Goodsprings: A historical archaeological review of the Yellow Pine Mining District

Christina A Miller
University of Nevada, Las Vegas

Follow this and additional works at: https://digitalscholarship.unlv.edu/rtds

Repository Citation
https://digitalscholarship.unlv.edu/rtds/178

This Thesis is brought to you for free and open access by Digital Scholarship@UNLV. It has been accepted for inclusion in UNLV Retrospective Theses & Dissertations by an authorized administrator of Digital Scholarship@UNLV. For more information, please contact digitalscholarship@unlv.edu.
INFORMATION TO USERS

This manuscript has been reproduced from the microfilm master. UMI films the text directly from the original or copy submitted. Thus, some thesis and dissertation copies are in typewriter face, while others may be from any type of computer printer.

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleedthrough, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send UMI a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

Oversize materials (e.g., maps, drawings, charts) are reproduced by sectioning the original, beginning at the upper left-hand corner and continuing from left to right in equal sections with small overlaps. Each original is also photographed in one exposure and is included in reduced form at the back of the book.

Photographs included in the original manuscript have been reproduced xerographically in this copy. Higher quality 6" x 9" black and white photographic prints are available for any photographs or illustrations appearing in this copy for an additional charge. Contact UMI directly to order.

UMI
University Microfilms International
A Bell & Howell Information Company
300 North Zeeb Road, Ann Arbor, MI 48106-1346 USA
313/761-4700  800/521-0600

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
Goodsprings: A historical archaeological review of the Yellow Pine Mining District

Miller, Christina A., M.A.

University of Nevada, Las Vegas, 1992

Copyright ©1992 by Miller, Christina A. All rights reserved.
GOODSPRINGS: A HISTORICAL
ARCHAEOLOGICAL REVIEW
OF THE YELLOW PINE
MINING DISTRICT

by
Christina A. Miller

A thesis submitted in partial fulfillment of the requirements for the degree of

Master of Arts
in
Anthropology

Department of Anthropology
University of Nevada, Las Vegas
May, 1992
The thesis of Christina A. Miller for the degree of Master of Arts in Anthropology is approved.

Chairperson, Claude N. Warren, Ph.D.

Examinining Committee Member, Sheilagh T. Brooks, Ph.D.

Examinining Committee Member, John J. Swetnam, Ph.D.

Graduate Faculty Representative, David L. Weide, Ph.D.

Graduate Dean, Ronald W. Smith, Ph.D.

University of Nevada, Las Vegas
May, 1992
ABSTRACT

This thesis consists of a comparative analysis of the written historical record and surface archaeological features relevant to three mines of the Yellow Pine Mining District. The intent is to discover if field observations do indeed confirm historical documentation. Using archival sources combined with an intuitive non-random sampling method, various feature systems associated with mining were recorded in order to discern chronological and historical accuracy. Research questions concerning length of mining activities, number of men employed at the mines, feature systems utilized, and the current condition of each site were addressed to confirm documentation and the historical significance of these sites.

The results of the field study has confirmed that the mines were active during the periods documented through various archival sources. Little physical evidence remains of the thematic feature systems associated with the once busy Yellow Pine Mining District. The most productive economic mining period of southern Nevada does not possess the physical criteria to be considered historically significant in regards to preservation. Nevada's cultural
resources associated with mining have almost totally vanished because of the ephemeral nature of mining operations.
TABLE OF CONTENTS

ABSTRACT iii

TABLE OF CONTENTS v

LIST OF FIGURES vii

LIST OF TABLES ix

ACKNOWLEDGEMENTS x

CHAPTER I 1
INTRODUCTION

CHAPTER II 6
ENVIRONMENTAL ANALYSIS
Geology 6
Flora and Fauna of the District 9

CHAPTER III 11
HISTORY OF THE YELLOW PINE MINING DISTRICT
History of Staking a Claim 19
Yellow Pine Mine 22
Yellow Pine Extension 30
Bybee Mine 31
Alice Mine 33
Prairie Flower Mine 35
Keystone Mine 38
Boss Mine 41

CHAPTER IV 46
KEYSTONE MINE FIELD ANALYSIS
Analysis of Artifacts Found at Tramway A 51
Upper or Southern Tailings 53
Analysis of Artifacts Found at the Upper Tailings 55
Road Two 59
Analysis of Artifacts Found by Road 2 62
Trash Dump 64
Analysis of Artifacts Found at the Trash Dump 68
Lower Tailings and Tramway B Remains 70

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
LIST OF FIGURES

Figure 1. Principal claims in the Yellow Pine District (Bestram 1986). 23
Figure 2. Principal claims in the Yellow Pine District (Bestram 1986). 24
Figure 3. Yellow Pine Extension underground workings, 1931 (Hewett, 1931). 32
Figure 4. Bybee Mine underground workings, 1912 (Hill 1914). 34
Figure 5. Prairie Flower underground workings, 1931 (Hewett 1931). 37
Figure 6. Boss Mine underground workings, 1914 (Knopf 1915). 45
Figure 7. Keystone site layout. Refer to Shenandoah Peak, Nev., 1956 topographic map. 48
Figure 8. Cement pads below Tramway A. 50
Figure 9. Tramways B and C with Road 3 in the background. 71
Figure 10. Yellow Pine Site Layout. Refer to Goodsprings, Nev., 1960 topographic map. 84
Figure 11. Adit D2 and remains of ore chutes for train. 90
Figure 12. Loading ore cars at the Yellow Pine mine, James Down Collection (UNLV 0015, #15). 95
Figure 13. Alice mine tramway. 98
Figure 14. Remains of main excavation feature. 111

Figure 15. Hoisting operation at the Yellow Pine mine, UNLV Special Collections (UNLV 0002, #78). 114

Figure 16. Boss mine site layout. Refer to Shenandoah Peak, Nev., 1956 topographic map. 138

Figure 17. Adit K and rail transportation feature. 142

Figure 18. Cement towers at the Boss mine. 148
LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1</td>
<td>Total historic production of the Yellow Pine Mining District.</td>
<td>20</td>
</tr>
<tr>
<td>Table 2</td>
<td>Production of the Yellow Pine Mining Co., 1907-1929.</td>
<td>27</td>
</tr>
<tr>
<td>Table 3</td>
<td>Production of Prairie Flower Mine, 1908-1918.</td>
<td>39</td>
</tr>
</tbody>
</table>
ACKNOWLEDGEMENTS

This thesis endeavor was not accomplished without support from my family and friends. I would like to give special thanks to Keith Myhrer of the Bureau of Land Management, Las Vegas District. Without his help in research, field work and advice, I would not have felt so confident. The (patient) direction I received from my advisor Dr. Claude Warren is appreciated. I would like to thank the rest of my committee members: Dr. Sheilagh Brooks, Dr. John Swetnam and Dr. David Weide for their time and effort. During my field work, I had a group of friends who went out with me to make sure I did not meet my end down some mine shaft. I give thanks to Elaine Billets, Mary Culp, Steve Silva, and Richard Stockton for accompanying me out in the field. Many of my friends supported me with advice for various thesis problems and thanks are due them: Tom Cook, Laura Cockerham, Dawna Ferris, and Runore Wycoff. Special thanks goes to Larry Clinesmith for drawing my illustrations, Margaret Ahrens for finishing touches, and Cheri Madison for editing this thesis twice. The support and prayers I received from my parents and other family members during this long haul assisted me with the
completion of this project. I must acknowledge the UNLV Library and Special Collections departments for their assistance in providing materials for research. One must not forget the miners who survived the rigors of excavation and the harsh desert environment, thus making this thesis possible.
CHAPTER I

INTRODUCTION

The Yellow Pine Mining District was the most important economic enterprise in southern Nevada between the years of 1900 and 1930. The rich lead, zinc, silver, and gold ores contributed to the economic and social development of southern Nevada. Nearly 26 million dollars in revenues were mined between 1900 and 1930 (Longwell et al. 1965:104b). No in-depth archaeological research has been conducted on this district’s mining features even though the archaeological record should show a preponderance of artifacts, structures, and technology relating to the periods of activity in the late nineteenth and early twentieth centuries.

Little physical evidence remains of the man-made structures associated with the mining enterprise. Mining was and is an enterprise identified with the quickest capital gain resulting in a boom and bust period of activity at mining loci. Equipment and technology were often transported out of one ore strike to the next. The cultural resources of Nevada’s mining history are rapidly disappearing under today’s determined technological processes.
The cultural resources of the Yellow Pine District are important in illustrating this period between the years of 1900 and 1930 in Nevada mining history. Therefore, it is important that these resources be recorded and evaluated in terms of their significance as to the archaeology and history of the area. This study employs an intuitively selected sample of three mines in the Yellow Pine District. These are:

1. The Keystone mine, the oldest mine and only major gold producing mine in the district. It was chosen to represent the earliest production and technology of gold mining activities in the area.

2. The Yellow Pine mine, the largest and most profitable operation in the district. The Yellow Pine produced mainly lead and zinc, the major minerals for all mining activities in the district. The Yellow Pine was selected because it was the longest running operation.

3. The Boss mine produced the most varied precious minerals mined in the district and was chosen because of its diversity of minerals and the small scale of operation.

The intent of this historical research is to discover if the surface archaeological features of the Yellow Pine Mining District are confirmed by historical documentation.
Field observations are used to validate and increase the information known from written records. Preliminary documentary research completed prior to fieldwork directed the course of the site inventory process. When the field observations and the historical documents regarding mining activities at the three sites agree, then the probability of accuracy of the record is high. When the field observations and the historical documents do not agree, a careful analysis and evaluation is necessary to determine the time frame and the activities that occurred at the sites.

Documentary research, aerial photographs, and topographic information indicate that human activity was centered around the areas of ore access and its extraction. These are areas where people worked and lived and from which transportation routes led to centers for milling or further processing of ore. In discussing problems of field survey strategy at mining sites, Hardesty (1988:109) wrote that "between major activity loci there is a 'no man's land' with no clear documentary or archaeological visibility to guide pedestrian surveys". The site boundaries must, therefore, be determined by the morphology of the feature system. In this study each of the various feature systems associated with mining could be treated as a separate cluster of data to be sampled. A non-random sampling method was used in which each sample unit consisted of features associated with
each mine.

Elements of mining engineering and historical records were researched in order to assist in the identification of feature systems present at the sites. The feature systems of mining were found to revolve around the following mining and frontier activities: ore excavation, milling, settlement patterns at sites, communication, and transportation elements associated with mining. The archaeological data recovery consisted of the recording and measurements of the structural features remaining and the recording of artifacts found in association with feature systems. "Archaeology, which deals with the material remains of past human behaviors, compliments the written records" (Ferris 1991:8).

Mining once again has become an important industry in Nevada. The new technologies employed will eradicate many of the remaining structures and features associated with these historical mining activities. The current methods of open pit mining and heap leaching of previous mine tailings will massively impact the cultural resources. All the mines inventoried and researched are under current patent and management, and these claims could commence operation at any time. The significance of this Yellow Pine District has not been determined. Are the cultural resources left here eligible for nomination on the National Register of Historic
Places? The four criteria consist of assessing whether the subject merits associations with events important to our history, with important persons, architecture or engineering styles and finally providing potential for scientific or scholarly information about the history of the area. It will be the behavioral aspects of the miners between the years 1900 to 1930 that will determine the significance of this Yellow Pine District.
CHAPTER II

ENVIRONMENTAL ANALYSIS

Geology

The Spring Mountains are the highest mountain range in Clark County with Charleston Peak the highest point at 11,918 feet. At the northern part of the range the crest runs in a north-south line, and in the southern half the crest is oriented northeast-southwest. Portions of these southern ridges are nearly at right angles to the main axis of the range reflecting important structural trends (Longwell et al. 1965:63). The Spring Mountains end near the present Nevada-California state line.

The northern two-thirds of the range consists of exposed sedimentary bedrock. Paleozoic systems ranging from Cambrian to Permian are present, and maximum thickness of the exposed Paleozoic strata can exceed 23,000 feet. The high parts of the range often have vertical cliffs hundreds of feet high forming a rugged topography. These vertical cliffs are formed on resistant Paleozoic limestone, dolomite and quartzite. Mesozoic rocks are described as:

The Aztec Sandstone which is protected by an overlying thrust plate of carbonate rocks is of Triassic and Jurassic formations and is of a softer material than the limestones. This sandstone formation (the Wilson
Cliffs) runs approximately 12 miles long and 3,000 feet high and is a part of the Spring Mountains' eastern slope (BLM 1980:41). The washes that fan out from the vertical walls of Spring Mountains consist of cemented gravel of late Tertiary and Quaternary ages and form the major alluvial fan material of the lower slopes and valleys. These gravels also contain the aquifers that conduct water from the high ranges down into the Las Vegas and Pahrump Valleys. The southern end of the range, in the vicinity of Goodsprings, contains both intrusive and extrusive rocks in addition to the Triassic and Jurassic formations. This southern area is much lower than the northern range (5,000' or less in elevation) and the Paleozoic section of rock is much thinner. The total thickness here is around 9,000 feet compared to 23,000 feet farther north.

The geologic structure of the Spring Mountains is complex due to its many thrust faults and large folds that are associated with the thrusts. The most famous thrust is the Keystone thrust which is exposed for more than 45 miles. This thrust is responsible for causing the dramatic scenery of Red Rock Canyon National Conservation Area where Cambrian dolomite lies above younger Aztec Sandstone formations. The Goodsprings/Yellow Pine Mining District is cut by the Green Monster, Milford, and Sultan thrusts involving various layers of dolomite with a breccia rock material marking the

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
fault tracer.

The Goodsprings mining area is considered to be bounded by the Potosi Mine on the north, the Pahrump and Mesquite valleys on the west, the State Line (Devil Peak vicinity) on the south, and the Goodsprings Valley on the east, which borders the Bird Spring Mountain Range. The term "Yellow Pine Mining District" appears to have come from the Yellowpine Limestone, so named by D.F. Hewett. In 1931 Hewett subdivided the Mississippian Monte Cristo Limestone into five divisions: Dawn Limestone, Anchor Limestone, Bullion Dolomite, Arrowhead Limestone and Yellowpine Limestone. The youngest or uppermost layer, the Yellowpine Limestone, is approximately 350 million years old and "accounted for approximately 85 percent of the lead-zinc production of the district. The Anchor Limestone Member hosted an additional 10 percent" (Albritton et al. 1954:104).

Most ore was found in the dolomitized limestone portion of the Monte Cristo Formation. Dolomitization of limestone occurs when fractured and sheared limestone was invaded by solutions preceded ore deposition and which came up the same conduits that ore-bearing solutions later used (Hewett 1928:104). Miners looked for these dolomitized zones which often contained lead, zinc and gold.
Flora and Fauna of the District

There are over 45 species of mammals, 100 species of birds and 30 species of reptiles and amphibians found in the Spring Mountain Range (BLM 1980:67). The lower southern end of this range lacks the riparian environment and abundance of water that the northern two-thirds of the range contains. "Moisture patterns on the South Spring Range are characteristic of the entire southwest in that rainfall is unpredictable and extremely sporadic" (McQuivey 1978:1). Wildlife still abounds in this spartan environment. Desert bighorn sheep (Ovis canadensis nelsoni) frequent the area and were a known food source to the miners.

Almost all of the 91 claims identified by Longwell et al. (1965) were located within the limits of sheep distribution. Historical records also show sheep were utilized as an important source of food for the miners since bighorn were readily available and fresh meat from other sources was limited (McQuivey 1978:4). Other animals found in this region include: mule deer (Odocoileus hemionus crooki), cottontail (Sylvilagus audubonii) and jackrabbits (Lepus aleni), antelope ground squirrels (Ammospermophilus harrisii), and coyotes (Canis latrans) (Olin and Thompson 1982:10, 32, 64, 66, 82). A few of the many species of birds may consist of Gambel’s quail (Callipepla gambelii), mourning doves (Zenaida macroura), various raptors and species of sparrows (Farrand 1988:179, 189). Reptiles may include the desert tortoise (Gopherus agassizi), Gila monsters (Heloderma suspectum), Mojave
rattlesnake (*Crotalus scutulatus*), zebra-tailed lizards (*Callisaurus draconoides*) and many more snakes and lizards (Stebbins 1980:97, 189, 190).

The three mines surveyed lie below 5,000 feet in elevation and therefore are "characterized by extremely low rainfall and a resultant sparse desert shrub vegetative type" (McQuivey 1978:9). The only tree observed in the area consists of the Joshua tree (*Yucca brevifolia*). Dominant plant species found near these mines include the creosote bush (*Larrea divaricata*), blackbrush (*Coleogyne ramosissima*), and snakeweed (*Gutierrezia sarothrae*) (Elmore and Janish 1976:60, 76, 82). Common, but found in lesser quantities, are Mojave yucca (*Yucca schidigera*), hedgehog cactus (*Echinocereus engelmannii*), and many grasses (Dodge and Janish 1985:6, 37, 128).
CHAPTER III

HISTORY OF THE YELLOW PINE MINING DISTRICT

The first mine to operate in what became the Yellow Pine Mining District was the Potosi mine, which was called the Old Mormon mine by some early residents. This lead ore mine, originally operated by a Las Vegas Mormon colony in 1856, reached full production in 1861 under the Colorado Mining Company with its deed signed by President Lincoln. The next major in the district was the Keystone mine, which primarily operated for the production of gold. During the Keystone’s operation in the 1890s, the district also produced a small but steady source of copper, gold, lead and silver. Prior to 1906, few people paid attention to the gray-white rock material that accompanied these lead ores. "In 1906 Connie Brown, an engineer from Socorro, N. Mex., made a professional visit to Good Springs and recognized this material as similar to some of the zinc ores mined at Magdalena, N. Mex" (Hill 1914:226). This discovery led to much experimentation, and the Yellow Pine mine was formed and became the first producer of good grade zinc ore.
There are two distinct types of ore deposits in the Yellow Pine district. The following source of geology information arrives from Hill (1914). The first type is the more traditional gold deposits in altered igneous rocks. The gold ores appear in intrusive quartz monzonite and granite porphyry or at contact points. These deposits were mainly found and mined at the Keystone mine near Sandy, Nevada. The gold deposits were less important than the zinc-lead and copper deposits in the upper Mississippian limestones. This zinc-lead ore is considered a replacement type of deposit and can be divided into deposits of zinc and lead which carry smaller amounts of silver and sulfurous copper. The lead-zinc deposits themselves can be broken down further into zinc minerals with little or no lead in them and lead deposits with little or no zinc in them.

The replacement deposits seem to have little relation to the few intrusive igneous rocks in Spring Mountain, as a large number of ore bodies are found in the limestone at considerable distance from any known porphyry. It is true that some of the mines notably the Bybee and Prairie Flower are located very near masses of igneous rock,...(Hill 1914:241).

The main factor in determining the location of ore bodies in the Yellow Pine district appears to have been the presence of fractures, either small or large in extent, that commonly strike east and west, with a second set striking nearly north and south. These fractures stand almost vertically. Because mineral-bearing waters moved through
these fractures much more easily than through rock, are minerals were deposited in open fissures and into beds of limestone for some distance from the fractures. Even where horizontal ore beds occur, such as the Bybee mine, they eventually angle into vertical beds. As is often the case with lead and zinc ores, they commonly occur together. The ratio of lead to zinc is extremely diverse in each sample, and in practically all the zinc ores there is more or less lead. "At the Bybee it has been fairly well established that there is a greater lead content in ore above the 300 foot level than below it..." (Hill 1914:242).

Much of the lead carbonate (called smithsonite - ZnCO₃) contains, theoretically, 52 percent metallic zinc. In the Yellow Pine district this carbonate material is stained brown to red by iron oxide and has the look of consolidated sand. The other lead carbonate, (cerusite - PbCO₃) sometimes called sand carbonate, contains up to 77.5 percent metallic lead. Cerusite was found in the first level of the Bybee mine and was so pure that it had a pearly luster about it. Lead sulphide, better known as galena, (PbS), theoretically carries 86.6 percent metallic lead. James Hill believed in 1914 that most of the "ores of the Yellow Pine district were derived entirely from bodies of sulphide ore whose mode of deposition is not definitely known, though they are thought to have been replacements" (Hill 1914:248). Lead Sulphate
Anglesite, PbSO₄, theoretically contains 73.6 percent of PbO. In the Yellow Pine district, anglesite occurs only as a thin coating around kernels of galena.

Zinc silicate, Calamine, (ZnOH)₂SiO₃₂, theoretically contains 54.3 percent metallic zinc. At the Yellow Pine mine, zinc silicate was often found lining cavities in other ores. At the Bybee claim, these beautifully clear white tabular crystals of small size were found along watercourses. Another common zinc mineral, Hydrozincite, (ZnCO₃₂Zn(OH)₂, carries approximately 60 percent metallic zinc. It occurs as a thin white coating on smithsonite near the surface of most of the lead-zinc mines in the Yellow Pine district and was found in fairly large masses at the Bybee mine.

The copper deposits in the Yellow Pine district are small compared to the lead-zinc and gold deposits and also are replacement over in fracture planes. Copper occurs in zones of oxidation as Cuprite, (Cu₂O), which theoretically contained 88.8 percent copper but rarely found in its pure form in the Yellow Pine district. Many small deposits of the bluish-green Chrysocolla, (CuSiO₃·2H₂O), and in thin crusts, bright green Malachite, (Cu₂(OH)₂CO₃), can be found in the carbonate and red oxide ores. The Yellow Pine mines, Keystone mine and Boss mines did not produce much copper (Hill 1914:243-246).
The gold ores in the Yellow Pine district are few in number compared to the copper, lead, silver and zinc deposits. The "purely gold deposits of the Yellow Pine district are less than ten in number....The Keystone and Red Cloud represent one type in which the gold occurs free, disseminated in very much altered quartz monzonite porphyry" (Hill 1914:249). Between 1910 and 1914 gold ore usually did not exceed $60 a ton and the general average was $15 to $20 per ton. The gold occurred in small light colored flakes and carried much silver with it.

The main ores of production are the lead, zinc and zinc-lead ores, and all three classes can be obtained from a single mine. The fairly pure lead ores consist mainly of galena, cerusite and anglesite. The lead products were shipped primarily to Salt Lake City, Utah, and to areas around that city for smelting. The zinc ores consisting of mixed smithsonite, hydrozincite and calamine are found practically free from galena and were sent to smelters in the Mississippi Valley. This zinc ore found a large market in zinc-white paint pigments.

The mixture of zinc-lead ores often found at the Potosi and Yellow Pine Company claims could not be sold at a profit without some form of separation of the two minerals. Three mills were built in the Yellow Pine district. The Keystone Mill was built at the town of Sandy, Nevada, to process gold
ores. This was a cyanide mill and was equipped "with two 4-foot Huntington Mills for crushing the soft altered porphyry ores and with iron leaching tanks" (Hill 1914:250).

The first mill used by the Yellow Pine Company in treating the ore from the Yellow Pine mine was built in 1899 at Goodsprings, Nevada, by lessees to the Columbia and Boss mines. It contained rolls, screens, Harz crusher to treat the coarse sizes, a Richards classifier, and tables. Its purpose was to recover silver and lead from the mixture of lead and zinc ores. This mill was not effective, and in 1911 the mill was altered to become more of a separating mill than a concentrating mill.

Previous to 1911 all ore of this grade was sorted by hand into the two products, but it was realized that there was a large loss in the fine material which could not be sorted by picking. The new Yellow Pine mill has demonstrated that this ore can be separated by mechanical means and the product, lead concentrate and zinc tailing, disposed of to the smelting companies (Hill 1914:250).

The mill designed by G.A. Overstrom in 1911 allowed the owners of the Yellow Pine to process not only at a faster rate, but to treat lower grade ores. "The facility also treated lower grades of ore, which were then shipped as readily marketable material. In 1914, the mill processed 80 to 100 tons of ore per day and earned profits of $30,000 and $40,00 per month" (Geary 1984:45). This mill operated 16 hours a day, and materials were shipped out by railroad to the smelters in Salt Lake.
In 1919, after a fire at the mine, the mill was remodeled and eight Diester-Overstrom tables, screens, jigs, and five oil-fired calcining furnaces were installed. In 1920 the company permitted the United States Bureau of Mines to make exhaustive tests in an experimental plant to determine the feasibility of separating the lead and silver from zinc by chloride volatilization. Although the tests were encouraging, no attempt has been made to change the plant. The remodeled mill was burned in September, 1924, and has since been replaced by a new mill (Hewett 1931:129-30).

What are ordinarily called concentrates constitute the lead product, which is said to average 57.5 percent of lead, 10 percent of zinc, and 40 ounces per ton of silver. The tailings that are waste in ordinary practice form in this mill the zinc product, with a content of 33 to 35 percent of zinc, 6 to 8 percent of lead, and 4 to 6 ounces per ton of silver.

The mill is rated at 80 tons in 24 hours, but in actual practice three 8-hour shifts treat about 75 tons of crude ore daily....Fred A. Hale, superintendent of the mine and mill, estimates that from ore of this class 68.6 per cent of the lead, 92.2 per cent of the zinc and 62.6 per cent of the silver are saved. During the fall of 1912 the monthly shipments amounted to 1,500 tons of zinc tailings and 300 tons of lead concentrates. A more detailed description of this mill has been prepared by the writer for publication in Mineral Resources of the United States for 1912 (Hill 1914:251).

The success of the Goodsprings mining district did not lie in just the minerals produced. The most important
factor for economic growth was the completion of railroads into the area to carry out the ore. In 1905 the San Pedro, Los Angeles and Salt Lake Railroad was finished to Jean, Nevada. With this completion many mines had a much shorter distance to haul of their ore to the railroad. They no longer had to wagon freight their ore into California. Later, smaller railroad lines from major mines were able to hook up to the main line of the San Pedro, Los Angeles and Salt Lake Railroad. "The completion of a narrow gauge railroad from Jean in June 1911 lowered transportation costs greatly, and the $1.2 million production for 1912 was four times that of 1911" (Paher 1984:266). In order to transport this ore to the railroad at Jean, Nevada, the owners of the Yellow Pine Mining Company built a

36-inch gage "ore road" from Jean to the Bybee mine, with switching facilities at the mill in Good Springs. A Shay geared locomotive is used to haul a train of seven 6-ton side-dump ore cars. Oil is used as fuel for this engine, the supply coming from the California oil fields at $1.24 a barrel. The train makes two trips daily between the mine and mill and one trip to Jean with concentrates for shipment. The estimated cost for transportation is 45 cents a ton. The freight charges from the shipping points to the smelters are fairly well established, being $6 a ton to the Salt Lake City plants and $8 a ton to the zinc smelters in the Mississippi Valley (Hill 1914:251-252).

While the railroad allowed the ore of the district to be shipped out and processed in mass quantities, it was very expensive.

Mine owners found freighting and packing ore from the mountains to the main line so expensive that it
eliminated profits. Some of the larger companies reduced costs by employing their own drivers and purchasing their own freight wagons and teams (Geary 1984:42).

The Yellow Pine Company owned their own hauling facilities, which came in handy when the dangerous grade caused accidents and flash floods washed out the tracks.

The cost of shipping ore varied throughout the district. Most claims were small in operation compared to the Yellow Pine and hauled their ore in wagons to Jean where the San Pedro, Los Angeles and Salt Lake (SPLA & SL) picked up the ore. "The Yellow Pine Company, with its own railroad, hauled its ore eight miles to Jean at the cost of $.45 per ton" (Geary 1984:43). Other operators paid between $.50 per ton to $6 per ton. Then, after these costs were incurred, the miners had to pay SPLA & SL for the shipping of their ore to Salt Lake or to the Mississippi Valley area. Most operators packed their ore out with mules hauling the wagons to the railroad lines. Later, in the 1920s, if the grade was not too steep, the arrival of gasoline trucks eased the haulage time for many operators. Total production of the entire Yellow Pine mining district is displayed in Table 1.

History of Staking a Claim

The 1872 federal mining law does not define the term "discovery" in its text. The Department of Interior and the
Table 1. Total historic production of the Yellow Pine Mining District.

<table>
<thead>
<tr>
<th>Year</th>
<th>Gold oz.</th>
<th>Silver oz.</th>
<th>Copper pounds</th>
<th>Lead pounds</th>
<th>Zinc pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1902</td>
<td>44,174</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1903</td>
<td>53,396</td>
<td>753</td>
<td>21,800</td>
<td>28,000</td>
<td></td>
</tr>
<tr>
<td>1904</td>
<td>47,878</td>
<td>146</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1905</td>
<td>15,000</td>
<td>3,707</td>
<td></td>
<td>290,063</td>
<td>658,659</td>
</tr>
<tr>
<td>1906</td>
<td>9,150</td>
<td>1,573</td>
<td>67,341</td>
<td>625,175</td>
<td>2,885,246</td>
</tr>
<tr>
<td>1907</td>
<td>9,743</td>
<td>2,994</td>
<td>93,090</td>
<td>187,310</td>
<td>1,879,432</td>
</tr>
<tr>
<td>1908</td>
<td>7,791</td>
<td>10,247</td>
<td>42,144</td>
<td>720,285</td>
<td>1,115,851</td>
</tr>
<tr>
<td>1909</td>
<td>5,740</td>
<td>18,461</td>
<td>392</td>
<td>460,353</td>
<td>3,013,352</td>
</tr>
<tr>
<td>1910</td>
<td>1,219</td>
<td>16,826</td>
<td>122,925</td>
<td>1,263,837</td>
<td>2,707,071</td>
</tr>
<tr>
<td>1911</td>
<td>2,424</td>
<td>47,072</td>
<td>173,719</td>
<td>1,617,224</td>
<td>3,548,032</td>
</tr>
</tbody>
</table>

(Hill 1914:227)
courts have used the "prudent man" test: "that the 'discovery' must be of sufficient size and quality that a person of ordinary prudence would be justified in further expenditure of time and money with a reasonable chance of success in developing a mine" (Papke 1987:7). There is no restriction on the number of claims a miner might stake. Nevada state law requires that within 60 days from the date of location, the locator must define the boundaries of the lode claim by placing a monument at each corner and at the center of each side line. Nevada state law requires that within 90 days after posting a notice of location, two copies of a map showing the claim must be prepared and filed with the county recorders (Papke 1987:10, 12).

Claims may vary in length and width. The maximum size of a lode claim is 1,500 feet in length and 600 feet in width. Most claims are rectangular in shape based on these dimensions. If possible, the claim should be oriented so the long axis is along and parallel to the vein or lode and the claim extends 300 feet on both sides of the centerline.

Miners may patent their claim if they can prove that it is a valid discovery and improvement on the claim of at least $500 has been installed for the benefit of the claim. Because of the complex and often expensive procedure to patent a claim, usually the claim is an operating and profitable mine before the patenting process is started. Mill sites and rock tailings may also be patented. Tunnel
rights are not patented, but they give the locator the right "to drive a tunnel or adit for a maximum distance of 3000 feet from the portal (entrance) along a line marked on the surface" (Papke 1987:21). If the operator cuts through a new vein, they may locate another lode claim and stake the surface. Once a claim is patented it is entered on the county tax roll. Figures 1-2 display the claims in the Yellow Pine District.

Yellow Pine Mine

In 1936 the Yellow Pine Mining Company owned 12 mining claims that enclosed an area known as Porphyry Gulch, which is four miles west of the town of Goodsprings. The following claims received the patent number 436952 from survey number 4147 on October 21, 1914: Rover, Bybee, Hilo, Capitano, Tail Ender, Iron Mountain, Big Chimney, Como, Radio, Scorpion, Consort and Queen. See Figures 1-2 for layout of these claims. The company also owned and ran the narrow-gauge railway that connected the mine with the mill at Goodsprings and continued the line to Jean, Nevada, where it hooked up with the Union Pacific Railroad. It was the Bybee claim located by Addison Bybee in 1900 that gave Porphyry Gulch its early eminence. After 1900 the Yellow Pine Mining Company extended its operation northward towards the Radio and Como claims which were located in 1904.

"The original company was organized by J.F. Kent in
Figure 1. Principal claims in the Yellow Pine District (Bestram 1986).
Figure 2. Principal claims in the Yellow Pine District (Bestram 1986).
1901 with 250,000 shares, but in 1906 it was reorganized with 1,000,000 shares of $1 par value" (Hewett 1931:129). The first shipment of ore did not occur until 1906, and it consisted of oxidized copper ore. This ore was taken from an area near the Hale shaft, and smaller bodies of mixed lead and zinc ore were found in this same section a year later.

Early in 1922 most of the ore known south of the porphyry dike on the 900-foot level had been mined, when a raise from the 900-foot level north of the dike struck two large bodies of ore. The present distribution of stopes is quite different from that of the ore bodies indicated by the work before 1916 (Hewett 1931:129).

The workings of the Yellow Pine mine explore a stratigraphic zone about 300 feet thick. All this is contained in the Yellow Pine limestone stratum. This stratum varies in thickness throughout the north and south ends of the mine. The Hale shaft and a few dikes in the northern portion, are in a Yellow Pine sill of granite porphyry. The Prairie Flower claim showed some sandstone and black shale beds mixed along with the Yellow Pine limestone. The beds that enclose the ore bodies trend northeast and dip northwest.

The simplest concept of the Yellow Pine shoots is that the sulphide minerals were deposited along a thrust fault in a simple pipe that plunged northward at an inclination of about 20° and that the shoot has since been broken by faults and weathered. This concept assumes that the solutions which deposited the sulphides had a source to the north and rose gently southward (Hewett 1931:134).
Increases in ore production from 1912 to 1929 are seen in Table 2. These increases result from:

a. Completion of the San Pedro, Los Angeles and Salt Lake Railroad in June of 1911.

b. Exploratory work done in 1916 at the northern part of the third level as the southern part of the Bybee mine yielded less.

c. In 1919 the Goodsprings Mill was remodeled with the addition of rolls, screens, Harz jigs to treat the coarse sizes, Richards classifier, and Overstrom tables.

d. In 1920 the U.S. Bureau of Mines did tests in an experimental plant to investigate the feasibility of separating the lead and silver from the zinc by chloride volatilization.

e. A raise in 1922 from the 900-foot level north of the porphyry dike (Bybee) struck two large bodies of ore.

f. Completion of a new vertical shaft in 1924 in the northern section of the Bybee mine.

g. After a 1924 mill fire, another new mill was constructed in 1925.

Profits often did not seem to materialize in the form of cash. "Mine owners found the transportation of materials in and out of the area consumed all of their earnings"
Table 2. Production of the Yellow Pine Mining Co., 1907-1929.

<table>
<thead>
<tr>
<th>Year</th>
<th>Ore Shipped (tons)</th>
<th>Net operation profit or loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>1907</td>
<td>122.12</td>
<td>-10,013.42</td>
</tr>
<tr>
<td>1908</td>
<td>645.73</td>
<td>-163.33</td>
</tr>
<tr>
<td>1909</td>
<td>1,220.73</td>
<td>+299.62</td>
</tr>
<tr>
<td>1910</td>
<td>1,719.85</td>
<td>-14,356.01</td>
</tr>
<tr>
<td>1911</td>
<td>3,334.80</td>
<td>-59,263.67</td>
</tr>
<tr>
<td>1912</td>
<td>20,096.00</td>
<td>+219,270.94</td>
</tr>
<tr>
<td>1913</td>
<td>17,563.84</td>
<td>+155,292.40</td>
</tr>
<tr>
<td>1914</td>
<td>14,169.10</td>
<td>+79,111.08</td>
</tr>
<tr>
<td>1915</td>
<td>17,702.59</td>
<td>+735,842.68</td>
</tr>
<tr>
<td>1916</td>
<td>22,185.39</td>
<td>+762,526.27</td>
</tr>
<tr>
<td>1917</td>
<td>20,030.14</td>
<td>+415,338.75</td>
</tr>
<tr>
<td>1918</td>
<td>19,420.50</td>
<td>+319,705.37</td>
</tr>
<tr>
<td>1919</td>
<td>11,279.59</td>
<td>+171,340.62</td>
</tr>
<tr>
<td>1920</td>
<td>14,858.34</td>
<td>+148,275.90</td>
</tr>
<tr>
<td>1921</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1922</td>
<td>1,510.00</td>
<td>+356.01</td>
</tr>
<tr>
<td>1923</td>
<td>12,220.00</td>
<td>+812,286.56</td>
</tr>
<tr>
<td>1924</td>
<td>18,924.24</td>
<td>+318,013.82</td>
</tr>
<tr>
<td>1925</td>
<td>13,535.93</td>
<td>+198,924.50</td>
</tr>
<tr>
<td>1926</td>
<td>2,274.14</td>
<td>+1,253.51</td>
</tr>
<tr>
<td>1927</td>
<td>5,821.00</td>
<td>+12,072.66</td>
</tr>
<tr>
<td>1928</td>
<td>3,573.02</td>
<td>+14,281.20</td>
</tr>
<tr>
<td>1929</td>
<td>2,037.62</td>
<td>+7,794.76</td>
</tr>
</tbody>
</table>

(Hewett 1931:130)

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
(Geary 1984:21). In addition, a mine owner had to constantly modernize his equipment in order to retrieve the best ore. Hard rock mining is deep rock mining. Problems associated with hard rock mining include high temperatures, flooding of mine levels, hoisting costs, equipment breakdown due to heat, wearing down and weight of the ore, power costs and labor difficulties.

At most mines the cost accounts include only the direct outgo, labor, and supplies. Indirect expenses such as management, depreciation, mechanical repairs, etc., are not included, the latter accounts being separately reported each month (Young 1946:665).

A review of the average content of the products shipped from the years spanning 1907-1929 showed that the crude lead ore contained 47 to 63 percent lead, 5 to 13 percent zinc and 17 to 22 ounces of silver per ton. The lead concentrate contained 51 to 56 percent of lead, 12.5 to 14.5 percent zinc and 25 to 50 ounces of silver per ton. As in other mines in the district where the crude ore had been milled to yield a lead concentrate, the silver content of the concentrate is two or more times that in the crude ore per unit of lead. The mixed lead-zinc ore contained 13 to 16 percent of lead, 27 to 30 percent zinc and about 11 ounces of silver per ton. The crude zinc ore contained 34 to 45 percent zinc, 3.5 to 6.5 percent lead and 1 to 6 ounces of silver per ton. The zinc concentrate contained 32 to 34.5 percent zinc, 4 to 6.5 percent of lead and 2.5 to 6 ounces
of silver per ton. The zinc slime contained 32 to 35 percent of zinc, 6.5 to 8 percent lead and 3.5 to 6 ounces of silver per ton. The rest of the insoluble matter consisted mainly of silica (Hewett 1931:130).

A U.S. Geological Survey and early mine records show that zinc minerals were approximately four times as abundant as lead minerals; but in the metal content recovered at the mills, zinc only yielded two to three times the amount of lead recovered. "From the observations in many other mining districts it is known that the effect of weathering upon the original bodies of zinc and lead sulphides is to convert the metals first to sulphates, then to carbonates" (Hewett 1931:130).

During World War I the demand for zinc, lead and other minerals mined in the area allowed the Yellow Pine District and the town of Goodsprings to prosper. This demand, in conjunction with access to railroads for transporting the miners' products nationwide, permitted expanded exploration and increased labor supplies. World War I encouraged more investors to reevaluate the district, and higher prices encouraged the lessors to develop their properties. Many of the middle-range operations were bought out by outside investors (Geary 1984:68).

In 1916, the Yellow Pine Company maintained 86 men on its payroll. A year later, the Bullion's president and general manager stated that the mine employed 30 men. Although there are no definite figures, the various
reports generally indicate there were probably over 300 men employed by mine owners in the district (Geary 1984:67).

As the previous production table showed, profits and production rapidly decreased after 1926. This was mainly the result of a combination of factors: new strikes elsewhere, the Great Depression, labor and equipment costs, and federal gold and silver restrictions. The mines slowed down in production and finally closed. The mining district can be viewed as an island of production set in an ecological theater. It has interaction spheres with transportation networks, smelting networks and world wide systems (Hardesty 1988:1). "The boom bust cycles that work on island networks, on the other hand, are best viewed as correlated episodes or 'punctuations' of world system technological or economic changes" (Hardesty 1988:111). The dependence of Goodsprings and the mines on just one factor, ore production demand, was probably the major factor in their decline. Mining districts rise and fall with the prices and demands of worldwide markets.

The Yellow Pine Extension

This area is more commonly known as the Green Mountain or Alice mine from the names of the claims. These claims are south of the original Yellow Pine mine by one mile. They were located in the years 1889, and 1892 for Alice and Green Mountain contact. The Yellow Pine Extension received
its patent number 488045 from survey number 3934 on August 25, 1915.

Most of the ore has come from a shaft about 680 feet deep having an average inclination of 21° 30'. The collar of the shaft lies at the end of a tunnel 165 feet long. The depth attained is 230 feet vertically below the tunnel, but is only 160 feet below the ravine west of the mine. Recently two other inclined shafts have been sunk 700 and 1,200 feet north of the main tunnel. These are 200 and 160 feet deep, respectively, but they have not yet encountered ore (Hewett 1931:138).

The extension produced lower outputs of ore due to more insoluble matter, mainly silica, mixed in the ore. "A rough estimate of the gross value of the output is $100,000 and of the net value, after paying railroad, freight, and smelting charges, $75,000" (Hewett 1931:138). See Figure 3 for mine layout.

**Bybee Mine**

This mine was operated by the Yellow Pine Mining Company and was the largest producer of ore out of the 14 claims owned by the company. The Bybee is developed by a shaft that is 166 feet deep on the incline, which is 49° to the first level and 35° below that. From the shaft there are levels at 82, 110 and 134 feet. There are approximately 680 feet of drifts on the first level, 966 feet on the second and 342 feet on the third (Hill 1914:264).

There were two horsepower gas hoists used at this mine. The main incline had a 15-horsepower gas hoist that operated a one-ton skip at the main incline, and there was a 25-horsepower engine that ran a 12 1/2 kilowatt generator and the compressor. This power enabled the use of electricity
Figure 3. Yellow Pine Extension underground workings, 1931 (Hewett, 1931).
to light the shafts and to allow hoisting below the third level along the main winze line.

The ore in the Bybee mine appeared along two fault zones. The ore along the upper levels dipped around 30°, and this could be found for the first three levels. The third level went down approximately 135 feet to follow the ore flow which ranged from 50 feet to 70 feet wide and about 360 feet long. The accompanying rock often was brecciated limestone, somewhat crystalline limestones of the upper Mississippian age. There were some intrusions of granite porphyry. Below the third level the ore was found along the brecciated area and is thought to be a branch of the main fault.

The ores so far mined consist largely of an iron-stained mixture of smithsonite, cerusite, and galena, in which there is more or less anglesite, calamine, and hyrozincite. It is understood that in the fall of 1912 the monthly production of this mine was 1,500 tons of zinc concentrate, 300 tons of lead concentrate, and 150 tons of crude ore (Hill 1914:266).

Much work was put into the construction of the mine. It was well timbered using the square-set system, and each square set was a seven foot square. Most of the timber used in the mine came from pine trees shipped from the states of Oregon and Washington. Cement pads were built to support the hoists. See Figure 4 for mine layout.

Alice Mine

The Alice mine consisted of 11 claims about a quarter
Figure 4. Bybee Mine underground workings, 1912 (Hill 1914).

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
mile south of the Bybee mine along the ridge line. These claims were consolidated under the Big Chimney claim patent 436952 in 1914. The main Yellow Pine mine road went south past the Bybee mine to the lower extension of the Alice mine. These claims belonged to A.J. Robbins, of Goodsprings. The ore found here was heavily stained with iron and had appreciable amounts of oxidized copper ore.

The ore bodies extend along the bedding planes of the limestone both above and below the porphyry sill. They range from 2 to 5 feet in thickness....This mine is a steady producer of sorted crude ore, but the present development has not demonstrated any very large bodies (Hill 1914:267).

Prairie Flower Mine

This mine is about a half mile north of the Bybee mine on the west side of the main mine road. This mine may be reached off a second road that emerges just below the large tailing of the Bybee mine on the north end of the tailing. In 1912 this mine was controlled by the Knight-Hyde interests but was under lease to George Meacham. This mine sits above the wash and "the limestones in this vicinity have a gently southwesterly dip and are cut about 50 feet west of the shaft by granite porphyry" (Hill 1914:263). The ore strikes at a N.45° E. angle and dips steeply northwest and runs along an open watercourse in the limestone. Most of the ore is iron-stained and is a mixture of lead and zinc carbonate. There is more zinc carbonate, and some small
masses of hydrozincite and some kernels of unaltered galena may be found in the ore. The shaft was built over a main crevice which goes below the 100 foot level, and this branch appears not to be so strongly mineralized. It has a steep dip of 60° on the average. The shaft is equipped with a gasoline hoist, and a one ton bucket that raises the ore. "There are drifts off the shaft at two levels, at 50 feet and 1000 feet. These southerly drifts follow the ore and there are large open stopes (underground caverns) varying in width from 5 to 15 feet" (Hill 1914:263-264). See Figure 5.

This mine was first located in 1901, and serious mining began in 1908 when S.E. Young and W.E. Allen bought the claim for $6,000. Soon after, they sold their mine to Jesse Knight and Alonzo D. Hyde for $12,000. They formed the Prairie Flower Mining Company and explored the ore body down to a depth of 110 feet beyond the original mine shaft. The mine was leased to G. Meacham, R. Duncan and J.A. Fredrickson from 1911 to 1913, and "the Prairie Flower paid $4.00 per day for miners, and the Yellow Pine $3.75" (Geary 1984:68). The new lessees proceeded to invest new capital into the Prairie Flower: these men sank the shaft to its present depth--300 feet--and mined 203 tons of lead and zinc ore. In 1917, under lease to the Prairie Flower Leasing Co., the new or Hale shaft several hundred feet south of the old shaft, was sunk to 200 feet and drifts run north and south. In 1923 this shaft was sunk to 400 feet, and crosscuts were run east and west. Early in 1927 the 400 foot level east was connected by a raise with the old Prairie Flower shaft... (Hewett 1931:128).

The Prairie Flower Consolidated Lode Mining Claim consisted
Figure 5. Prairie Flower underground workings, 1931 (Hewett 1931).
of the August 25, 1915 patent 488045 from survey 3934 for the Prairie Flower, Solio, West Prairie Flower, and Yellow Pine Extension claims. "For many years the underground workings of the Yellow Pine and Prairie Flower mines have been connected and they have been operated as one mine.." (Longwell et al. 1965:108).

The rock formation of the Prairie Flower mine includes both Yellowpine limestone and the Yellow Pine sill of granite porphyry. Some sandstone present in the workings is like those found down the line by the Yellowpine winze, but located closer to the surface and represented by nearly black sheared shale. Production of this mine slowed down by 1918 and only minor activity occurred after this time. Table 3 shows production of the Prairie Flower Mine between the years of 1908 and 1918.

The Keystone Mine

The Keystone mine became the largest mining activity in the group of claims operated by the Nevada Keystone Mining Company. This mine started production in 1892 and ceased most activity around 1906. Previous to 1906:

the Keystone was worked intermittently for about 15 years and is reported to have produced $1,000,000 in gold. The development consists of several large open-cut glory holes, three tunnel levels, and an inclined winze from the lower working tunnel, said to be 1,100' deep. From the lower tunnel there are a number of crosscuts and raises to the upper levels. The workings were badly caved in September, 1912, and but little of the deposit could be seen (Hill 1914:255).
Table 3. Production of Prairie Flower Mine, 1908 - 1918.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1908</td>
<td>22</td>
<td>187</td>
<td>38</td>
<td>25,238</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1909</td>
<td>105</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>67,204</td>
</tr>
<tr>
<td>1910</td>
<td>1,209</td>
<td>10.63</td>
<td>5,010</td>
<td>4,730</td>
<td>363,517</td>
<td>388,111</td>
</tr>
<tr>
<td>1911</td>
<td>40</td>
<td>123</td>
<td>232</td>
<td>19,302</td>
<td></td>
<td>10,873</td>
</tr>
<tr>
<td>1912</td>
<td>44</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>26,924</td>
</tr>
<tr>
<td>1913</td>
<td>119</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>79,909</td>
</tr>
<tr>
<td>1915</td>
<td>57</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>39,760</td>
</tr>
<tr>
<td>1916</td>
<td>346</td>
<td>2,085</td>
<td></td>
<td>92,648</td>
<td></td>
<td>156,400</td>
</tr>
<tr>
<td>1917</td>
<td>339</td>
<td>1,406</td>
<td>666</td>
<td>124,322</td>
<td></td>
<td>9,457</td>
</tr>
<tr>
<td>1918</td>
<td>20</td>
<td>182</td>
<td></td>
<td>9,439</td>
<td></td>
<td>3,527</td>
</tr>
</tbody>
</table>

(Hewett 1931:128)

The ore was found in limestone formations predominantly of the Monte Cristo Limestone of Mississippian Age, whose appearance is of a dense blue-gray rock. Limestones of a pinkish-gray color are found surrounding the mining area, but the porphyry was found in altered places in a southward direction. "This altered porphyry is the ore and its value is due entirely to free gold, which occurs in minute flakes throughout the ore, especially where the rock is most iron stained" (Hill 1914:256). The areas of richer ore were said to have occurred along the smaller sills and dikelets instead of along the larger bodies of granite porphyry. Due to the lack of records and deterioration of the Keystone mine, "the nature of the gold in primary ores is not known."
It may have been present as a telluride (Hewett 1931:viii) in the unoxidized ores..." (Longwell et al. 1965:106). A hoist station was erected in the lower tunnel, and the tunnel could be entered for only 450 feet.

The ore was all raised or dropped to the lower-tunnel level, trammed to bins on the dump, and drawn into the wagons which took it to the cyanide mill at Sandy, the nearest water. The grade of the ore is not definitely known but is thought to have been between $18 and $25 a ton in gold and a little silver (Hill 1914:256).

The transportation of the ore occurred before the era of railroads. All of the Keystone's ore was transported on bags strapped to pack animals and hauled in wagons. "During the 1880's, the Keystone Mine owners packed their ore from the Yellow Pine District to Bidwell's silver mill in Ivanpah; from there, freighters hauled it to the Atchison, Topeka and Santa Fe railroad" (Geary 1984:22).

The Keystone mine was the only great gold producing mine in the Yellow Pine District. While lead and zinc ores were the mainstream of the district, the Keystone mine brought in reportedly $1,000,000 worth of gold by 1906. "Little attention was paid to the Yellow Pine District on account of its inaccessibility until the rich Keystone Gold Mine was discovered in the early nineties" (Paher 1982:29). Unfortunately, little written documentation remains of all the activity produced by those mining the Keystone mine. What early documentation exists comes from James M. Hill's 1912 article "Contributions To Economic Geology," which
appeared in the 1914 Bulletin 540 of the United States Geological Survey. Mr. Hill traveled for nine days in the Yellow Pine District and wrote of local resident Mr. Richard Foster, "Whose acquaintance with mines, roads, water holes and people of the district did much to expedite the work" (Hill 1914:223). An article in the Sunday, June 18, 1967 The Nevadan quoted Will McClanahan of Goodsprings, Nevada, as saying "the Keystone produced $8 million in minerals, a half million of which he and his partners took out in the period from 1930 to 1941 when World War II priorities forced them to close" (Vincent 1967:6). No formal documentation has been found to exist on the ore lode removal or production earnings on the Keystone mine, unlike reports on other mines in the Yellow Pine District.

The Boss Mine

The Boss mine is located two and one half miles south of the Keystone mine and is off the east side of the Wilson Pass Road. It is just a few miles above the town of Sandy, which was established in the 1890s to process the Keystone ore and was abandoned in 1914 as a mill operation. The population of Sandy shrunk and it is still inhabited by only a small fraction of its once booming population. At one time the town of Sandy operated the cyanide plant of the Keystone mine. In approximately 1884 the ore at the Boss mine was discovered. At that time the presence of chrysocolla and
other oxidized copper minerals were known. In the 1890s, property "was bonded and a leaching plant was built at Good Springs to treat the oxidized copper ores, but the process proving a failure, the property reverted to its original owners" (Knopf 1915:2). In 1914 the Boss Gold Mining Company was organized by a Mr. Yount and Mr. White, and they employed O.J. Fisk as manager after a high gold content was discovered by sampling and assaying. The reason the gold ore was not discovered earlier is that it is not evident by panning and is surrounded by a black residue that earlier miners thought was black sand. This black residue also obscured the platinum content of the ore.

The discovery of the platinum content of the ore is due to the acumen of Mr. H.K. Riddall, chemist for the Yellow Pine Mining Company. He suspected that the buttons of gold might contain platinum, and this suspicion was strengthened by the fact "that solutions obtained on parting, instead of being colorless as is the rule when the gold is alloyed with silver only, showed yellow and brown tints, indication the presence of platinum and palladium (Knopf 1915:2).

The common cleaning solution of this time was a molten sodium carbonate that separated the gray metal of platinum and palladium from the yellow gold material. "This platinum find triggered a frenzy of prospecting and speculation, and the location of two other alleged platinum mines....All three platinum finds failed to live up to expectations" (Geary 1984:61).

This platinum content was so rich at the Boss mine that
the Pacific Platinum Works, of Los Angeles, agreed to pay $46 an ounce for the combined platinum and palladium content. Pacific Platinum charged the Boss Gold Mining Company $300 a ton for processing this rare combination of platinum and palladium in a gold bearing lode. The original owners sold the Boss Gold Mining Company late in 1914 to W.C. Price and associates for $150,000 (Knopf 1915:3).

Most of the ore in this district is of lead-zinc bodies due to the dolomite or limestone content. Intrusive igneous rocks are not common in the district and consist of short dikes of quartz monzonite porphyry and granite porphyry. The gold deposits of the Keystone mine and Boss mine are of unusual importance in the area. At the Boss mine the richest ore was found exposed at the top of the ridge and the ore winze was sunk from the upper tunnel to connect with the middle tunnel (Knopf 1915:6). In 1915 it was estimated that 1,000 to 2,000 tons of ore had already been mined. A development tunnel was started several hundred feet below the upper group of tunnels; but at the time Knopf's 1915 article was written, most work had stopped on this tunnel. In 1914 it was probable "that there are several hundred tons of ore of this grade, which, with platinum and palladium at $45 an ounce, has a value of $256 a ton" (Knopf 1915:9).

The significance of the Boss mine is that most of the world's supply of platinum came from placer deposits in the
Ural Mountains, Russia, during the early part of this century. The rich find at the Boss mine is highly unusual in location, mineral content and its probable genetic connection with siliceous igneous rocks. Minor quantities of platinum presently come from Brazil, Canada, Colombia, California, and New South Wales. Nevada also has platinum bearing dikes near Bunkerville, but these quantities are quite small (Parkhurst 1989:76).

In addition to the amounts of gold, silver and platinum metals, talc was also mined at the Boss mine. A rich shoot of greenish talc was "developed by a winze sunk from a point near the end of the upper tunnel. Some of these were mined separately and two shipments aggregating about 1 ton were sent to the smelter at Murray, Utah" (Knopf 1915:7). Overall, the Boss mine was an extremely diverse and rich find. In 1914, 22 samples were taken from the winze connecting the upper and middle tunnels, and the return in ounces to the ton was: gold, 3.46; silver, 6.4; platinum, 0.74; palladium, 3.38 (Knopf 1915:9).

The Azurite Mining Company has claims adjoining those of the Boss mine. These claims are just north of the Boss mine along the base of the ridge. Most of the ore from this mine consists of oxidized copper ore enclosed in coarsely crystalline dolomite. See Figure 6 for site layout.
Figure 6. Boss Mine underground workings, 1914 (Knopf 1915).
CHAPTER IV

KEYSTONE MINE FIELD ANALYSIS

The Keystone mine and related features may be found in southern Nevada just 10 miles west of the town of Goodsprings. The areas surveyed were found respectively in the SW ¼ SW ¼, sec. 19, NE ¼ SE ¼, SE ¼ SE ¼, sec. 25 and N ¼ NW ¼ NW ¼, sec. 30 T24S, R57-58E. This mine may be reached by taking the wash road which exits the Wilson Pass Road 10 miles west of town. The road passes the Chiquita mine and, at 1.8 miles from the junction with the Wilson Pass Road, reaches at the Keystone mine. There are many shafts and adits present that are not shown on the 1956 Shenandoah Peak topographic map. A two day surface site inventory was conducted on June 28 and July 14, 1989.

Based on historic sources, the Keystone is the oldest mine in the region and the major gold producing operation in the Yellow Pine District. Leading periods of activity were from 1892 to 1895. It was mined intermittently from 1895 until 1947. Over $1,000,000 was reportedly removed up to 1902. "The most important lode gold mine was the Keystone which is credited with the production of over 21,000 ounces, along with copper and silver" (Heylmun 1990:13). According
to information found in the "Report of the State Controller's Office, 1903 - 1904," the Keystone mine yielded a gross of $31,031 in 1903 and $22,118 in 1904. Expenses for the mine were at $22,857 in 1903 and $22,141 in 1904 (Geary 1984:33). At present, Durvada Resources, Inc. a Delaware corporation, is the claim owner of the five historic Keystone claims: Keystone, Oversite, What-not, Honduras and the Empire. See Figure 7 for a site layout of the Keystone mine.

The surface features at the Keystone mine were recorded. Features include: mine tailings, mine shafts, mine adits, trash mounds, building foundations, building structures, roads and industrial artifacts standing alone or in clusters.

The first area surveyed is where the main road (Road 1) ends at the intersection of the wash road (Road 3). Road 1 is south and above the lower stone wall and wooden timber structure by the wash road. This area is approximately 1 acre in the middle of the mining complex and is the level from which most of the tailings appear to originate.

The first feature recorded appeared to be the only ore tramway (Tramway A) still standing and was the first target of survey. It is a wooden tramway above Road 1 and appears to be in the middle of the site and tailings.

1. a. Tramway A is 37'6" south (uphill) of the level
Figure 7. Keystone site layout. Refer to Shenandoah Peak, Nev., 1956 topographic map.
turn-around area where Road 1 dead ends. A footpath runs along the steep slope on the west side of Tramway A. The tramway measures 19 ¾’ x 8 ¾’ x 2’. Mine Shaft A at its southern end (uphill) is wood lined at the top and measures 6’ x 5’5”. Tramway A has a wooden frame with corrugated metal lining the base and sides of the tramway. There is 1/8" wire wrapped around portions of the tramway. The eastern border of the Chiquita mine can be seen up the hill to the west.

b. Located below Tramway A in an open area are four cement pads measuring 7’4” x 1’4”, 5’5” x 1’6”, 1’ x 9”, and 3’6” x 2’8”.
Surrounding the pads are the remains of a cement foundation and pieces of the lumber from the frame. Also strewn around is piping that measures 1” in diameter. See Figure 8.

c. The main opening to the surface is an adit (B) located to the left and north of Tramway A’s lower end. The entrance measures 6’ x 5’ and is at a gentle grade. The remains of a unreadable metal sign are above the entrance.

2. a. Just east of the cement slabs against the bank where the work area ends and the road starts is
Figure 8. Cement pads below Tramway A.
another shaft (C). It has white tailings around it and measures 4’ x 3’ at the entrance.

b. There is a rock lined retaining wall to the north of the smaller Shaft C and a cement floor below the rock lined wall. Found next to the cement floor is a piece of metal equipment with the embossed words “SQUARED SWITCH, SINGLE THROW FUSIBLE, CAT. NO. 88345 400 AMPS., SQUARED CO., DETROIT MICH” inscribed on the machine. Five cylindrical cans with a 13” diameter, a pink ceramic crucible, window screening, and one rusted upright tobacco can measuring 4 ¼” x 3” x 7/8” with an external hinged friction lid were present. There was an absence of any household items or features.

Analysis of Artifacts Found at Tramway A

An analysis of the cans found at the site yield some positive identification to one period of mine activity. The upright or vertical tobacco tins were manufactured as early as 1908 and ceased being manufactured in the early 1930s. "R.J. Reynolds Tobacco Company was founded in 1895 and introduced Prince Albert tobacco in an upright pocket tin in 1908. The upright tobacco tins are sometimes called vertical pockets. These cans were designed to slide easily into a man’s shirt pocket" (Rock 1987:62). Upright tobacco
tins were also made at the same time by the American Tobacco Company which sold Lucky Strikes, and Leggett and Meyers Tobacco Company which sold the Velvet brand in 1912.

Rusted cans, 13" in diameter, have machine closed seams and have small holes punched in one end of them to allow the contained substance to come out. The rust obliterated any identification that might have been on the exterior of the cans. These cans found in association with the remaining machine and their large diameter might lead to the assumption that these are motor oil cans. "Several oil companies made their own cylindrical containers in 1, 2, and 5 quart sizes. These cans had soldered lock body seams and double seamed ends. Marketing established [for motor oil cans] 1932-1936 (In Rock 1987:57). Exact dating of the cans is not possible.

The functions of mining features can be identified in some cases but not all. Tramway A is the remains of a system that transported the ore downhill from the wood lined Shaft A found at the uphill base of the tramway. The pink crucible is evidence of assaying procedures that were done in the immediate vicinity.

Assaying was used to monitor both mining and milling processes. Assay houses were often built close to the mill or mine site, but far enough away so that vibrations would not be a problem. The artifacts collected from an assay house site usually include crucible and cupel fragments, slag and charcoal, and nails, window glass and lumber fragments related to architecture (Hardesty 1988:38-39).
The presence of the cement foundation, window screening and the pink crucible, all located close to Adit B and Shafts A & C, strongly suggest a structure used for assaying. The cement pads and piping found below the tramway is a mining feature that has not been identified as to its function. There are possibilities these were foundations for machinery that drained water out of the mine (1" piping) or that they were used as concrete engine pads for processing ore. Surrounding the entire area is the huge rock waste dump that extends over 50 yards west and south almost down to the wash and road. The road and cement foundations found around Adit A and two lower Shafts A & C are all built on leveled tailings. The close proximity of two shafts, one adit, and the huge tailing are evidence that this loci had major ore deposits which were worked deep and assayed to test the materials excavated.

**Upper or Southern Tailings**

Southeast up the hill from Road 1 (see Figures 1-2) behind Tramway A are many small tailings. The shafts and adits they contain are as follows:

3. a. Small adit (D) with a claim marker below its tailings. The adit measures 7'4" x 5'5 ½" and has a door frame around its entrance. The door is gone and pieces of wood and a gas can are present.
b. Fifty five feet to the east of Adit D is another shaft (E) that was too unstable to gain close measurements. The entrance is estimated as 10' x 8' in size and has two pieces of wooden timber used to support the entrance walls. A few shards of purple glass are found nearby.

c. South up the hill approximately 80 yards past Shaft E and Adit D are two more shafts (F and G). The hill is quite steep and no foot path was observed. Shafts F and G openings are only five feet apart. The openings are approximately 5' x 5'. Again, safety hazards prevented accurate measurements.

Considerable trash occurs around these shafts. This includes: crown bottle caps, a rubber bottle stopper (about an inch long with a slight lip at one end that appeared to be made out of rubber that turned grey with age), lots of dark brown glass shards, and part of a dark brown bottle neck with the words "CROWN DISTILLERY AND COMPANY" visible. The seam along the bottle's side is present to the neck and does not include the lip as the lip was applied separately by hand. A leather boot with screws in its sole and a can with soldered sides measuring 4 ¾" in diameter were found adjacent to Shafts F and G. A wire cable extends from this area down to a gully just east of the main tailings near
Tramway A.

Analysis of Artifacts Found at the Upper Tailings

Analysis of glass fragments are based on their color and physical features such as seams, mold marks, neck finishes, and embossing characteristics. Although there were thousands of glass fragments present, only those pieces that could provide some diagnostic characteristics were examined. Dating of the mine by glass and bottle fragments is not an exact procedure. Early in the twentieth century bottles were more likely to be recycled for private use compared to contemporary times, extending their circulation (Rock 1980:17). Since a policy of no collection was followed, glass and bottle fragments were left in situ and examined in the field.

The material substance of glass varies over the ages, and the mineral component of glass can be a diagnostic means to determine chronology and function of the bottle fragments. Colored glass occurred for a variety of reasons, from impurities in the minerals used to produce colored glass (colored class protects the contents from light), to standardizing the marketing of a manufacturer's product and informing the consumer of the contents of the bottle. It was not until the 1880s that clear bottles were manufactured by adding manganese. Amethyst or purple glass has nickel and manganese added to it and is clear at the time of its...
production.

The length of time required for glass to become purple depends partly on the composition of the glass, especially its manganese content, partly on the exposure to sunlight, and partly on the color of the background. Given optimum conditions the color change can occur in less than a month (Hunt 1959:34).

A dating chart presented by Newman (1970:74) has the dates of 1880 - 1925 for manganese additives. Most manganese was imported from Germany, and with the start of World War I this supply was cut off. According to Fike, "amethyst glass (clear color at manufacture) was the most popular prescription bottle color. Prescription use: predominant colors in descending order of popularity: clear, aqua, amber cobalt and green" (Fike 1987:14).

The purple glass found in front of the unstable Shaft E was probably manufactured between 1880 and 1914. Function of the glass container is not known as no embossed features or any other mold characteristics were observed. Time of operation for the Keystone mine was 1892 to 1947, with the major period of production between 1892 and 1906. The purple glass and its dates of manufacture according to Miller (1991:107) is consistent with Keystone historic mining activity here.

Besides color being a good chronological indicator for bottles, how the bottle was manufactured is an excellent time indicator. "Whether the bottle was hand blown, formed in a dip mold, iron molds, automatic bottle machines or had
the finish applied with a lipping tool, they all left a
tell-tale mark on the bottle" (White 1987:19). The
invention of the automatic bottle machine in 1903 with its
mold marks and seams from the base all the way to the lip of
the bottle is one of the easiest ways to date bottles and
glass shards. At the same time the automatic bottle machine
was used, the ease of technology for mining the necessary
minerals for glass made clear glass the dominant color used
for glass.

The brown bottle neck found at Shafts F & G had seam
marks going up to the neck of the bottle and not to the
collar. This is evidence that it was possibly made between
the years of 1880 - 1913 when the semi-automatic bottle
machine was in use (Newman 1970:72). Brown, dark brown or
black colored glass was often used to contain alcoholic
beverages. Brown was a common color for beer containers.
The exact date of the brown bottle neck with the embossed
words "CROWN DISTILLERY AND COMPANY" could not be found.
Whether this company is related to the Crown company that
made crown caps for carbonated beverages is only a guess.

The crown bottle caps found at the site can be assigned
estimated times of manufacture between the years 1892 and
1955. These bottle caps are metal closures with crimped
edges that fit over the round lip of a bottle. The inside
flat portion of the cap has a cork fill as a sealer. This
closure cap was invented by William Painter in 1889 and patented in 1892 under Crown Cork and Seal Company. Since 1955 plastic liners instead of the cork have been used to cap carbonated beverages (Rock 1980:12). The one can at the site has machine soldered side seams, but no hole in the cap was observed since the top was missing. "The Norton Brothers of Chicago, Illinois, introduced a semi-automatic machine for soldering can side seams in 1883" (Rock 1984:103). As with the crown caps and glass bottle fragments, the can fits the historic time period of the late 1890s or early 1900s of manufacture. This also corresponds with the most active operational period of the Keystone mine.

The leather boot with the missing heel has no known diagnostic features; thus, it cannot be dated. The boot was presumed trashed because the heel was gone.

The wire cable descending down to Tramway A obviously connected this site with the main mine Shafts E, F, G and Adit D below. No wood, flat foundations or cement foundations were observed here. No wooden headframe for a hoisting system was found at the site; therefore, the conclusion is that this cable was used to pull up small loads from Shafts F & G. "A CABLEWAY transports a load for a short distance, in a single carrier traveling back and forth on a single cable, or on multiple parallel cables..."
(Peele 1945:26-16). It is possible that Shafts F & G served a double purpose in use as winzes which went downward to the mine's interior. Since the slope up the hill was extremely steep, no trail was visible and the lack of hoisting materials indicates the winzes were used for ventilation. "Many of the surviving shafts and adits leading to the outside in historical mines were used only for ventilation" (Hardesty 1988:29).

Road Two

Following the wash road (Road 3) east around a corner and past an area of the major mining activity, another road (Road 2) goes up the hill to the south. Road 2 is rock lined to prevent erosion, and traveling this road 270' east a trench measuring 105' x 75' is found next to the road.

4. a. South and above the trench are some tailings that cover an area 60' x 55' and are below two small shafts (H & I) that appear to be only about eight feet deep. A light brown bottle with an applied neck and lip was found here. Road 2 in this portion is overgrown with snakeweed and blackbrush plants.

b. One hundred feet around a corner to the southeast, Road 2 arrives at an adit (J) with the door still intact in its frame. There is an area big enough for a car to turn around in front of
this adit. The door and frame measures 5'4" x 3'. This area appears to be the small black square (shaft) on the Shenandoah Peak topographic map nearest to the K in Keystone as displayed in Figure 8. The door has a metal eye loop and back plate for a lock to go through it, but the actual lock is missing. The door is wedged in and prevents one from going inside the mine. The floor of the mine appears level and is visible to a depth of at least 20 feet.

c. There is a cement pad 4'7" x 1'7" x 13 ¼" to the east or left of Adit J. Trash found in this area includes: purple and brown glass shards, shards of flat purple glass side panels, and a can that had been converted into a candle holder. The can had a wire slip through side holes and a hole punched out on the bottom for the candle and two small holes punched above for air. A large 5 gallon can that had a spout attached to it, part of a stove pipe, a cylindrical can, and part of a leather shoe were found in the vicinity.

d. Following Road 2 south and up the ravine past Adit J for a distance of 225 feet, there are three small (18" to 24" high) rock lined terraces going up the ravine. Due to the location of Adit
J below the gully, it might be presumed these terraces are flood or erosion control methods. Trash found along this road includes: a frame with close net wire on one side (possible bed frame), wire fence, part of a stove pipe, window screen, clear and purple glass, and square nail heads. At the end of the road is another small inclined shaft (K) that measures 6' x 3'.

e. Following the gully south up the ravine there are some barrels and bricks with a star imprinted on the sides. There appears to be a foot path up (south) the gully and another vertical shaft (L) that is on top of a tailing. There is a wooden frame around Shaft L extending over the mouth of the shaft by one foot, and some piping comes up out of the shaft and ends up on the tailing. This same size of piping also comes out of the tailing at its bottom on the north end. This might have been for water removal in the shaft since it is in a wash. The shaft measures 10’ x 10’ and the piping is of 2" diameter. Shaft L is approximately 500 feet south and above Adit J.

f. Another 280 feet south and above Shaft L is a large tailing 75’ x 65’ with no visible shaft. It is conceivable that the shaft was filled in or
had its entrance covered. Above Shaft L 75 feet and south of the tailing is another shaft (M) that measures 4'10" x 4'8" with surrounding tailing measuring 105' x 62'6".

Analysis of Artifacts Found by Road 2

The light brown bottle found near the shallow Shafts H & I and associated tailings is probably a beverage bottle. Brown and dark green glass were commonly used for beer or wine. The lip on this bottle was smooth and polished. A lipping tool made smooth-lipped bottles between 1870 and 1920 (Rock 1980:4). The fact that the neck was applied as well as the lip shows this bottle to be made without the fully automatic bottle machine process which was patented in 1904. According to Newman (1970:72, 74), semi-automatic bottle machines and applied lip manufacture occurred until 1913. The small size of the tailings of Shafts H & I would lead to the conclusion that this area did not produce good quality ore and the diggings here were terminated.

Adit J, observed with a door in place, shows a major source of ore removal. There is space large enough for a truck or car to turn around and connect with Road 2 that goes downhill (north) towards the wash or uphill (south). The function of the cement pad to the left (east) of Adit J is unknown. No window glass, wood, wooden framing or aluminum framing were found in the vicinity of this
foundation. The lack of household materials suggests that this cement foundation was related to industrial purposes of the mining operation.

The can that was converted into a candle holder is a touch of adaptability that a miner showed in this area. It also shows that either no cap (head) lamps were used here or that not everyone working the mine had access to Wheat lamps which had 2-cell lead-acid batteries or Edison lamps that had 2- or 3-cell alkaline batteries (Peele 1945:16-21). These lamps could also be found with handles to be carried instead of worn. Oil lamps were safe, and miners utilized the Wolf lamp with its flat wick that consumed about 738 grams of benzene oil which does not vaporize easily. Oil lamps that went out were relighted by an internal igniter (Wolf lamp), electric relighter and relight stations which had a fire boss at them (Peele 1946:23-26, 27).

The purple glass fragments exhibit again bottles in use manufactured before World War I. The brown colored glass consisting of side panels of a rectangular shape might be associated with a medicinal bottle. "Even though amber was a common color for whiskey bottles, it was the third most popular color for medicinal bottles" (White 1987:20). The exact function of the brown bottle cannot be determined by the glass fragments.

The relationship of the features and artifacts found at
Shafts H and I are not significant in themselves. They must be viewed as part of the whole Keystone complex. A common feature of hard rock mining is the scattered shafts and adits found wherever an ore outcropping appears. "Mining features may cover a large geographical area, often well beyond the boundaries of a single site" (Hardesty 1988:109).

Trash Dump

Northwest of Adit J 140 feet following Road 2, the start of a large trash dump becomes apparent. This dump extends north from the wash (Road 3), west to the main road (Road 1) where Tramway A is, and southeast where the wash curves and connects with Road 2. The southern boundary of the dump is uphill to where Tramway A begins. See Figure 7. The dump stretches 312'6" from the east where Road 3 curves below a steep ridge to the west where Road 1 is the western boundary. Shaft N in the wash is the northern boundary, and the dump goes uphill (south) for 330' with Road 2 as its boundary.

5. The area has a mix of time period trash in it. An old automobile with chrome around its round headlights and a chrome grille possibly of 1950s vintage seems to be the most recent castaway. Other artifacts of interest recorded in this trash dump include the following:
   a. A building foundation 247'6" north of the dump's southeast corner. Possible pit toilet holes are
just 37'6" southeast of foundation. A wooden claim marker with no identification is in this area. Above the building foundation are some rock ledges where bottles were set up and shot, as the fall of glass and 22 caliber bullets on the ledge indicate. Colors of glass examined range from light to forest greens, aqua, purple, dark brown with mineral leaching on top, and deep blue. A piece of white plate ware painted with a blue border was found before the ledge south of the foundation.

b. The building foundation measures 21' x 20' and has what is left of a wooden floor. The foundation is only 6' east from the start of the road bank. Lumber material lies strewn around the feature and the wooden walls lie flat where they fell outward from the floor. Fragments of broken flat light green window glass, window screening, and broken concrete (cinder blocks) are found around the west and south side of the foundation. Sheet metal strips of 8'2' x 2'2" lie adjacent to the area. Ten pieces of red brick lie near the cinder blocks.

c. North and east of the foundation scores of exposed rusted tin cans rest on the surface. Can
types include: sardine cans with the key still attached, crown bottle caps, cans with the lids punched or peeled back, and tobacco tins. Most of the cans near the foundation have double ended seams with no hole on the top. The shards of glass number in the hundreds and consist of clear, purple, brown, and green colors. Part of one round brown bottle base and side had the inscription "WESTHIEMER & SONS, ST. JOSEPH MO, CINCINNATI, OHIO, LOUISVILLE, KT." The base was flat and measured 3 ½' in diameter. The broken side panel was 3" long.

d. Along the road below the building foundation, two glass bottle stoppers were found. One was a dark brown and the other a light green. Many glass fragments and tin cans are eroding out of the road bank. A piece of white ceramic with the letters "Macl-, Trade Cheese, RCSD," was found.

e. The trash from the dump spills down into Road 1 from the top of the bank, as well as from the bank of Road 1. Broken glass and white ceramics shards, and tin cans were observed coming out of the bank strata.

f. Many of the cans north of this site (downhill) have ½" holes in the top, and an average can size
appears to be 2 3/4". A can was found that had inscribed "SEAL OF NORTH CAROLINA, PLUG CUT." This round can of 3 ¼" x 5 ¾" had an engraving of a human holding a tobacco leaf(?) and the lettering went around the can's edge. Also, a can inscribed "SHILLING BEST, 5 LB." that measured 8 ¾" x 6" was found.

g. Adjacent and south of the building foundation are wooden stairs that lead to two pits that measure 5' x 5' and 5' x 4' and are five feet apart. The depths of the holes are four feet.

h. A two inch diameter pipe leads from the north of the area to the foundation. This pipe is not connected at either end.

i. The east boundary is a large trash dump of rusted corrugated metal, barrels and tin cans. This dump is 312'6" north - south along the ravine side. A "ROYAL BAKING POWDER, ABSOLUTELY PURE, 12 OZ." can and another candle holder made from a tin can were the only artifacts of diagnostic significance observed.

j. The northern boundary has trash diminishing as it gets to the wash. Shaft N next to the wash is atop an earthen tailing mound. It is fenced with loose wire around it, has no artifacts near it,
Analysis of Artifacts Found at the Trash Dump

The various colors and quantities of glass, tin and ceramics by the building foundation indicate this site to be an assemblage of household items. Color is not indicative of time of manufacture or use, and the attributes needed to discern age were lacking from the many small shards of glass. All the glass colors were commonly in use in the 1890s, and the purple glass containing manganese was manufactured between the 1880s and 1920s. The white flat ceramic with the blue border appears to be tableware and of the period of occupancy at the Keystone mine. "Edged wares are generally limited to flat wares, sauce boats, tureens, and butter boats, which as a general class are known as tableware. Edged wares were the cheapest decorated tableware available for most of the 19th century" (Miller 1991:6). The large quantities of glass scattered throughout the site and the shards on the rock outcropping south of the foundation lead to the conclusion that there was easy access to glass. The scant quantities of ceramic ware may point to it being of a higher cost or that it was not as easily obtained.
The quality of foods and textiles will co-vary with household social and economic position, while ceramics will not. Since these goods are generally purchased with regularity, unlike ceramics, they are logically better measures of short-term changes in consumption patterns among households of different social and economic affiliations (Klein 1991:83-84).

The structure foundation is definitely a building foundation as the flat green window glass, window screening and lumber indicate. "In order to qualify as window glass, individual pieces had to have two flat parallel surfaces and had to exhibit a consistent thickness" (White 1987:55). Green color glass is very common and the natural color of glass is a light green or brownish amber due to the iron content (Fike 1987:230). The lumber had planed surfaces, nail holes and ends cut to fit together. The lumber framework remains appear to have fallen outward in a square direction from the edges of the cinder blocks embedded in the ground. The red bricks in the immediate area were also used in this structure.

Northeast of the foundation not more than 10 yards lie additional rusted cans and glass shards. Many of the cans had double side seams also known as the sanitary can. "Double side seams were introduced in 1888 and were being commercially produced by the late 1890s" (Rock 1984:106). This type of can is still being used today. The crown caps found around the foundation would not date to any earlier...
than 1892 when they were patented. Crown caps were seldom manufactured after the 1970s. Cans with a hole in the top were more numerous than other can manufacture types found at this location. These cans were manufactured in mass between the periods of 1810 to ca. 1930+ and held mainly canned fruits and vegetables (Rock 1987:12).

Royal Baking Powder was manufactured from the late 1860s to the early 1960s. "The cans were metal with an embossed top that read "FULL WEIGHT/ 1/4 lb/ ROYAL BAKING POWDER/ ABSOLUTELY PURE" until 1934 (Rock 1978:28). This can, found along with the "SEAL OF NORTH CAROLINA, PLUG CUT" AND SHILLING BEST, 5 LB." cans, had raised embossed lettering on the top portions of the can. Embossing began in the 1840s and continued well into the 1920s (Rock 1978:104, 105). Once again, these cans correlate to the period of activity for the Keystone mine.

Lower Tailings and Tramway B Remains
6. Next to the wash are the remains of a tramway (Tramway B) with a stone foundation at its end for support. Above this area to the southeast is a small wooden Tramway (C) that has no shaft above it. Figure 9 displays the two tramways. Tramway C’s frame is 8’6" x 6’11". To the east of Tramway C is a shaft (0) that has had a large boulder dropped into its opening. Downslope from Shaft 0 are some rectangular cement
Figure 9. Tramways B and C with Road 3 in the background.
blocks that are part of a foundation that measures 21' x 20'. Scattered around the cement blocks are pieces of iron piping of various sizes from 2" to 6" in diameter, sheet metal, screen material, and wire cable reels. The five cement blocks measured: 7'5" x 1'9", 3'11" x 1'5", 7'4" x 4'1 ¼", 2'7" x 1'1 ¼" x 1'8", and 1'1 ¼" x 1'11" x 1'7 ¼".

7. Tramway B dominates the lower landscape and it is the end (dumping station) of the complex. Tramway B measures 34'1" x 7' x 13'3". This dumping station for ore is made up of two walls facing each other supporting the upper timber frame from which the ore was dumped. The southern side of the foundation wall is of stone and consists of a smooth limestone with mortar between the stones. Railroad timbers laid horizontally make up the northern foundation frame. The upper part of Tramway B consists of thick rectangle timber frames. South of the tramway are the remains of an earthen railroad grade with some iron rails protruding from its exposed end.

a. The tailings at the bottom or north end of Tramway B measure 135' (east-west) x 115' (north-south).

b. Just 50 feet east of the stone-based Tramway B is a building foundation of dirt and wood that
measures 10'6" x 12'7". A window frame is lying nearby, as well as side framing of sheet metal. There is a cement pad in the middle that measures 5' x 2'7" with iron rebar and iron bands along its side. Five tin cans lie scattered around this feature which probably slid down the road embankment above.

c. The ore tailings were dumped off the northern end of Tramway B. Below the tailings is a cement foundation 19'9" x 12'2". This foundation has six cement block walls, each one foot high and three feet long. These blocks also have cut wooden railroad ties with two pieces of rebar protruding from them on top of the cement blocks. A large round iron cylinder that is cone shaped lies on the foundation's southeast corner. Yards of % cable wire are strewn around the foundation. Signs of a recent boundary survey completed in the area are present in the white string (survey thread used for measuring length) boxing in the tailing.

8. The area below Tramway B and to the west along the road is marked with trash alongside the road.

a. From where Road 1 intersects with the wash road 207'6" to the west, there is a claim marker next
to the road. The wooden marker has the letter B on it and the Arabic number 2.

b. Walking 50’ north from the wooden claim marker past the Road 3 and into the wash, a huge dump consisting mainly of cans was observed. This dump measures 250’ x 74’. The author estimated this dump contained at least a thousand cans is given for this dump. Many of the cans have soldered side seams with a hole in the top. Some cans measure 3 and 3/8" at the base and 4 and ¼" long. A "Log Cabin" syrup can was found with its tin chimney still intact. There were also cans with non-soldered seams or double lipped. Other trash found in this dump included: parts of a stove, metal bowls, metal buckets, screen material, and glass shards of aqua, amber, purple, light yellow, dark brown, and light and dark green. A few broken pieces of white ceramic plates and a bed frame farther up the wash were noted.

c. On Road (3) there is a small incline between the road and start of the hill where the tailings from Adit P and Shafts Q and R can be seen in the western distance. These shafts, along with a weathered wooden claim marker that has a base
made of piled stones, were determined to be the western boundary due to the presence of new and non-historic mine workings of the Chiquita mine found west of this complex.

d. Adit P is the westernmost adit and tailing area. It measures 5'6" x 5' and approximately 4' into this adit, shaft Q is placed in the floor. Measurements were not taken due to the unstable ground conditions. A smashed five gallon can, some broken brown glass, and one piece of wood are in the area.

e. Shaft (R) just to the east of this area has a fence of chicken wire material around it and a metal sign with a white background that says "KEEP OUT." The shaft is filled in with dirt.

f. Just east of Shaft R is a mound of fine dirt fill. A small concrete pad lies north of it with an earthen wall about 2' high surrounding it. A few timber railroad ties lie strewn around the earth walls. It is possible that this was a small retaining pond and might have held liquid in it as the bottom of the soil is of a silt nature. This area is not more than 25 yards west of Tramway B.
Analysis of Artifacts from Tramway B and the Western Boundary

Transportation of the ore, waste, supplies and men is one of the most important functions of a mining operation. The three tramways, and especially Tramway B, attest to the importance of loading, unloading and transferring materials between points both underground and aboveground. "Most large-scale operations in metal, coal, and industrial minerals employ mechanical loaders. No one loader meets all mining conditions; hence loaders are more or less specialized" (Young 1946:181). Wooden Tramway C might have been a belt or chain conveyor. The abrasive material of the ore bound in the limestone material would have worn down any belt or metal trough quickly with heavy repetitive use over long distances. "Relatively little use had been made of conveyors in deep metal mining. Probably the principal use is to take the discharge from an underground crusher station and to deliver it to skip-storage bins at a shaft station or to transfers serving a haulage level" (Young 1946:185). In small scale mining, hand tramming is very common as it is cost effective. Tramway C’s material was probably hand trammed over to Tramway B as the distance is only a few yards even though no rails of wood or metal were observed going over to Tramway B.

Tramway B is definitely the main dumping station for ore haulage out of the site. The large stone and railroad
tie structure at the end of the rail system support the last dumping station for ore into cars, wagons or bins. The type system used to haul the ore down from Shafts A and C and Adit B cannot be determined. Mule haulage of ore in wagons from the Keystone mine to the Nevada Keystone Company's mill in Sandy has been documented in photos from the James Hardy Collection (Paher 1984:273). It is probable that mules pulled the cars used on the rails to Tramway B. The cement foundation below (north) of the end of the Tramway would be a logical foundation for the loading of cars or wagons. No railroad system or associated features was observed out of the Keystone mine complex. Historical texts (Hill, Hewett and Longwell et al.) concerning mining activity in the Yellow Pine District make no mention of a railroad line leading out of the site to the town of Sandy where the ore was milled. As the mill shut down in 1906 and the San Pedro, Los Angeles, and Salt Lake Railroad did not even reach Jean, Nevada, until 1905, it is reasonable that mule haulage was the main transportation method used.

The iron cylinder's purpose found below Tramway B is unknown. An assumption would be that this cylinder was related to an initial stage of ore processing. The ½" cable wire lying around, combined with the cement foundation, indicates a power station was needed to convey ore material into the cars or wagons. Tailings lying to the north of
Tramway B are not accompanied by any shaft, and it is presumed that this tailing is runoff from some of the ore loading.

The large trash dump measuring 250’ x 74’ in the wash north of Road 3 consists mainly of cans that contained probable food materials. This dump is the second largest on the site and gives validity to the historical record that the Keystone mine was active for the early operational period 1892 through 1905 and possibly later. "Other things being equal, the size of the artifact assemblage for a given activity is expected to increase as group size grows larger..." (Hardesty 1988:74).

The cans observed by the author had diagnostic components on them. Many of the cans had their side seams machine soldered with a hole in the top that was closed by a piece of solder. These cans were popular until the early 1900s when the solderless "Sanitary can" took over in manufacturing. These hole in the top cans that made up the majority of cans observed at this dump can be placed in a general time period of 1810 to about 1920, as only evaporated milk tins continued to be hole in the top cans after 1920 (Rock 1984:101). Many sanitary cans were also observed. None of the cans examined had any labels associated with them to identify what food stuffs were consumed. The cans with open lids give a good idea that
solids had been inside as the cans with slits probably contained liquids (Rock 1978:113). A rectangular Log Cabin Syrup can that must have had a paper label which was manufactured between the periods of 1895 and 1918 was found in the dump (Rock 1978:52).

This dump contained mainly household items. Tin cans, metal bowls, broken ceramics, bottle glass, a bed frame and parts of a metal stove littered the area. The glass fragments included purple glass and bottle necks that were hand finished and machine finished. These components indicate manufacture dates before 1900 and manufacture dates with the fully automatic bottle machine after 1903. In addition, there were a few buckets, possible oil and gas cans, and window screen material present.

**Keystone Mine Analysis Conclusion**

The artifactual assemblages present at this site are related to the technical and domestic activities that occurred during the hardrock mining periods from the late 1890s-1920s at the Keystone mine. The 19 shafts and adits associated with their tailings and tramways represent most of the technical cultural material. In all but one case, the structure foundations are associated directly with a shaft or tramway. A mining camp did exist for the miners working the area as the two trash dumps and one non-industrial building foundation exposed. The diagnostic
features of the cans, glass and the few ceramics observed concur with the historic references that the mine was active between the periods of 1892 to ca. 1920. Little historic material from the period 1930-1941 when Will McClanahan and his partner worked the mine was found. This observance could be refuted or verified with additional sampling at this site.

The hardrock technology in the form of belt conveyors, tramways, one small gauge rail system, and the general lack of a large transportation system show this mine to be a small scale operation. The photo documentation that mules were used to haul out the ore (Paher 1984:273), historical documentation of mule freightage (Geary 1984:22, 43), and the fact that railroads did not even reach Goodsprings until 1911 (Hill 1914:251-252), plus the lack of physical evidence of a transportation system, indicate a small scale operation where the peak years were between 1892 and 1905. "Mule haulage is often advantageous in low tonnage and small operation...where quantities handled per day are about 200 tons or less" (Young 1946:184). The small scale of this operation might be confirmed by the lack of household settlements, as there was often a pattern of "dispersal of households over widespread and low yielding ore deposits..." (Hardesty 1988:102).

Later periods of activity can be examined at Shaft C
and surrounding shafts, by machinery near these shafts, the condition of Road 1 and the car body found by the road. This more recent operation would have been from the 1930s (Longwell et al. 1965:191) to the present Durvada Resources, Inc. operations at the Chiquita mine.

The large quantities of tin cans and broken brown and green glass shards are diagnostic features which correspond to recorded periods of operation for the Keystone mine. The few building foundations observed on the site lead to the conclusion that this area was used primarily for ore extraction and not as a permanent place of settlement. The lack of building foundations with household trash nearby suggests either that occupants lived in tents, rode into Goodsprings or Sandy to sleep, or that any other structural remains were later removed, possibly covered up by tailings or deteriorated. The miners were 10 miles west of Goodsprings and approximately 5 miles away from Sandy, allowing for the opportunity to go elsewhere for entertainment and economic comforts if time afforded. The overall structure of this mining site would be of a multiple small scale occupation and activity over a period of 50 years with the major activity covering the first 10 years. "From 1893 to 1905 mining in the district was confined principally to the Keystone, Boss, and Clementina gold ores" (Longwell et al. 1965:102). "The Nevada Keystone Co.
terminated operations at its mine in 1905 and the mill shut down permanently in 1906" (Paher 1984:272).

This non-random sample of mining features and associated artifacts can provide insights to the consumer behavior of the miners when used in conjunction with documentary research. The documentary records disclose when the mine was active and the archaeological record confirms and adds data to the written record. "A major contribution that archaeological and historical research can make is an understanding of broad patterns of consumer behavior over time" (Henry 1991:12). Consumer behavior at this site displays miners who transported the majority of their food in. The large quantities of tin cans confirm this. The many green and brown glass shards show that beer and wine were consumed at the site. Allowing that there are no spring sources near by, water must have been at a premium and the beer and wine were part of the fluids consumed daily by miners. The handmade candle holders are examples of creativity when lantern materials might have been sparse or too expensive for the company or miners to purchase. The glass bottle tops might have been for ink wells referencing business reports done at the sight.
CHAPTER V

YELLOW PINE FIELD ANALYSIS

The Yellow Pine mining complex and related features may be found in southern Nevada just three and one half miles northwest of the town of Goodsprings. The areas respectively surveyed were found in SW ¼ SW ¼, sec. 16, SE ¼ SE ¼, sec. 17, NW ¼ NW ¼, E ¼ NW ¼, NE ¼ SW ¼, sec. 20 T24S, R58E. The shafts and adits appear well marked on the Goodsprings topographic map. This Yellow Pine complex can be reached by exiting south from the Wilson Pass Road two and one half miles northwest of Goodsprings. Figure 10 displays the Yellow Pine site layout. The Yellow Pine Road is a dirt road that travels one mile west before the first shafts are observed next to the road. These shafts belong to the Prairie Flower and Solio claims. A five day surface site inventory was conducted March-June of 1989.

The Yellow Pine complex was the largest zinc-lead producing mine in the country from 1906-1931. Over $196,485 was earned in the years between 1902 and 1911. The name "Yellow Pine" comes from the Yellowpine Limestone which is the youngest layer of the Monte Cristo formation. This 350 million-year-old formation produced 85% of the lead and zinc.
Figure 10. Yellow Pine Site Layout. Refer to Goodsprings, Nev., 1960 topographic map.
found in Porphyry Gulch where the Yellow Pine Company was located. At present, the claims are in private ownership in that they are patented. Refer to Figure 11 for a map of the site layout.

The Main Tailings and Related Features

The dominant physical feature of the valley is the main tailing of the Yellow Pine mine. This includes the Hilo, Capitano, Bybee, Rover, Como, Radio, Scorpion, Queen, and Consort claims used to enlarge the tailings from the Yellow Pine mine. Approaching the tailing there are three mine shafts no more than 30 yards off the main road between the road and the wall of tailings to the west.

1. a. Shaft A is the closest shaft of the three to the road and has a wire fence in bad repair around it. The fence measures 8' x 5'. This shaft has timber framing around the opening that appears to go down at least 6 feet in order to stabilize the opening.

b. Sixty-two feet and six inches southwest of Shaft A is Shaft B. This is a smaller shaft with the remains of some framing sticking out of it and it has been filled in with dirt. The ground was too unstable to measure the shaft.

c. Shaft C is the major shaft with a cement foundation around it. The foundation measures 16
There are two iron eye hooks measuring 5" x 4" just above (west) of the shaft. Two raised cement rectangles lie just six feet to the north of Shaft C. Broken purple glass shards and some tin cans litter the ground. One flat tobacco can measured was 4 ½" x 3". The ground on the east side of the cement foundation is raised, and what is left of a wooden hoist structure is lying flat on the ground and measures 13’ x 11’8". The tailings surrounding this area covers an area 245’ x 117’6". Most of the discarded artifacts in this area are sheet metal, pieces of railroad ties, cement blocks and large cans (8" x 6") with holes punched in the top of them.

A timber frame surrounds this deep shaft, and an estimated measurement of 13’ x 6’ was given to the shaft opening. The timbers lining the shaft are narrow, appearing to be no more than 8" x 8" each. The ground area is unstable, preventing accurate measurements of Shaft C. This shaft has a sloping wooden floor that continues beyond viewing distance. The surrounding rock tailings are of red and green colors.

d. Just southwest of this area is Shaft D that has
been filled in with tailings. It has its own tailing base that measures 8' x 9'. Metal pipes come out of the adjacent area. These pipes have screw thread on their tops. A large Joshua tree borders this area on the west, growing out of the tailings.

2. The large tailings are the dominant landscape feature. Timbers are sticking out of the east side of the tailings. The tailings have four main fingers and run north-south. The total length measurement of the tailing is 575'. Width varies from 27'6" at the tip to 195' in the southern end. At the north end of the tailing, railroad ties lie parallel and imbedded into the tailing. Industrial debris is found along the northeast tip of the tailing where an iron tube 19" long with a width of 2" protrudes from the tailing. There is also a metal bailing wire bobbin and a dark brown bottle base that has glass 1/4" thick. The whole tailing has recent survey thread and orange tape marking new measurements.

3. Road 1 runs east-west along the northern end of the tailings and swings along the west side of the tailings to the mill site above and south of the tailings. This road connects with the main Yellow Pine road (Road 2) just north of the tailings.
a. Along the north side of Road 1 is a dump site. Items found include part of a wooden trunk with iron siding, part of a stove pipe, shards of white jar glass, amber glass and dark brown glass, plus many cans.

b. Cans that contained diagnostic features include five Ghirardelli chocolate tins. These chocolate tins are round, with the words "GHIRARDELLIS CHOCOLATE" and a symbol on the top. These tins measure 3" x 3". An identifiable baking powder can was found stating "FULL WEIGHT, ROYAL BAKING POWDER 5 LBS, ABSOLUTELY PURE, round in shape measuring 5" x 5 1/2". Fourteen flat tobacco cans, smashed flat like the majority of tobacco cans found throughout the whole area, were found at this dump site.

c. There are also between 30 and 40 cans, with some having their lids peeled back and others having holes punched into them. Cans' measurements included 3" in diameter x 4 1/4" in height (hole in top) and the open cans 4" x 3 1/4", a possible gas can.

4. Along the northeast end of the tailing is a small underground structure next to Road 2. This structure has a wooden front, a corrugated metal roof with earth
covering it, and the other three sides of the structure are underground. Inside can be seen the remains of a wooden frame that helps hold up the earth. To the north in front of this structure is a cement circle with a hole in the middle and the remains of a cut off pipe in this hole. This looks very much like a flag pole base. The cement has inscribed in capital letters "LIBERTY LOAN 1918 JULY 3RD". From this structure due south a channel measuring 150' x 97'6" runs along the east side of the tailing where the timber posts stick out of the tailing. The channel floor is level, and Adit D2 is at the southern end. See Figure 11. Along the way is iron debris and a sheet metal tank measuring 6' x 3' 1/2 " shot full of holes.

5. East of Road 2 across from Shafts A, B and C near the road is a wash. The area leading to the wash and the wash itself consists of a large trash dump. The total dump measures 392'6" x 351'6". The ground is level. Artifacts found in this area include: various broken glass shards numbering in the hundreds. The colors include a straw color, aqua, dark blue, purple, and some flat light green window glass. Non-glass items are white ceramics shards, brick colored pottery shards with decorative bumps and no glaze, a rusted safety razor blade, chair springs, and hundreds of cans with
Figure 11. Adit D2 and remains of ore chutes for train.
punched, peeled, cut and church key openings. Some of the cans were hole in the top, but the majority were sanitary cans. An unusual find was made of a bisque doll leg that measures 2 1/4" x 3/4". It has a painted black shoe, sock, and at the top of the doll leg painted "short panties".

6. Bordering this dump site on the north is a large trench. Trench A measures 237'6" x 32'6" and runs east-west. On both sides of the west end of the trench are flattened foundation areas with broken pieces of timber lying around. The south side of Trench A has limestone core samples, broken white ceramics that are curved in shape, purple glass shards, and rusted cans scattered about. The north side of the trench has oil cans, broken dark brown bottle necks and bases, and some purple glass shards. The northern side of Trench A has the faint tracks of a road (Road 3) leading north to another trench, Trench B.

Analysis of Artifacts Found at the Main Tailings

An analysis of the Shafts A, B and C's features associated with the main mill tailings show the typical rectangular shape most metallic mines in America had in the 1800s and early 1900s. "Rectangular shafts are ordinarily arranged so that units of two compartments each are used for balanced hoisting. The odd compartment is the manway. The
two cages may be 4 ft. by 13 ft. or 5 ft. 4 ¼ in. by 14 ft. 8 in" (Lewis 1950:169). The manway often contains pipes for water removal and air vents. The main factors determining the size of a shaft are the daily tonnage of ore and waste to be hoisted out, plus the number of men and supplies to be hoisted. Shaft C is rectangular and still contains its cement pads to hold the hoist firmly and provide an anchor support. The entrance of the shaft is called the "collar". "The collar set may be carried by some form of heavy truss if the ground is not firm at the surface" (Lewis 1950:171). Concrete and timbered walls were often a form of collar that provided firm support. Collars combined with cement pads at the entrance provided an even better anchoring. "End plates and dividers are bolted to overlying and parallel timbers that project beyond the excavation onto suitable blocking or a concrete foundation" (Lewis 1950:171).

The wooden floor of the shaft could have been part of the collar, caging for the shaft, or to assist an ore cart on the way out. The type of hoist used is not clear. A horse whim was capable of 4 to 5 tons in an eight hour shift. However, both gasoline and electric hoists were available in the early 1900s, and "a gasoline engine is portable and costs little for attendance and has a low first cost" (Lewis 1950:186). The purple glass and Prince Albert type tobacco can have been cited earlier (Rock 1980, 1987)
as existing from 1895 to the early 1930s when this mine was most active.

The stove pipe, wooden trunk, GHIRARDELLIS CHOCOLATE tins, ROYAL BAKING POWDER 5 LB. tin, amber-brown glass, ceramics, and sanitary and hole in the top cans have diagnostic characteristics. The baking powder was cited earlier (Rock 1978) as being manufactured between 1840 and 1920. Efforts were made to date the Ghirardellis tin by writing the company. Correspondence received from the Ghirardellis company indicated that they do not keep historical records on their packaging of chocolates. The five chocolate tins do prove that goods were shipped in from hundreds of miles away to please hungry miners. The glass shards and tin cans can be dated from the late 1800s to the 1930s. The shape and opening correspond to food cans (Rock 1984:106).

The dugout is interesting in that it was the only dugout found in the Yellow Pine complex. Dugouts were found at the Shoshone Wells mining complex in Nevada and were a most common house construction there. Like true pit houses, this dugout "appeared to have little or no wall exposed above the ground, but the open end was closed with a wooden or stone wall and door. The roof was flat, covered with branches, dirt, flattened tin cans, corrugated metal sheets..." (Hardesty 1988:86). The cement circle with a cut
off pipe implant in the bottom with the inscription "Liberty Loan 1918 July 3rd" gives an exact historical date for this part of the site. This feature leads to the possible reference to a loan made because of the end of World War I and celebrated as a flagpole. This dugout was right next to the tailing and where the train filled with ore took off as the photo from James Down in UNLV Special Collections 0015, #15 exposed, so it is likely this dugout was related to mine activities and not domestic use. See Figure 12. The large timbers sticking out of the tailing behind (south) of this dugout correspond to the ore bins/chutes that dropped ore into the train's cars.

The large dump found east of the dugout contained mainly domestic refuse. The bisque doll leg is a direct correlation with families of miners living at or near the mining site. This fragment of a toy part is the only example of an artifact for children being found at any of the features surveyed at the Boss, Keystone or Yellow Pine sites. The white ceramic plates, earthen pottery ware, glass shards, chair springs and razor blades are other examples of domestic habitation in the area. As stated earlier (Klein 1991), ceramics may indicate a longer period of occupation or higher social or economic status of a household site. The flat green window glass is the only indication that a building might have existed in the area.
Figure 12. Yellow Pine complex. James Down (UNLV 0015, #15).
A historic photo (Hewett 1931) displayed a wooden frame house standing on a cinder block foundation (raised above the ground) with a four-sided pitched roof. Where the glass was found was hard packed-flat dirt. However, no lumber was seen in the area. Relocating buildings and "lumber scavenging are probably the most common post-occupational processes responsible for the archaeological invisibility of wooden frame house sites on the Nevada mining frontier" (Hardesty 1988:87).

Trench A may be a form of sampling. "Trenches may be cut through a shallow superficial deposit, a dump or a tailing pile. The proportion taken is greater if the material is rich and irregular in content than if it is uniformly low grade" (Lewis 1950:517). The building foundation and lumber fragments associated with the trench, in conjunction with the core samples and white ceramic crucibles, indicate an assay lab was next to the trench. The purple glass and rusted tin cans show a time period before World War I.

**Alice Mine**

The most visible structure along the southern ridge line is an old ore tramway. This tramway can be reached by taking Road (4) that branches off the main Yellow Pine road (2) by looping uphill (south) to the ore tramway standing on the ridge. Road 4 goes under the downhill side of the
tramway and continues in a northeast loop past the tramway tailing before connecting with Road 2 again. The limestone rocks in and around the tailings are a green color with small veins of red color running through them. Quartz and mica material appears in much of the limestone in this area.

7. The tramway consists of lumber lined with a metal sheet 1/8" to 1/4" thick in places. The standing tramway measures 54' in length. Below the tramway there are lumber and metal fragments of the tramway scattered about. The majority of lumber fragments are 6' in length, and the sheet metal matches that left on the tramway. This scattered material indicates that the tramway continued further downhill on the tailings for an undetermined distance. There are board slats running along the extended bottom of the tramway that would have allowed for a person to walk the ore tramway. The tramway rests on a limestone tailing 55' x 170'. The mine shaft (E) is at the top of the tramway. Iron nails that have round heads and are 5" long lie scattered in all directions over the site. See Figure 13.

8. At the top of the tailings a limestone retaining wall remains at the eastern corner. It measures 7 ½' long and is 2' high. Above this wall are the remains of a wooden frame structure 12' x 9'. Broken flat aqua...
Figure 13. Alice mine tramway.
window glass litters the area within and outside the frame. Most of the lumber is 6' or longer, 5"-9" wide and 1"-2" thick. The author counted 250 lumber fragments scattered around the tailing top and more than what was observed remained in the general area. The only other artifacts associated with the frame were a few iron nails with round heads.

a. The top of the tailings have a scatter of various historic artifacts: A tobacco can with a smooth seam 4 ½" x 3" x 1" with 3 back hinges to move the lid and part of another tobacco can were found; broken purple glass shards and tin cans are scattered in many places. Most of the cans have a soldered top with one smooth side seam and consist of both round and rectangular shapes. A wooden barrel 28" x 28" with a 1/4" thick walls with rusted staves was found in the vicinity.

b. A narrow trail leaving from the west side of the tailings went 170' south to the top of the hill above the mine hole and tailings. No artifacts were found on the top of the hill, and no mining activity was seen in the gullies below.

c. The tailings associated with the tramway also have recent artifacts including spent shot gun
shells, brown glass beer bottles, pop bottles and 22 rifle casings found in association with the historic artifacts.

9. Shafts F and G are 80' above and 25' west of Shaft E and the tailing from them measures 125' long. These two small shafts are next to each other and separated by only a few feet. These shafts are lined with lumber, but the instability of the ground prevented shaft measurements and viewing the slant or bottom of either shaft. A few yards east of Shafts F and G is the small Shaft H measuring 5' x 3' with a fine dust tailing below it. The shaft is blocked with lumber and there are wood chips around the site.

10. Road 4 leaves the tramway and heads downhill by passing along the eastern border of the tailings. Beside the road a cable wire stretches for 77'6" where it ends at a large mining feature at the bottom of the hill. Artifacts found in association with the road include: a wooden claim marker and a can measuring 2 ¾" x 2 ¾" that reads "shoe polish" plus some flattened cans.

a. The mining feature measures 170' x 55' and Road 4 continues north out of it to connect with Road 2. On its eastern border are two limestone retaining walls built in a terrace fashion. The lower wall is 80' x 55', and on the north side is Shaft I.
The shaft opening is approximately 20' x 15' as measured a few feet away from the unstable opening. This lower wall has six layers of limestone, and a cement slab on top with five iron rivets still in the cement. There are 10 fragments of lumber fragments, a pipe head, an SAE oil can and 8 tin can lids scattered about.

b. Sixty-seven feet and six inches east on the lower limestone wall is the higher terrace wall measuring 35' long. At the southern end is a small pit 6' deep and 15' x 6'. A large pipe is just southwest of this wall, and there are tin can lids and a rubber belt on the ground. At the north end is located a 6'6" x 32" cement slab with a wooden track and six 5" iron bolts protruding up through the track. There is a piece of sheet metal 4' x 1 ½" long nearby. This cement slab is directly above (east) of Shaft I by 20 yards.

c. The large tailing created by Shaft I is 120' long and runs north-south with Road 4 paralleling it. At the southern end of the tailing there is the remains of a large wooden hoist lying on its side. This host frame is 23' x 5'11" wide. The cross beam in the upper third of the frame is
5'6" long. There are two warped beams that form a "T," breaking the upper third into three sections. Recently staked orange flagging tape and surveyor thread are sectioned across the flat top of the tailing.

d. Three hundred and seventy feet southeast of Shaft I is a hole measuring 5 ¾' deep. A rusted bucket, one can lid, and five cans all rusted and opened lie near the pit. There is a small trench 10'6" x 5'8" just south of the lower wall, and 55' above the trench is a small pit 25' x 18'. No historic artifacts were found in this area.

11. A 13' x 11' hard-packed dirt foundation was observed on the west side of Road 4 across from the tailing. A disintegrated wooden frame structure lies on this foundation. Historic artifacts inside the fallen-down frame and just outside it include: part of a stove pipe, dark blue glass fragments, flat aqua window glass shards, fragments of clear, brown and green bottle bases, and a variety of rusted cans. The openings found on these cans include triangular church key cuts; others are punched through with a knife or cylindrical tool, and the rest have their top cut off. The total number of cans found on the ground exceeds 60. There might possibly be cans buried in the dirt mound.
Sections of window screen are found inside the foundation and matching screen material occurred found near the limestone walls. A more recently made oil fuel can consisting of a steel alloy was amidst the historic material.

a. A second packed-dirt foundation is just 20 feet southwest of the first foundation. Part of a stove pipe elbow, window screen, many rusted cans, a dark brown glass bottle base, and five tobacco cans were found scattered about the foundation.

b. There is a loose dirt mound near the junction of Road 4 with Road 2. A complete medicine bottle was found here, no more than 17'6" northwest of where Road 4 leaves the mining feature area associated with Shaft I. This rectangular shaped clear glass bottle is 5 3/4" x 2 1/4". It has a front panel with the following embossed lettering, "PREPARED BY DR PETER FAHRNEY & SONS CO, CHICAGO, ILL. U.S.A." The 1 ¾" x 1 ¼" base has the number 71 over 10 on it. There is a faint ghost seam all the way up to the lip of the bottle. Also, there are fine lines going around the neck. There are partial decorative lines extending go 1 ¼" from the neck to the panel and
from the base to the panel. No bottle stopper was found.

12. Twenty-six feet above and east of the large tailing from Shaft I is Shaft J with piled rocks in front of it. The tailing cover an area 57'6" x 21'. The shaft has wooden timbers still in place around its four sides, and the bottom of the shaft cannot be seen. Above the shaft is a flattened-earth area. A large bolt stuck in the ground, a tin can, and an iron barrel rim 9' in diameter, plus green glass shards are the only artifacts seen.

a. East of Shaft J is a pit 18' x 9'. The bottom can be seen, and the rock tailing is 47'6" x 37'6". A gas can, 2 oil cans, and a tobacco can that said tobacco on it were in the vicinity.

b. Two claim markers made out of wood can be found 182'6" south of Shaft J. Marker A has a metal tag with the words "Roc Mon, For ELM #36" on it. Marker B has a plastic medicine bottle with this claim notice in it "Located 3/14/85, Joseph B. Smith, Robert B. Smith, 8304 Puerta Vista, Austin TX 78759."

Analysis of the Alice Mine

The tramway is a feature of the transportation system for ore removal from the shaft to the surface. This
activity locus is represented by tramways, hoists and roadways necessary to remove ore. No wire cable, spools, or associated pulling devices were found here. This does not necessarily mean that this was a hand-tramming station. As the tramway is as long as the tailing under it, 170’, it is unlikely that this was a hand-trammed site. Most large-scale operations employed mechanical loaders (Young 1946:181). The flat aqua window glass, nails, and wooden frame structure atop the limestone wall lead to the conclusion that some type of structure was here for mining operations. The tobacco can could date from 1895 to the mid 1930s (Rock 1987:63), and the purple glass shards into the early 1920s. The historical record tells of these claims (Big Chimney) being patented in 1914, and this information confirms the age of artifacts found here. The can with the soldered top could date anywhere from the 1880s to early 1920s as the sanitary can was generally accepted by the public in the 1920s (Busch 1981:98).

Rectangular Shafts F and G are next to each other separated by only a few feet. The reason for two shafts next to each other could be for separate hoisting systems, one for the ore and the other for hoisting men or venting air; or that two shaft collars provide better stability or anchoring of the surface rather than one large shaft. As a closer look was not possible, this shaft hypothesis cannot
be validated.

The purpose of the cable wire leading to Shaft I could not be determined. The strands or layer of wires determines what the purpose of the wire was. "Thus a single layer makes a strand of 7 wires. Two layers make a strand of 19 wires... With increasing number the wires in a strand become smaller and the rope is more flexible" (Lewis 1950:196). Unfortunately, at the time the survey was conducted, this information was not known. Haulage rope consisted of six strands of seven wires, and hoisting rope consisted of six strands of 19 wires (Lewis 1950:196).

Shaft I produced a good quantity of ore judging by the size of the tailings (120' long) and the features associated with this shaft. The cement pads are related to the hoisting system. The method of hoisting is not known; however, the two separate cement pads and wooden track lead to the conclusion that gasoline or electric engines were used. "Gasoline hoists are especially useful where fuel and water are scarce. A 20-horsepower engine will require about 1 gal. of gasoline an hour. The gasoline engine is portable..." (Lewis 1950:186). The hoisting engine was kept near the shaft. Wood or metal drums were used to wind the rope for hoisting and were often on separate cement pads from the head frame. If a mine had more than one level, it was customary to have two drums, one for each shaft.
compartment.

"Wood is chiefly used for temporary head frames or in case steel is not easily available. The height of head frames is controlled mainly by the length of the cage or skip and its connections to the rope..." (Lewis 1950:215-216). No steel head frames were found at any of the Yellow Pine District sites, indicating that steel was not available for implementation.

The artifact assemblages associated with the building foundations across the road west of Shaft I are domestic in use. The sizes and openings of the 60+ cans found here suggest food cans. Motor oil cans were not marketed established until 1932, and their sizes were in 1-, 2- and 5-quart sizes (Rock 1987:57). The majority of cans were sanitary cans, and a few found in the same strata had a distinct triangular church key opening. This can opener was not developed until 1935 by the Vaugh Novelty Company (Rock 1987:112). Tobacco tins found also date from the late 1890s to early 1930s. The ground around the foundation for over 20 yards was disturbed and probably contained more domestic artifacts. Additional probing of the surface would prove or disprove a broader assemblage of household artifacts.

The hundreds of shards of clear, brown and green glass as whole containers might have held medicines, beverages or cleaning solutions. The whole bottle found with the
embossed description "PREPARED BY DR PETER FAHRNEY & SONS CO, CHICAGO, ILL. U.S.A." is dated after 1900 to 1910 and was a blood cleanser and Vitalizing Panacea (Fike 1987:58, 112). The artifacts here range in age from the early 1900s to early 1930s. Recent claim markers in the area (1985) by the Smiths show a continued interest in Porphyry Gulch.

**Yellow Pine Southernmost Extension**

13. South on Road 2 from the Alice Extension of the Yellow Pine operation, is a stone claim marker next to the road. This marker consists of limestone rocks piled together in a pyramid shape 18" high. Due west of this marker by a few feet is the first of a series of six trenches. Trenches C - F lie in row next to each other in a north-south direction. Each trench is separated from the other by eight feet. Trench C measures 90' long x 21' wide; and Trenches D, E and F are longer measuring 187'6" x 22'6".

a. Trench H is 132'6" long and 17'6" wide and it borders trenches D, E and F which are perpendicular to and west of H. No historic artifacts were observed in any of the trenches. The depth of these trenches was not measured, but appeared to be not more than 20 to 25 feet. Recent surveyors have been in the area as the white survey thread and orange flagging tape
suggest. Two more claim markers are within viewing distance from the limestone claim marker next to the road.

b. Trench G measures 135' x 18' and is found northwest of Trench H by 10 feet. East and next to trench G is a mine shaft (K) with a wire fence around it. Shaft K borders the main road (Road 2) that leads south to the Alice mine extensions. A wooden hoist with large bolts on either end lies on its back just northwest of the shaft and measures 8' x 2'8". Shaft K's fencing measures 17' x 13". Due to the fencing, no measurements were taken and only the berm could be seen.

c. There is a road (5) that begins by Trench G and goes northwest for 165', then dead ends on top of a ridge on a flat surface. Road 5 has rock lining along its downhill side for erosion support. There are some timbers, wire cable, a few cans measuring 4 ¾" x 3 ½", and one large can that by appearance seems to be an oil can. Looking due east and down from Road 5 Trenches C-H can be seen and Shaft K. Due north of Road 5 the five cyanide containers, foundations for the main hoisting complex and the main tailings can be seen at a distance of 60 yards away.
Figure 14 displays the main tailings.

14. Between the trenches and mill site there is a road (6) going west off Road 2 just north of the trenches. Road 6 is only 960' long, and its main purpose seems to be as an entrance to a dump. The dump is found on the left (south) side of the road near its beginning. Debris found at the dump includes: window screen, a bale of wire, burnt wood, a rusted bucket, a large can with a hole at the bottom, and 10 iron tubes of 3" diameter. The only diagnostic artifacts found are two old Pepsicola bottles. They are 10 fluid oz. containers and measure 7 1/4" x 2 1/4". On each side raised letters state "NO REFILL DISPOSE OF PROPERLY." The other side of each bottle has in raised letters the word FLEXSPOT with a trademark R. The bottom of each bottle has these numbers and letters stamped on them: V 23A 74, G 6-8-379, e.

a. Farther west up Road 6 is a small shaft (L) with wood thrown over it to keep people out. The ore tailings here are a deep rust which is in contrast to the limestone rock surrounding it. The entrance of Shaft L measures 10' x 5'8".

b. Twenty-two feet southwest of Shaft L is the largest trench (I) found in the Yellow Pine complex. It measures 300' x 245'.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
Figure 14. Remains of the main excavation feature and tailing.
c. Where Road 6 ends there is a long turnaround that measures 1305" x 87'6". No historic artifacts were viewed along the road. A wooden marker set in small stones was next to the road, and it had visible the numbers 124141 engraved on it.

d. On the north side of Road 6 is a small hill made out of the fill of Trenches J and K. Both these trenches measure 240' x 17'5" wide. No historic artifacts are found here.

Analysis of the Southernmost Extension

The features associated with the southern extension are related with ore sampling methods. Trenches are a means of test pitting; if the sample provides a good grade of ore, then a shaft will be sunk (Lewis 1950:517). In this area just south of the mill, the eight trenches and Shaft L indicate the ore quality was of a low grade. The debris found along Road 6 is industrial in nature and contain virtually no chronological diagnostic components. The only diagnostic artifacts found here were the two Pepsicola bottles from the industrial dump. These bottles probably do not date before 1924 as 8- and 10-ounce soda bottles were not standardized among companies until 1924 (Broilo 1977:239).
The Bybee Mine and Excavation Site

15. The Bybee mine's recovery of ore to the surface feature system is adjacent and south of the major tailing pile where the first processing and separating of ore occurred. The actual site is located on the Hilo and Bybee claims. It has a large concrete foundation with many raised concrete pads inside the foundation walls, large cyanide vats behind it (south), and an extensive industrial debris pile to the south and west of the concrete foundation. A possible historic photo of this area is found in Figure 15 which is from the Squires Collection at UNLV.

a. Structural foundation dimensions are as follows:

1) west wall 39'6" long; part of the wall has crumbled
2) east wall 43' long; door within measures 7'5" long
3) south wall 54'4" long
4) north wall 54'4" long; and from the west side going east it is 15'8" in length to the door on the north face. The door measures 3'6" wide. From the door going east, it is 7'1" until a large gap of 15'4" breaks up the wall. The wall begins again, and it is 16'2" from the break to the east wall.
Figure 15. Hoisting operation at the Yellow Pine mine, UNLV Special Collections (UNLV 0002, #78).

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
b. The wall is a cinder block construction, and it ranges from 12" to 18" high in its present condition. The floor is poured concrete. A crevice that starts along the northern wall appears to be part of Shaft M that apparently went under the hoisting system and later the floor collapsed into the shaft. The expanse of Shaft M could not be determined, and a rough estimate shows the crevice to be 15'4" wide.

c. There are seven raised concrete blocks within the foundation. From east to west they measure:

1) 2'3" x 1'2" x 7" high
2) 1'7" x 1' x 7" high
3) 13'5" x 5' x 10" high
4) a) 16' x 18' x 1'10" high
   b) 16' x 18' x 2'7" high
   c) 16' x 18' x 4' high
5) 7'6" x 4' x 2'1" high
6) 7' x 6' x 2' high
7) a) 2'2" x 1' x 2'11" high
   b) is 5' west of (a), 2'2" x 1' x 2'11" high
   c) is 5'2" from (b), 2' x 1'11" x 2'7" high
8) 6' x 6' x 1'6" high
16. Just east of the foundation by 5’ are two large iron vats set into the ground. Both vats are 5’5” in height.

a. Scattered around the interior and exterior of the foundation are these historic remains: flat window glass either clear or a light green color, purple glass, clear glass, dark brown glass, white pieces of cylindrical ceramics that appear to be electric insulators, a few smashed tobacco cans, and a 3” bottle base with these letters and numbers from top to bottom: 1305 . CK, EZNT . ITS, 1 PT 12 FL ozs, 5, 23 OZ. Large pieces of corrugated sheet metal over 20 in number litter the area around the foundation. They are wide enough and numerous enough to have been wall siding at one time.

b. North of the wall lying on a flat earthen area, is the frame of a small building that is intact, but lying flat on its side. The metal roof of the building points north, and the collapsed structure is lying five yards northwest of the foundation. The walls of the structure are plywood, and the roof sheet metal.

17. Adjacent and south of the foundation are 5 large sheet metal drums, presumed to be cyanide drums. Four of the
drums measure 12' x 12' x 4'2" high, and the fifth drum is 12' x 12' x 7'2" high. All the drums have this inscription on their sides: "MANUFACTURED BY, J.F. HOLBROON CO., LOS ANGELES, CAL."

a. Three of the drums including the tallest one are in a row, and just a few feet downhill are the remaining two drums. One of the downhill drums is upside down. Just south of the drums in a wash channel are rusted sheet metal, tin food cans, wire, iron strips, broken cement slabs, wooden timbers, nails and broken glass.

b. Two trenches are within view south and up the hill behind the industrial dump. These are Trenches J and K.

18. West of the cylindrical drums is a road (7) going up the hill. Railroad timbers are seen lying parallel in the ground at various points. These timbers deadend 80 feet uphill (west) from Road 7 and the hoisting foundation site. Also in line with Road 7, more timbers go past the south side of the wall and over to the vats on the east side of the foundation wall.

a. The remains of a possible wooden structure, as evidenced by the flat lumber and small foundation area, can be seen on the north side of the road.

b. There is a pit on the south side of the road that
measures 15 feet off the road. It is 19' x 8' x 5' deep. There are seven wooden steps near here that appear to lead nowhere.

19. On the west side of the hoisting foundation and tailings, Road 1 curves around the tailing north and connects with the main road (2). A portion of Road 1 is in a wash bed. Off the side of Road 1, a drum measuring 12' x 12' x 7'2" lies on its side in the wash.

a. On the right (east) side of Road 1 (slightly raised above the road) are the remains of a wooden structure. Some tin cans, 12 tobacco cans smashed flat, broken clear window glass, amber and aqua glass, plus some dark green glass are lying around the area. The green glass has the words "MILANO, BRANCH, FRAIELLI" inscribed around it. The rest of the wash area had few artifacts in it. An occasional iron ribbon, fragments of lumber, window screen, and tin cans were observed.

20. At the intersection of Roads 1 and 2, there is a trench (L) on either side of Road 1.

a. The east side of Trench L measures 80' x 40' x 20'. Artifacts found around the trench include many shards of green and purple glass, tobacco
cans, and a flat ceramic piece with the words "WARRANTEL, K.T. [?] W., GRANITE," with an eagle symbol by the writing.

b. The west side of Trench L is 117'6" x 30'. A few pieces of green glass shards are scattered about.

Analysis of the Bybee Mine and Excavation Methods

Historic photos can greatly enhance the knowledge of a site. A photo of the Yellow Pine mine in 1931 (Longwell et al. 1965:109) showed the large hoist and its housing atop the Bybee's tailings. This feature system is above what is referenced as Shaft M here. Behind the hoisting system some of the large vats can be seen, as well as a small wooden structure to the west of the hoisting compound. Below the tailings the wooden ore chutes used to load the train cars with ore can be viewed. Without this photo and historic references by Hill (1914), the large foundation could be confused more with basic milling operations due to the two iron vats, five large drums, and other industrial debris nearby. The cement foundation and raised platforms inside it housed the electrical system and motor to run the hoist. "A 150 horsepower gas hoist operates the 1-ton skip in the main incline [Shaft M], and a 25-horsepower engine runs the compressor and a 12 ½-kilowatt generator. Electricity is used to light the mine and for hoisting in the winze below the third level" (Hill 1914:264). The artifacts associated
with a building feature: window glass, corrugated sheet metal for siding or roofing, and the ceramic insulators, all of which give a temporal reference to this mine's major period of activity as between the years of 1911 to 1928 (Longwell et. al. 1965:108).

The leaching vats do prove that some milling was done here, but the majority of material was shipped out to the mill at Goodsprings or to the lead smelters in Salt Lake City or in the Mississippi Valley (Hill 1914:251). The ore leached here might have been more for sampling methods since it was small scale. The mill tailings observed here extend only 10 yards, lending support to the idea that the vats were mainly for sampling and that the building foundation was for the hoisting system.

Samples for mill runs range from 10 to 50 tons. The samples were crushed in a 5-stamp battery provided with a slotted screen equivalent to 60 mesh. The concentrates were amalgamated in a barrel, and the tailing from the barrel was sampled (Young 1946:706).

The wooden structure found in front and west of the hoisting feature is no doubt related to the excavation system as no domestic debris was found here. The building foundation next to Road 7 did contain artifacts associated with leisure activities. The green bottle with the inscription "MILANO, BRANCH, FRAIELLI" was probably a container that held wine since green bottles often held wine (Fike 1987:13) and this container came from Milan, Italy.
The tobacco tins and other glass shards support that this small building was not industrial in purpose. The exact purpose of this building site is not known, nor what feature system it is related to. Trench L again was a sampling trench that showed a period of human activity as the green and purple glass shards, tobacco tins, and ceramic shard indicate.

Prairie Flower and Extension Claims

21. North of the major tailings is a smaller complex of white tailings. These tailings are associated with the Prairie Flower, West Prairie Flower, Yellow Pine Extension, and Solio claims and may be reached by following Road 8 that starts just north of the junction of the main road (2) and the mill road (7). Road 8 begins in a wash and moves northeast to higher ground.

a. After following Road 8 for 257' the remains of a wooden structure lies on top of the flat tailing in the southeast corner. All the wood is splintered in pieces and lays around a hard-packed dirt foundation. Artifacts found in association within the foundation and immediate surrounding area include: light green window glass, iron slag scattered about, a burlap sack containing cement hardened due to the elements, a few Prince Albert type tobacco cans, and down the
tailings to the east are purple and aqua glass shards. No household items were found here.

b. The white tailings spread out in a shape of having four fingers pointing north with a total measurement of 290' x 150'. On top of the tailings on the southwest corner is an industrial complex. This consists of a shaft (N), cement pads, a cylinder vat, and the remains of a wooden hoist. Measurements include:

1) Fencing around Shaft N measures 17' x 15'. The shaft is cement lined with an estimated measure from outside the fence of 6' x 10'7".

2) Cement slabs just south of Shaft N 10'9' x 2'.

3) The wooden hoist lying between shaft and slabs measures 26'11" x 4'6".

4) The iron vat with a cement core is 15 yards west of the rest of the industrial complex. It is 5'4" in diameter with a iron tube coming out of the east and west sides. All sizes of grey slag in the shape of little balls lie around. This slag is mixed in a charcoal scattering with lots of burnt wood chips in it. Five pieces of sheet metal
measuring 5' x 3' each lie scattered about.

22. The east side of the tailings are one big dump mixed with domestic artifacts and industrial iron scraps. The whole tailing and dump complex measures a four sided area with sides measuring 425’ x 335’ x 362'6" x 160’. The can dump itself must have over 500 rusted cans. There are oil cans marked 'SAE 30'; some cans have been opened by a church key opener, a few hole in the top cans are observed, and many of the cans have the lid peeled off or have holes punched in them. Part of a purple wine glass stem and base was found among the cans. One of the largest Joshua trees in the area is growing amidst this dump. In the wash adjacent to this site, are found more scattered cans, metal scraps, and part of an upright wringer washer.

23. Down the road from the Prairie Flower tailings are a series of mine shafts along the road going north for over ¾ mile. These shafts are part of the various Yellow Pine, Solio and Prairie Flower extensions of the Yellow Pine mining complex.

a. Trench M measures 85’ x 25’ on the east side of Road 2 directly across from the northernmost tailings mentioned above. Some core samples, cable, ceramic cupel fragments, tin cans, and a rock pile claim marker lie scattered around the
trench.

b. Just north of Trench M is a pit measuring 6 ½’ x 3’. The pink granite tailing around the pit measures 25’ x 5’.

c. One tenth of a mile north of the pit off Road 2 is a shaft (O) with no fence around it. Shaft O’s measurements were not taken due to safety. Wooden material from a destroyed hoist lies around this shaft. There are two cement pads near Shaft O. Pad A measures 6’ x 4’ and is 18’ west of the shaft. Pad B measures 8’ x 4 ½’ x 10” and has a matching cement pad (c) next to it.

24. Shaft P is the first shaft north from the junction of the Green Copper Mine road (9) and the Yellow Pine Road (2) junctions. It is on the east side of the road approximately 2/10 of a mile from the intersection.

Shaft P has a fence around it that is knocked down. The shaft measures 12’ x 8’. A small hoist lies south and east of Shaft P. There are two concrete pads with metal rebar sticking out of them just east of the shaft’s opening. The pads measure 4 ½’ x 1’ and 6 ½’ x 4’. The metal rebar is 13” high. Prince Albert type tobacco cans and metal sheeting were the only artifacts...
in the area.

a. Forty-seven feet and six inches due east of Shaft P is a large cement pad with a raised platform, and possible wooden running boards south of the raised platform. The pad measures 23' x 22'; the raised platform is 11' x 32" x 18". Four rubber tires cut in thin strips on 2" x 4" boards were nailed down next to the pad.

b. The type of debris found in the area included sanitary cans with a hole in the top and a 3" diameter, oil cans, window screen and broken flat light green window glass.

c. The tailing around Shaft P measures 240' x 85'. Recent survey thread is throughout the area. There is also a possible trench along the road going in a southerly direction, but it is shallow and may have had another purpose.

25. One-tenth mile down the road going north is another shaft (Q) on the east side of the road. This worked area is at the northern tip of the tailing from Shaft P. There are three shafts within five yards of each other here.
a. Shaft Q has a beautiful rock wall supporting the entrance of the shaft. Wooden beams are still in place over the shaft entrance. Measurements were not taken.

b. Shaft R measures approximately 20' x 20'. The ground is too unstable to go up close for measurement. No visible hoist or concrete pad is near it. There is a faint trace of a road (10) going between Shafts Q and R up over the hill in an easterly direction and then just stopping about 20 yards up the small slope.

c. Shaft S has a wooden frame lining all four sides of the shaft. Again, safety allowed only for an approximation of about 9 ¾ ', circumference. Shaft S is only about five yards away from shaft R to the south. The tailing here appears to be from both Shafts R and S and measures 115' x 165'. Historic artifacts in this area include: numerous purple glass shards, 1" bail wire, food cans with holes punched in them or the tops peeled back, SAE 20 oil cans, and pieces of metal lying around. Many tobacco cans were found. A "Prince Albert" can with the outside marking still clear was the only can found in the entire area with the advertising markings intact. The
can has a yellow background on both the front and back. Prince Albert is on the front standing in black garb and the can says "PRINCE ALBERT". All inscription letters were in capital letter format. The total inscription follows and a question mark was placed where deterioration erased letters: PRINCE ALBERT/? ? IS PREPARED/FOR SMOKERS UNDER THE/PROCESS DISCOVERED ???/MAKING EXPERIMENTS/PRODUCE THE MOST DE/LIGHTFUL AND WHOLE/SOME TOBACCO TO ???/AE ?? AND ???SMOKERS/PROCESS PATENTED JULY 30th 1907/R.J. REYNOLDS TOBACCO COMP./WINSTON--N.C./?????THE TONGUE. The can measures 6" long x 3" wide.

26. Across from Shafts Q, R and S to the west 382'6" are two shafts (T & U) in the wash. This is the first instance throughout the Yellow Pine complex of mining work done in the channel of a wash. Shaft T is the main shaft and created the tailing around it. Shaft U is really a deep pit that was started along the southeast side of the tailing. The tailings measured 105' x 42'6".

a. East towards Road 2 from Shafts T and U in the direction of Shafts Q, R, and S are the remains of a structure and its platform just 92'6" from
Road 2. The platform measures 40' x 30', and much weathered lumber is lying around. No broken window glass is found within this area. Over 80 cans were found adjacent to this area, a few tobacco cans, one gas can, and some nails. None of the cans were opened with a church key. They were either punched or peeled back. The majority of the cans were the hole in the top variety with pressed seamed edges.

27. The Red Cloud mine and its tailing can be seen from Road 2 in the west from Shafts Q-U. Since this mine and road (11) are not within the Yellow Pine boundary, this area was not surveyed.

28. The last shaft (V) (i.e., the first shaft viewed when driving south on Road 2 from Goodsprings) is on the east side of Road 2. Shaft V has a fence around it which measures 72'6" x 40'. The tailing measures 160' x 90'. There are parts of a hoist, splintered wood and purple glass around the shaft area. Shaft V is caved in.

a. Fifty feet east of Shaft V is a small dirt foundation 11' x 9'. Part of a window screen, tobacco cans, cans that are double seamed, aqua and purple glass (no window glass), and rebar are sticking out in this area. Railroad wood ties
from the east side of Shaft V lead to this foundation.

b. There is a well-defined rock lined road (12) at the southern end of the feature area that passes a large raised dirt foundation and winds up the hill going east. Road 12 goes 30 yards and then deadends.

c. The raised dirt foundation measures 22' x 18' and is just east of Road 2 by a few yards. No wood/lumber fragments are found in this area. This raised platform area is lined with small rocks, about one foot in diameter surrounding the four sides. In places the rock line is broken.

d. A large quantity (too numerous to count) of shards of purple, aqua, amber, and some light blue glass were found in this area. Bottle necks and bases of all the glass colors except light blue lie scattered among the other artifacts. Many of the necks and bases are small and not liqueur bottles. Over 20 pieces of broken flat (plate) and curved (cups) of white ceramics are found here. Even a piece of a china plate with little red roses painted on it measuring ¼" x 3/4" was found. An enamel white saucer was lying on the surface, and little rusted spice boxes
with lids in place were found thrown up the hill (east) of the raised foundation. Many shards of glass bottles were found up the rocky hill where they had been thrown up from the lower foundation. One of the bottles had the inscription on it "TICE & BROTHERS, [?]PREEFRYLS, ROCHESTER, N.Y." Part of a stove pipe was also found next to the platform. The quantity of tin cans was scant, no more than 12. A very large creosote bush perhaps 20 feet high is growing out of the southwest corner of the foundation.

An observation made of the flora found in the Yellow Pine mining complex is that no trace of past fires was observed even with all the machinery and gas and oil cans around. In addition, the Mojave yuccas and Joshua trees found here thrive in the mine tailings. The yuccas and Joshua trees are growing out of the sides and tops of the tailings, suggesting growth after abandonment.

Analysis of Prairie Flower and Extensions

Serious mining began in 1908 with the major periods of activity, 1906-1931, the same as the rest of the Yellow Pine claims. The workings of the Prairie Flower mine (Shaft N) were connected underground to the Bybee and associated claims (Longwell et al. 1965:108). The large tailings (290'
x 150’) indicate a serious excavation from this shaft. The cement collar around the shaft supports the rectangular vertical shaft opening (Lewis 1950:171). This opening is larger than many shafts and might have supported a two compartment caging system. The surrounding cement pads are part of the excavation feature system needed for hoisting out ore. The 5’4" diameter circular iron vat with round pieces of slag, charcoal and wood chips; and the earthen foundation with slag around it are indicative of assay activities. Assay houses were often built close to the mine site and include slag, charcoal and wood chips (Hardesty 1988:38). The wooden headframe would have been part of the hoisting feature.

The large dump on the eastern side of the tailing consists of both industrial and domestic debris. Glass shards in a variety of colors were observed. Their original container functions could not be determined. The purple wine glass stem could date from the late 1880s to possibly 1925 as its manganese additive indicates (Newman 1970). The use behind this wine stem could have been for a celebration or special occasion as it was the only piece of formal dinnerware found at the Yellow Pine complex. The large quantity of mainly sanitary tin cans with peeled back lids, punched holes in the tops, and some with church key openings show possible manufacture dates from 1905 to the late 1930s.
Their sizes and can openings would lend evidence to these cans being domestic in use rather than industrial. A rough estimate of the 500 or more cans seen would show that about ¾ of the cans were hole-in-cap cans that were manufactured between 1840 and 1930. The majority of hole-in-cap cans were for fruits and vegetables (Rock 1987:12). The types of cans support the time frame of mining activity recorded in the historical records. The scrap metal, SAE 30 can, timber and wire fragments are descriptive of a excavation feature showing possibly a hoisting feature that is no longer visible. The wringer washer was set in the wash apart from the main dump and it is not clear if the washer was dumped independently of the mining activity or was part of the household feature system.

Trench M and Shafts O - U are related to the Prairie Flower extension. Almost all the artifacts here are related to the excavation feature systems: headframes, hoist pads, light green window glass, SAE 20, and other oil can containers. The only Prince Albert can with its inscription intact was found at Shaft R. This tin had a date of 1907 printed on it. This can and the other similarly shaped cans found at these shafts were manufactured until the early 1930s when the more square (5 3/4" x 4 ½" x 9/16") tobacco tins were manufactured (Rock 1987:64). The two earthen foundations near the road by
Shafts T and U had older hole-in-top cans with punched or peeled back tops. No church key openings or window glass or other glass shards were observed here.

Shaft V has a sizable tailing resulting from its excavation. No cement foundation for the hoisting operation was observed. The rest of the artifacts found here indicate foundations for equipment and a small building foundation. The function of the rock lined road and foundation near it can be considered part of Shaft V's operation.

The 22' x 18' raised dirt foundation lined with small rocks might be a tent foundation. Not a piece of wood or lumber fragments were found in this area. The proximity of kitchen and food artifacts might suggest a tent dining hall. Tents were known to be used at other mining camps in Nevada (Hardesty 1988:77). The flat white ceramics would belong to a plate, and the curved white ceramics to cups or bowls. "Beginning in the 1850s plain undecorated ironstone became popular and available..." (Miller 1991:54). The enamel saucer and piece of painted china are also eating utensils. The stove pipe with the five spice boxes found next to the foundation give credence to this foundation being used as a kitchen and eating area for a group of people. The spice cans are oblong with a dredge top, date unknown (Rock 1987:74). The glass shards number in the hundreds with amber, aqua, blue, and large quantities of
purple shards. Most of the bottle necks observed had a seam all the way up to the mouth, which would date those bottles’ manufacture after 1906 when the Owens automatic bottle machine was patented. Some of the bottle necks had the side seam going up to the lip, then the lip was hand applied. This process was used up to 1913 (Newman 1970:74). The bottle part with "TICE & BROTHERS" from Rochester, N.Y. could not be dated or identified as to use. The absence of tin cans is a puzzle if this was a cooking and eating area. There is a possibility that the cans were dumped south up the road.

Yellow Pine Analysis Conclusion

The current physical attributes of the Yellow Pine mining complex exhibit little of the large operation it once was. The artifactual assemblages confirm the chronological period of activity between 1906 and 1931 and that a large scale mining operation happened here. These assemblages, however, do not give a clear picture of how many people were involved in the different features associated with hard rock mining. There are no buildings or mining equipment left standing at the various features. Historic photos show multiple buildings and structures related to the assorted mining activities: excavation, hoisting, assaying, milling, administrative, transportation, and domestic use. The dating of mining camps seldom occurs in vertical stratigraphy. The
nature of obtaining an ore supply implies geographical movement within the area depending on the availability of the ore sample and technology necessary to extract the ore. "The structure of mining sites must be viewed as discontinuous surviving remnants of multiple occupations and feature systems, not as a continuous accumulation of historic debris" (Hardesty 1988:12). The amount of tin cans, structural foundations, and industrial waste left behind give clues to the activities conducted and their relative periods of enterprise.

"Where no other method suggests itself, some estimate of the rate at which a refuse deposit accumulates may yield a date figure for a site" (Hester 1975:273). The size of the artifact assemblage at a given site would be expected to increase through time and as the group size grows larger. "It is assumed that some kind of direct relationship between floor area and group size exists" (Hardesty 1988:74). Because no written records on the count of men working each year at the Yellow Pine could be found, there could not be a proper study between length of stay and artifactual assemblage. The written records suggest periods of activity from 1906 to 1931 and the amount of tonnage extracted. Lewis (1950:542) stated that for a mine that puts out 4,800 tons per month, the mine will employ an average of 18 men. Yellow Pine production averaged only 11,346 tons per year
between 1915 and 1928 (Hewett 1931:130). This would indicate that the Yellow Pine Company probably employed much less than 18 men at the site at a given year. An exception would be 1916 when the Yellow Pine Company claimed 86 men on the payroll (Geary 1984: 67). The number of men working, people living at the site and time of worked activity can only be estimated from the remaining historical record and artifact assemblages left. The 1910 Census Report for Clark County had 266 people as mine operators, 374 people as mine owners and 5,572 people as mine workers (U.S. Bureau of Census 1913:422). How many of these people worked for the Yellow Pine Mining Company is not known. The census also listed 81 steam, 176 gasoline and 416 electric engines used at the mines (Houswich 1913:114). The 1920 census showed only 4,860 miners compared to 5,333 in 1909. This is a 9% decrease in miners. Capital for mining operations was down 32% from 1910 (Hartley 1923:157).

The above figures correspond with the major periods of activity from 1911 to 1928 (Hewett 1931:130). The site survey of the Yellow Pine complex did confirm corresponding historical records. The analysis provided insights on how temporary mining assemblages remain on site, thus making an evaluation of the historical context and site significance difficult.
CHAPTER VI

BOSS MINE FIELD ANALYSIS

The Boss mine and related features may be found in southern Nevada 1 1/2 miles north of the town of Sandy. The mine is accessed by taking the Wilson Pass Road from Goodsprings, Nevada, 11 miles west and exiting onto a dirt road ¼ mile to the mine. The areas respectively surveyed consist of the Boss, Boss Extension, Boss No. 2, Boss No. 3, Campo, Manse, and the Saturday claims found in the SW ¼ SE ¼, Sec. 27, NW ¼ NE ¼ sec. 34, T. 24 S, R. 57 E. Shenandoah Peak, Nevada, Topographic Map. Many of the features, including the tramway, of the Boss mine can be seen from the Wilson Pass Road. The Boss mine was active between 1886 and 1914; at that time it was the second largest producing mine in the area. These claims were known for their richness and diversity. Besides the primary ores of lead-zinc mined there, good grades of silver, platinum, palladium, gold and copper were also extracted.

1. The road (1) into the Boss mine ends just south and below the two cement towers. See Figure 16. A small footpath leaves the parking area northeast to a cement foundation partially buried in the ground. This cement
Figure 16. Boss mine site layout. Refer to Shenandoah Peak, Nev., 1956 topographic map.
structure measures 12'10" x 10 ½'. The purpose of this structure is unknown. No broken glass, wood or any other artifacts were found near it. See Figure 16 for the Boss mine layout.

2. Visible from the Wilson Pass Road on the eastern ridge is a large tramway halfway up the mountain. Below the tramway are two separate tailings.

a. Two hundred feet due east and above the end of Road 1 is the lower and smaller tailing. On top of the tailing is an adit (A) entrance. Fifty feet into the adit, it separates into two horizontal passages. Both have entrances approximately 5’8" high. As far as the light would permit sight, both passages have wooden timber supports across the top and sides. There are remains of timbers being used for a fire in the middle of Adit A. The adit appears to go directly east into the hill below the tramway area. Beautiful white quartz is mixed in with the tailings here. Mining artifacts found adjacent to this area include a rusted gas can, sheet metal and some wire. There is very little trash overall.

b. Up a steep slope 225’ on the south side of the main-upper tailing, the following artifacts were
found: wash basin, railroad timber ties, some oil cans(?), food cans, and piping of 2" diameter. Not more than 50 pieces of debris were seen overall.

3. The main tailing measures a total of 640’.
   a. At the top of the tailing is Adit B, the main entrance. Adit B is 450’ above Adit A and its small tailing. This is a huge adit with six separate adits (C,D,E,F,G,H) inside it. The entrance is estimated 30’ high and measured 8’ wide. Once inside, the room opens up to approximately twice the height and width as the outside entrance. Because of the fallen support timbers inside, no measurements were taken of the five smaller adits. Each adit tunnels inside the major opening. The largest opening, Adit C, is on the right or south side of Adit B and appears to be approximately 30’ x 20’. Adit D is inside Adit C and Adits E, F and G are to the left of Adit C. Adits E, F and G are placed one above the other. Adits D, E, F, G and H seem to have at least a 5’ x 5’ opening. Refer to Figure 6.
   b. Outside Adit B’s entrance, the miners started another adit (I) next to the major hole, but did not go more than 5’ in depth. There appears to
be either a natural crevice or another attempt at a shaft (J) below the 5' indentation.

c. Very few historic artifacts were observed. There are recent dark brown beer bottles, some Budweiser beer cans, and a fire(s) was built just inside the entrance of Adit B.

4. Below and west of Adit B 125' is the wooden tramway. A large flat earthen foundation measuring 67'6" x 40' separates the tramway and Adit B. Two other adits (K, L) are placed into the ridge on the north side and they are entered from the flat earthen area.

a. Adit K is 97'6" due east and above the tramway. It still has metal railroad rails going into it. See Figure 17. The width of the ties is 1 3/4". The measurement between the ties was not taken. These railroad ties went back as far as sight would allow, which could be estimated at 30 yards. About 8' from the entrance to Adit K, the ties end in a tangled mess. Along the right side of the entrance could be seen wooden troughs where something could be stored. The bottoms of these troughs had a dirt foundation. Between Adit K and the lower adit (L) are two metal pipes approximately 4" in diameter coming out of the ground. These pipes were too high to measure and
Figure 17. Adit K and rail transportation feature.
the air was foul around them.

b. Only 47'6" east of the tramway is Adit L, whose entrance measured 8' x 6'. A bad odor was coming from this adit. Wooden rail timbers laid horizontally to the entrance parallel to each other are still visible coming out of the floor of Adit L. No metal rails were visible associated with the wooden tracks laid here. A narrow path leads from Adit L to the top of the tramway. Besides piping, very few artifacts associated with the feature were observed. Only 8 seamed cans, 20 railroad tie spikes, and some splintered wood were noted.

5. The tramway itself has wooden walls, a sheet metal base, and at the top or east end an iron wheel with cable still attached to it. Due to the steep terrain, only a rough measurement of 22' for the length of the tramway was made. The height measured 7 feet at the top of the incline and the width 3 feet.

Analysis of the Tailings and Adits

Adit A is a major adit and probably related more to the transportation of ore from Adits B - L than an adit of ore extraction itself. Adit A is likely connected by winzes to the main Adit, B. The small tailings in front of Adit A indicate little ore was removed from this well-defined adit
with two tunnels inside it. If ore was dropped into cars below in Adit A, no artifacts remain to express this feature system. The firm-packed floor and two passages near the bottom of the hill still lead to Adit A being a transportation feature. This analysis is confirmed in the historical records. Knopf (1915:6) stated in the 1915 U.S Geological Survey report that a winze was sunk from the upper tunnel to connect with the middle tunnel.

Few cultural assemblages surround the feature systems at the Boss mine. The reason for this is unclear. The large tailings had mainly industrial artifacts and only a few of them. It is possible that this area's equipment was removed to be used elsewhere since the mine ceased production while other areas such as the Keystone mine nearby were still active. The 2" piping was likely related to the drainage system of the mine. "In desert countries the water plane may be conspicuously absent or at such great depth as to be encountered only by the deepest workings. At Tonopah, in Nevada, water was struck in small quantities at depths of about 1,000 ft." (Young 1946:230). No exact figures on the depth of the Boss mine have been found. A drawing of the tunnels from Knopf (1915:6) has a legend showing approximately 350 feet. The line contours on the Shenandoah Peak, NV, topographic map show the depth closer to 400'.
"Discharge pipes of centrifugal pumps are connected to a horizontal mine, which connects to the shaft columns or pipes. Strength, corrosion resistance, weight, and cost determine the pipe material" (Young 1946:254).

No written records known explain pumps being used, but the pipes are proof that water was found in the mine and pumped out.

Adits B - K indicate the large removal of ore and manpower necessary to extract the ore. Adits C - G most likely ran off one large concentration of ore. They might have been drifts excavated around the long axis of ore bodies. There is a good possibility the adits dumped ore out into carts to be taken to the tramway for transportation as their level grade suggests. "Adits are also planned with grades favoring loads" (Young 1946:191). Shuttle-car applications, which originated the term "trackless mine" due to their rubber tires and low top, were used in mining zinc ore and limestone (Young 1946:187). No tracks were found in this area.

Lower Area of the Boss Site

6. There is a road (2) starting at the downhill side of the tramway. Its average width is 13'. The road runs 640 yards to the north downhill. Road 2 flattens out in an area where Adit (M) and a earthen bunker are placed near each other. Along Road 2 only one can with
soldered side seams and a hole-in-top end was seen.

a. Adit M has a opening of 5'7" x 4'. The area is surrounded by a dump not more than 30 yards in diameter. Trash observed included Prince Albert type tobacco cans, cans that had church key openings, sheet metal, and cans with the hole-in-the-top feature. There were easily over 100 rusted cans at this dump.

b. The bunker is 80' east of Adit M. This structure has a wooden entrance but earth roof and sides. The inside of the bunker is wood and has wooden benches attached to the walls on either side of it. Around the outside of the bunker, window screen and bed springs were seen. No purple glass was in the area, but much broken clear glass.

c. Ninety-two feet and six inches southeast of Road 2 is a trash dump. This dump starts along the south side of Road 2 and ends in the wash. The approximate area of dumping is 125' x 75'. There is both industrial and domestic trash in this area. Artifacts observed include: cable, metal rims 26" x 1", rusted gasoline cans, white ceramic plate ware, and rusted cans with machine crimp side seams. No soldered cans were observed.
Some of the cans were the hole-in-the-top variety, but they were not the majority. Hundreds of cans were in this dump, and their quantity prevented counting.

7. A foot trail starts from the dumping area. This trail went 777’ and ended up at the cement towers at the Boss mine.

8. The two towers are placed side by side. They are made out of concrete, and each measures 11’9” x 5’2” x 5’ deep. There is a sulfur smell around them and they have iron pipes coming out of them. See Figure 18. The towers were surrounded by small shards of broken purple glass, rusted food cans and wire. These towers are placed at the bottom of the ridge, and Road 1 ends directly next to them. The remains of a cement pad measuring 8’2” long is just above and south of the towers.

9. The gully to the south of the towers has three stone walls built in a terrace fashion up the gully. The walls are constructed of limestone placed on top of each other with no mortar between the stones. The third and lowest wall ends south of the towers by 7 ¼ yards, and the space between the wall and towers is built up with dirt. The dirt mound created behind the two towers splits the gully into two forks. At the
Figure 18. Cement towers at the Boss mine.
gully below the towers are 16 rusted 50 gallon barrels.

**Analysis of Lower Boss Site**

Adit M has no tailings associated with it and is separated from all the other excavation features. There is a strong possibility that this is not an adit but a deep dugout or an explosive storage area.

Explosives and blasting supplies should be stored in a dry and well-ventilated building.... A stone or magazine is undesirable because of the danger of flying missiles in case of an explosion. A brick, or wooden frame filled with sand, or a wood and iron magazine is preferred (Lewis 1950:117-118).

In the desert a dugout would provide the best protection from the elements and keep a constant temperature. The exact purpose of this feature cannot be determined as no exploring of the entrance was conducted. The structure with the wooden roof and earthen sides is a definite dugout. The shelves inside the structure, window screen and bed springs in the near vicinity, and the distance from ore excavation features, indicate more of a domestic use than industrial.

The dump associated with the dugout and possible adit/dugout consists of both industrial and domestic debris related to mining activities. The domestic trash appears to be of later time period as the absence of soldered cans might demonstrate. The clear glass shards in the dump lead to a manufacture date of the original containers after World War I, as no manganese concentrates are in the glass to turn
The exact purpose of the two cement towers is unclear. It is possible they were for ore storage or ore grinding. It is doubtful they were for a chemical method of milling as cement is much too porous to contain chemical solutions. The Keystone mill was only two miles away and is the only recorded mill in the area. Hardesty (1988:39) makes reference to rock breakers and stamp mills as the first steps in breaking up the ore. These processes were popular until 1910 when more advanced mills using balls and rods came into use. The Boss mine ceased activity in 1914, and these towers would fit into the time period for rock breakers and stamp mill methods.

**Boss Mine Analysis Conclusion**

The amount of capital invested into this mine confirms the diversity and richness of the Boss mine. The tramway, rail systems and winze system of ore removal (Adit A) suggest ore of good quality and quantity to have such a developed transportation feature system. The closeness to the town of Sandy might indicate why only one domestic site was recorded. The Keystone mill at Sandy operated at the same time activity occurred at the Boss mine, and it is probable that the ore was taken there for processing. Tin cans and glass shards coincide with historical documents of the mine's operational period.
CHAPTER VII

SUMMARY AND CONCLUSION

The Yellow Pine Mining District was the most important economic enterprise in southern Nevada between the years of 1900 and 1930. The rich lead, zinc, silver, and gold ores contributed to the economic and social development of southern Nevada. Nearly 26 million dollars in revenues were mined between 1900 and 1930 (Longwell et al. 1965:104b). Little physical evidence remains of the man-made structures associated with this mining enterprise. Mining was and is an enterprise identified with the quickest capital gain resulting in a boom and bust period of activity at mining loci. Equipment and technology were often transported out of one ore strike to the next. "Evolution on the mining frontier can be viewed, then, as a sequence of historically unique 'quantum leaps' working in tandem with a rather mechanical process of selection" (Hardesty 1988:114). Quantum leaps can be viewed as the technological wonders of transportation and ore processing that accelerated the rate of mining operations.

Transportation feature systems were the greatest aid to the mining industry in that they shipped out ore to the
milling centers and the product to waiting markets. The San Pedro, Los Angeles, and Salt Lake Railroad installed at Jean, Nevada, allowed ore shipment to smelters in Salt Lake and California. The gain of 47% in revenue in 1912 over the combined years of 1910 and 1911 gives testimony to the important role transportation played in the success of mining (Longwell et al. 1965:104a). Transportation in earlier years was the traditional haulage of ore in wagons pulled by horses or mules. Inner mine transportation varied dependent on underground workings, but cars pushed on tracks did occur such as at the Boss mine. Hoisting systems generated by electricity or gas did power the cages that brought out the ore and men (Houswich 1913).

The most dominant physical feature left at the Boss, Keystone and Yellow Pine complex mines are the waste tailings. These large waste piles remain as the sole testimony of the extent of the enterprise that took place at each operation. Such a large tonnage of ore removal was necessary for just a few ounces of each precious metal. An average of 18,000 tons per year was processed between 1912 and 1917 for the Yellow Pine Mining Company. This only yielded an average of $28 per ton (Hewett 1931:130).

The size of the adits and shafts have a direct correlation with the size of the tailing. Shafts associated with large tailings had firm collar supports around their
entrance, headframes and cement pads associated with the hoisting systems. These shafts were usually over 12' in diameter. Adits associated with large tailings had sturdy frames around the entrance that were still standing. All adits were associated with large tailing mounds and they all had roads leading to them. System features associated with the excavation of ore are still visible emerging from adits, shafts and tailing complexes.

The scope of the mining operation was small scale at the Keystone and Boss mines compared to the Yellow Pine Company operations. The Yellow Pine’s large tailings and related features are scattered over more than one 1/2 miles, and historical records (Hewitt 1931:130) report an average of 18 men working at any given year at the Yellow Pine between 1915 and 1928.

The lack of structures and their materials can be connected with the economic cost of transporting in materials and the tendency of miners to move equipment to the next site to save costs. The key to dating mining sites is in a horizontal stratigraphy rather than a vertical stratigraphy. "As a result, mining camps tend to be separated into geographical clusters, each representing a different time period or component" (Hardesty 1988:13). The availability of the ore determined where mines, supporting structures, and even trash dumps became situated. This
often leads to a mixed period of occupation on the horizontal ground surface.

The amount of tin cans, structural foundations and industrial waste left behind give credence to the different periods of mining occupation. All three sites had tin cans ranging from the late 1890s (soldered cans) to sanitary cans (1903 to present), and even the can openings (church key 1935 and later) showed a time index of operation. The mining shafts and adits varied with time and construction. The large hoisting system at the Yellow Pine (Shaft M) showed physical evidence of the late 1920s and early 1930s. The Alice mine just a half mile south of Shaft M had a cruder shaft opening and hoisting system in the tramway. The number of men working at the mines and domestic household sites can only be estimated from the remaining historical record and artifactual assemblages left.

The written record with photographic reference, not the field record, is the best representative of this active period. The easily observable and isolated features of shafts, tailings, hoisting systems, and trash dumps became the best means of comparing the accuracy of the historical record of the Yellow Pine Mining District. The artifactual assemblage associated with household dumps contains the best indicators for periods of activity. Colors of glass shards and diagnostic components of glass and tin cans were the
most sensitive indicators of chronology for the mines. These assemblages were the best means to correlate activity with archival records.

These diagnostic features of domestic refuse, together with features of excavation, milling, and hoisting features, confirm the historic references to mining activities and chronology. Unfortunately, the very nature of mining leaves little physical trace after the miners have left the area.

The hardrock technology left on the surface is the best evidence of the scope of activity. Few building foundations are found at any of the sites. All the concrete pads are associated with the excavation and hoisting feature systems of the mines. There are only two references that verify domestic activities at mining loci, trash dumps found in the field analysis and historic photos of the Yellow Pine Company. The overall lack of domestic structures and related artifacts gives strong evidence that the majority of occupants did not take up long term residence at the mines. The workers either lived in tents or rode the distance to Goodsprings or Sandy, Nevada. The Yellow Pine Company mines were no more than three miles from Goodsprings; the Keystone and Boss mines eight miles away. Both the former mines were only ½ mile from the town of Sandy, Nevada. Of the three mines studied, only the Yellow Pine sites showed evidence of families. This deduction was evident by the bisque doll
leg. The large kitchen complex recorded at the Prairie Flower sites and the large can deposits and trash dump found at the Keystone mine show evidence of domestic activities at these mines. Most of the tin cans found were soldered or sanitary food cans. The documentary records found in Hewett (1931), Hill (1914), Knoff (1915) and Longwell (1965) made no mention of the social behaviors related with the miners. The sampling of each mining feature provided insights to the consumer behavior of the miners. The sanitary food cans, beer and wine consumption as evidenced by the glass shards, chocolate tins and medicine bottle give a glimpse into the tastes and needs of the miners.

The Yellow Pine District is significant in its economic importance for southern Nevada. Significance is evaluated according to published federal criteria from Section 36 Code of Federal Regulations, Part 800.10. The four main criteria for an area to be considered significant are:

1. associations with events that have made an important contribution to our history;

2. association with an important person;

3. embodies a form or style that is typical of a time period, master, cultural resource type, or method of construction;

4. has provided or has the potential for providing important scientific or scholarly information about history or prehistory (Hardesty 1986:57).

The Yellow Pine District is not associated with architecture, an important person(s) or an event of national importance.
historic importance. The surface structures are few and the tailings are not unique. The underground mining system that produced the excavation, hoisting, leaching and assay features is not unusual in itself. The features observed in the field such as adits, assaying complexes, cyanide drums, headframes, machine pads, roads and railroad beds (transportation systems), rock dumps (tailings), shafts, tramways, and the various timbers and structural materials associated with the underground and leaching systems can be found throughout Nevada. The abundance of mining activity in the Yellow Pine District relates it to the technology available for underground mining in the first part of the nineteenth century throughout the West and the state. This district is significant in that it is representative of the miners' society that drew immigrants into an area, developing a society that lasted in the Goodsprings and Las Vegas areas.

Criteria four considers if the resources are important for scientific and scholarly information. This criteria is the hardest of all to judge because the nature of "significant" can be determined as unclear. There are no firm or set guidelines on what is considered important as research. The information gathered should assist researchers with filling in the blank spots of history. At the Yellow Pine District, the documentary research explains
in full detail the ore extracted and the types of equipment used. The Boss, Keystone and Yellow Pine mine records do not mention behavioral aspects of the miners at all. The various information discovered at the sites, as addressed earlier in the conclusion, reveals much of the behavioral activity regarding domestic and technical activities.

The author found that the settlement pattern at the mining sites and nearby communities of Goodsprings and Sandy were typical of the mining frontier. "Machinery has been removed from mining and milling sites, ... wooden frame buildings at mining camps usually have been moved to new mining areas, or dismantled and used for firewood and building materials (Hardesty 1988:110). The close proximity to towns did not necessitate sturdy domestic structures on site nor bring in families to live on site. Unlike farming and ranching communities that were settled for a long term commitment, mining communities only lasted as long as the economic demand for their product continued. The three mines in the Yellow Pine District appeared similar in settlement patterns and mining excavation methods to the Cortez Mining District (Hardesty 1988:11,18-21).

The history of Nevada’s settlement started with mining. This is why the Yellow Pine District is so important, for it started the community of Goodsprings and strengthened the community of Las Vegas. Southern Nevada had serious mining
operations well before the 1859 Comstock Lode strike. "The recorded history of mining in Clark County began with the discovery of lead ore by a party of Mormons in 1855, at what was later to become the Potosi mine [1857] (Longwell et al. 1967:xi,100)." The first steps at non-Native American communities lasting for significant periods is due to mining.

Barnes, in her thesis Technology and Evolution in the Mining Region of California and Nevada 1848-1880, described the four evolutionary stages of mining. The final stage was lode or quartz mining. This stage required great investment of capital from non-regional sources, manpower and technology (Barnes 1984:11). By this time:

Towns with economic, social, and political institutions had to be developed in order to support growth, physical environment, economic location, technology and population density all contribute to the evolution of a community from a simple mining camp to a fully urban environment (Barnes 1984:9)

The mining communities in southern Nevada were supported by local farmers in the Las Vegas, Moapa and Virgin valleys and by the goods transported in by wagon and railway. The farmers needed the mining communities to continue their own prosperity.

The 1900 Census Report helps confirm the importance of mining for the State's economic stability in that all of Nevada had only 19,809 employed inhabitants and 5,002 of these were in manufacturing [mining] (U.S. Bureau of Census
The above figures demonstrate that mining enterprises constituted 25% of all economic activities in Nevada by 1900. Additional census reports in Clark County for 1910 had 5,572 miners working at 374 mines (U.S. Bureau of Census 1910:422), and by 1940 Goodsprings had 528 inhabitants and Las Vegas 10,389 inhabitants (U.S. Bureau of Census 1940:756).

The Yellow Pine District and the three mines studied produced a wealth of information. This investigation displayed major capital and manpower investments in the District for over a 30 year period. The town of Goodsprings was a thriving community with government, commerce, churches, schools and all the amenities necessary to civilize the Mojave Desert of Nevada. Further research into a variety of scholarly directions can be undertaken at the Yellow Pine District. Some of the following future research topics include: health of miners working in lead-zinc mines compared to gold and silver mines, adaptations of hardrock mining in extreme heat and arid conditions, the rate of environmental changes to the landscape due to the degree of mining activity, and lastly, is southern Nevada’s population still culturally a boom-bust society based on the precedence set by the early mining communities.

The Yellow Pine District did produce the largest lead-zinc deposits in all of Nevada and, combined with its
copper, gold and silver, was a major economic and population center from the early 1900s to the early 1930s. The similarities of the mining features and technology of the Yellow Pine District throughout Nevada exhibit this to have been Nevada’s state of being between the years of 1900 and 1930. The behavioral and economic norms for a quarter of the population during this period can be better understood by studying the most productive mining community of southern Nevada. The foundations laid by these early miners became the Nevada of today. A majority of the Boss, Keystone and Yellow Pine mine’s cultural resources occur on privately owned land. Many of the tailings, trash dumps and transportation feature systems occur on public land. The significance of this history should be explored before new mining ventures on the Public Domain obliterate these rich sites of American activity and history. Perhaps the most important questions arising from the Yellow Pine analysis might shed light on the prospector society that assisted in the creation of Nevada today.

The field analysis conducted by the author in the Yellow Pine District indeed confirmed the historical documentation of activity at the Boss, Keystone and Yellow Pine mines in the area. Most importantly, this analysis enhanced the known knowledge of these mines by discovering behavioral attributes of the miners left at these sites.
Earlier documentation expressed only the geologic, mining technology, and economic progress of these mines. Now domestic feature systems, transportation feature systems and new excavation feature systems can be added as cultural attributes to this mining district. This new information links the Yellow Pine District with the entire state of Nevada's mining community, economics, and the historical importance mining played in Nevada. The significance of the Yellow Pine District lies not just in its regional importance, but statewide as a cultural, economic and technological link to our past.
APPENDIX A

GEOLOGIC TERMINOLOGY

Breccia:
A coarse-grained clastic rock, composed of angular broken rock fragments held together by a mineral cement or in a fine-grained matrix; it differs from conglomerate in that the fragments have sharp edges and unworn corners.

Crystal:
A homogeneous, solid body of a chemical element, compound, or isomorphous mixture, having a regularly repeating atomic arrangement that may be outwardly expressed by plane faces.

Cryptocrystalline:
Said of a rock consisting wholly of crystals or fragments of crystals; especially said of an igneous rock developed through cooling from a molten state and containing no glass, or a metamorphic rock that has undergone recrystallization as a result of temperature and pressure changes. The term may also be applied to
certain sedimentary rocks (such as quartzite, some limestones, evaporites) composed of entirely of contiguous crystals.

Crystallization:
The process by which matter becomes crystalline, from a gaseous, fluid, or dispersed state.

Dolomite $\text{CaMg(CO}_3\text{)}_2$:
It is a common vein mineral, and is found in serpentinite and other magnesian rocks. Dolomite is white, colorless, or tinge yellow, brown, pink or gray and it has a perfect rhombohedral cleavage.

Dolomitization:
The process by which limestone is wholly or partly converted to dolomite rock or dolomitic limestone by replacement of the original calcium carbonate (calcite) by magnesium carbonate ($\text{CaMg(CO}_3\text{)}_2$), usually through the action of magnesium-bearing water (seawater or percolating meteoric water).

Extrusive Rock:
Said of igneous rock that has been erupted onto the surface of the Earth.

Feldspar:
Feldspars are the most widespread of any mineral group
and constitute 60% of the Earth's crust; they occur as components of all kinds of rocks (crystalline schists, migmatites, gneisses, granites, most magmatic rocks and as fissure minerals in clefts and druse minerals in cavities. Feldspars are usually white or nearly white and clear and translucent.

Granite:
A plutonic rock in which quartz constitutes 10 to 50 percent of the feldsic components and in which the alkali feldspar/total feldspar ratio is generally restricted to the range of 65 to 90 percent.

Granular Texture:
A rock texture resulting from the aggregation of mineral grains of approximately equal size. Whose particles range in diameter from 0.05 to 10 mm.

Groundmass:
The material between the phenocrysts of porphyric igneous rock.

Intrusive Rock:
A rock or mineral that solidified from molten or partly molten material i.e. from a magma. An assemblage of temporally and spatially related igneous rocks of the same general form of occurrence.
Limestone:
A sedimentary rock consisting chiefly (more than 50% by weight or by areal percentages under the microscope) of calcium carbonate. Many limestones are highly fossiliferous and clearly represent ancient shell banks or coral reefs.

Metamorphic:
Pertaining to the process of metamorphism or to its results.

Metamorphic Rock:
In current usage, any rock derived from pre-existing rocks by mineralological, chemical, and/or structural changes, essentially in the solid state, in response to marked changes in temperature, pressure, shearing stress, and chemical environments, generally at depth in the Earth’s crust.

Orthoclase:
Ordinary or common orthoclase is a common rock-forming mineral; it occurs especially in granites, acid igneous rocks, and crystalline schists, and is usually perthitic.

Phenocryst:
A relatively large, conspicuous crystal in a
porphyritic rock.

Porphyry:
Igneous rock containing conspicuous phenocrysts (a crystal significantly larger than crystals of surrounding minerals) in fine-grained or glassy groundmass.

Quartz:
A crystalline silica, an important rock-forming mineral: SiO₂. Quartz is the commonest gangue mineral of ore deposits, forms the major proportion of most sands, and has a widespread distribution in igneous, metamorphic and sedimentary rocks.

Rock:
An aggregate of one or more minerals, e.g. granite, shale, marble; or a body of undifferentiated mineral matter, e.g. obsidian, or of solid organic material, e.g. coal.

Sedimentary Rock:
A rock resulting from the consolidation of loose sediment that has accumulated in layers.

Thrust Fault:
A fault with a dip of 45° or less over much of its
extent, on which the hanging wall appears to have moved upward relative to the footwall. Horizontal compression rather than vertical displacement is its characteristic feature.

Silica Rock:

An industrial term for certain sandstones and quartzites that contain at least 95% silica (quartz).

(Bates and Jackson 1980)
APPENDIX B

MINING TERMINOLOGY

Open Pit Mining:
Used when the lode deposit outcropped and did not dip too steeply.

Underground Mining:
When the ore body was narrow and dipped steeply. Either low or high tech tools could be used for underground and open pit mining.

Excavation Methods:
1867 - the invention of dynamite, often called "Giant Powder."
1869 - the invention of the Burleigh mechanical drill. Mechanical drills were run by compressed air which was usually installed outside the mine.

1. Rat-hole mining: Access to and removal of the ore body are accomplished with a single shaft (vertical or inclined passage that opens to the surface of the mine).

2. Adit (a horizontal passage or tunnel that opens to the surface of the mine)
3. Drift horizontal passages are excavated in or around and parallel to the long axis of ore bodies.

4. Cross-cuts are horizontal passages running at sharp angles to the long axis of the ore body.

5. Winzes are shafts sunk downward in the mine's interior.

6. Raises are shafts excavated upward to connect different levels of a mine's interior.

7. Shrinkage is a system of stopping. Here a drift was excavated just below the ore body section and served as a floor, upon which ore cars ran. Raises (manway raises) were excavated at each end of the ore body. The ore body was laid out in sections of 100 to 125 feet.

8. Chuteway raises could be used to drop mined ore into the cars waiting on the floor below.

Hoisting Methods:

This method gets miners, waste rock, ore and supplies in and out of the mine.

1. Low tech: Man or animal power.

2. Trump-lines: Rope around the head to carry out buckets on the back.

3. Windlass: A hand-operated winch is used to lower and raise miners, ore, etc.
4. **Whim:** A horse-powered variant.

5. **Headframe hoisting system:** A "gallows"-like structure is erected over the mine shaft. A steam engine was frequently used to power the hoist.

6. **High tech:** Using large steam engines sometimes up to 1,000 horsepower to hoist men, ore and supplies out.

**Ventilation Methods:**

1. **Forcing air into the mine.** Simple techniques such as using blacksmith bellows, wind sails that forced air through a tube, or big fans.

2. **Draft ventilation worked much like a siphon.** All drifts, raises, stopes, shafts, and winzes had to be connected in order for proper draft ventilation to work.

**Drainage Methods:**

Were as simple as men carrying out water with buckets or using steam-powered pumps.

**Features Associated with Mines:**

Household sites, trash dumps, excavation methods, mill sites, roads (transportation systems), privies, etc.
Milling Feature Systems:

1. Assay houses: Look for porcelain crucibles, slag, charcoal, nails, window glass, and other building materials.

2. Stamp mills: These stamps crushed ores down to a sandy mixture. Large turning wheels, screens and heavy metal frames should be visible.

3. Grinding mills: These mills ground the ore into particles even finer than the stamp mills. A clay-like texture, commonly called "all slime," was produced by large cylinder rollers. These Krom rollers ground the ore to the preferred size by the jostling movement of the balls or rods inside the cylinder.

4. Chemical methods for more complex ores:
   a. Chlorination: Here ore was put into a cylinder, and bleach powder and acid were added to leech the ore.
   b. Lead removal: Adding extra solution of cupreous hyposulfite to the leaching vats.
   c. Cyanide leaching: Cyanidation uses a compound of cyanide (first potassium cyanide and later sodium cyanide) in solution to dissolve silver and gold from the crushed ore; zinc shavings are added to precipitate
a silver-gold sludge, which then is refined into bullion.

Lead Smelting and Refining

1. Visible features: Sandstone furnace, shaft with a brick-lined dust catcher.

(Hardesty 1988)
REFERENCES CITED

Barnes, Julie A.

Bates, Robert L., and Julia A. Jackson

Becker, Roberta L.

Bestram, Brent

Broilo, Frank J.

Bureau of Land Management

Bureau of Land Management

Busch, Jane

Clark County, Minutes of the Meetings of the Clark County Commissioners. Book I. July 1, 1909 - February 7, 1919.
Dodge, Natt N., and Jeanne R. Janish  
1985 **Flowers of the Southwest Deserts.** Southwest Parks and Monuments Association, Tucson.

Elmore Francis H., Jeanne R. Janish.  
1976 **Shrubs and Trees of the Southwest Uplands.** Southwest Parks and Monuments Association, Tucson.

Ferris, Dawna E.  

Fike, Richard E.  

Geary, Kim.  

Hardesty, Donald L. (editor)  
1978 **Historical, Architectural, And Archaeological Studies of Fort Churchill, Nevada.** Nevada Division of State Parks, Carson City.


1986 **Issues Regarding The Conduct Of Historical Archaeology In Nevada.** Nevada Council of Professional Archaeologists, Silver City, Nevada.


Hartley, Eugene F.

Henry, Susan L.

Hewett, D. F.

Heylmun, Edgar B.

Hill, James M.

Houswich, Isaac A.

Hunt, Charles B.

James, Steven R., Donald L. Hardesty, and Eugene M. Hattori
1985 *Eureka Historical Building And Archaeological Project.* Nevada Historical Society, Reno.

Klein, Terry H.
Knopf, Adolph.

Lett, Don L., Sheldon Judson, and Marvin E. Kauffman

Lewis, Robert S.

Lincoln, Francis C.

Longwell, C.R., E. H. Pampyan, Ben Bowyer, and R.J. Roberts

McQuivey, Robert P.

Miller, George L.

Miller, George L. and Catherine Sullivan

Newman, Stell
Olin, George., Dale Thompson.  

Paher, Stanley W.  

Papke, Keith G.  

Parkhurst, Dave W.  

Peele, Robert  


Rock, Jim.  
1980  *American Bottles: A Few Basics.* Klamath National Forest, Region 5, USDA.

Rock, James T.  
1984  *Cans in the Countryside.*  *Historical Archeology,* Vol. 18, Number 2.

Rock, James.  
1987  *A Brief Commentary On Cans.* Klamath National Forest, Region 5, USDA.

Stebbins, Robert C.  
United States Bureau of Census

United States Bureau of Census

United States Bureau of Census

University of Nevada Las Vegas, Special Collections, Catalog 0015,# 15 and Catalog 0002, # 78.

Vincent, Bill.

White, William G.

White, William G., Pat Polk, Chris Miller, Christanne Smith.
1987 An Expose On Trash: Structure 3, West Point. Ms. on file, Department of Anthropology, University of Nevada Las Vegas, Las Vegas.

Young, George J.

Young, Otis E. Jr.