis of their statements for corroboration with documentary and other evidence is presented in Section 3.

Information on the handling and storage of munitions was obtained from historic documents: the Army Ordnance Safety Manual, 1941 and 1945 editions, and the Standard Operating Procedures for the Safe Handling and Control of Explosives, Ammunition, and Chemical

Warfare Toxic Agents at the Los Angeles Port of Embarkation and at the Rialto Ammunition Back-Up Storage Point, as presented in Appendix B.

No person was identified with expert knowledge on the chemical constituents of munitions used in World War II. Information on munitions constituents was obtained from historic documents and current databases such as MIDAS. Findings, presented in Section 3, underscore the paucity of data on the chemical constituents of munitions used in World War II, especially with respect to perchlorate. The Department of Defense has initiated research into the chemical composition of military munitions used in World War II. When completed, the findings will be applicable to any site where there is a potential perchlorate release from military munitions.

## 1.3 Report Organization

This report on the Operational History, 1941 to 1945, of the Rialto Ammunition Back-Up Storage Point presents research findings as specified in the Scope of Work. To provide a context for understanding operations at the site, the report briefly describes the real estate history and improvements made to the site. Organization of the report is as follows:

**Section 1.0 Introduction**

This section explains the basis for the report, the research focus, and research strategy. It also serves as a *vade mecum* to the report.

**Section 2.0 Site Characteristics**

The location of the site and a summary description of its topography and hydrology are provided.

**Section 3.0 Site Operations**

A summary chronology and description of site acquisition and improvements introduce this section. The operation of the site and its association with the Los Angeles Port of Embarkation and the Desert Training Center are then described in detail based on

documentary and anecdotal evidence. Cessation of operations and disposal of the property are briefly described.

**Section 4.0 Conclusions**

Conclusions based on the research findings are presented in this section.

**Appendix A Aerial Photograph Interpretation**

Aerial photographs covering the period of operation, 1941 to 1945, and both before (1933, 1938) and after Army operations (1948, 1952, 1955), and their interpretation, are provided. In the text, photographs are referenced by a "P" preceding their number, e.g., P-1, P-2.

**Appendix B Standard Operating Procedures**

A copy of Standard Operating Procedures at the Rialto Ammunition Back-Up Storage Point, illustrated with examples of safe practices, is provided.

**Appendix C Records Reviewed**

A list of documents reviewed is presented. In the text, documents are referenced by their number.

**Appendix D Interviews and Contacts**

A list of former Rialto Ammunition Back-Up Storage Point employees whom SAIC attempted to contact is provided, together with contacts made during the course of this research. The interviews with Mr. R. K. Weyand, former Ordnance Officer at the Los Angeles Port of Embarkation during the period 1943 to 1946, and with Mr. Ralph V. Thompson and Mr. A. Holt, formerly of the 622$^{nd}$ Ordnance Ammunition Company which encamped at the site in 1943, are presented. Interviews are referenced in the text by an "I" preceding their number, e.g., I-1, I-2.

**Appendix E Exhibits**

Exhibits referenced in the text are provided.

# 2.0 SITE CHARACTERISTICS

## 2.1 Site Location

As shown in Figure 2-1, the site of the former Rialto Ammunition Back-Up Storage Point is located within the northern limits of the City of Rialto, San Bernardino County, California. The site lies seven miles northwest of the City of San Bernardino and north-northeast of the City of Fontana, in San Bernardino County. The central business district of Rialto is located just east of the site. Secondary roads are well developed in the area. Interstate 15 lies to the west and northwest, and Interstate 215 lies to the northeast.

The property is bounded by Linden Avenue (east), Riverside Avenue (north), Sierra Avenue (west), and Highland Avenue (south). Specifically, the site is located in parts of Sections 17, 20, 21, and Sections 28, and 29, Township 1 North, Range 5 West, San Bernardino Base and Meridian. A former railroad spur of the Atchison, Topeka, and Santa Fe Railway Company passed to the Santa Fe main railroad line through Sections 27 and 34, Township 1 North, Range 5 West.

The reference for the point shown in Figure 2-1, within the former storage area of Rialto Ammunition Back-Up Storage Point, at the intersection of Locust Avenue and West Lowell Street is at Latitude North 34° 9' 15"; Longitude West 117° 24' 32"; elevation 1637 feet above mean sea level. Figure 2-1 does not show the former railroad spur to the site.

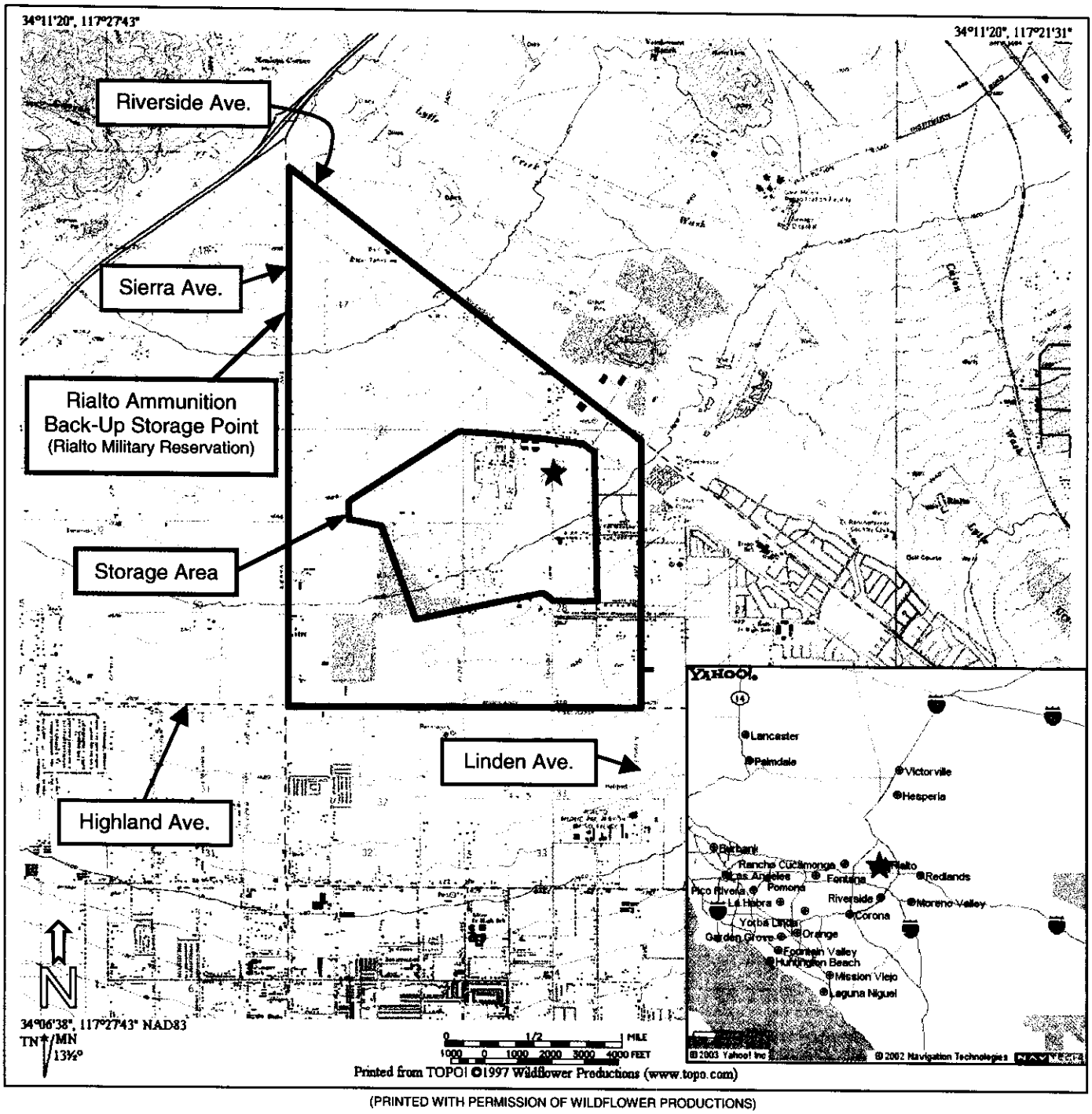
## 2.2 Site Physical Characteristics

Terrain at the site slopes moderately and uniformly at a three percent grade to the southeast. Northwest of the site terrain is much steeper with local relief greater than 2,000 feet. Surface drainage channels are poorly developed. Lytle Creek, located northeast of the site, is a wide wash with ill-defined intermittent channels and prominent braiding of creek bed sediments. Much of the drainage of surface water is probably internal through granular soils.

Soil at the site is typical of alluvial fans and terraces with surface soil and subsoil mostly sandy silty clay, with gravel washed from Lytle Creek apparent throughout the northern part of the site (270).

The hydrogeology of the site is complex and incompletely characterized. Depth to groundwater at the site is about 300 feet below ground surface, and flow is to the south and southeast. The site lies within the Upper Santa Ana River Watershed in the Rialto-Colton groundwater basin. Horizontal groundwater flow from the basin is impeded by the San Jacinto Fault which separates the basin on the northeast from the Lytle and Bunker Hill Basins, and on the northwest, southeast, and southwest by groundwater barriers which have been identified from large groundwater elevation differences historically measured in groundwater production wells (252).

The site is located in a seismically active region with active faults within 30 miles: San Andreas, San Jacinto, Cucamonga, Glen Helen and Whittier-Elsinore fault zones. The San Jacinto fault and Cucamonga fault zones are within three miles of the site. No active or potentially active faults have been identified on the site (286).

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U.S.G.S. TOPO, DEVORE, CALIFORNIA

Township 1 North, Range 5 West, parts of Sections 17, 20, 21 and 28 and 29

★ Latitude N 34° 09' 15", Longitude. W 117° 24' 32"
Elevation 1637 ft.

**Figure 2-1. Rialto Ammunition Back-up Storage Point Site Location Map**

# 3.0 SITE OPERATIONS 1941-1945

## 3.1 Chronology of Ownership and Operation

Rialto Ammunition Back-Up Storage Point was operated during World War II by the Army Service Forces, Ninth Command, Transportation Corps, as a sub-depot of the Los Angeles Port of Embarkation at Long Beach. Rialto Ammunition Back-Up Storage Point served as an inspection and storage facility for ordnance-loaded railcars until they were dispatched to Victory Pier at the Los Angeles Port of Embarkation, where ordnance was loaded onto ships sailing for the China-Burma-India Theatre of War (83). Storage of ordnance-loaded railcars at the Rialto Ammunition Back-Up Storage Point enabled the number of ordnance-loaded railcars at Victory Pier to be kept to a minimum. The chronology of site ownership and operation is summarized below, with details provided in subsequent sections.

- *31 December 1941-9 February 1942*: acquisition of 2814.55 acres of land near Rialto.
- *February 1942*, onwards: improvements made to construct the igloo storage area, classification yard, and administration buildings.
- *16 November 1942*: Rialto Ammunition Back-Up Storage Point is activated.
- *2 December 1942*: operations begin with the first railcar received.
- *January to August 1943*: storage of small arms ammunition in the igloos for DTC operations in the Mojave Desert.
- *May 1944*: 220 railcar holding area constructed.
- *30 November 1944*: 7.6 acres acquired as a no-fee easement for railroad spur.
- *September 1945*: operations cease.
- *16 October 1945:* Rialto Ammunition Back-Up Storage Point put on "caretaker" status.
- *13 November 1945*: Rialto Ammunition Back-Up Storage Point declared surplus by the Army Service Forces and transferred to the War Assets Administration for disposal.
- *9 July 1946*: the Farm Credit Administration assumed custody and responsibility for disposal of the land and improvements.

## 3.2 Acquisition

Through War Department Real Estate Directives RE-D 536 (31 December 1941), 536-L (9 February 1942), 534 (9 February 1942), and 536-I (30 November 1944), the Army acquired 2,822.15 acres of mostly undeveloped land in a remote, unincorporated area of San Bernardino County, California. (The area became incorporated into the City of Rialto in 1967.) As shown on the Real Estate map (Exhibit 1), 2814.55 acres were acquired 31 December 1941 through 9 February 1942 in fee by deed or Declaration of Taking from 77 landowners listed on the Real Estate map (Exhibit 1), and 7.60 acres were acquired on 30 November 1944 as a no fee easement for an Atchison, Topeka, and Santa Fe railroad spur to the site.

The property is described in historic documents as located three miles northwest of the City of Rialto, two and a half miles north of the City of Fontana, seven miles northwest of the City of San Bernardino, 67 miles by road, and 70 miles via railroad, from Victory Pier at Long Beach (84, 145). A real estate map prepared for the disposal of the property in 1946 (Figure 3-1), shows the site with respect to boundaries, leased areas, and the area on which the Rialto Ammunition Back-Up Storage Point was developed (146).

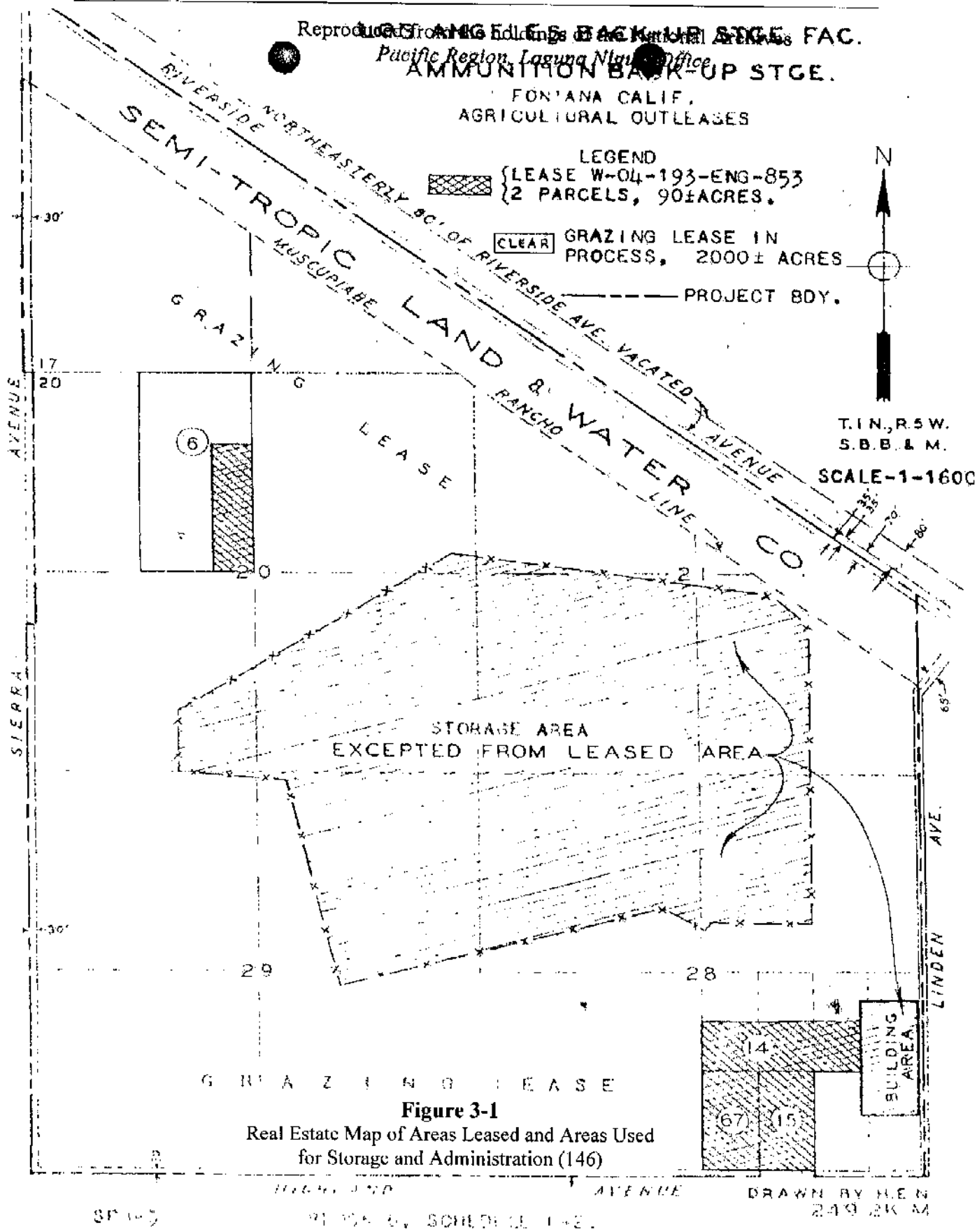



**Figure 3-1**
Real Estate Map of Areas Leased and Areas Used for Storage and Administration (146)

## 3.3 Improvements to the Site

Photographs of the land acquired in 1942 (Figure 3-2, P1, P2) and the area developed for storage (Figure 3-3, P5a, P5b) illustrate that improvements for operation of the Rialto Ammunition Back-Up Storage Point were made on only about 740 acres of the 2,822.15-acre military reservation. Improvements to the site were made by the Army Corps of Engineers and its subcontractors, and were primarily to construct temporary storage for ordnance-loaded railcars.

Improvements began in February 1942 with grubbing brush and grading in the location of the former Airfield, shown in a 1938 photograph (P2), and no longer extant in 1942. As shown in Figure 3-4, General Plot Plan, dated August 1942, initial improvements included 20 earthen-covered concrete igloos, 26 feet 6 inches wide and 81 feet deep (179), accessed by dirt roads and rail, and built according to the distance-quantity requirements for ordnance storage specified in the United States Government Ordnance Safety Manual, 1941 edition. Rail track and fencing, and a classification yard for inspection of railcars were also installed. As shown in Figure 3-4, south of the fenced storage area and adjacent to Linden Avenue, five buildings were constructed initially: the Administration Building, gasoline station, garage, locomotive shop, and sewage treatment plant. The chicken house, shown on the General Plot Plan, was an existing structure. Except for the two-story Administration Building, these buildings were one-story, wood and frame construction (84).

The General Layout Plan (Exhibit 2), prepared in 1946 for disposal of the site, shows the complement of improvements made to the site. As additional storage space, four fuze and powder magazines were built and bunkers with a capacity to store 220 railcars loaded with explosives were constructed in the area to the north of the igloos. Shown in Figure 3-3, and still visible in an aerial photograph taken in 1948, are the railcar bunkers (or turnouts) constructed as eight rows, each with a railroad spur (P5a, 5b). Each of 40 bunkers was approximately 100 feet wide by 700 feet long and was built by excavating into the existing grade (85).

Reproduced from the holdings of the National Archives
*Pacific Region, Laguna Niguel Office*

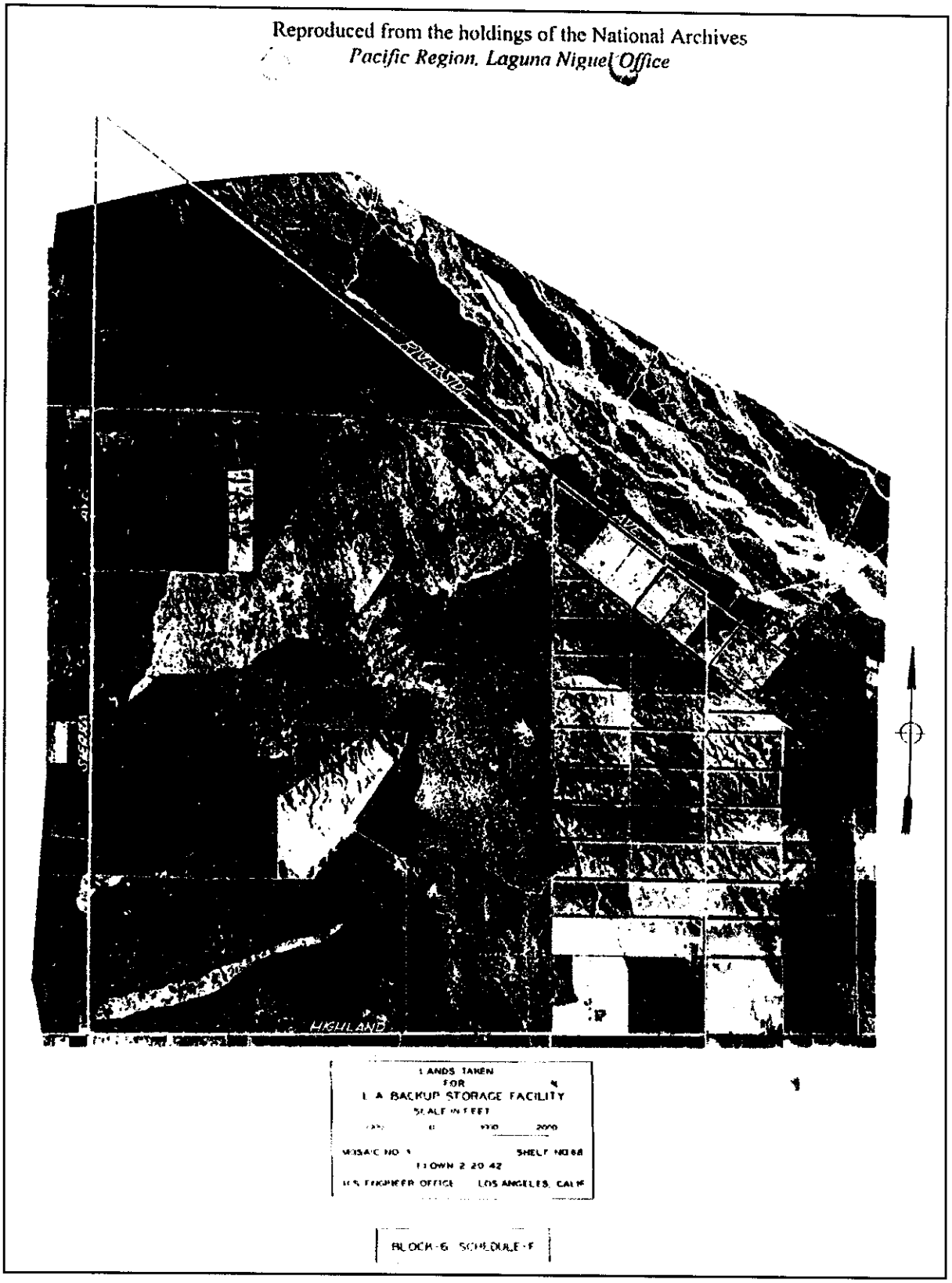



**Figure 3-2**
Aerial Photograph of Land Acquired for
Rialto Ammunition Back-up Storage Point
(146)

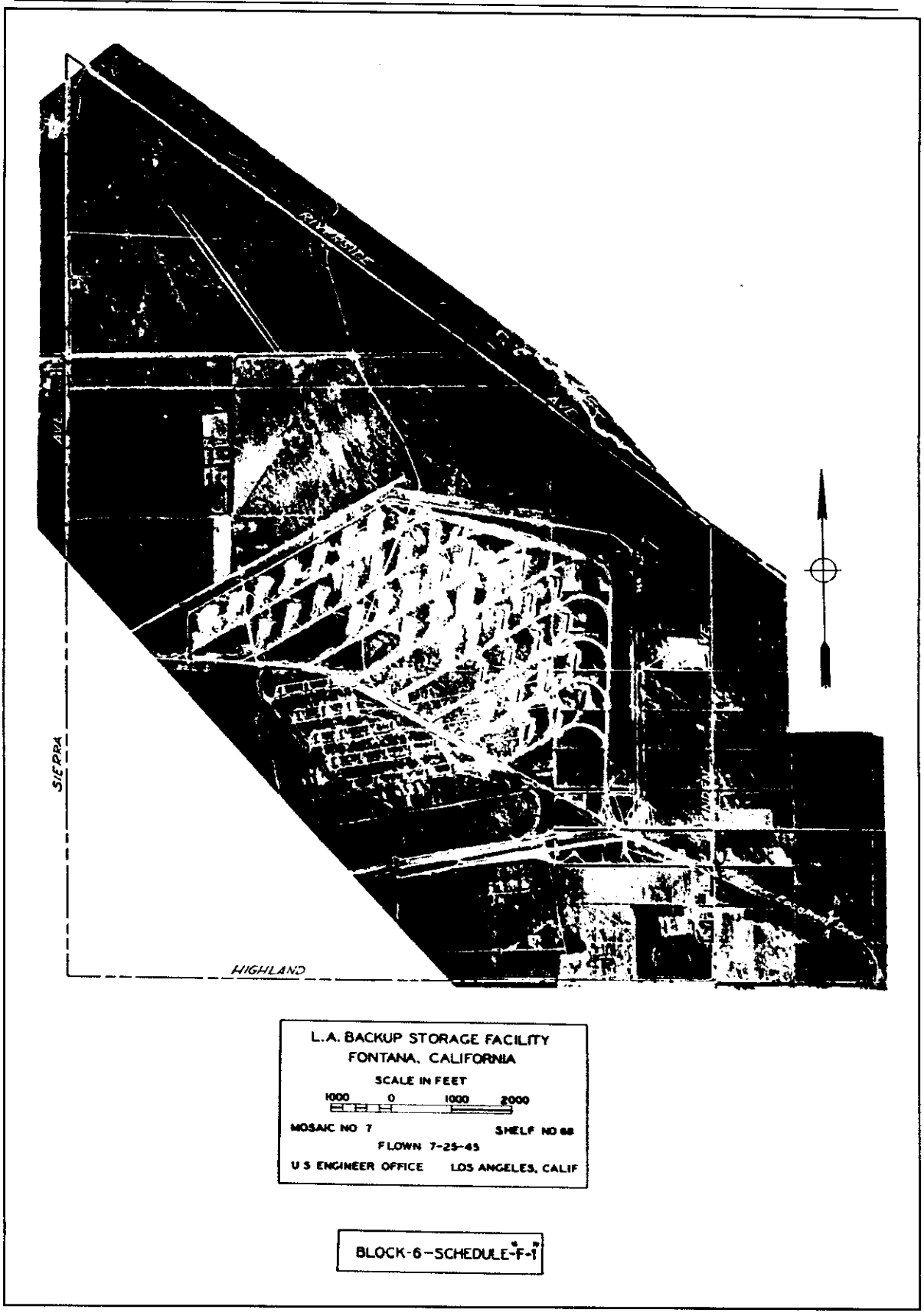



**Figure 3-3**
Aerial Photograph of Site with Improvements, July 1945 (146)

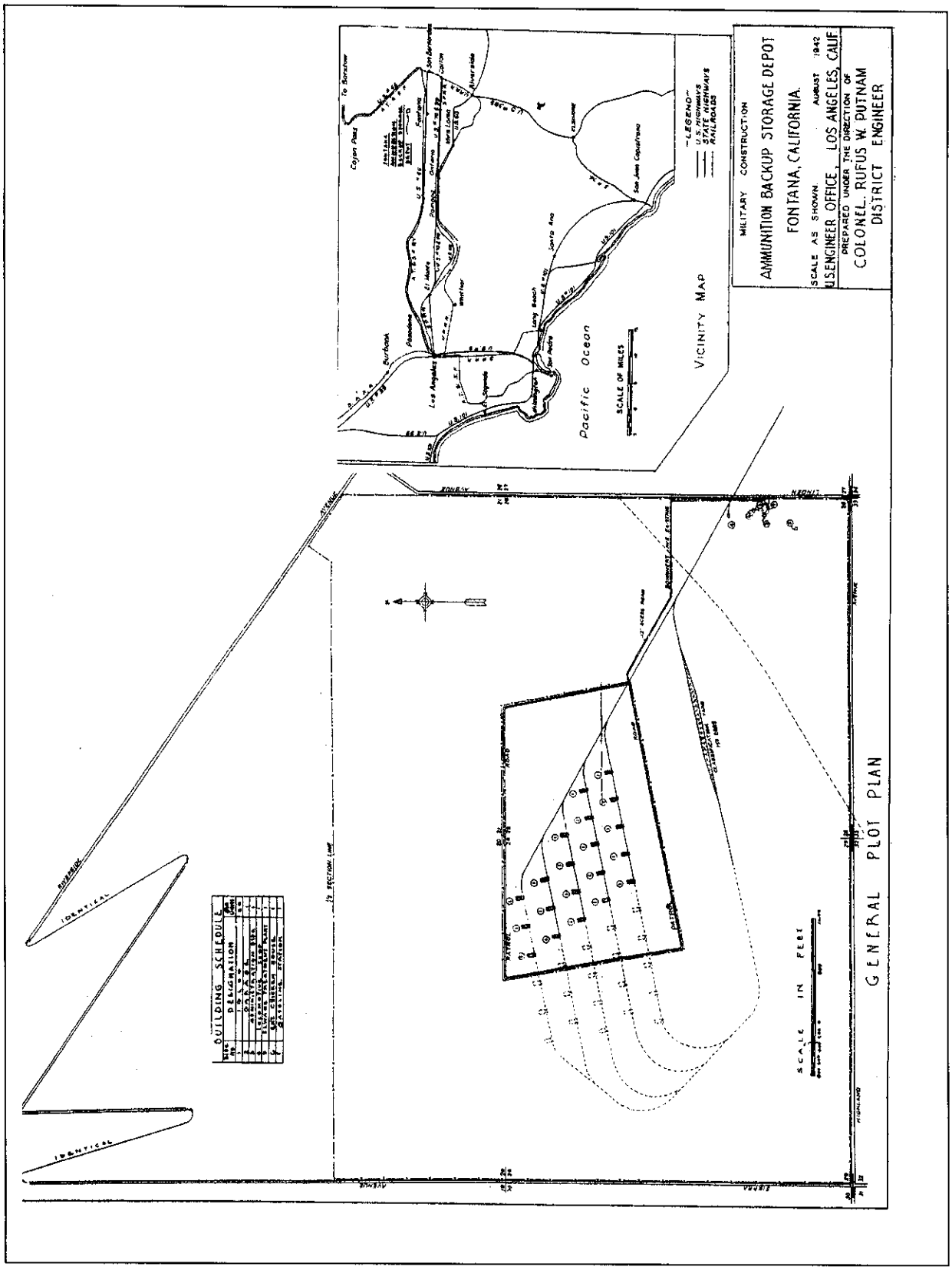



**Figure 3-4**
General Plot Plan, August 1942 (155)

Major improvements to the site included 23 buildings for administration, fire prevention, and maintenance of the site, 16 watch towers, a well, a railcar inspection pit, two concrete underground shelters, a classification yard, rail trackage (23.5 miles total), a locomotive shop, seven underground storage tanks, perimeter and critical fencing, and a power and light distribution system. The existing farm house was converted to a dispensary. Improvements are listed on the General Layout Plan (Exhibit 2) and in a site audit completed prior to disposal of the site in 1946 (46, Exhibit 3). A suspect railcar track, where railcars suspected of having been damaged or tampered with would have been shunted, is shown on the General Layout Plan, and in Figure 3-3. Photographs of the igloos and specific operations of the Rialto Ammunition Back-Up Storage Point are provided in Appendix B to illustrate the standard operating procedures for inspection and storage of ordnance-loaded railcars (81).

## 3.4 Standard Operating Procedures

Operations of the Rialto Ammunition Back-Up Storage Point, also known as Fontana Ammunition Storage Point, and by other names listed in Section 1.1, are best understood in the context of the Los Angeles Port of Embarkation, for which it served as a back-up ordnance storage facility. The account presented is based on review of historical documents associated with the Rialto Ammunition Back-Up Storage Point, and on interviews with Mr. R. K. Weyand, who served as Ordnance Officer at the Los Angeles Port of Embarkation from July 1943 until March 1946, and Mr. Holt and Mr. Thompson, both of whom served in the 622$^{nd}$ Ordnance Ammunition Company, temporarily stationed at the site in 1943.

In January 1942, the Los Angeles Port of Embarkation was established by the Army, with berths and storage areas at Wilmington leased from the Los Angeles and Long Beach Harbor Commissioners. At inception, the Los Angeles Port of Embarkation's mission was to expedite the movement of cargo and troops through the port to the China-Burma-India Theatre of War (45). Cargo included general supplies, planes, tanks, subsistence, guns, and ammunition, with ammunition comprising about a third of all materiel shipped.

The control of ammunition to be shipped presented a difficult problem in that, unlike inert supplies, safety considerations required that the amount stored had to be limited based on the explosive content and the loading capacity of ships in port. At Victory Pier, Los Angeles Port of Embarkation, where ammunition was loaded onto vessels, ammunition holding time was determined by the Captain of the Port and based on the explosive content of ammunition in the railcars. For example, a common shipment to the China-Burma-India Theatre of War was an order of 500-pound general purpose bombs with high explosive content. The Captain of the Port allowed only two railcars loaded with 500-pound bombs at Victory Pier at the same time. In order to limit the amount of explosives stored at the pier, yet efficiently meet overseas needs, ordnance-loaded railcars were stored on the tracks at the Rialto Ammunition Back-Up Storage Point until called for at the Port when a ship was ready for loading (I-1). Ammunition was thus brought by rail to the Los Angeles Port of Embarkation in increments, as needed (80). This system was the World War II equivalent of the late 20th century just-in-time chain of supply: keeping stock on hand to a minimum and shipping only as much as needed.

Because of its remote desert location, proximity to railroads, and distance (70 miles) from the Los Angeles Port of Embarkation, the Rialto/Fontana area was chosen to establish a back-up ammunition storage area. The location of the Rialto Ammunition Back-Up Storage Point with respect to the Los Angeles Port of Embarkation and associated facilities is shown in Figure 3-5.

As illustrated in the organization chart (Exhibit 4), the Rialto Ammunition Back-Up Storage Point was operated as a sub-depot or command of the Los Angeles Port of Embarkation under the Army Service Forces, Ninth Command, Transportation Corps, from its activation on 16 November 1942, with the first railcar received on 2 December 1942, until closure in September 1945 (45). It was accessed by the Atchison, Topeka, and Santa Fe Railway and by the Pacific Electric Railway.

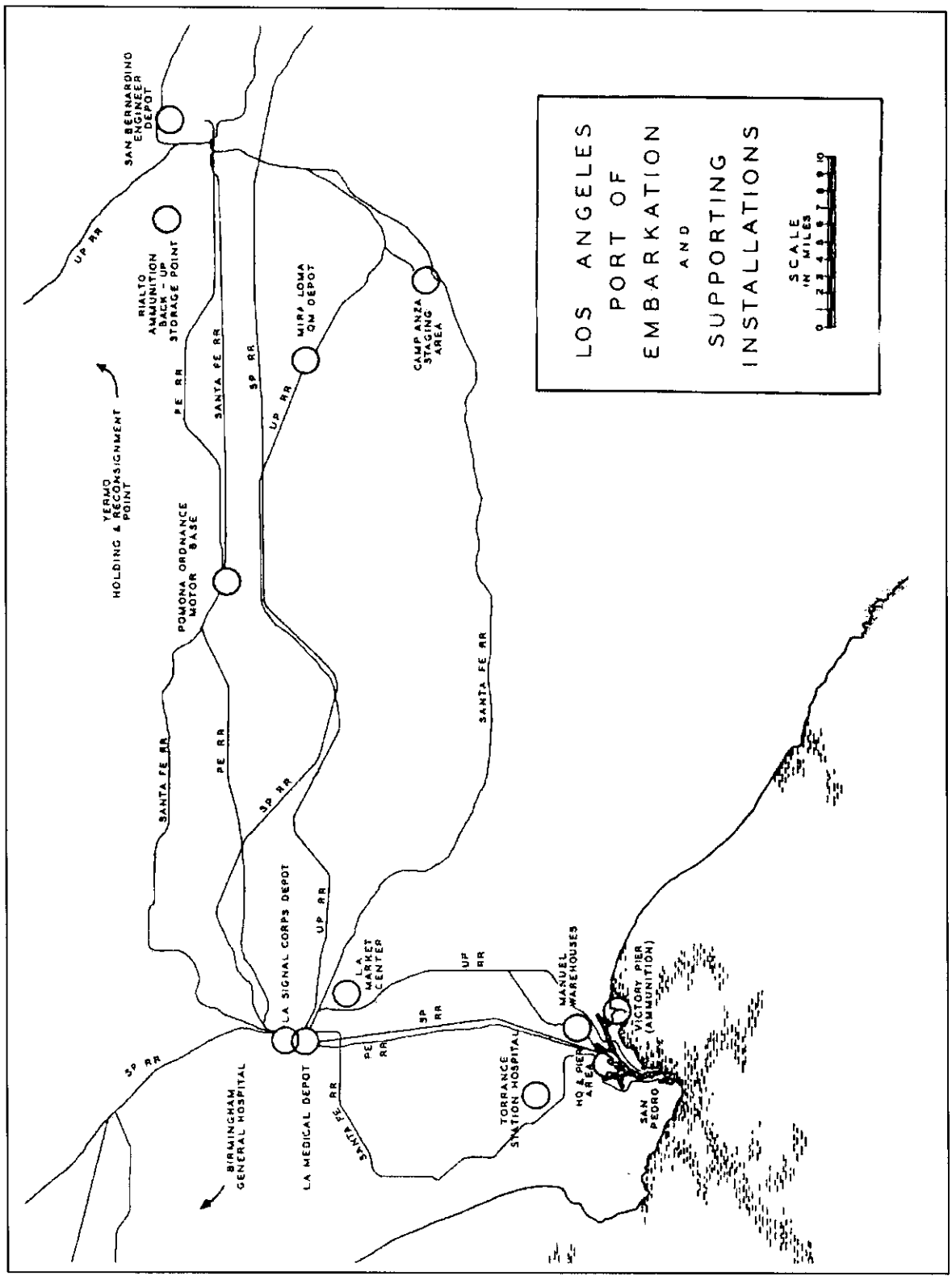



**Figure 3-5**
Location of Rialto Ammunition Back-Up Storage Point in relation to the Los Angeles Port of Embarkation

The primary role of the Rialto Ammunition Back-Up Storage Point was to serve as a back-up or holding location for ordnance-loaded railcars destined for Victory Pier, Port of Los Angeles, until the railcars were ordered to the port. Additional operations at the Rialto Ammunition Back-Up Storage Point were: inspection of railcars for condition of the contents and detection of attempts at sabotage; recoopering damaged bracing and dunnage; consolidation of partial shipments; and receipt and dispatch of railcars as directed by the Port Transportation Division. No evidence was found that the role of the Rialto Ammunition Back-Up Storage Point included handling damaged munitions; responsibility for damaged munitions, which were rarely found, was with the Los Angeles Port of Embarkation.

Details of the operations of the Rialto Ammunition Back-Up Storage Point are described in the interview with Mr. R. K. Weyand, Ordnance Officer at the Los Angeles Port of Embarkation from July 1943 until March 1946 (I-1). Mr. R. K. Weyand's primary responsibility was to maintain the ammunition supply levels for the China-Burma-India Theatre of War during World War II. Mr. Weyand's testimony is corroborated by documentary evidence from the Los Angeles Port of Embarkation and the testimony of Mr. Holt and Mr. Thompson.

On the first of each month, Mr. R. K. Weyand would receive from the China-Burma-India Theater a radio communication on the how much ammunition and ordnance had been expended. With knowledge of the amount of ammunition and ordnance originally provisioned, and what was in transit from the port, Mr. R. K. Weyand was able to determine how much to order from one of depots around the United States, shown in Figure 3-6. Mr. R. K. Weyand recalled that Navajo and Sierra were the two depots most frequently supplying munitions, principally bombs (100, 200, and 500-pound general purpose bombs) and 155 mm artillery shells. Small arms were supplied by the Edgewood Arsenal. Boosters and fuzes were packed and shipped separately from the associated bombs.

An essential skill Mr. R. K. Weyand developed and deployed was scheduling the arrival of ordnance-loaded railcars to coincide with the arrival of supply ships at Victory Pier. The orders to the depots were arranged so that the ordnance-loaded railcars arrived at Victory Pier

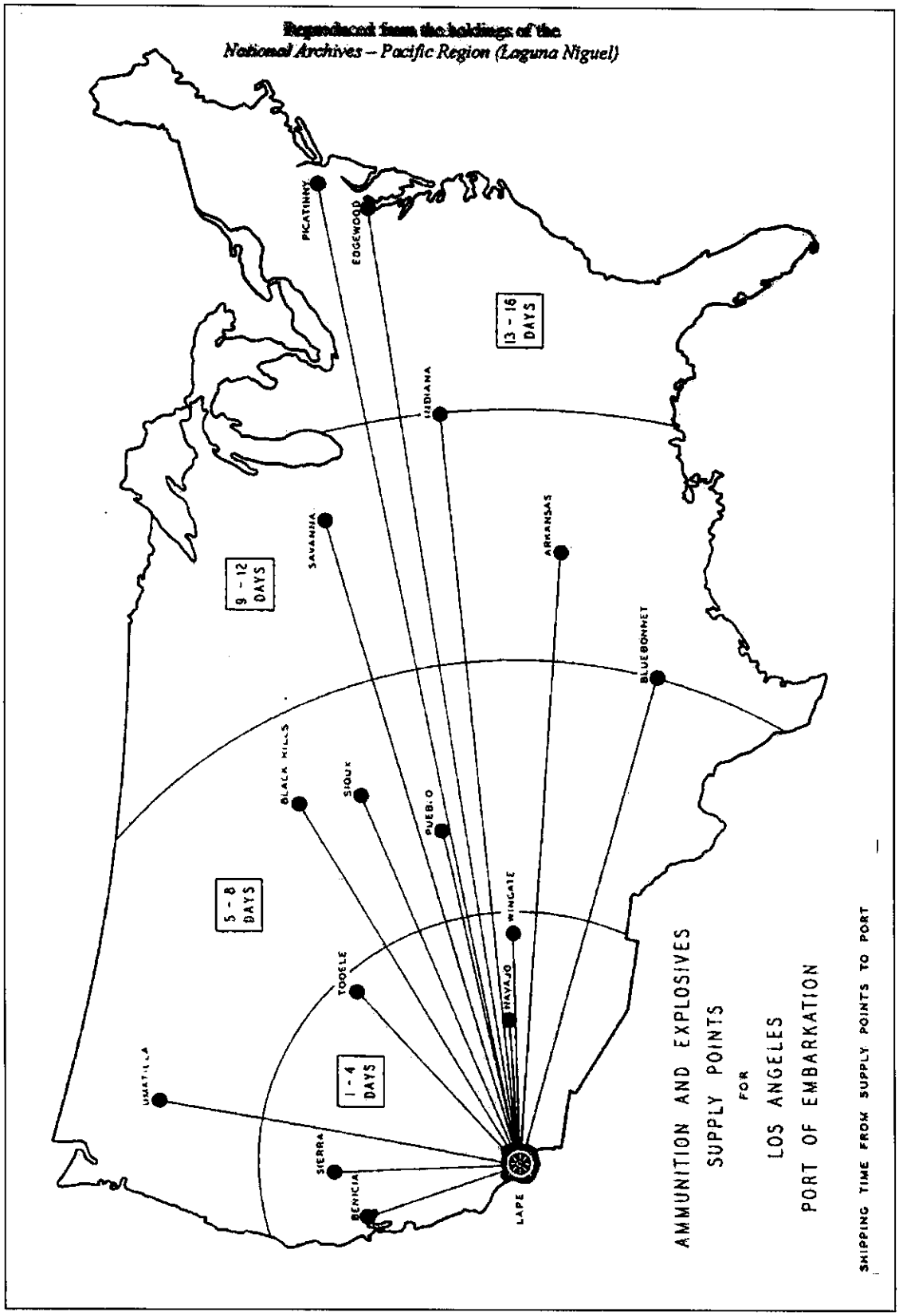



**Figure 3-6**
Ammunition Depots Supplying,
Los Angeles Port of Embarkation (154)

when the dock crew was ready to load the supply ship, such that the number of ordnance-loaded railcars at Victory Pier was kept to a minimum. Mr. R. K. Weyand recalled that there were rarely more than two ordnance-loaded railcars at Victory Pier.

Most of the ordnance-loaded railcars came directly to Victory Pier. However, if a ship was late in arriving at the port, or a delay occurred in loading, or if the port had reached the maximum number of ordnance-loaded railcars allowed by the Captain of the Port, then the ordnance-loaded railcars would be diverted to the Rialto Ammunition Back-Up Storage Point, where they would be stored on the tracks or in the bunkers, until called to the port. Mr. R. K. Weyand emphasized that the practice was not to unload ordnance from railcars at the Rialto Ammunition Back-Up Storage Point. He recalled only two occasions when ordnance was unloaded from a railcar and stored in a magazine at the Rialto Ammunition Back-Up Storage Point. That unloading the railcars was not a common practice is corroborated in the Statistics sections of the Monthly Historical Reports for the Rialto Ammunition Back-Up Storage Point, which show that very few railcars were unloaded/loaded compared with the number of railcars in transit through the site. An example of historic transit data is shown on page 3-26.

Holding railcars on the tracks at the Rialto Ammunition Back-Up Storage Point for more than seven days incurred demurrage costs, which the Port Commander greatly discouraged. Thus, Mr. R. K. Weyand stated that through direct transport of ordnance-loaded railcars to Victory Pier, with a high accuracy in scheduling coincidence of railcar arrival with loading ordnance onto a supply ship, storage of ordnance-loaded railcars at the Rialto Ammunition Back-Up Storage Point was minimized and demurrage costs avoided. Construction of the railcar bunkers in May 1944 provided additional railcar storage and also reduced demurrage costs.

Of the 3.5 million tons of munitions shipped through the Los Angeles Port of Embarkation during World War II, Mr. Weyand stated that less than ten per cent were routed through the Rialto Ammunition Back-Up Storage Point. This statement is contrary to the SOP for Rialto Ammunition Back-Up Storage Point, which specified that all munitions were to be routed to

the port through Rialto (Appendix B). However, that less than ten per cent of the munitions shipped from the Los Angeles Port of Embarkation were routed via Rialto is corroborated by statistical data from the port that show a total of 320,830 long tons, i.e., less than ten per cent of the total munitions shipped from the port, were routed via Rialto Ammunition Back-Up Storage Point (81, and page 3-27).

After the arrival of ammunition at the Rialto Ammunition Back-Up Storage Point from the supply depots, the railcars were inspected for evidence of tampering, sabotage, and damaged packing. During World War II, wooden crates were used to transport munitions and wooden dunnage was used to separate munitions to prevent sympathetic detonations (277). Mr. R .K. Weyand stated that wooden bracing and dunnage inside a railcar could be damaged by railcars banging together when being switched to different tracks. Bracing for 155 mm ordnance was especially susceptible to damage because the shells were shipped standing on end. At the Rialto Ammunition Back-Up Storage Point damaged bracing and dunnage would be repaired by recooperers, i.e., carpenters, who climbed inside the railcar to repair the bracing around the ordnance or replace broken dunnage.

Mr. R. K. Weyand was shown a Monthly History Report for Rialto Ammunition Back-Up Storage Point, dated October 1944, which stated:

*Recoopering is done between or around the igloos, one box at a time. Damaged material is destroyed out in the area. There is no designated burning ground. Small quantities have been burned in a pit. However, this is now a target range* (84).

Mr. R. K. Weyand emphatically stated that the "damaged material" referenced above refers not to munitions, which would not have been detonated or burned at Rialto Ammunition Back-Up Storage Point, but to damaged wooden bracing material of broken dunnage which could not be repaired. The dunnage and bracing damaged beyond repair would have been burned, as burning was less expensive than having the wood hauled away. Mr. Holt's testimony corroborated that of Mr. Weyand in stating that only wood was burnt at the site and that any munitions would have been disposed of not at the site, but in the Mojave Desert.

To guard against sabotage, a seal was fixed to the door of a railcar after an interior inspection. Before moving the railcar to Victory Pier, numbered car seals were placed on the doors. Information on car numbers, seal numbers, and expected and actual times of departure from Rialto Ammunition Back-Up Storage Point was forwarded by the most expeditious means to the Port Transportation Division, Ordnance or Chemical Office, Los Angeles Port of Embarkation, where seals were checked and railcars were inspected. The coordination of the Los Angeles Port of Embarkation with the Rialto Ammunition Back-Up Storage Point is illustrated in a flow chart, with text, presented as Exhibit 4, Appendix E.

In addition to temporary storage of ordnance-loaded railcars prior to shipment through the Los Angeles Port of Embarkation, an additional function of the facility was to provide storage of ammunition used by troops of the Army Ground Forces training for desert warfare at the Desert Training Center in the Mojave Desert, California. Three igloos and an open storage area were used January through March 1943 to store chemical warfare supplies for troops training in the Mojave Desert. Exercises were to prepare troops for combat in North Africa under simulated Theater of War operations. During February 1943, the 261st Ordnance Maintenance Company was stationed at Rialto Ammunition Back-Up Storage Point with five officers, one warrant officer and 145 enlisted men; during March the 622$^{nd}$ Ammunition Ordnance Company with three officers and 190 enlisted men was stationed there. The Ordnance personnel received training in the handling of ammunition and explosives when 72 cars of simulated ammunition for the Desert Training Center were received and unloaded with the assistance of personnel working at the Rialto Ammunition Back-Up Storage Point (173).

Details about the use of the igloos and fuze magazines at the Rialto Ammunition Back-Up Storage Point to store ammunition for troops training in the Desert Training Center were provided by Mr. Robert Thompson and Mr. Aaron Holt, both of whom served in the 622$^{nd}$ Ordnance Ammunition Company as Staff Sergeant and Tech Sergeant, E-7, respectively (I-2, I-3).

As combat in World War II shifted from North Africa to Italy, operations of the Desert Training Center - known from November 1943 as the California-Arizona Maneuver Area (C-AMA) - wound down and ceased on 1 May 1944. When operations at the Desert Training Center began to wind down, the 622nd Ordnance Ammunition Company was relocated in April 1943 to Fontana, within the perimeter of the military reservation which encompassed Rialto Ammunition Back-Up Storage Point. The Company remained at that location until August 1943 when they sailed from the San Francisco Port of Embarkation for the Pacific Theater of War (I-2, I-3).

The 622nd Ordnance Ammunition Company of 186 enlisted men and six officers encamped at the eastern boundary of the military reservation, specifically in an area near the Bonhert Avenue entrance to the Rialto Ammunition Back-Up Storage Point storage area. The encampment was bounded on the north and south by a line of eucalyptus trees, by the reservation perimeter gated fence (fence type Fen-D-M) on the east at Linden Avenue, and on the west by the guarded fence (critical fence type Fen-F-M) which secured the storage area of the Rialto Ammunition Back-Up Storage Point. The cleared area on the east of the installation shown in previous Figure 3-3, page 3-6, may indicate the location of the encampment (I-2).

The 622nd Ordnance Ammunition Company was responsible for receiving, storing, and issuing .30 to .50 caliber ammunition used by troops of the Army Ground Forces for small arms training in the Desert Training Center. About once per week, a shipment of ammunition, primarily small arms ammunition and sometimes other munitions such as landmines, mortars, and bazooka rockets, would arrive at the Fontana Ammunition Storage Point, after transportation by the Pacific Electric Railroad to the Army rail distribution center at Colton (I-2, I-3).

A diesel locomotive was on site to move the ordnance-loaded railcars along spur tracks to the storage igloos in the Rialto Ammunition Back-Up Storage Point. A diesel locomotive positioned a freight car so that the sliding doors of the railcar were adjacent to the open doors of the igloo. Then the ammunition would be unloaded directly into the igloo for storage. The

ammunition was shipped in metal-lined wooden boxes. When issued to troops, the ammunition was transported by truck to the units of the Army Ground Forces training in the Mojave Desert within the Desert Training Center.

"Rialto" was not used in the site name by the 622nd Ordnance Ammunition Company, as their encampment at the military reservation was adjacent to the City of Fontana, and not at that time incorporated into the City of Rialto. Use of the name "Fontana Ammunition Storage Point for the Los Angeles Port of Embarkation" reflects the use of the Rialto Ammunition Back-Up Facility by the 622nd Ordnance Ammunition Company as a storage facility for small arms ammunition for use in training in the Mojave Desert within the Desert Training Center, rather than as a back-up location for holding ordnance-loaded railcars until dispatched to Victory Pier at the Los Angeles Port of Embarkation.

Neither Mr. Thompson nor Mr. Holt recalled any accidents involving ammunition. Mr. Thompson said that safety was "their watchword." He did not know of any burning at the site, nor of any detonation of explosives on the site and referenced Mr. Holt, whom he regarded as a munitions expert, for further information. Mr. Holt's rank as a Master Sergeant with a grade of E-7 and his work as a munitions demolition expert during his tenure at the Desert Training Center and throughout his Army career underscore his munitions expertise. Mr. Holt stated that defective munitions were taken to the Mojave Desert for disposal. He was familiar with chemicals used in munitions and did not recall that any of the munitions stored in the igloos and magazines contained perchlorate. The composition of munitions used during the training maneuvers conducted in the Desert Training Center is a current research project of the Department of Defense. Data is not yet available to confirm or refute Mr. Holt's statement about the perchlorate content of munitions stored in the igloos and magazines at the Rialto Ammunition Back-Up Storage Point.

### 3.4.1 Safety in Storage and Handling of Ordnance

Precautionary measures against sympathetic detonations, fire, damage, and sabotage were taken at every stage of transportation and storage. The Standard Operating Procedures (SOP)

for the Safe Handling and Control of Explosives, Ammunition (other than Small Arms), and Chemical Warfare Toxic Agents at Los Angeles Port of Embarkation and Rialto Ammunition Back-Up Storage Point are shown in Appendix B (81). The practice of these standard operating procedures relative to safe handling of ammunition is illustrated in Appendix B through photographs included as a part of the SOP. The SOP followed procedures required by Army regulations and published by the U.S Government as an Ordnance Safety Manual (156). Of note is that a civilian fire department was on duty at all times and the State Forestry Department loaned a 500-gallon pumper equipped with a 250-gallon water tank for fighting brush fires (84).

The Monthly Historical Reports from the Rialto Ammunition Back-Up Storage Point were reviewed for reports of release of explosives or incidents relating to munitions: none were found. The exceptional safety record of both the Los Angeles Port of Embarkation and Rialto Ammunition Back-Up Storage Point is testimony to the practice of the safety procedures outlined in the SOP: the shipping of 100,227 tons of ordnance during 1943, 130,721 tons during 1944, and 89,882 tons during 1945 (through September) via the Rialto Ammunition Back-Up Storage Point to the Port was accomplished without a single explosion or fire, (81).

Review of historic records and anecdotal accounts did not provide evidence of open burning of explosives, open detonation of munitions, or use of flares at Rialto Ammunition Back-Up Storage Point during the operating period 1941 to 45 (I-1, I-2, I-3).

### 3.4.2 Munitions Stored at Rialto Ammunition Back-Up Storage Point

Analysis of records of operations at the Rialto Ammunition Back-Up Storage Point and evidence from the interview of Mr. Weyand lead to the conclusion that ordnance was rarely unloaded from the railcars and stored in the magazines; rather the sealed ordnance-loaded railcars were stored on the tracks and in the bunkers until called to the port. An inventory of munitions which were routed through or stored at the Rialto Ammunition Back-Up Storage Point was not discovered.

To gain insight into what kind of munitions which passed through the Rialto Ammunition Back-Up Storage Point may have been stored there, and which may have contained perchlorate, records were reviewed for munitions in transit to the Los Angeles Port of Embarkation through Rialto Ammunition Back-Up Storage Point. Information on munitions specific to Rialto Ammunition Back-Up Storage Point was scant.

Table 3-1 shows munitions referenced in historic records of railcars routed via Rialto Ammunition Back-Up Storage Point. This list is consistent with the account of Mr. R. K. Weyand who stated that supply for the China-Burma-India Theatre principally comprised general purpose bombs (100, 250, and 500-pound) and 155 mm artillery shells. Pyrotechnics (incendiary bombs, photoflash bombs, and flares) were infrequently shipped and comprised less than an estimated five percent by weight of munitions shipped through the Los Angeles Port of Embarkation (I-3). Based on research on munitions fillers (*vide infra*), none of the munitions shown in Table 3-1 contained perchlorate.

In terms of munitions stored to supply troops of the Army Ground Forces training in the Mojave Desert within the Desert Training Center, the accounts of Mr. Thompson and Mr. Holt, both members of the 622$^{nd}$ Ordnance Ammunition Company stationed at Rialto Ammunition Back-Up Storage Point from April 1943 until August 1943, state that small arms munitions were primarily stored in the igloos; at times, landmines, shoulder-launched 2.3-inch bazooka rockets, and mortars were also stored there. These munitions were not shipped to the Los Angeles Port of Embarkation, but transported by truck east to the Desert Training Center in the Mojave Desert (I-2, I-3).

One historic document noted that 183,000 pounds of black powder, which consisted of charcoal, sulfur and saltpeter (potassium nitrate) and was conventionally stored in drums or metal-lined wooden crates, were transferred from Rialto Ammunition Back-Up Storage Point in October 1945, after operations had ceased (282, 288, 290). This document is cited because it provides the only specific reference to ordnance stored at the Rialto Ammunition Back-Up Storage Point (282). Of note, is that perchlorate was not a constituent (288).

Figures 3-7 and 3-8 depict ordnance-loaded railcars routed to the Los Angeles Port of Embarkation. Figure 3-7 shows a railcar loaded with ammunition and Figure 3-8 shows the use of dunnage in railcars to prevent sympathetic detonations of 100-pound bombs.

The munitions listed in Table 3-1 and shown in Figures 3-7 and 3-8 are representative of World War II ordnance. Composition has been estimated based on records of chemical compositions of fillers and incendiary devices and igniter compositions (135). All types of bombs had a container or body, a fuze or fuzes, a booster and a stabilizing device. Different types of fuzes were placed in the nose and/or base of a bomb depending on the target and damage intended. A primer flashed from the actions of mechanical parts in a fuze and ignited a small amount of explosive, usually black powder, which set off a detonator that caused the bomb filler, such as TNT, to explode. During World War II most bombs had warheads filled with TNT.

#### 3.4.2.1 Munitions Used in World War II

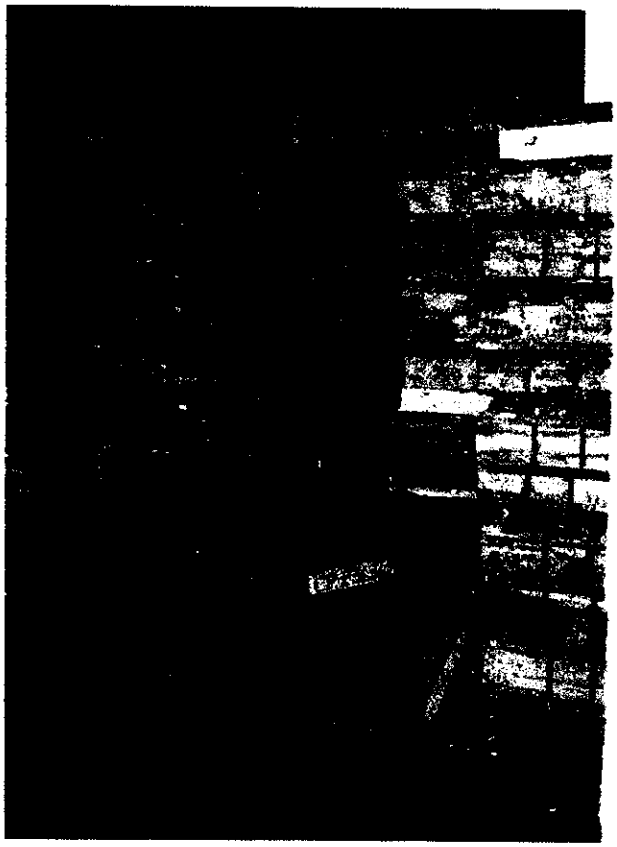
Given the paucity of data on munitions stored specifically at Rialto Ammunition Back-Up Storage Point, additional research was undertaken to determine the types of munitions used during WWII, and those which could have been transported or stored at the site. Of particular interest was whether perchlorate was a constituent of the munitions fillers or other munitions components. Research was undertaken at the Army Military Institute, the Library of Congress, the Soldier Biological and Chemical Command History Office, and the various NARA repositories associated with the regions where arsenals supplied the Los Angeles Port of Embarkation with munitions.

Military explosives during World War II included propellants, high-explosive bursting charges, and low explosives like black powder and tetryl used for fuzes. For the most part, the United States military used single-base smokeless powders, consisting of nitrocellulose and stabilizers, as propellants because the single base powders were less sensitive and safer for personnel. At the beginning of World War II, aerial and underwater ordnance used TNT bursting charges. By 1943, Torpex (a mixture of RDX (Royal Demolition Explosive,

## Table 3-1 World War II Ordnance Shipped through Rialto Ammunition Back-Up Storage Point**

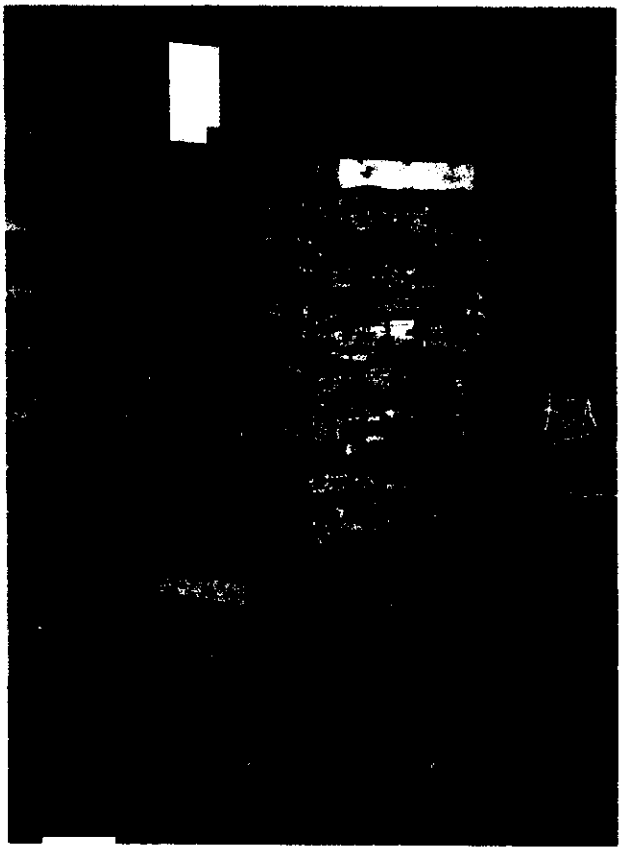
| Ordnance | | Diameter | Length (inches) | Weight (pounds) | Warhead (pounds) | Fill | Fuze | *Remarks* |
|---|---|---|---|---|---|---|---|---|
| Bomb | M1 | | | | | TNT | | *Cluster fragmentation* |
| Bomb | Mark 17 | 15 in | 52.5 | 325 | 234 | TNT | | *Aircraft depth bomb With hydrostatic nose and base fuzes* |
| Bomb | | | | | | Gasoline and Napalm | | *Incendiary* |
| Bomb | Mark C/R | 17.7 | 67.2 | 650 | | TNT | | *Aircraft depth bomb With hydrostatic nose and base fuzes* |
| Bomb | M30 | | | 100 | | TNT | | *Demolition unfuzed* |
| Bomb | M43 | | | 500 | | TNT | | *Demolition* |
| Bomb | M43 | | | 500 | | TNT | | *General Purpose with Band, Trunnion* |
| Bomb | M44 | | | 1000 | | TNT | | *General Purpose with Band, Trunnion* |
| Fuze | M103 | | | | | | Nose | *Bomb fuze* |
| Fuze | M100A1 | | | | | | Tail with .025 sec. delay | *Bomb fuze* |
| Fuze | M102A1 | | | | | | Tail with .025 sec. delay | *Bomb fuze* |
| Shell | M71 | 90mm | | | | High Explosive | M43 TM | *Cartridge for 90-mm AA gun M-1 with M43A2 TM fuze* |
| Shell | M38A1 | 105mm | | | | High Explosive | M43A2 TM | *Cartridge for 105-mm AA gun with M43A2 TM fuze* |
| Shell | M54 | 37mm | | | | High Explosive | M56 PD | *Cartridge for 37-mm M54 with XD Tracer and fuze PD M56* |
| Shell | M55A1 | | | | | High Explosive | | *With tracer, flares and signals* |
| Shell | | 3 in | | | | High Explosive | | *AA gun* |
| Mortar | Light | 60mm | | | | TNT | | *Sheet powder propulsion* |
| Mortar | Heavy | 81mm | | | | TNT | | *Sheet powder propulsion* |
| Rocket | Target | | | | | | | *AA N2 C/R* |
| Grenade | | | | | | TNT | | |

** Noted in the 1942 Memoranda to the Port Transportation Officers as being shipped to the Rialto Ammunition Back-Up Storage Point

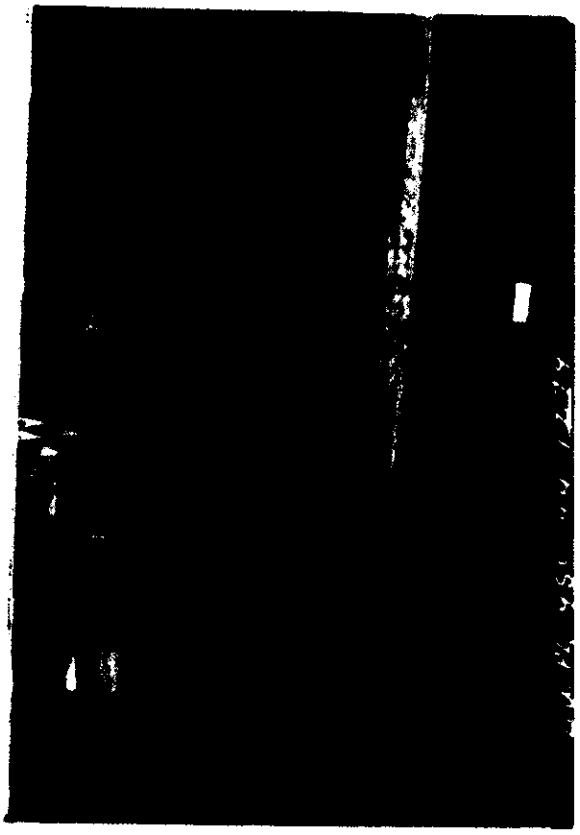


L.A.P.E. 9 S C
3458 9-18-44
AMM ON RR CARS

**Figure 3-7**
Ammunition Crates LAPE Railcar Loaded with Ammunition (68)

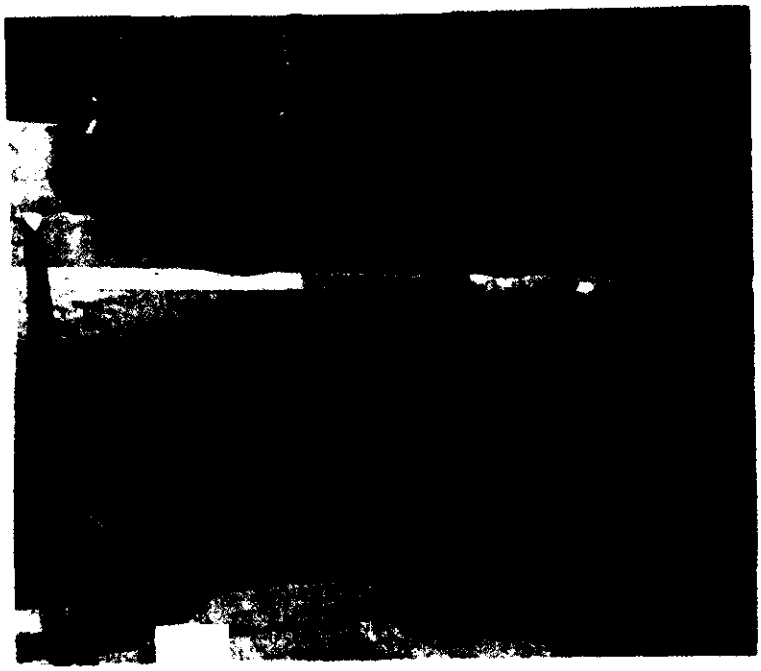


L.A.P.E. 9 S C
3459 9-18-44
AMM ON RR CARS



L.A.P.E. 9 S C
1279 3-18-44
LOADING & BRACING
AMM. IN R.R. CARS

**Figure 3-8**
Ammunition Crates LAPE Railcar Containing 100# Bombs (66)



L.A.P.E. 9 S C
1280 3-18-44
LOADING & BRACING
OF AMM. IN R.R. CARS

1,3,5-trinitro-1,3,5,-triazine), TNT, and aluminum powder) became the standard torpedo warhead because it was more powerful.

A list of munitions and fillers was derived from an Ordnance Field Guide published in 1946; the list is presented as Exhibit 6 in Appendix E (281). From this list and other military publications reviewed, it is apparent that the fillers of general purpose bombs, both low and high explosive, including fragmentation bombs and semi-armor piercing bombs, did not contain perchlorate (278, 280, 281, 276).

For several years prior to about July 1943, the standard bomb loading consisted of a main charge of 50/50 amatol (50% Trinitrotoluene (TNT) and 50% Ammonium Nitrate), with TNT nose and tail surrounds. This loading was used for most of the demolition bombs. For a short period during WWII there was a shortage of TNT and it was necessary to use amatol having a content of only 35 percent TNT. However, this was a temporary expedient to carry over a critical period, and as soon as TNT became available again, loading bombs with standard explosives was quickly resumed. In 1944, the availability of TNT increased to such an extent that amatol loading ceased. All 100 and 250-pound general purpose bombs were loaded with 100 percent TNT. Of the 500, 1,000, and 2,000-pound general purpose bombs, 75 percent were loaded with 100 percent TNT. The other 25 percent were loaded with Composition B (40 percent TNT, 60 percent RDX), with TNT nose and tail surrounds (284, 288). Other explosive fillers included Tetryl (trinitrophenylmethylnitramine), Explosive D (ammonium picrate), Tetrytol, Pentolite, Dynamite, and black powder (285, 288).

Pyrotechnics describes a class of munitions used to brightly illuminate an area or to burn an area. It includes incendiary bombs, photoflash bombs, and parachute flares and signals. As shown in the list in Appendix E of incendiary bomb fillers and explosive charges, perchlorate was not a constituent. Fillers included thermite (a mixture of ferrous oxide and aluminum), or gelled gasoline, which was composed of gasoline made viscous by the addition of sodium palmitate (this mixture was also known as napalm). Tetryl was used as an explosive charge (281, 289). The Corps compiled a list of munitions potentially used during World War II for training troops in the California-Arizona Maneuver Area; the list shows three incendiary

bomb fillers, IM 23, IM 28, and IM 136 with perchlorate as a constituent at 50, 10, and 49 percent on a weight basis (134, 135). Where perchlorate was used in these munitions it was in gram quantities or trace amounts. Potassium chlorate and potassium perchlorate are shown as a constituent of photoflash bombs, flares, and signals (281, 289).

Based on this analysis, a conclusion is that, of the munitions that might have been stored at the Rialto Back-Up Ammunition Storage Point, perchlorate was an extremely minor constituent, principally found in pyrotechnic munitions such as flares, photoflash bombs, and some incendiary bombs. There is no record that pyrotechnic munitions were stored at the site.

### 3.4.3 Statistics

Monthly Historical Reports from the Commanding Officer at Rialto Ammunition Back-Up Storage Point to the Port Commander, Los Angeles Port of Embarkation, provide information on personnel; railcars received, unloaded, shipped, loaded; storage space; facilities; and any problems encountered. Mr. R. K. Weyand recalled only two occasions when ordnance was unloaded from a railcar and stored in a magazine at the Rialto Ammunition Back-Up Storage Point. He stated that the loading and unloading referenced in the statistics referred to consolidation of partial shipments into one railcar (I-1).

***Persons Operating the Facility:***

Initially there were three officers, of whom the Commanding Officer and 1st Lieutenant were stationed at Rialto Ammunition Back-Up Storage Point; the Chemical Warfare Officer was assigned from the Los Angeles Port of Embarkation. From August 1944, all three officers were assigned from the Los Angeles Port of Embarkation. The Commanding Officer served as Ordnance Officer. The 1st Lieutenant served as Transportation Officer and the Chemical Warfare Officer was also the Security and Property Officer. A complement of civilians, ranging in number from about 64 to 138, supported the officers in operating the facility.

***Storage Space***

The amount of storage space was a constant until the addition of bunkers for 220 railcars in May 1944.

Office Space: 1,000 sq. ft.

Warehouse Space: 1,975 sq. ft.

Magazine Explosives Space (20 igloos and 4 fuze and powder magazines): 37,200 sq. ft.

Open Storage for bomb dunnage and dunnage lumber: 15,000 sq. ft.

***Accomplishments***

Data on railcars received and shipped comprised this section and the numbers varied. Below are data for March 1944. Total railcars received December 1942, when operations began, was 47; monthly average for 1943 was 248 (25).

| | |
|---|---|
| Number of [rail]cars received for the month of March: | 461 |
| Number of [rail]cars unloaded for the month of March: | 1 |
| Number of [rail]cars loaded for the month of March: | 1 |
| Number of [rail]cars shipped for the month of March: | 493 |

These data are representative of operations in that the numbers of cars loaded and the numbers of cars unloaded are low relative to the numbers of cars shipped and received. This suggests that handling of munitions may not have occurred on a daily basis, thus reducing the possibility of a release. This reasoning is supported by a monthly historical report dated October 1944 from Rialto Ammunition Back-Up Storage Point wherein it is stated that [storage] igloos were not used to a great extent, and by Mr. R. K. Weyand's account that unloading of ordnance for storage in a magazine occurred only twice in his recollection; this data on unloading and loading refers to consolidation of partial shipments into one railcar (I-1).

***Issues***

This section included such subjects as clearance of brush from the igloo area, or temporary storage of two Japanese bombs removed from a vessel at Victory Pier (31).

***Total amount of ordnance shipped to Los Angeles Port of Embarkation through the Rialto Ammunition Back-Up Storage Point:***

*1943: 100,227 long tons*
*1944: 130,721 long tons*
*1945: 89,882 long tons (through September)*
*Total: 320, 830 long tons* (81)

This amount is consistent with Mr. R. K. Weyand's statement that less than ten percent of the 3.5 million tons of ordnance shipped from the Los Angeles Port of Embarkation was routed through the Rialto Ammunition Back-Up Storage Point.

## 3.5 Closure and Disposal

Operations ceased in September 1945. The Army put the Rialto Ammunition Back-Up Storage Point on caretaker status 16 October 1945, and declared the site surplus 13 November 1945. Custody of the property was transferred from the War Assets Administration to the Farm Credit Administration 9 July 1946.

Two thousand acres outside the fenced storage area were leased for sheep grazing from 1 April 1946 until 31 October 1950. The storage area was subsequently sold to companies which could beneficially use the explosives storage facilities. Most of the property is zoned as industrial and occupied by various businesses, including pyrotechnic firms. Military improvements that have been beneficially used by nonmilitary entities include the water well, the igloos and bunkers, and a bomb shelter. There was no evidence that the seven underground storage tanks were beneficially used. The City of Rialto removed one tank, four were removed by others, and Ecology Control Industries, under contract to the U.S. Army Corps of Engineers, removed the remaining two underground tanks in 2000; a Closure Report was approved 27 November 2000.

## 4.0 CONCLUSIONS

Based on review of extensive historical records and interviews with persons with a working knowledge of the installation, no evidence was found that Rialto Ammunition Back-Up Storage Point was operated as other than a temporary storage facility for ordnance-loaded railcars in transit to the Los Angeles Port of Embarkation during World War II, and for storage of small arms ammunition for troops of the Army Ground Forces training in the Mojave desert. There is no evidence of ordnance manufacture, treatment, or disposal.

Less than ten percent of the 3.5 million tons of munitions transported to the Los Angeles Port of Embarkation was routed through the Rialto Ammunition Back-Up Storage Point. The standard practice was to leave the munitions stored in the sealed railcars rather than unloading railcars and storing munitions in igloos and magazines at the Rialto Ammunition Back-Up Storage Point.

The principal activity at the Rialto Ammunition Back-Up Storage Point was inspection and temporary storage of ordnance-loaded railcars (on the tracks or in bunkers) until shipment to the Los Angeles Port of Embarkation. Thus, with a low frequency of handling munitions, the probability of an accidental release is low.

Railcars routed through Rialto Ammunition Back-Up Storage Point were inspected for damage to the wooden packaging: bracing and dunnage. Repairs to bracing and dunnage were made inside the railcars by recooperers. Staff burned wooden bracing and dunnage that could not be repaired. No evidence was found of open burning of munitions or detonation of ordnance or explosives.

The exceptional safety record of no explosions or ordnance-related fires throughout the three-year period of operation of Rialto Ammunition Back-Up Storage Point is testimony that the facility was operated in accordance with the Army's stringent requirements for Ordnance Safety.

Historical records and anecdotal accounts of types of munitions routed through the Rialto Ammunition Back-Up Storage Point, knowledge of the composition of these munitions and constituents of the fillers and igniters used, and knowledge that perchlorate was a minor constituent in military munitions until near the end of World War II, support the conclusion that the amount of perchlorate, as a munition constituent routed through, or stored at the site, was very small.

Given that:

- munitions were stored in sealed railcars;
- the standard practice was *not* to unload railcars and store munitions in the magazines;
- perchlorate was not a constituent of most munitions and only a minor consituent of some pyrotechnics;
- pyrotechnics comprised less than five percent of all munitions shipped from the Los Angeles Port of Embarkation;
- no evidence was found of shipment of pyrotechnics through Rialto Ammunition Back-Up Storage Point;
- small arms ammunition stored in the igloos for troops undergoing training in the Mojave Desert either did not contain perchlorate or contained only gram quantities, then,

the probability of a release of perchlorate from the Rialto Ammunition Back-Up Storage Point is virtually zero.