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Culture history of the Yahk Mining District

Rebecca S. Timmons

The University of Montana

A CULTURE HISTORY
OF THE YAHK MINING DISTRICT

By

Rebecca S. Timmons

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The historic Yahk Mining District provides a unique opportunity to study the lifestyle and technology of the northern Rocky Mountain miner. Lacking from Montana mining literature is the anthropological perspective as well as the mountainous mining community. A composite method of study was applied to this site, synthesizing information from the written, oral, and archaeological record. In order to direct the study a deductive approach was chosen, outlining research questions and expectations.

The seventeen research questions focused on several informational categories; mining's historical context, the site's environmental description, the lifestyle of the miner, and stamp milling technology. The written record was carefully examined to gather the information pertinent to the research questions. Local informants were interviewed to collect the oral record. In 1983, the systematic fieldwork began. A radial transect design was used as a random sample survey method, and the dog leash method was applied to the systematic collection of artifacts. At the end of the fieldwork 139 features were recorded at the Yahk Mining camp, including five stamp mills, houses, adits, blacksmith shops, an assay office, and a business office. The information from the fieldwork was combined with the oral and written record and applied to the research questions.

Due to lack of information, several research questions were never answered. Placing the site within its historical context showed that the popular mining history was comparable to the two earlier mining periods for the Yahk Mining camp (1890's and 1910), but was not so for the 1930's period of occupation. There were some general trends that did not fit the history at the camp; the disproportionate number of men to women at the camp and the image of the prospector as the "transient" vagabond. The questions focused on the environmental description verify that historic man was just as much a part of his environment as was prehistoric man. The environment shaped the miner's decisions and molded his lifestyle. One of the stamp mills was in such a good state of preservation that it allowed for detailed study into stamp milling technology. Analysis of stamp milling technology reported by two leading minerologists in the 1890's indicated that the composition of the ore had to be matched with the specifications of the mill to successfully free the gold and silver. This information, when utilized to examine the efficiency of the Keystone Mill, indicated the mill to have been effective in the milling of the ore.

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This thesis is gratefully dedicated to my daughter Lauren, whose arrival inspired its completion, and to my husband Russ Gautreaux for his generous support and upraising enthusiasm.

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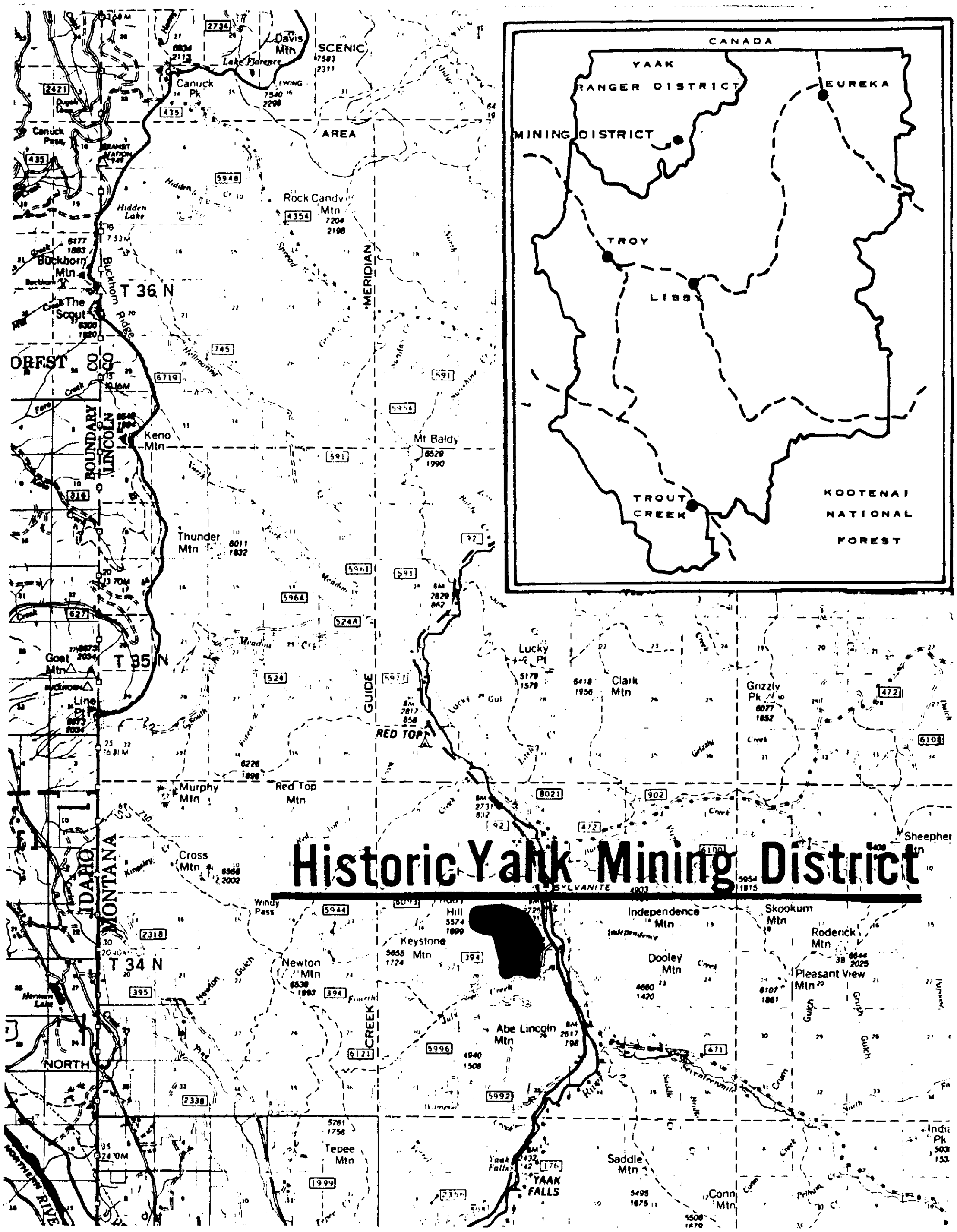
CHAPTER I

INTRODUCTION

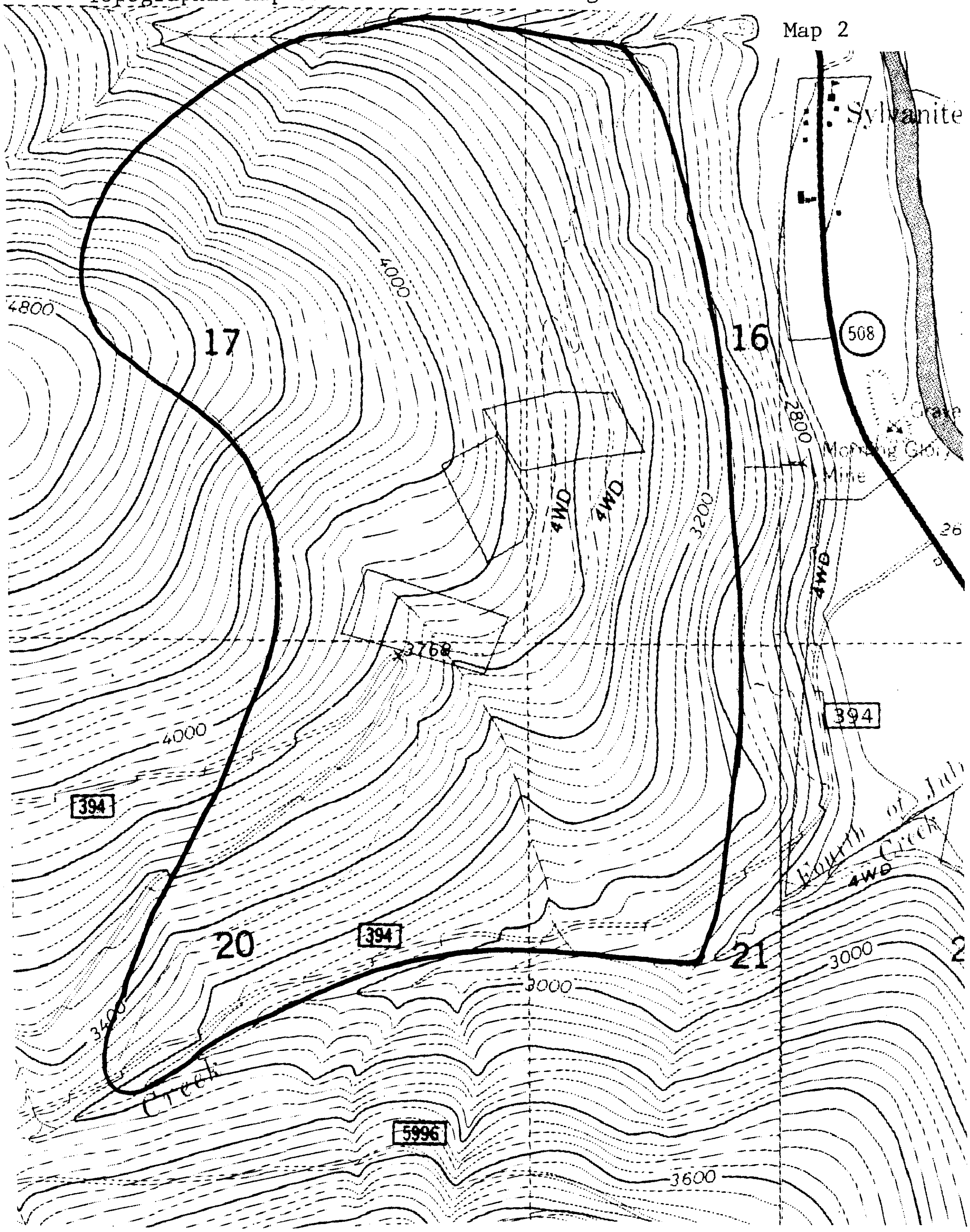
My association with the Historic Yahk Mining District project began in 1982 when Jim Calvi, cultural resource paraprofessional, turned in a site lead. The site lead led to our discovery of a mining camp covering 570 steeply forested acres of Forest Service and private land in northwestern Montana, as seen in Maps 1 and 2. It contained artifacts representing the technology of hard rock mining and stamp milling as well as the lifestyles of the northwestern miner. The camp was established in the 1890's, declined and then was revitalized in the 1910's and 1930's.

I was drawn to this project largely because I had worked on projects where historic artifacts were pushed aside, as they intruded upon the "important" work of prehistory. Even though I understood this attitude as growing out of the archaeologist's attempt to focus on specific research questions, I perceived a loss of historic information. A common assumption is that historic sites are adequately and accurately documented and therefore need no archaeological investigation. More broadly, there is an assumption that historians have thoroughly researched a historic period. Neither assumption could be further from the truth. Anthropologists claim they have an approach that elucidates the ordinary, the day-to-day patterns that emerge when a culture is studied. Actually, the approach should not discriminate by considering historical

Map 1


Historic Yaak Mining District
CANADA
YAAK RANGER DISTRICT
MINING DISTRICT
EUREKA
TROY
LIBBY
TROUT CREEK
KOOTENAI NATIONAL FOREST
IDAHO
MONTANA
BOUNDARY
LINCOLN
T 36 N
T 35 N
T 34 N
GUIDE
MERIDIAN
CREEK
NORTH
SCENIC
AREA
Davis Mtn
Canuck Pk
Rock Candy Mtn
Buckhorn Mtn
Buckhorn Ridge
The Scout
Keno Mtn
Mt Baldy
Thunder Mtn
Lucky Pt
Clark Mtn
Grizzly Pk
Goat Mtn
Line Pt
RED TOP
Red Top Mtn
Murphy Mtn
Cross Mtn
Windy Pass
Hill
Keystone Mtn
Newton Mtn
Independence Mtn
Skookum Mtn
Roderick Mtn
Dooley Mtn
Pleasant View Mtn
Abe Lincoln Mtn
Tepee Mtn
Saddle Mtn
Conn Mtn
YAAK FALLS
SYLVANITE

Topographic Map of Historic Yahk Mining District



cultures unworthy. Bernard Fontana speculates, "Perhaps when we analyze the situation, and if we are honest with ourselves, we will agree that among American archaeologists prehistoric archaeology carries more status than historic archaeology" (in Schuyler 1978:25).

Whatever the origin of my motivation, I have approached the study of the Yahk Mining District as an archaeologist, applying techniques that are being developed in historic archaeology. The techniques involve the synthesis of historic documentation (the written record), oral history, and the archaeological record. The first two techniques are certainly not new to the historian, but the combination with the last adds the historical archaeologist's unique perspective, providing the link between documentation of an event or a time period with the physical remains of a site from that period. Another contribution of the archaeologist is their focus on lifeways, the everyday events that allows us all to "get to know" our predecessors. One of the methods for studying lifeways is the classification of artifacts. Historic sites pose some different problems of classification than do prehistoric sites, which has forced the historical archaeologist to come up with different, but meaningful typologies. The Yahk Mining District presented a situation which allowed me to make this site a good foundation study for historic mining in the Northern Rockies.

After first seeing the Yahk Mining District, Forest Service Personnel became aware of the urgency to gather information from this rapidly deteriorating site. The project took shape as a cooperative effort between the Sylvanite District, the Kootenai National Forest

Supervisor's Office, the USFS Region 1 Office, the State Historic Preservation Office, and the University of Montana Anthropology Department. I recognized that the site might be a vital source of information about northwestern mining. The relative lack of immediate information on the site distressed me. Perhaps it was the nature of the sleepy valley it lay in, its lack of "progress" or its jungle-like terrain, that combined to fully hide the secrets of this mining community. Whatever the reasons for lack of knowledge about the mining district, I was determined to find some answers. Interest in the site as a significant historical resource and in providing a worthy management plan provided an opportunity for me to combine historical archaeology and cultural resource management in a cooperative effort.

A broad goal of this effort was to produce a culture history of the mining community. In keeping with Bernard Fontana's philosophy, historical archaeology should provide,

> ...a kind of culture history, or cultural anthropology,or social history, or historical ethnography-I'm not concerned with what it is called-which will adequately described and interpret the way of life at a historic community in much the same way as a good ethnographer records the way of life of a particular living community (in Schuyler 1978:7).

Communication between the Forest Archaeologist and the University faculty opened up a unique opportunity. At that time a University archaeologist suggested that the site might provide field work for members of a class in historic archaeology. The class was to be a rigorous 10-day field course focusing on historical archaeological method and theory. Expertise was provided by specialists within the

Forest Service who shared their knowledge in photography, mining geology, and land surveying. I coordinated with university staff to organize the field class the summer of 1983.

Background Information on the Site

The Sylvanite Mining District is recorded in historical records as the Yahk Mining District. It is located on the Sylvanite District of the Kootenai National Forest, approximately 16 miles east of the Idaho state border and 30 miles south of the Canadian border. The site sits on both privately and federally owned land.

Objectives of the Yahk Mining District Study

There were several objectives set up for the Yahk Mining District. The cultural resource management objectives were to provide the Kootenai National Forest personnel with the information necessary to draw up a management plan. They needed an accurate boundary of the site, the density and character of features and artifacts, and evaluation of significance of the features. In order to establish a boundary and to identify features and artifacts, a sampling design was used. The features were described and evaluated as to their contribution of significance, according to National Register Criteria (36 CFR 60.6).

National Register Criteria germane to this site includes:

a. that are associated with events that have made a significant contribution to the broad patterns of our history," and

b. that have yielded, or may be likely to yield, information important in prehistory or history."

The broad pattern of historical significance is mining and yet the pattern promised by the Yahk Mining District was somewhat unique. The site was evaluated for its unique characteristics. In Montana many of the known mining sites are in environments that vary greatly from the Yaak. It is the only remaining example of stamp milling on the Kootenai and, according to the State Historic Preservation Office, two of the best preserved stamp mill sites in Montana. Consequently, the site possesses significance in its potential for educational interpretation to the public (Raab and Klinger 1977, Moratto and Kelly 1978).

The other set of objectives met the scientific goals of historical archaeology. I decided upon a problem-oriented design for the site which would address the importance of scientific significance. Defined, "A site or resource is said to be scientifically significant when its further study may be expected to help answer current research questions. That is, scientific significance is defined as research potential" (Schiffer and Gummerman 1977:241). A slightly different definition of scientific significance "...involves the potential for using cultural resources to establish reliable facts and generalizations about the past" (Moratto and Kelly 1978:5). The objectives of cultural resource management were geared toward collecting the physical evidence and determining management goals. This information in and of itself lacks any significant meaning as it only partially represents the people who left it. It is only when the data collected can be interpreted and explained that one can reconstruct lifestyles. It is this composite approach that historical archaeology demands. In order to explain the physical data, I proposed a research design which asked several meaningful questions. I discovered that the different methods used were most appropriate for answering certain questions. For example, the questions of political organization of the camp were best resolved by research of the written records. What the miners ate was best answered by looking at their material remains. Some questions demanded a combination of methods. The role of women in the life of the Yahk Camp was examined in the written documentation and enlightened the distribution of certain artifacts from the site. With other questions there were no readily available answers. Those would have to either go unanswered or await more intensive research.

Research Design

In order conduct a historic archaeological study one must carefully consider approaches to the problem area. Early during the study, it was obvious that such a large site would require a specific research design. When the object is simply to record everything, serious problems can arise. First, it is not possible to record everything. Secondly, if upon later analysis one discovers that additional data would be useful to substantiate a conclusion, inevitably that data will not have been collected. Ian Walker's argument can used to expand this point,

> All of us tell our novice archaeological students to make certain they record everything when they are excavating, whether they understand everything or not; how many of us also tell them that you do not collect evidence independently of thinking, and that nothing is evidence except in relation to a definite question? (in Schuyler 1978:211)

The method of collecting everything and letting the data "tell its own story" is most commonly known as the inductive approach. The alternative to this is a deductive approach which calls for a research design to focus on particular problems. Data is gathered in the field to address these problems. When the researcher uses this approach she does not ignore any new and unexpected data collection, for one must always be open to new input. It simply gives focus and direction to a study. A further explanation of a research design is needed. When cultural resource management programs began, it became necessary to define what was meant by research design. Several archaeologists took on this task in the 1970's (Raab 1973 and 1977; Goodyear 1975; Plog, Weide, and Stewart 1977; Schiffer and Gumerman 1977). Defined, a research design is:

> ...an explicit plan for solving a problem or set of problems. It is a plan that must contain theoretical goals in the form of a specific problem or hypothesis, relevant analytical variables, and specification of data that will allow empirical testing. To be complete, the design must lay out the methods and techniques for acquiring and analyzing the data, and predict the expected outcomes of the analysis (Goodyear, Raab, and Klinger, 1978).

Lewis Binford has set out new goals for North American archaeology by demanding research designs. The guidelines set by Binford on the use of a research design are applicable and were employed for this project (1964:427). Working within the limits of time and money, archaeologists must obtain a valid representation of all cultural materials present at a site. The most reliable manner of doing this is by sampling, defined as, "...the science of controlling and measuring the reliability of information through the theory of probability" (Deming 1950:2 in Binford 1964:427). Sampling theory requires the definition of units. In our case these units can be referred to as the "universe" and "populations". Defined "the universe is the ...isolated field of study....", which can be either a region or a site. For this project I identified the Yahk Mining District as the site; consequently, as the universe. Within that universe I recognized three populations: cultural items, cultural features, and ecofacts. Cultural items are the artifacts present at the site. Cultural features are "...bounded and qualitatively isolated units that exhibit a structural association between two or more cultural items and types of nonrecoverable or composite matrices" (Binford 1964:431). At the Yahk Mining District, these features include different units at the site: the adits, stamp mills, houses, business establishments, and other structures. The third population are "ecofacts", which Binford refers to as "...those elements which inform about points of articulation between cultural systems and other natural systems;" i.e., soils, pollen, animal bone (1964:431). In the cases of the mining camp, the most vital natural resource that would have influenced the cultural system was the ore body.

After the universe has been chosen, a "frame" must be applied to divide the universe into a number of small sampling units. Joseph Cartoff outlines a sampling design which he calls "transect interval sampling" (1978:46-53). While the sampling design suggested by Cartoff is for excavation, the design was used for surface reconnaissance at the Yahk Mining District. The design suggests a central point of origin with transects radiating out as seen in Appendix IV. In an informal preliminary overview, we had identified many features at the mining district. The hub of the radial sample survey was placed in the area where most features were concentrated. The most apparent problem with the design was that it failed to comply with a principle deemed vital to efficient sampling technique;"...the units of the frame should be approximately equal in size" (Parten 1950 in Binford 1964:428). Due to the fact that the hub of the design was off-center within the suspected boundary of the site, the transects (units) varied in length. The asymetrical shape created by the varied length of transects also created a bias. The eastern boundary was closer to the hub than the western boundary, therefore the transects on the eastern half of the site were shorter than the western transects. Also, the farther out the transects from the hub, the further apart they become. Taking into account these biases, the field design was still chosen because of its simplicity in design and application. [Refer to Appendix IV for a visual aid.]

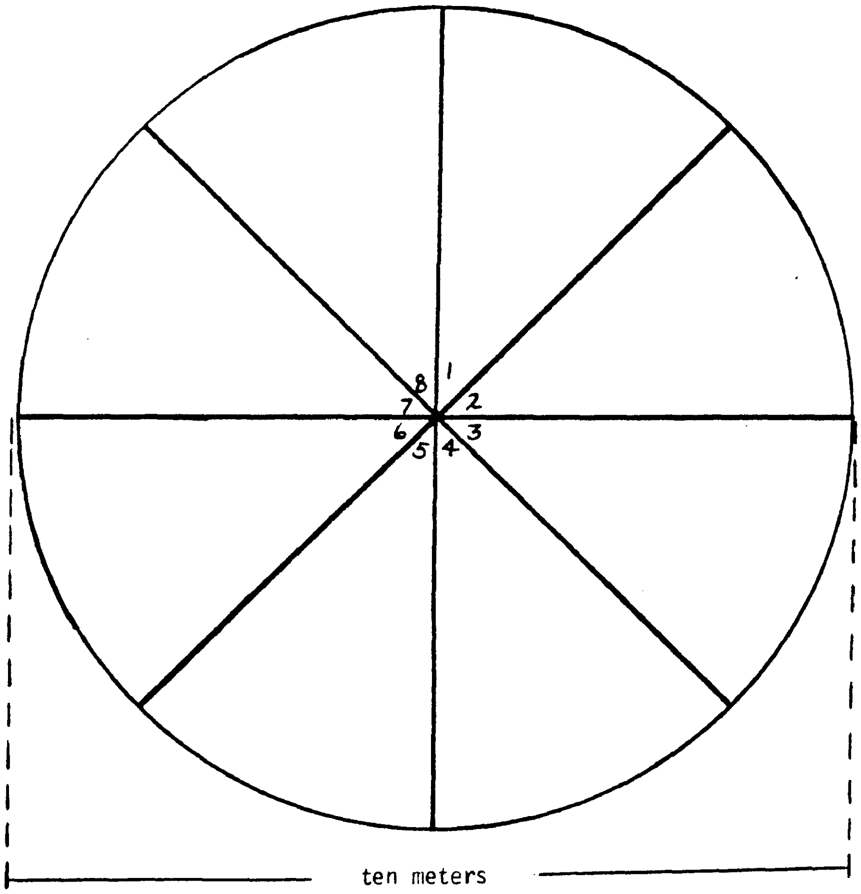
The field worker systematically recorded all structures and artifacts visible from the transect on prepared forms. Visibility varied according to the density of vegetation and topography. The transects were followed until the field worker ran out to a predetermined boundary. This boundary was defined using a geological estimation of the ore body location, produced by mining geologist Brian White. Experience with mining sites has revealed that community development was limited by the location of the ore body. Miners built their homes close to the ore body to maximize use of their time.

The transect reconnaissance was designed to provide a representation of structures on the site and used to systematically record the artifacts. The method used was one suggested by Binford as the "dog leash" method (1964:436). Every 23 meters on the transect (the length of the tapes used) the field worker put a wooden stake in the ground on which was attached a five meter length of cord. That cord was pulled around to create a circle with a 10 meter diameter, and all artifacts within that circle were recorded on a form and collected. For tighter control, the circle could be divided into wedges each numbered as seen in Figure 1. The artifacts from each wedge were collected and labeled. The smaller the wedges the tighter the comparative control. We discovered that a maximum of eight wedges were adequate to record the collection of artifacts.

Binford urges that all populations must be considered when designing a survey technique (1964). The ore body has been identified as an ecofact. In order to relate this natural feature to cultural reactions, in this case the placement of adits, the survey crews were to trace the vein. The direction of the ore vein

Figure 1

Sample Circle for Artifact Collection



KEY

- ✗ tin cans
- √ bottles
- / nails
- O shovels
- 7 picks
- stove parts
- + kitchenware
- Δ window glass
- dimensional lumber (4"x4")
- timber (4"x4")

*Note location of above items on the circle in appropriate wedge, as well as any other significant items. Indicate north.

was projected by an on-the-ground survey of the vein's outcroppings (White 1983). This projection was recorded on a topographic map. Following topographic features the predicted vein could be traced on the ground and the adits located along the vein recorded.

Research Questions

A research design "...is a plan that must contain theoretical goals in the form of a specific problem...." (Goodyear, Raab, and Klinger, 1978). In an attempt to adhere to this definition, I formulated several research questions.

A preliminary search of the written documents on mining camps in general, and the Yahk camp specifically, led me to several questions and problems. The following was to be neither an exhaustive list of questions, nor a final one.

1. What insight can the study of mining history lend in the interpretation of information on the Yahk Mining District? How does the site fit into historic perspective?

2. What information does the written record yield on the culture history of the Yahk Mining District?

3. How did environmental factors influence the decisions that the Yahk miners made?

4. The old townsite of Sylvanite is located about one mile from the camp. How was the Yahk camp connected with the town; politically, socially, and economically? Could we define patterns of occupation that were unique to each? What elements of choice

determined which area was chosen for residence? For example, did the more affluent people with families live in the town, while the poor or single miner occupy the camp?

Implications: The archaeological record might contain a majority of single-person residences and bunkhouses at the mining camp, indicating that most residents were single miners.

5. According to an article by a landscape architect, mining communities followed similar sequences of development from camps or mine locations to towns and villages. He maintains that the company-owned and -built camps could be detected by examination of the camps' physical layout. Company-built camps would exhibit an "...undeviating, orthogonal pattern....", as laid out by company engineers. On the other hand, "...unplatted/squatters' locations were characterized by poorly built housing strung out along haphazardly arranged streets and pathways" (Alanen 1979:51).

Implications: To test this hypothesis I asked the following questions: Was the layout of the Yahk camp haphazard or orderly? Was the physical layout of the camp a true indicator of it being company-built or erected by individuals? One might expect building style and material types to be more homogeneous in the case of the company-built camp and more heterogeneous in the case of the individually-built camp.

6. Historians depict the prospector as rather independent adventurous men; fortune hunters who made the initial discoveries and placer mined their claim, then sold the claim for a fraction of its worth. Later they squandered the profits with wild abandon and

often died paupers. Because hard rock mining required capital, most prospectors faded out of the picture. Money came from mining companies, several of which were involved at the Yahk Mining District. Did the pattern of the prospector fading into obscurity hold true at the Yahk Mining District?

Implications: The written record would indicate change of ownership from individuals to mining companies. The prospector's name would either totally disappear or assume minor mention in the written record as the mine developed.

7. Were any delineations of economic class evident in the mining community?

Implications: Obvious disparities might show up in the archaeological record, in artifact types and distribution and/or the occupational features.

8. Were there ethnic divisions in the mining community?

Implications: A number of names of similar ethnic origin might show up in the written record. Some ethnic groups, namely the Chinese, brought material goods with them that identify them in the archaeological record; rice paper, certain baskets, opium pipes. People of eastern European decent have been documented as having built rock ovens for baking bread. Are any of these artifacts and/or features found at the Yahk camp?

9. Mining communities are recorded in history to have been made up of a disproportionate number of males to females. Was this the case at the Yahk camp?

Implications: I suspect that certain artifacts would indicate the presence of women and children; elaborate china, perfume bottles, shoes, toys. The proportions of any of these types of artifacts might indicate the population's primary gender.

10. Historians report the early mining camps to have been relatively lawless. The first arrivals at the camp were concerned only with laws governing mining; size of claim, water rights, requirements for proving up the claim annually. It was this lawlessness and crime that inspired the development of the Montana Vigilantes. What level of political organization did the camp develop? What were the methods of law making, enforcement of the laws, and processing of offenders?

Implications: Written records might indicate political concerns. The length of occupation is short, therefore one would expect little more than the minimal level of government.

11. What trade networks were established for operating the camp? An archaeologist, Joel Klein, suggests that as the gold ran out, changes in the trading networks occurred.

> During periods of economic stress communities will increase their involvement in short-range trading networks.
> Implications:
> 1) The variety of short-range commodities found at the site should increase.
> 2) The amount of each short-range commodity found should increase.
>
> During periods of economic stress communities will decrease their involvement in long-range and local trading networks.
> Implications:
> 1) The variety of long-range and local commodities found at the site should decrease.

2) The amount of each long-range and local commodity found should decrease (Klein 1973:76).

One would have to define long-range, short-range, and local to pursue the above problem.

12. What part did religion play in the life of the Yahk miners?

Implications: The importance of religion might be indicated in both the written and archaeological record by the presence of churches, and possibly the presence of religious artifacts; bibles, crosses.

13. What kinds of food did the miners eat, and what medicines did they use? According to one historian, the majority of bottles found at mining sites are drug and medicine bottles, then whiskeys, "bitters, cosmetics, mineral water, foods in glass and household items" (Toulousse 1970:60). Is this the pattern at the Yahk camp?

Implications: While the written record might mention food or medicine in relation to their costs, it is most likely that the archaeological record will be most productive in addressing this problem. Food and medicine receptacles often survive within a site. If the pattern indicated by Toulousse holds true, it will be revealed by looking at the frequency of occurrence of these types of artifacts.

14. Were educational facilities available locally?

Implications: Archaeological evidence of a school house and teaching tools would help in addressing this problem. As the introduction of a teacher in the community was considered to be an status symbol, the event would probably make it in to the local newspapers.

15. What did the people do for entertainment? Where did they go?

Implications: The presence of saloons, brothels, dance halls, theatres, and libraries would all lend information to answer this question. Again these establishments gave a community a semblance of permanency and news of the availability of these was usually highlighted in the local newspaper. Artifacts representing these activities might appear in the archaeological record.

16. Was mining the initial impetus for peopling the Yaak River Valley? If so, what other industries came into the valley?

Implications: If mining was the parent industry for the area, it would be the first to show up in the written record, with other industries following.

Some questions could only be answered after the 1983 field season. As I noted earlier a research design does not indicate all potential problems. Certain aspects of the site came to light after the field work, and undoubtedly, materials from the site itself best answered certain questions. The historical record also made possible more sophisticated answers.

After the field work had been completed for the 1983 season, a pressing research question materialized. The question revolved around the stamp milling process itself. Written studies of the process contained a wealth of information on the proper planning and construction of the stamp mill. A lack of planning evidenced itself throughout mining history. It was not uncommon for a stamp mill designed to process a specific kind of ore was set up in a mining district with a very different kind of ore. The "mistake" may have been the deliberate action of a "promoter", more infamously known as a shyster, whose only goal was to make money off of an uninformed miner. Through years of scientific study, two experts establishing themselves as outstanding mining geologists--Thomas Egelston (1887) and T. A. Rickard (1897)--proved that a knowledge of metallury, combined with common sense, was necessary to create an efficient stamp milling system. [More details on the stamp milling process is presented in Chapter VI.] A mining geologist, Pete Cadwell, gained expertise in stamp milling technology through years of work with the milling processes. He toured our site to lend us his knowledge. Egelston's and Rickard's technical documentation along with Pete Cadwell's testimony can be used to evaluate the efficiency of the Keystone stamp mill. Thus the final research problem follows:

17. Comparison of the written record with the archaeological materials recorded at the Keystone Stamp Mill will indicate whether or not the operation was set up to efficiently process the ore body at the Yahk Mining District.

Implications: If the operation was efficient, specifications for the mill as indicated by Egelston and Rickard, will be aligned with the specific type of ore present in the Yahk ore body.

CHAPTER II

METHODOLOGY

Use of the Historical Record

The availability of written information about sites is one unique feature of historical archaeology. Written records can serve as site leads, provide background information, and help to place the sites in their behavioral context. There are many sources for mining research: historians' accounts, company journals, mining journals, county records, federal records, census', and newspapers. While some of these sources strive for objectivity (historians' accounts, county and federal records), others are often, although not always, biased (newspapers). Some of these records "newsworthy" changes that occur, but do not necessarily focus on the day-to-day events. By itself a source, whether the written or archaeological record, can only present a sketchy, incomplete mosaic of a historical period. While the archaeological record can correct documentary error most often it simply provides another perspective. Ian Walker articulates this contention,

> Facts, therefore, like a diamond, have many facets... The most important thing to know is not whether an historical statement-or archaeological "fact"-is true or not, but what it means (Collingwood 1946:260, 1961 ed.). Thus, archaeology rarely "proves" anything, its primary purpose is to discover not facts so much as facets (in Schuyler 1978:212).

On historical sites, all of these valuable sources combine to afford the researcher maximum results.

Several topics were researched in my historical documentation, and these can be divided into two major categories. The first category included any information on mining in general. I compiled these sources by reviewing bibliographies of other mining documents and by talking with university professors, mining professionals, and other cultural resource managers. These sources provided information on the history and technology of mining.

The second category included information on the Yahk Mining District itself. I gathered this data from mining journals, newspapers, interviews, legal documents, and local histories.

Local newspapers for the years 1894-1900, 1910-1912, and 1931-1937 were examined. At least one major newspaper for each of these three periods was read and notes taken. I kept a cross reference system with one set of cards that had the newspaper name, date, and notes. Another set cross-referenced the first with subject headings: claims and adits, birth, business, death, injury and disasters, education, ethnic divisions, education, economic divisions, food, marriage, mills, ore values and deposits, politics, Sylvanite townsite, transportation, communication and trade networks, the Yaak valley, and miscellaneous. Two University of Montana students helped with the newspaper research; Joy Bolton and Anita Hansen.

Local newspapers also provided a unique service to this study. The _Western News_ in Libby, Montana; the _Bonners Ferry Herald_ in Bonners Ferry, Idaho; and the _Sandpoint Daily Bee_ in Sandpoint, Idaho, offered to run a story making an appeal to anyone with information on the Yahk Mining District to contact me. I hoped to reach people in the community who had worked in the mines during the 1930's and made many new contacts because of the _Western News_ article. Most of these were not people directly tied to the camp as miners. One was a widow of a miner. Mr. Carl Cummings had played a key role in the construction of the 1930's camp. The new information was documented. We had no response to the articles in the _Bonners Ferry Herald_ or the _Sandpoint Daily Bee_.

Local histories were read and pertinent information noted. Mining journals proved to be excellent sources for information on mining operations and ore values.

The Lincoln County Courthouse is a repository for many old mining records. Three books were checked for information: The Placer Index Book, The Quartz Lode Index, and the Lode Location Book. Information included the name of the claim, the names of the locaters, the date located, the date recorded, and a general description of location. Adjacent claims were also identified. Unfortunately, locations often were extremely vague, for example, the Wesley #1 claim was reported as being located 6 miles north of Sylvanite. From those three sources information was compiled on the Yahk Mining District claims and a map was drawn.

The Bureau of Land Management (BLM) helped our research by sending all of the patented claims in the mining district that they had on file. They forwarded copies of the plats and the mineral survey field notes. Locations of many structures were acquired from the maps and those notes.

Use of the Oral Record

Oral interview is another method used in historical research. Often an old-timer is available in the community to comment on the problem at hand. Information acquired in the oral interview can help to verify the written record, and also help explain the archaeological record. An informant can be used to attain site leads and to give insight into the site's background. During field work and after it is completed, an informant can identify structures and artifacts.

I interviewed three key informants about the Yahk mines; two provided a historical perspective, and one gave technical assistance.

One local informant, Gene Grush, had come to the valley to fight the 1910 fire and stayed on, dabbling in mining. Grush's contact with the Yahk Mining District was related to his ownership of a patented claim within the district. The claim played a key role in the 1890's mining scene and was a part of subsequent mining. Gene worked his claim sporadically throughout the years, but more frequently leased it to other miners. Therefore, Gene was not directly involved with the district for most of its' lifetime. He was interviewed prior to the field work. Gene was also interviewed after the survey and was recorded on tape. The interviewers (Rebecca

Timmons, Jim Calvi, and Russ Gautreaux) took a site map of the known district features so that identification and background histories could be compiled on individual features. This interview was then transcribed. Gene's interview provided valuable historical background on the mining district and offered a feeling of the atmosphere surrounding the mining experience.

A mining engineer/assayer, Pete Cadwell, who spent most of his working career in South America visited the 20 stamp mill the last day of our field work. He identified the many mysterious pieces of mining equipment and explained the milling process. That interview was taped and transcribed and has helped us to understand the stamp mill process at the Keystone Mill.

Late in the research of the project a chance meeting took place with a man who had worked at the Keystone stamp mill. Don Barron, a long time Yaak valley resident, began working in the mine when he was fifteen years old, in 1933. When the owner was told that laws prohibited anyone under the age of sixteen from working underground, Don was moved to the mill as the foreman's helper. Don provided valuable details about his coworkers, the mill's technology, and the people who lived in the community.

Use of the Archaeological Record

The Field Work

The archaeological field work was divided into three phases. Phase 1 was considered the most important and involved on-the-ground survey of all twelve transects. This included the systematic collection of artifacts and the recording of all features visible from the transects, except for the largest features. During the second phase we recorded all known features not recorded in Phase 1 and the larger features including the two stamp mills, the mine, the mill owner's house (Joe Thornton) and the largest dump areas. The third phase was to be the following out of the predicted ore body to record adits and walking the roads in the area.

Phase 1 extended over five days and became fairly routine. Two individuals made up a survey team. Upon their completion of a transect, a team was assigned a new one. Using this approach, four teams completed twelve transects in five days.

Phase 2 took the last two days to complete, during which time the teams recorded known sites that had been missed by the transect survey. The large structures (stamp mills and Thornton's house) were described during this phase. Seventy-three of the 137 known features were recorded in the first two phases.

Phase 3 has been ongoing from 1983 until present and has resulted in the recording of an additional fifty-five features.

Evaluation of Methods

A few comments may help other researchers who use the methods as outlined in this chapter.

The radial transect survey design, while it involved a certain amount of sampling error, is a very expedient method. The design eliminates the lay out of a base line, a necessary step in establishing a square grid. In steep topography, sophisticated survey equipment and a great deal of time would be required to complete a base line survey. The dog leash method of laying out sample circles proved to be very efficient, especially for a small team to use.

Alterations to the research design had to be made after the first day. The design directed that the transect be measured so that every seventy-five feet any artifacts could be collected. The process of measuring on a barren transect was extremely time consuming. We decided to measure along the transect until the crew had gone 600 feet without seeing any features or artifacts. At that point, the team stopped measuring and walked the line out to the predetermined boundary. If a feature or artifact was found after the measuring phase had ended it was measured back to a known point. This newly designed system seemed better fitted to the field work situation, and demonstrated the need to remain open to changes in research design.

The research questions were indeed successful in helping to direct and focus the collection of information. The bulk of written information about the Yahk Camp came from newspaper research. Large quantities of information can quickly become unmanageable unless one has a system to organize and to recall it. The system described in this chapter was very effective in that it allowed us to easily retrieve the data.

The oral interview cannot be underestimated in its contribution to a cultural inventory. While there are some good suggestions about how to conduct an oral interview, polishing of this technique seems to come with experience. The technique of taking a map of the site is helpful to "jog" an informant's memory and is highly recommended.

Examination of the written record becomes vital prior to field work. The information resulting from the search is of best use if it is carefully reviewed and organized into a comprehensive summary. In the case of the Yahk Camp, the locations of structures from the 1890's era could have easily been overlooked if we had not reviewed the early mining plats and estimated their locations on the ground.

In retrospect, it is of value to evaluate our accomplishments when using a random sample survey design. Its usefulness is unquestionable when working in a previously unsurveyed area. In the case of the Yahk Mining District, 100 features had been located prior to the 1983 field season. A random sample survey design was chosen to identify the remaining features. As it turned out only ten new features were identified as a result of using the radial transect design.

CHAPTER III

HISTORICAL CONTEXT

A thorough study of any site depends on placing the site in its historical context. The Yahk Mining District did not develop in isolation of national events, but rather because of those events. The following research question was asked:

What insight can the study of the written record of mining history in the U.S. lend in the interpretation of information on the Yahk Mining District? How does the site fit into historic perspective?

Implications: Written history of mining in the U.S. tends to focus on the early mining era; 1840's through the 1880's. As such, the information may be comparable for interpreting the data for the earliest mining era at the Yahk Mining District (1890's), but limited in its direct application to the 1910 and 1930 periods. If information gained on the Yahk Mining District from the two later periods show elements of similarity to the earlier period, then an argument may be made for technological and possibly sociological stasis for this site, lessening the limitations just mentioned.

The Miner's Lifestyle

The following discussion of the miners' lifestyle is presented to add flavor to the Yahk Mining Camp. My description of the Yahk Camp lacks certain elements of lifestyle and does not reflect the camp in reality. Rather, it indicates the kind of information that we are able to recover from the site. While much of the historical background discussed is from an earlier mining history (1850's and 1860's), its application to the Yahk Camp in the 1890's is considered to be valid. This validity is based on a comparison of the written record indicating the 1860's miners' lifestyle and the lifestyle of the 1890's Yahk miner to be comparatively similar.

The Miners' Integrity

Much has been written on "the miner." Some information is most likely factual and objective while some comes from the romantic version of their dramatic past. While understanding that the specific contributions of the factual and the folklore is important, eliminating one or the other gives an incomplete picture. In providing a view of the miner an attempt will be made to combine the emic and etic to present a unified picture.

Many eager and adventurous spirits left the security and comforts of their eastern homes to seek their fortune in gold out west. The journeys were made by ship, wagon, horse, and even foot. The trips were long and took them into areas ranging from open deserts to steep, rugged mountain ranges. Indeed, mining sites on the Kootenai National Forest are in such treacherous terrain. One can imagine the amazing amounts of personal drive that enabled men to accomplish such feats. Undoubtedly, many embarked upon their adventure not fully prepared for the life awaiting them and upon arrival had no choice but to adjust. The words of a young man writing home from the Klondike may typify this situation:

> I have been working like a slave since I came here trying to get over the trail and am not over it yet, and furthermore do not think I will be in time to get to the Yukon this winter. Since I came in we have lost our mule and one horse. I am undoubtedly a crazy fool for being here in this God-forsaken country but I have the consolation of seeing thousands of other men in all stages of life, rich and poor, wise and foolish, here in the same plight as I (Wallace 1976:210).

Nonetheless, once arrived they did adjust and we will examine some of the events that marked their lives as miners.

While historical accounts similar to these tend to be dramatic, the hardships of the early miner must be understood. Walking through the precipitous terrain of the Yahk Mining District, one cannot help but to respect the miner for "colonizing" this area. Long winters, well known for the area, posed other obstacles that the Yahk miner had to contend with.

Role of the Family

The composition of the early mining camp was predominantly male, "...a society dominated by men" (Smith 1967:21). The scarcity and subsequent reaction to the arrival of "respectable" women is best expressed in the words of a New England traveler. "Among the miners of the upper country, who had not seen a white women for a year, I received such honors that I am afraid I should have had a very mistaken impression of my importance if I had lived long among them" (Wallace 1976:153). It is told that even the early prostitutes were well respected and "brought elements of gentility to mining towns" (Wallace 1976:153). Gradually, women did arrive in the mining camp and always with great fanfare. Their existence in this society was different from their previous experience:

> Women, too, enjoyed more freedom than they might have had otherwise. They found higher paying jobs, especially with the scarcity of servant girls. The number of divorce proceedings reported in the newspapers indicated that the uninhibited ways of society affected both sexes. No longer did a woman have to tolerate poor marital relationships when so many eligible men were available.

Once in a while, a brave new bride would accompany her husband to the mining frontier. Such was the story of Harriet Fish Backus who lived with her husband, an assayer, in several mining towns. Her tales of the tremendous and often frustrated efforts to set up housekeeping in a mining camp and the survival of winter gales and blizzards at 13,000 feet elevation are impressive. The mortality rate of infants was high in areas where medical attention--at best--was limited to an overworked doctor with instrument bag. In reading Harriet Backus' memoirs I was amazed at the resilience that these women displayed; tragedy brought good friends for comfort and the daily frustrations were handled with an unwavering humor. Indeed, friendships were formed for life and friends often helped each other to survive the rigors of the camp (Backus 1969).

Children raised in mining camps were exposed to some very different circumstances:

> Their impressionable years were spent in a situation which condoned and consented too much that was not considered part of the usual education of American youth. Boys and girls grew up quickly in a society where emphasis was placed on adult vocation and avocation. Girls, especially, in the masculine society short of women, matured rapidly. In early teens they began to be escorted to dances by older men, and soon they were married.
>
> Boys must have found the life of the mining camp much to their liking, with what they considered to be

its adventure and excitement. At any early age, unfortunately, many of them started to partake of its more seamy aspects. Newspaper editors commented, on occasion, about such matters as profanity, gambling, and drinking habits of some of the younger members of the community; in age the participants ranged from five to fifteen (Smith 1967:23).

I had hoped that exposure to information about women and children lives in the mining camps would sensitize me to similar scenarios that may have taken place at the Yahk Mining Camp. As discussed in Chapter V, women and children were very much a part of Yahk Camp life.

Housing and Sustenance

Housing at these early camps was most often haphazard and built with little thought to permanency. Board and batten framed houses were most numerous in the mining camp although a few log structures were built. The soundness of these framed structures comes into question when one hears the tales of winds, snows, and dust filtering into the homes with little resistence (Backus 1969). Most likely, the reason for this hurried construction was that the miner could afford little time away from his main livelihood--mining.

As the camp grew, hotels, saloons, and merchandise stores arrived on the scene. Some communities died and were abandoned when the ore ran out, while others developed into thriving communities that outlived the mining phase.

The mining family was dependent on outside markets. This was especially true of mining communities in western Montana which has been described as "a land in many ways more hostile to agriculture than Colorado" as "they found the season, altitude, soil, and amount of moisture strikingly different from what they had previously experienced. Unlike some of the Colorado camps, very few in Montana were located where agriculture was possible" (Smith 1967:130). Even today, the Yaak Valley is considered as unsuitable to agriculture as limited by a growing season of only two months.

Mining was so profitable that there was little motivation to become a full-time agriculturalist. Nevertheless, the historical record contends that the mining camp was dependent on the farmer for its food, and mining is known to have greatly stimulated farming in other parts of Montana, "agricultural settlements lived on as monuments to the frontier which had passed" (Smith 1967:128). In many parts of Montana big game was present or could be hunted for food. But, during the 1890's northwestern Montana was not a very appropriate habitat for large game; the land was too densely timbered. The large fire that swept through Idaho and Montana in 1910 opened the area to create more attractive habitat for these species. The question remains, however, as to whether the local miners took much time away from their jobs to hunt. Food supplies were freighted in from the nearest local market. The local market serving the Yahk Camp in the 1890's was Leonia, Montana. In the 1910's and 1930's Troy, Montana became the market center. When a local source did not exist, miners were forced to go elsewhere. "A report of sheep being driven from Utah to [southern] Montana in the winter of 1863-64 is one of the earliest recorded incidents of this nature" (Smith 1967:133).

Health and Well-Being

Much light can be shed on the liquors and medicines that miners used through analysis of the artifacts found. Julian Toulousse tells the story of the miners by analyzing the bottles they left. There were different types of bottles used between 1850 and 1890. The majority of bottles found are drug and medicine bottles, then whiskeys, "bitters, cosmetics, mineral waters, foods in glass, and household items" (Toulousse 1970:60).

Whiskeys were manufactured largely in San Francisco and are part of a long list of brand names. Bitters bottles head the list in terms of variety with over 100 brand names. It is questionable as to whether bitters were medicinal in purpose. Toulousse tells the history of bitters.

> The statement that the alcohol content "was only sufficient to hold in solution the extracted medicinal properties" no doubt assuaged the feelings of many an otherwise temperate imbiber. One could always increase the dosage to speed the cure (1970:63).

Medicine bottles say something about the kinds of "ailments" the miners suffered. Liniments attest to aching muscles, stomach remedies may support the theory of "poor cooks and poor food". Respiratory problems are evidenced by the many cough, asthma, and cold cures; "chills and fevers were common" (Toulousse 1970:63-64). Pain killers, kidney pills, and eye cures abound (Toulousse 1970:64). Food bottles in the mining camp held various products, the most prevalent being olive oil, extracts for flavoring, baking powder, pickled foods, mustard, catsup, and miscellaneous sauces (Toulousse 1970:67-86). Sauces abounded in order to make meat palatable. A detailed list of cosmetics and household items are also given in Toulousse's study.

Generally affecting the well-being of the camp were the sanitary conditions. Smith describes the camps as "not the cleanest places to begin with, considering the mining and general lack of planning, they became even worse after the years of habitation" (1967:149). Several problems contributed to the situation; a poor drinking system, improper sewage, and unconfined animals (Smith 1967:149-150). The numerous and seemingly random distribution of dumps at the Yahk camp attest to its poor sanitary condition. Of interest would have been the occasional visits to those nearby dumps by wild animals.

Types of injuries varied from camp to camp. The Comstock Mine in Nevada was several thousand feet deep and access was through an elevator shaft. The heat at 1500 feet was over 100°. As men ascended on the elevator the temperatures changed rapidly from very hot to cool. The drastic change often caused men to faint and as their arms or legs fell outside the cage they were crushed against the timbers (Wallace 1976:72). Fires and cave-ins were other near fatal dangers in the mines, and survival rate in such catastrophies was low. From glancing through a register of injuries at Butte's Orphan Girl Mine, one gets the impression that injuries usually centered around smashed fingers and toes and broken limbs. There were, to my surprise, few reports of deaths. As technology improved, it is almost certain that better working conditions followed. The formation of unions in the 1890's initiated a mouthpiece to demand improvement, however mining remained a hazardous profession. Two deaths occurred at the Yahk Mining District in the 1930's. One took place in the 1930's when a miner struck an old box of dynamite that had been abandoned in an adit. Another occurred when a Mr. Harold Mason fell down a shaft (Barron 1985).

Laws and Regulations

The miners' laws first centered around issues of mining; the size and ownership of claims and water rights (Toole 1973:73).

Wallace describes other problems requiring justice:

> Claim jumping, theft, and murder were the only crimes that seriously disturbed the miners. In all such cases, a meeting was speedily convened to deal with the suspect. Judge, jury, prosecutor and defender were elected (everyone in camp, including youngsters of only 15 or 16, could vote), and the trial went on at once. If the suspect was found guilty he received some sentence that could be executed without delay; summary punishments were the rule because new mining camps had few jails--no one wanted to build, pay for and guard them. Mutilation--the cropping or removal of an ear or two--was sometimes recommended. Flogging was common, as was banishment; men were obliged to leave the mining district immediately and to remain out of it on pain of violence or death. Hanging was the routine sentence not only for murder but for theft of a particularly obnoxious kind, such as the stealing of scarce food in the Klondike (1967:37-40).

As mining districts were created, the miners' court was often established as a more formal legal system than described above. The court consisted of a president, a recorder, and a sheriff who served a term of six months. The miners' court was responsible for civil and criminal cases. The civil court was made up of a jury of miners, while the criminal court's decisions were up to the miners' judgment. In either case, justice was not always attained. Because of the speedy trials, people were often falsely accused and punished (Wallace 1976:40). The smaller infringements, punished in more "sophisticated" towns and cities, were often tolerated in the mining camp as long as it did not endanger the community (Smith 1967:21). The miner's court was held over a claim jumping case at the Yahk camp in the 1890's.

Mining Systems

I include a brief explanation of mining technology to help the reader understand the kinds of tools and techniques that miners used. In the prospector we find the pioneer of the mining industry. For some, prospecting was a life-long vocation, for others an advocation--a break from their professions as carpenters, lawyers, doctors, and merchants. The latter group might have succumbed to the temptation of the get-rich-quick schemes, sold their business, sought their fortune, then later returned to the security of their traditional lifestyle. Whenever the national economy was in a slump the numbers in this group grew. The professional prospector would often spend years seeking the source of a fragment of ore. It's ironic that after years of effort to make his fortune, he would placer mine his claim and then sell it for a fraction of its end worth. The story of Bob Womack is a common one. This prospector spent twelve years locating his vein, minimally mined the claim, and while on a drunken binge sold the claim for $300. The Cripple Creek claim in Colorado produced $3,000,000 in gold, but Womack died a pauper (Wallace 1967:32).

Placer Mining

Prospectors usually followed certain procedures in their efforts to discover gold. Streambeds were the first place checked. Deposition of gold in a streambed resulted as the ore vein was exposed to weathering. When pieces eroded off the rains often carried these fragments into the streams. Whenever this gold was found in streams and could be washed out it was referred to as a placer gold. "The richest placers were to be found in the foothills of a mountain range, where swift streams, slowing down as they flowed into less precipitous terrain, lost their carrying power and relinquished most of their treasure" (Wallace 1976:27). Any obstacle that would stop the gold was carefully examined. Wallace describes this process:

> Having found a promising placer, the prospector brought into play the basic tool of his trade--a gold pan [Photograph 1]. This was a 3- or 4-inch-deep basin made of tin plate or sheet iron with sloping sides. It measured about 10 inches across its flat bottom and about 15 inches across the top. The prospector would shovel some sand into the pan, submerge the pan in the stream and spin it slowly with a flipping motion that washed the light sand and silt out over its rim. After 5 or 10 minutes, the pan would be washed clean of everything but a spoonful of heavy residue called the drag--probably a corruption of the word "dregs." Then, with a skillful flick, the prospector fanned out the drag on the bottom of the pan, revealing, if he was in luck, a little comet tail of gold specks called colors. He picked out each color with a knife or fingernail and stashed it in a bottle or can, transferring the gleanings to another leather pouch when he quit work at nightfall.
>
> In a long day spent squatting in a cold mountain stream, a miner could process about 50 panfuls of sand, and he would make ends meet at high boomtown prices if he averaged 10 cents worth of gold per pan. In rich placers, miners sometimes washed panfuls of sand worth $50 each, and on rare claims in the Klondike, individual pans yielded as much as $800 (1976:27).

If the placer proved rich, other more sophisticated devices were constructed to increase efficiency; long toms, sluices, and rockers, [Photograph 2]. When these simple devices were insufficient in reaching buried deposits at the bedrock level whole streams would be diverted (Wallace 1976:27-28). Another method washed away whole hillsides forcing the earth to yield its riches was called hydraulic mining [Photograph 3]. A forceful jet of water would erode away the soil and then the outwash would be channeled into the sluices. It might come to a point when the prospector could no longer finance the methods needed to extract the gold. At this stage, the claim was usually sold to someone with more capital and the prospector moved on for "easier pickins'" (Wallace 1976:29).

Hardrock Mining

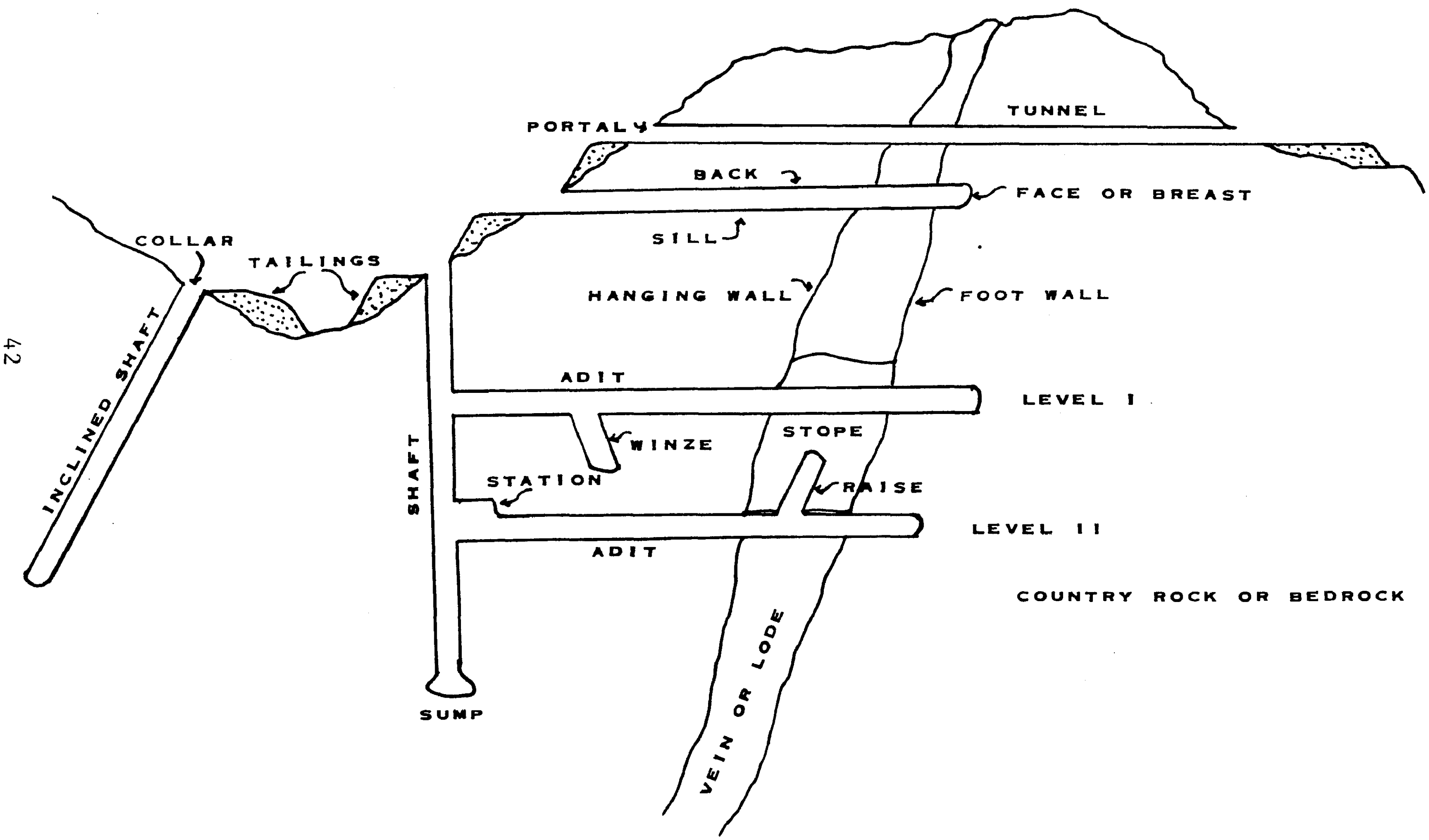
Another system of mining is called hardrock mining. This is much more complicated than placering because the ore vein must be extracted and processed. Figure 2 illustrates the anatomy of a mine.

Ore extraction is accomplished by either sinking a shaft, tunnel or adit. The choice of approach depended on the dip and strike of the vein. Prior to drilling the country rock was removed using a "handheld steel" drill which was hammered with a "double jack" or sledge hammer (Peter 1979:50). The first mechanical drill was patented in 1866, but did not entirely replace the handheld steel. Another very effective method of loosening the country rock was to use dynamite (Peter 1979:51-52). Once loose, the rock was loaded into ore cars which were mounted on rails in an adit and transported in an ore cage in a shaft. Ore cars and cages occur in many configurations. The first ore cars constructed were made of wood, (often hand hewn) and later were made of steel. [See Photographs 6, 7, and 8.] If it was necessary to haul ore vertically using an ore cage or bucket a device had to be constructed to lift the ore. [See Photographs 4, 5, and 9]. These devices range from simple to complex. The early device, a windlass was simply a hand cranked shaft with rope to lift buckets in and out [See Photograph 10], and was replaced by mechanized hoists, powered by steam, air, diesel, or electricity [Photographs 11, 12, and 13].

While extraction of ore was in progress, the miner had to keep check on the quality of ore coming out. At large operations an assayer was employed nearby in an assayer's office. [See Photograph 15]. He ascertained the quality of ore by using specialized methods. An ore sample was ground with a small crusher or mortar and pestle, a random sample selected for testing, and was then weighed. The sample was heated in a tapered clay pot called a crucible with "lead oxide borax, argol, wheat flour, and an inquart needle of silver of precise purity and weight" (Young 197:35). [See Photograph 17]. The heating process took thirty minutes. The "slag" or molten waste rock was separated from the lead and the lead put into cupels; small round cups of bone ash. [See Photograph 16]. Heating took place in an oxidizing furnace. [See Photograph 14]. The unique characteristic of bone ash

Figure 2

ANATOMY OF A MINE



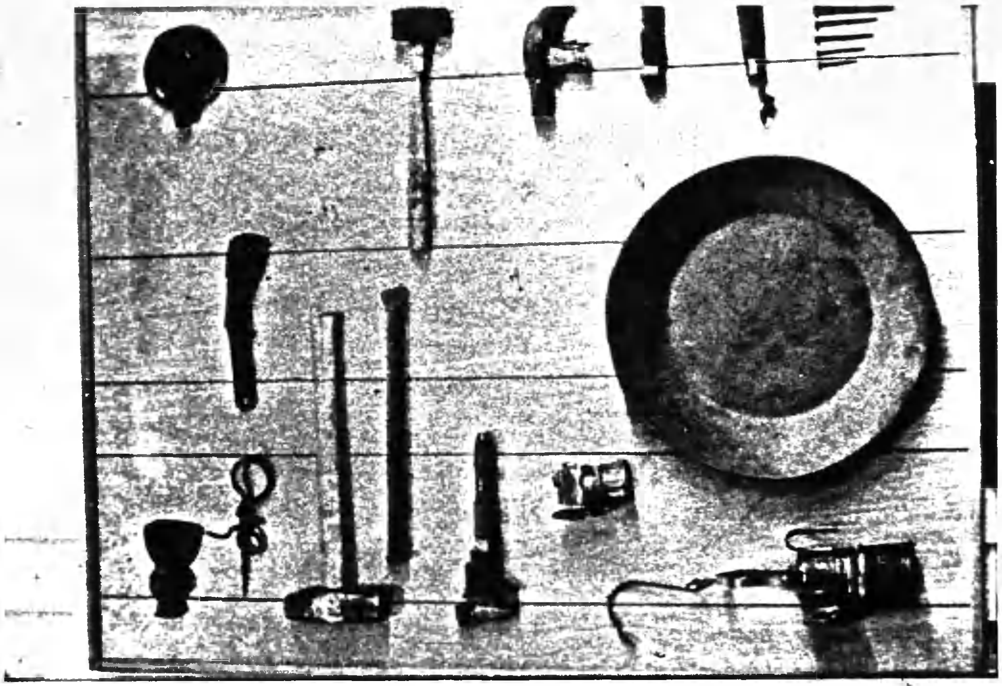
EXTRACTED FROM <u>IDENTIFYING ARCHAEOLOGICAL AND HISTORICAL REMAINS</u>
COMPILED BY JOAN PETER, SNOQUALMIE NF, 1979: 54.

is that when heated, it would absorb the lead and leave the molten metal (the gold).

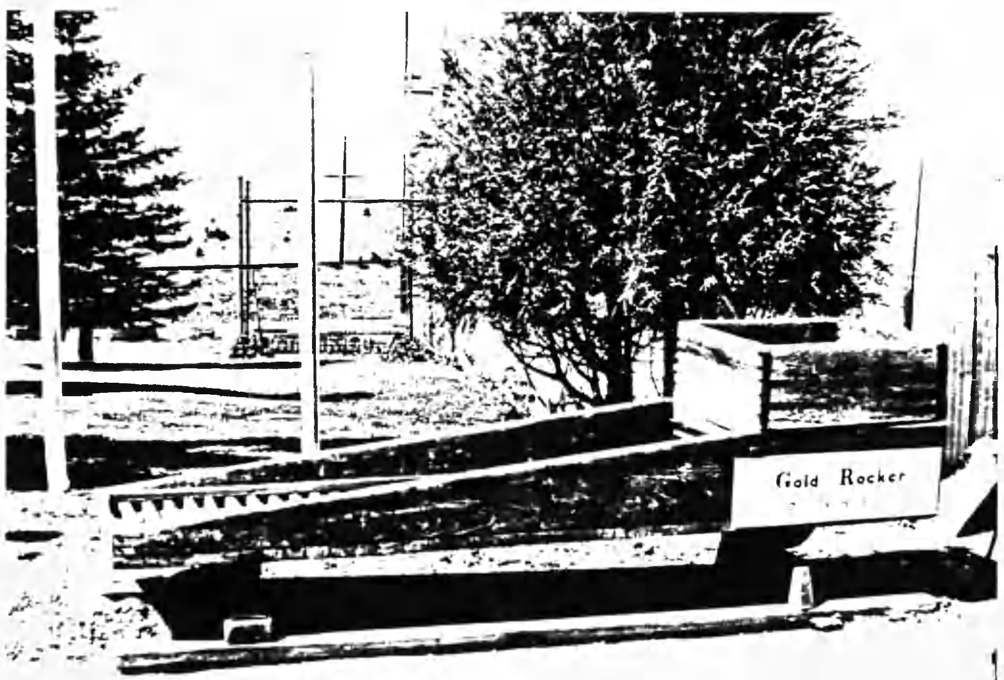
The inquart silver needle was removed and if it was larger than the original there was gold present. A parting process separated the gold from the silver needle. From this test the dollar value of gold per ton of ore could be determined (Young 1970:37-39). This information would be passed back to the men undergound to guide their movement to the richest veins. Remains of cupels, wooden chemical bins, and crucibles identify the location of the assay office as being within a few feet of the Keystone stamp mill. It is a safe assumption to make that the assay office played a vital role in the operation of the Yahk Mining District.

The most complicated part of hardrock mining was ore processing. Once the tons of ore were extracted, the gold had to be "freed." A stamp mill was used in the early days of mining to accomplish this. The overall process is summarized by mining expert T. A. Rickard:

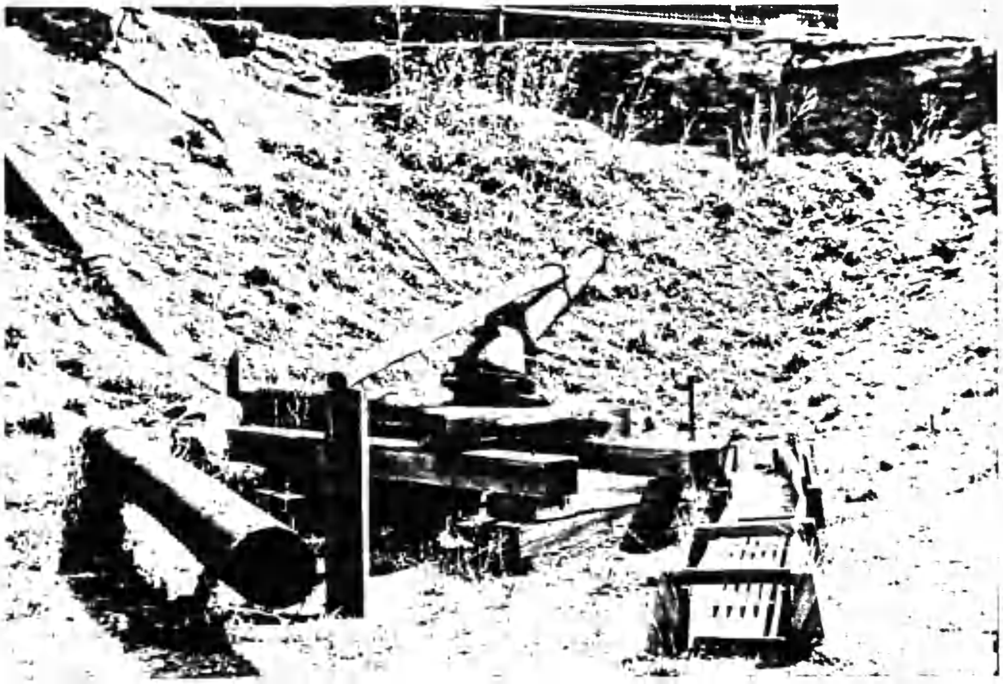
> Milling is a processing of ore reduction whereby the extraction of the valuable metals is effected at a minimum of expense. Gold stamp milling is that particular process in which a heavy cylindrical body of iron is made to fall upon the ore in such a manner as to crush it, and thereby facilitate a separation between the gold and the valueless minerals by which the gold is encased. The latter, which weighs less than the former, is then collected through the agency of mercury with which it readily forms an alloy or amalgam. From this combination it is finally extracted by the distillation or retorting of the mercury (1897:1).



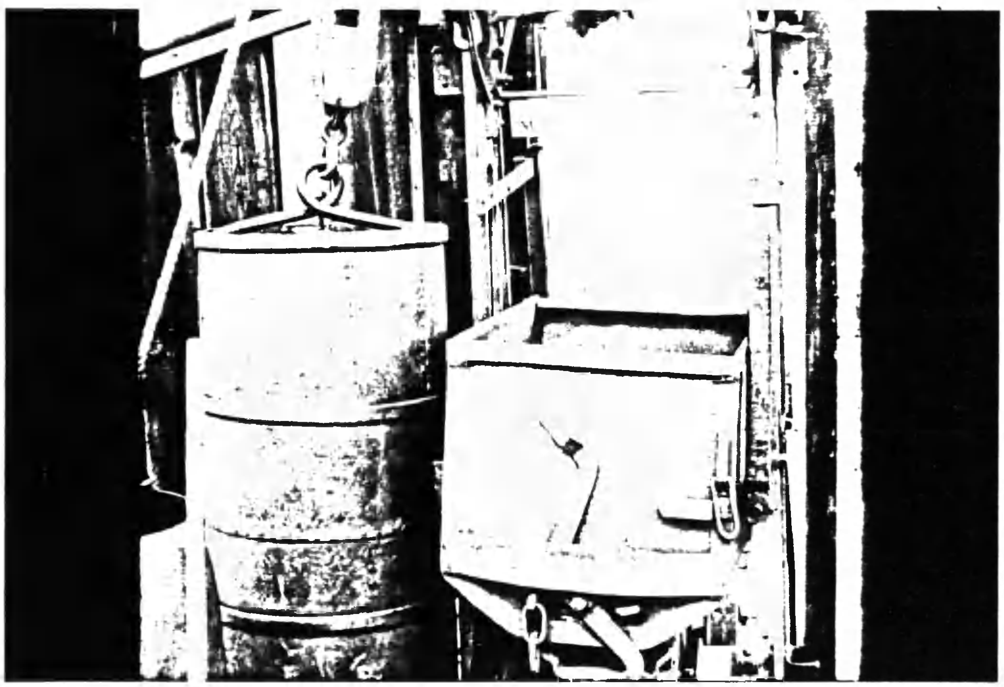
Photograph 1. Gold pan.



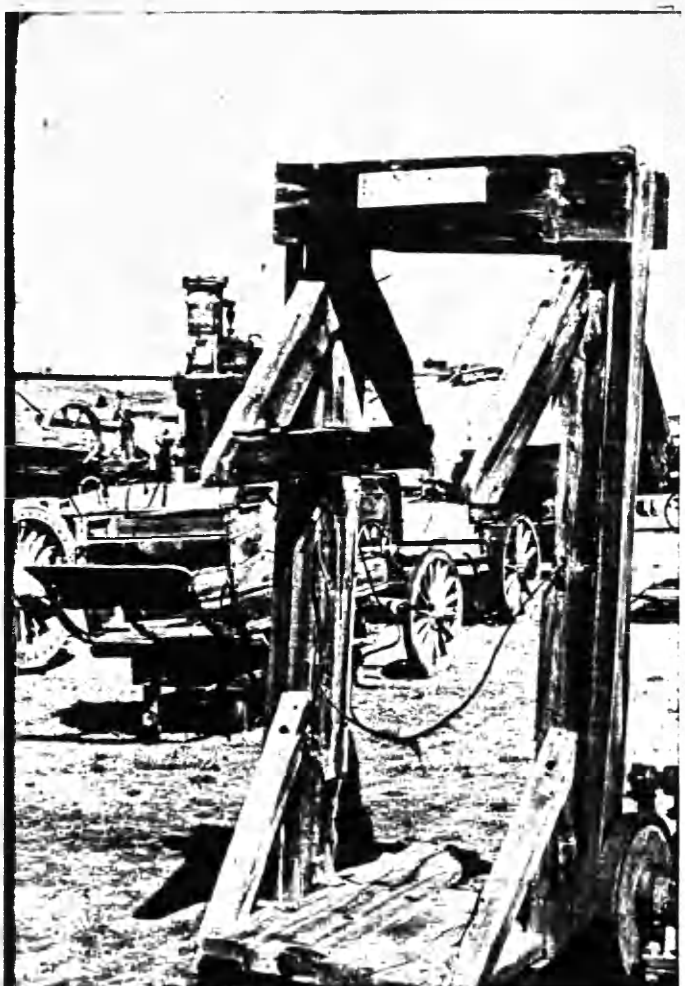
Photograph 2. Rocker



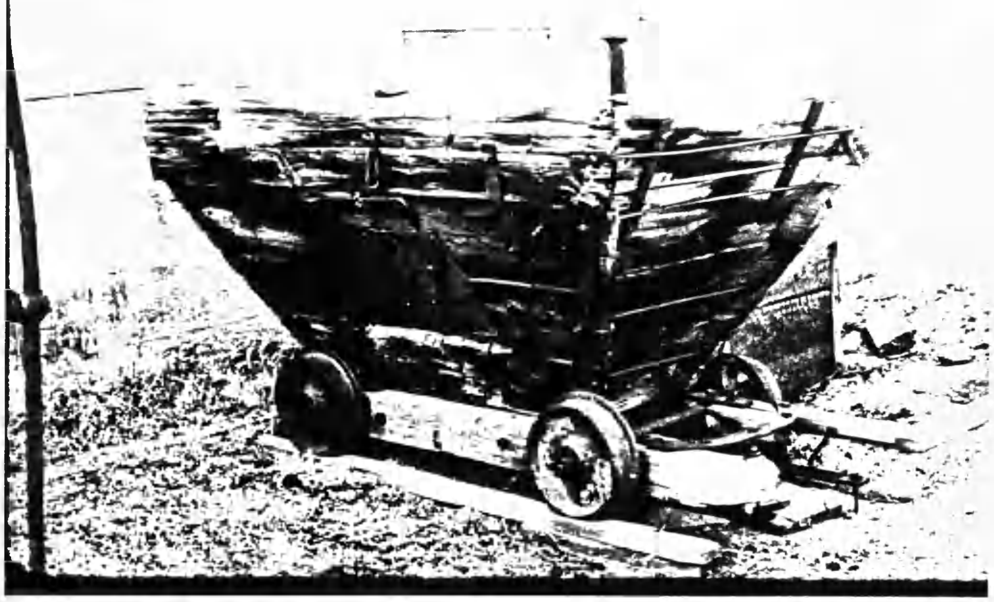
Photograph 3. Hydraulic mining.



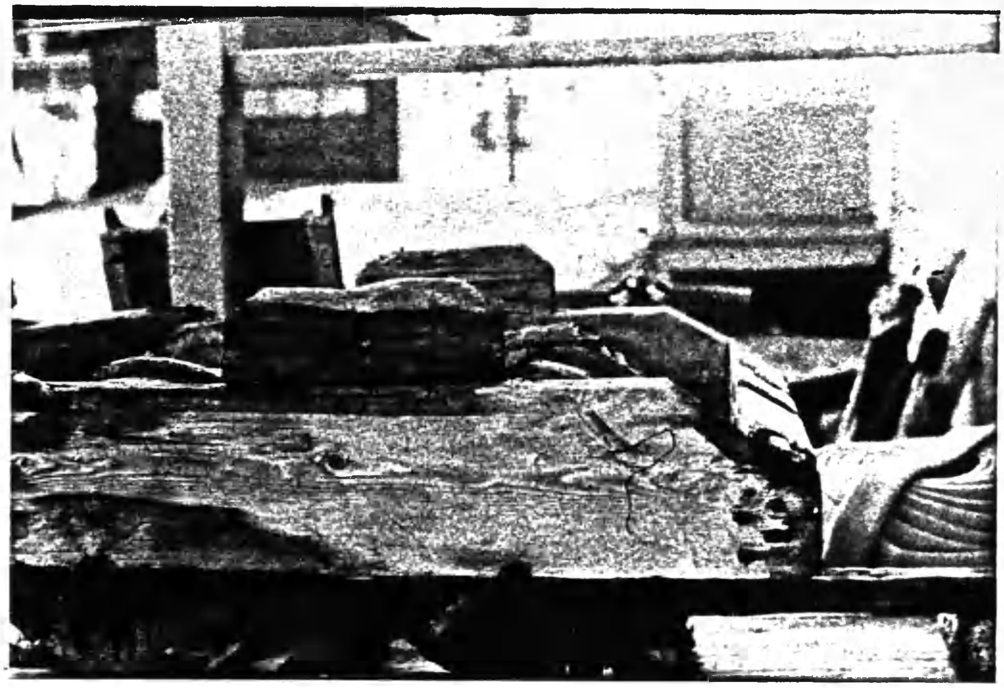
Photograph 4. Water bucket and ore car.



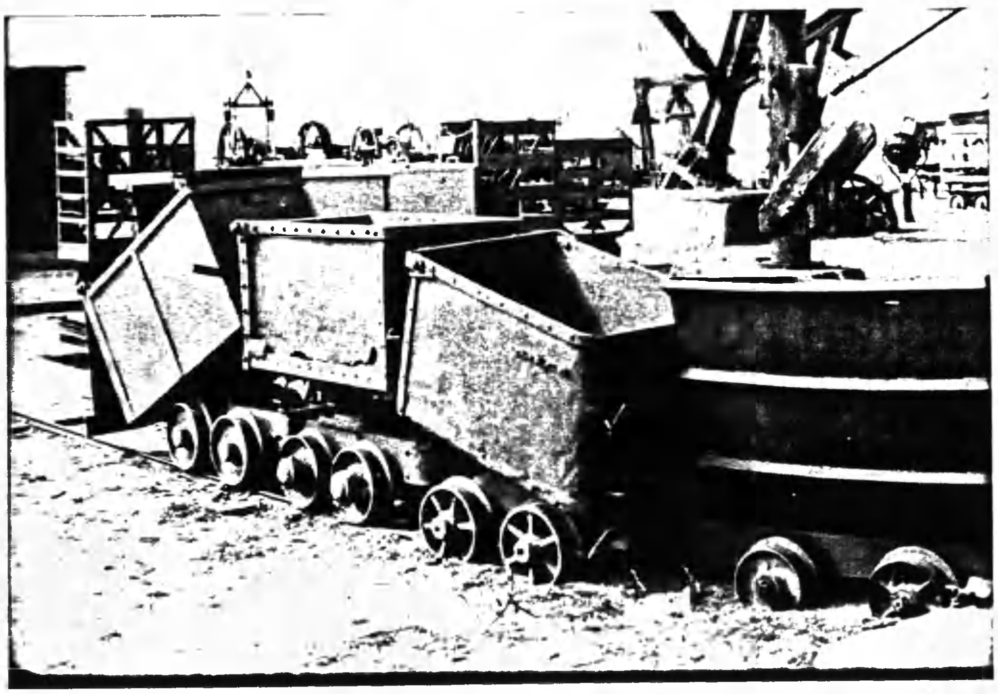
Photograph 5.
Wooden Ore Cage



Photograph 6. Wooden Ore Car

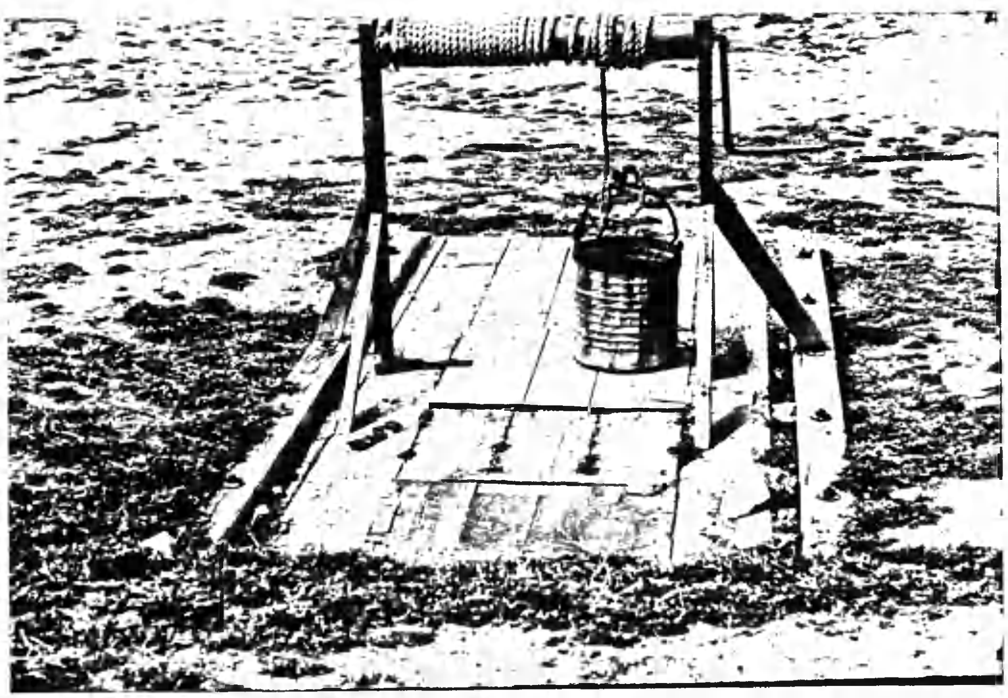


Photograph 7. Hand Hewn Wooden Ore Car

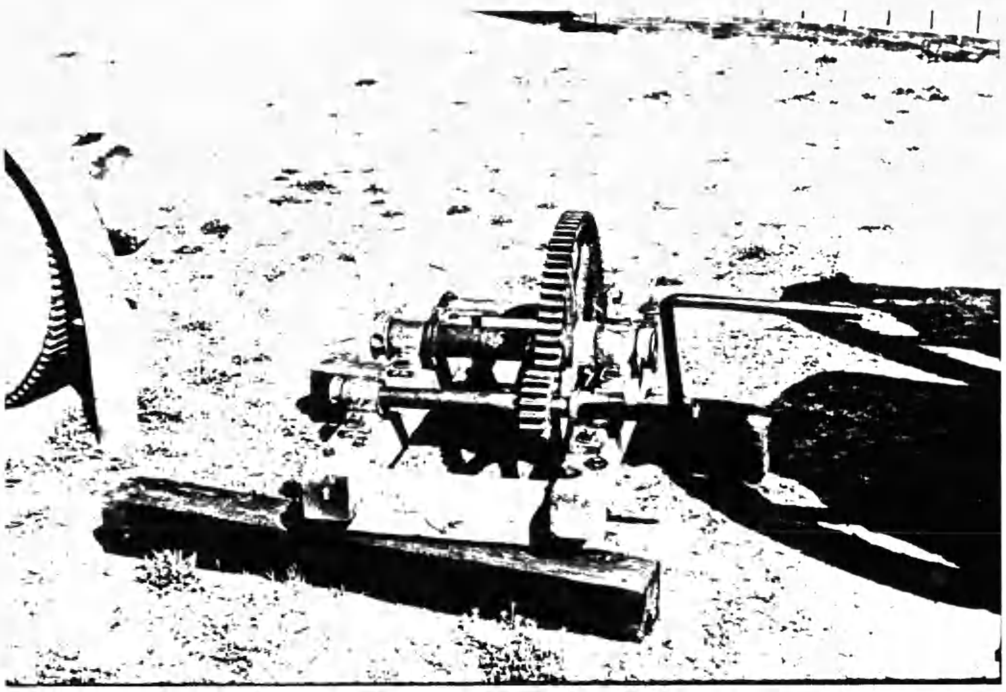


Photograph 8. Steel Ore Car

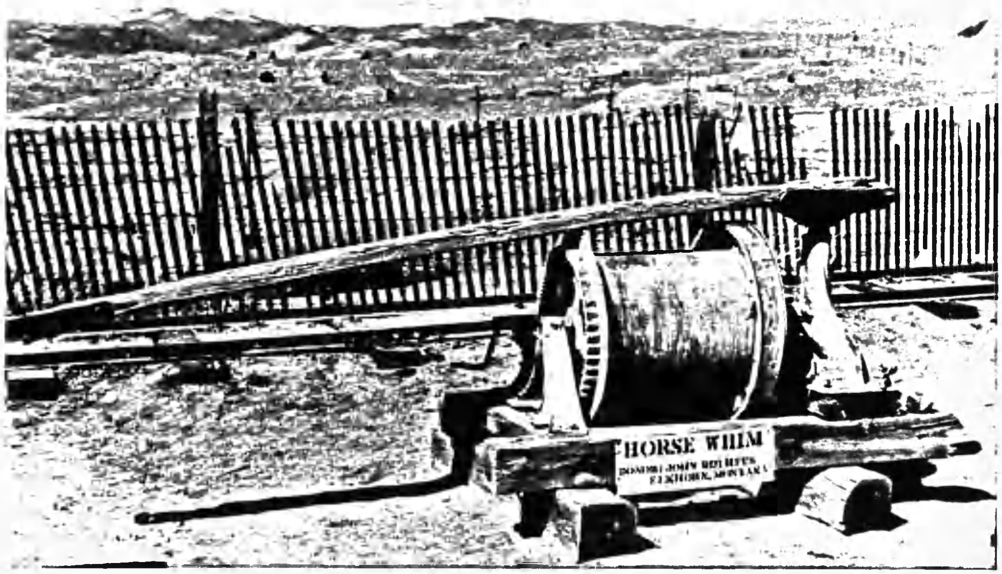
Photograph 9. Ore buckets.



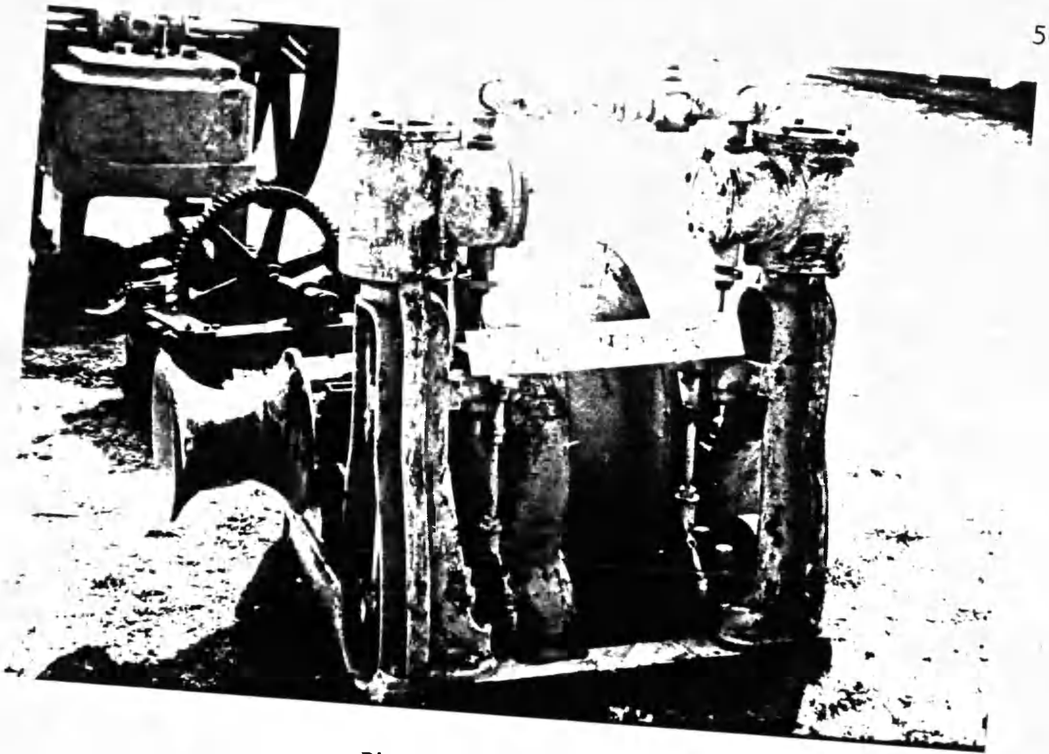
Photograph 10. Windlass.



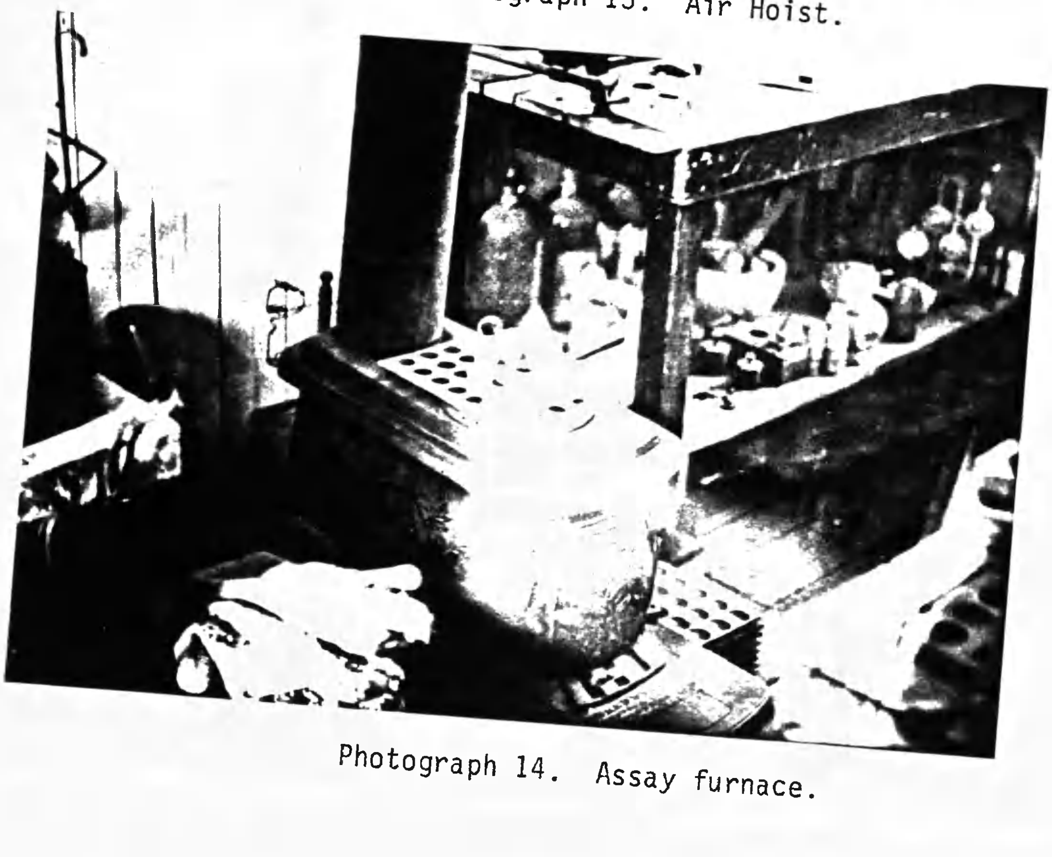
Photograph 11. Hand cranked hoist.



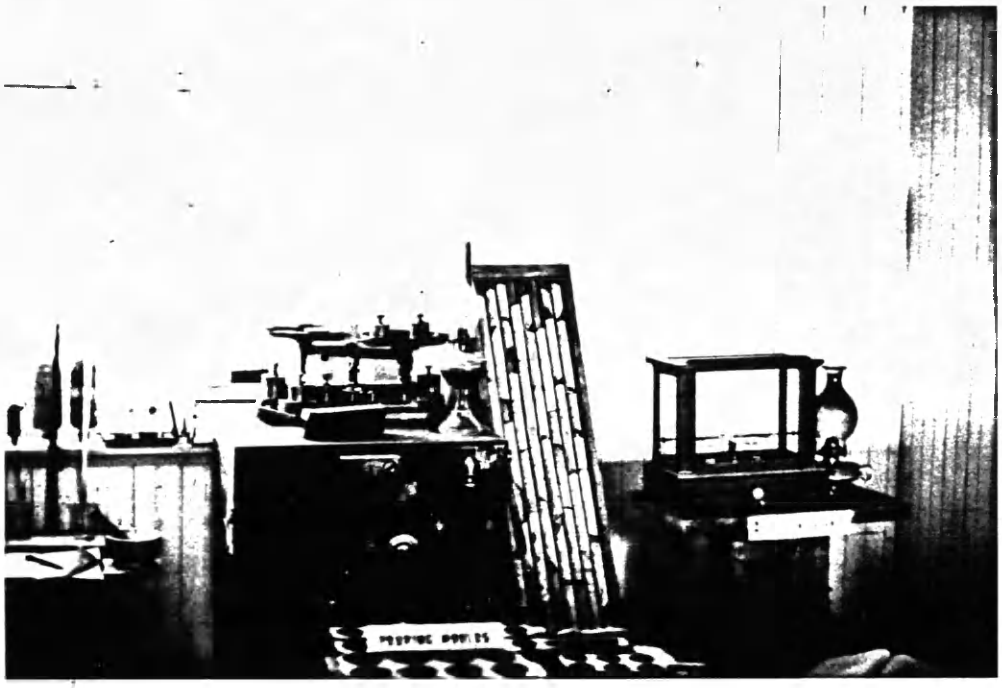
Photograph 12. Horse whim.



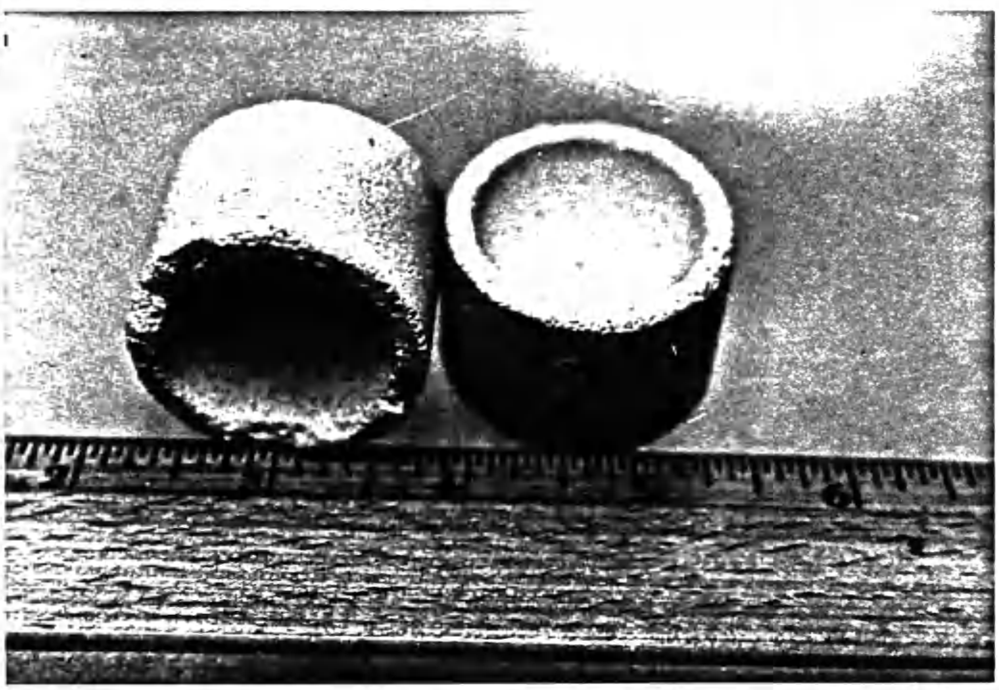
Photograph 13. Air Hoist.



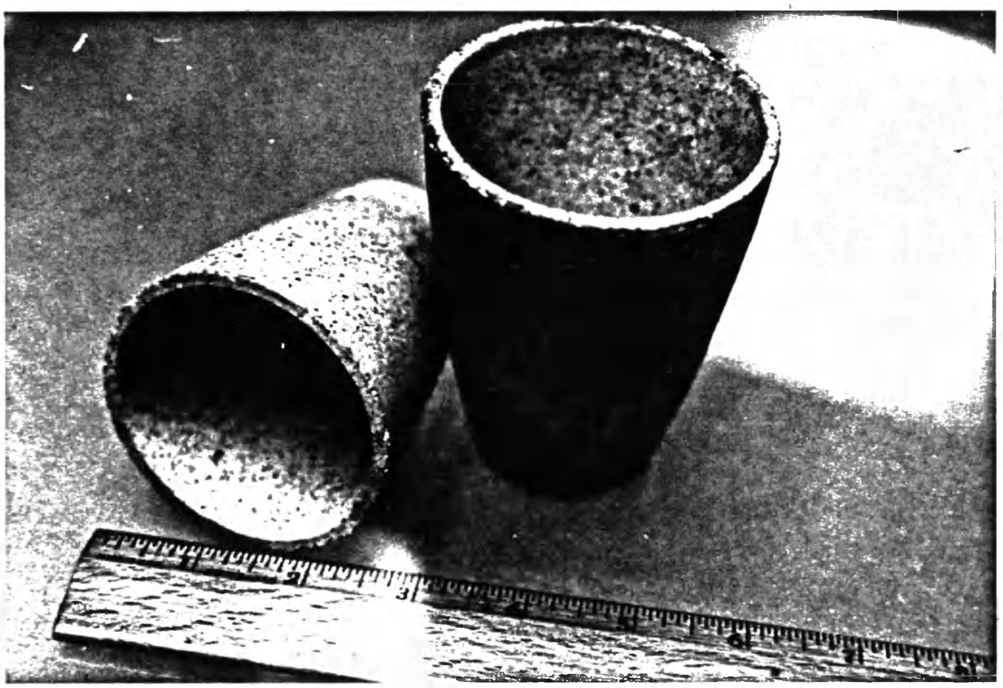
Photograph 14. Assay furnace.



Photograph 15. Assay Office.



Photograph 16. Cupels.



Photograph 17. Crucibles.

Mining History in the United States

Review of mining history in the United States will be used as a backdrop for understanding the development of the Yahk Mining Camp. The movement of mining into the western frontiers occurred during the Civil War (Billington 1974:529). There seemed to be no call greater than the lure of the untapped mineral resources, and these early miners allowed no obstacle to stand in their way, an attitude viewed by some as exploitive by others, industrious. They not only ignored the Civil War, but also defied Indian treaties in the Black Hills, forged paths through the wild mountains of Montana, and conquered the deserts of Nevada.

California

The first large gold rush was the 1849 California Gold Rush. News of the free gold available in the streams of the Sacramento and San Joaquin valleys spread out and soon was followed by hordes of interested gold seekers. These people traveled across the land in covered wagons and around Cape Horn via clipper ships. The first gold was attained through "placer mining" (Billington 1974:530). This process required few laborers and little capital outlay. By 1850, amounts of free gold attained by placering dwindled and this change created the need for hardrock mining. Hardrock mining required more manpower and greater capital.

After gaining the experience and knowledge necessary to embark on a mining career, people expanded out from California to test their luck in other areas. Besides being confined to the western states, the movement did not seem to follow any particular geographical pattern. The 1850's saw mining develop in Nevada, Colorado, Idaho, and British Columbia.

Colorado

Events in Colorado's mining history ranged from tragedy to success. An economic depression, the Panic of 1857, set the stage "for one of the wildest and least rational rushes in the nation's history" (Billington 1974:533). Eager to regain their economic balance perspective miners responded to newspaper ads heralding Pikes Peak gold as their panacea. Over 50,000 miners responded to the call in the spring of 1859 with signs on wagons exclaiming "Pikes Peak or Bust." More accurate became "Pikes Peak and Bust," because free gold proved scarce, and "by midsummer half of the 50,000 miners who actually reached Colorado were back in their eastern homes" (Billington 1974:533). The story began in 1860 when a prospector retrieving water for his coffee discovered gold around Leadville. This initiated placer operations which lasted 15 years, a time period surrounded by many folktales. In 1875, two penniless prospectors made a deal with a store owner to exchange supplies for half of their findings. The story tells that one of their provisions was a jug of whiskey which they drained one mile from their point of origin (the store). They proceeded to dig and struck an ore body which eventually yielded them a fortune. W. A. Tabor, the store owner, celebrated with a total of $1 million for his original $17 investment (Wallace

1976:26). In the end, the Leadville mines produced $215,000,000 in lead and silver. The Pikes Peak area did eventually yield gold in the form of gold telluride, an ore that went unrecognized until assayers testing began using a blow pipe to separate the gold out. This area, Cripple Creek, produced several mines and great wealth.

Nevada

Nevada's tales of discovery are equally colorful. In 1858, prospectors panning the soil from a gopher hole, discovered gold. A year later two men were digging a water hole and struck earth with yellowish sand. It was washed and displayed remnants of gold. Henry Comstock, fur trader, trapper, and shyster, appeared on the scene, declared that he owned 160 acres of the area, and demanded an equal share for himself and his partner. As a result Comstock ended up with a large share of the claim. Later the Opher Mine was bought from Comstock for a few thousand dollars. The tragedy is that the mine produced around $17,000,000 worth of gold. Comstock committed suicide, and the two original prospectors died paupers. The aura of tricky dealings continued on as tradition in the Comstock mines. The Comstock is unique in a number of ways. The ore vein exceeded forty feet in height and the method of timbering at that time proved inadequate to mine a vein of this dimension. A German mining consultant was called in to engineer a new method, which resulted in "a system of timbering in 'square sets,' at once so novel and so effective that it became famous overnight" (Wallace 1976:64). The other unique feature of the Comstock is that monies from the mines profits were contributed to the Union cause and helped fund the Civil War.

Idaho

Idaho's mining history began back in 1853 when gold was discovered. Prospectors and miners were not allowed access into the area until the 1860's. The delay was caused by disputed treaties with the Nez Perce and Spokane Indians. The Indian Wars were over by 1863 and the rush was on. In 1885, Noah Kellogg discovered gold in the form of galena, in an ore body that was later developed into the Bunker Hill Mine. At the Bunker Hill mines there were several labor disputes between 1892 and 1899. The newly formed unions demanded that the laborers be allowed to discontinue payments for medical insurance as there were no hospitals available. Another dispute about freight rates ended in strikes that shut all mines down. Yet another issue concerning pay rate increases resulted in mine workers dynamiting a tramway and processing mill. The mine owners responded by backing a declaration of martial law, resulting in armed soldiers escorting nonunion workers to the mines. The conflicts were settled when it was discovered that the major source of trouble was a few imported agitators; the agitators were exiled and peace was restored (Rickard 1932a:311-314 and 318-339).

Canada

One of the last, broadly recorded rushes occurred in the Klondike region of Canada's Northwest Territory. Historically, it is known as the most futile gold rush in the history of mining. It began in the winter of 1897. Arrival to the area required a grueling ascent up the Chilkoot Pass to "a wilderness of tundra and forest that spread across an area almost the size of Texas" (Wallace 1976:199). The pass was well known for its frequent avalanches. At the top of the pass a police post checked prospectors for adequate supplies, without which they were turned back. In order to assure passage the load of supplies had to be carried up the pass in several trips. "The average load that a city-bred man or woman could carry up that slope was 50 pounds, and it took 6 hours to make the climb. At that rate it would require 35 or 40 trips and allowing for delays caused by frequent storms, 3 months to get the job done" (Wallace 1976:211). Once they had crossed the pass and gone through the miles of frozen rivers and streams, the prospector had to penetrate up to fifty feet of permafrost to reach bedrock (Wallace 1976:205). In the end, for many, the major accomplishment of a Klondike excursion was simply surviving the trip.

Mining History in Montana

A chronological ordering of the hallmarks of mining discoveries in Montana reveals a fascinating story. The first chapter takes place in 1852 when a prospector by the name of Francois Finlay discovered gold on Gold Creek in the Deerlodge Valley. His discovery went unnoticed and it was not until 1858 that the discovery came to public notice. Two prospectors wandered onto Gold Creek and found gold, but left when they were threatened by Blackfeet Indians. In 1860, several prospectors returned and numbers increased as miners were joined by some men enroute to some Idaho mines. In 1860, work in Gold Creek is noteworthy because it was the first of systematic mining in Montana. An ingenuous Henry Thomas constructed sluice boxes to increase his daily yield considerably (Greever 1963:215-216; Rickard 1932a:341).

The year 1862 was marked by a discovery of gold on Grasshopper Creek by John White. The rush that ensued led to the settlement of Bannack City. "The placers of Bannack yielded about $4,000,000 in gold" (Rickard 1932a:3420). During that same year, the first hardrock mining began at the Decotah Lode where there was a water-powered mill with stamps made out of wagon tires (Greever 1963:216-2170).

Alder Creek has received notoriety as "the richest placer diggings ever developed in Montana" (Rickard 1932a:342). Its discovery in 1863 was followed by the settling of Virginia City. More locally pertinent is the story of the gold rush to the Kootenai area. Many from Virginia City left to head for the new strike and got as far as Hellgate Canyon near Missoula. There they met discouraged miners who disclosed the fact that the rumor was a hoax (Toole 1973:70).

By 1864, Alder Gulch boasted of 10,000-15,000 placer miners. These were well paid for their efforts, for by 1898 $30,000,000 in gold had been extracted (Rickard 1932a:219). There was even word of nuggets appearing in the area each worth $200-$800 (Greever 1963:3420). Discovery of gold at Last Chance Gulch yielded $30,000,000 in gold. Another placer operation called Confederate Gulch is famous in Montana mining history for producing more gold per square yard in less time than any other placer in Montana. The same year, a lode claim named Travona was staked out near where the town of Butte would be established in 1866. In May of 1864, Montana Territory was established with Virginia City as its territorial capital. The seal for the territory was appropriately the miner's pick and shovel with the farmer's plow in the background (Billington 1976:543). This tribute to the miner, along with the fact that four major cities sprung up around mines, emphasizes the importance of the mining industry to Montana history.

In the year 1873, miners first began to mine copper. The delay in the development of copper mining is attributed to the fact that copper mining required a much more sophisticated system, a good economy, and railroad transportation (Rickard 1932a:350).

"Butte began to revive in 1875, as a silver rather than gold camp" (Greever 1963:222). A smelter was built and production of silver dominated the Butte scene until 1887. That year, Marcus Daly arrived in Butte where he took an option on the Alice Mine for $5,000 (Rickard 1932a:349). He was to have a major impact on the history of mining. His contribution was enormous and volumes have been written on this subject. The peak of the era of placer mining occurred in Montana in 1876, when there was a total yield of $150,000,000 (Rickard 1932a:344).

Daly bought the Anaconda Mine in 1881 where he later coordinated the advanced mechanization of the mills. That year, the Butte mining industry was well into its third phase of development, that devoted to copper (Rickard 1932a:352). "Butte's potential as a copper mining center was not fully developed until after the arrival of the Utah and Northern Railroad in the early 80s" (Alvin 1972:25).

Obviously, presented here is only capsulation of mining in Montana's history. Tales of personal hardships, fierce competition, lawlessness, tragedy and success abound. What then will the unweaving of the Yahk's history yield; a story with threads similar to the more famous of Montana's communities or one uniquely distinctive?

The History of the Yahk Mining District

The second research domain asks: What information does the written record yield about the specific history of the Yahk Mining District? How does the site compare to the reported history of other mining camps?

Implications: The written record will undoubtedly provide information significant in piecing together the history of the Yahk Mining District. Information that the written history provides can be developed into an outline but must include information from the archaeological record to complete the story. As discussed in Chapter II, written information may be limited to topics that are "newsworthy", lacking discussion of lifestyle.

The Yahk Mining Camp in the 1890's

The following discussion will include mention of different mining claims within the Yahk Mining District.

1894

The Yahk Mining Camp began with the discovery of free gold at the head of Crawford Creek and at Friday Hill. Two trappers, Pete Berg and Bill Lemley, made the discovery in 1894. Since they originally believed the ore to be Sylvanite ore which is a telluride of silver, the area was christened Sylvanite. During 1894 a Leonia merchant, E. F. Merrin, acquired over $1,500 worth of gold dust, much of which came from the Yahk (Kootenai Herald, December 1894).

1895

The news of the gold strike spread rapidly and the July 6, 1895 headlines of the Kootenai Herald proclaimed that there was a "Stampede to the Yahk." The first news couched in grandiose phrasing, proclaimed there to be "a mountain of it" (Kootenai Herald, July 6, 1895). Initially, the prospectors announced that the claims sat squarely within the state of Idaho. By August of that year the Kootenai Herald told of 100 men in the camp with 100 claims, spread over a three-by-five-mile area. The assays received from several claims in the area ranged from $4.25 a ton to $64.00 a ton. Work at the mines was substantial enough to warrant the construction of a wagon road from the mouth of the Yahk River up to the camp. The camp acquired the name of Lemleyberg in the newspaper articles and was referred to as such throughout the 1890's. That name was a tribute to one of the trappers who had made the first discovery of gold at the head of Crawford Creek.

A particularly productive claim called the Keystone, located and owned by William Johnson and S. J. Whitcomb, was bonded by two separate parties. When a claim was bonded it meant that a miner had to put up a bond to work the claim in order to protect the owner. Often the miner was given the option to purchase the claim at a later date. In August 1895, Jap King bonded the Keystone for $200.00 on William Johnson's interest. In November, a group of capitalists from Spokane arranged for payments to be made to purchase the Keystone. Since full payment had not been made, the purchasers, Mr. French and Mr. Campbell, bonded the Keystone for $12,500. A Mr. H. J. Jory was assigned to run the operation and represent the Spokane firm (Kootenai Herald July-November 1895).

1896

Apparently French and Campbell misjudged Jory's character. By January 1896, Jory had been accused of jumping five claims. Hastily a delegation from Leonia was dispatched to confront the problem in a miners meeting, complete with appointed officials. Jory presented the excuse that the claims were improperly located and he had moved the claims to protect the interest of his company. The committee did not accept Jory's explanation and the resultant decision on the case was best described in the Kootenai Herald, "They plainly intimate in some instances that the climate on the Yahk may become too warm, even in the dead of winter, to make it a congenial stopping place for Jory" (January 25, 1896). Needless to say, Jory disappeared from the Yahk scene.

The camp weathered several other problems in these early years. Confusion arose over the problem as to whether the mining district was located in Montana or Idaho. A shaft on the Keystone had to be abandoned, due to flooding, and the work on the Julietta claim had to shut down due to the exorbitant cost of getting in supplies ($.05 per pound).

In spite of these obstacles, work progressed both at the camp and at the nearby townsite of Sylvanite. At the camp at least sixteen buildings were under construction and more were scheduled to be built. There were fifty men in camp. The Keystone's tunnels and shafts were lengthened and profiting $4.00 per ton in its free gold. The Keystone expanded by the addition of an office, ore bins, more bunkhouses, and the erection of a water-powered 10 stamp mill. Forty-eight men were employed at the Keystone. A $6,000 payment on the Keystone lifted the bond which meant the claim was owned free and clear (Kootenai Herald, February-October 1896).

The Goldflint Claim was developed, with Charles Bartlett in charge. Chicago parties invested in the claim. Eight men were to work the claim through the winter, and fifteen to twenty men were hired to build roads and buildings. A concentrating plant was planned for construction in the spring. The Jim Hill Claim was bonded for $30,000 (Kootenai Herald, June-October 1896). Access to the newly developed claims was made possible where, "Around 1896, Edward Gilson helped cut a road wide enough for wagons from the Kootenai River across from Leonia to the Sylvanite Mines" (Kootenai Herald, June-October 1896).

Sylvanite became a thriving town the year of 1896. The land for the townsite was surveyed and platted, and M. S. Lindsey became town manager. The Evergreen Placer was to be divided into lots with streets and avenues and the first fifty claims to the lots were to be leased for $25.00 as ten-year leases. Seventy men were on the payroll at Sylvanite (Kootenai Herald, April-October 1896). The town grew rapidly; log stores, saloons, a post office, and hotels were constructed in the winter of 1896.

1897

Transportation routes were expanded when E. L. Preston and a crew of 25 men "built a wagon road from Troy to Sylvanite, with a wooden bridge up the river at Yaak Falls" (Friedman, Brechtel, Martarano, and Walker 1983:49).

The Sylvanite townsite had a growth spurt with a population of 500 people, three merchandise stores, three hotels, one drug store, six saloons, and one saw mill (Western News, 1931). There were 200 men on the payroll at Sylvanite. A newspaper, the Sylvanite Miner, began publishing and was edited by George Shawler. It was praised by the Kootenai Herald as "a neat 6-column folio well edited...." Its news covered local mining development and the first issue reported on the Keystone and Goldflint claims. The Keystone was to build a new mill and tram.

The news about the continuing development of the Goldflint Mine boasted that three shifts of men were lengthening a 450-foot tunnel. Larger ore bins were added. The Goldflint Mill was reported to process eighty tons of ore per day and the machinery for the mill was to arrive in two weeks. The total cost of the mill was $35,000. The Doran Freight and Transportation Company had been contracted to haul 150 tons of machinery and supplies to the Goldflint. The company was also to haul concentrates from the Keystone to Leonia (Kootenai Herald, August 1897).

The Keystone made plans to build a tramway from the mine up on the hill down to the mill in the valley. This year it produced a gold brick worth $1,900 resulting from a 308-ton run through the 10 stamp mill (Kootenai Herald, February-January 1897). There were eighteen men employed at the mine. Miners at the Keystone worked three eight-hour shifts and thus far the tunnel was 500 feet long.

1898

The year of 1898 was truly one of boom and bust. The Keystone Mining Company which operated the Keystone had employed eighteen miners, eight topmen, one manager (R. K. Neil), one superintendent (Jesse Colter), one foreman (W. M. Anderson), and nine others (probably millmen) for a total of thirty-five employees. The 10 stamp mill was still in operation, producing thirty tons of ore every twenty-four hours (Johns, 1970; Byrne, 1898; Montana Bureau of Agriculture, Labor and Industry; Kootenai Herald, August 1898).

The Goldflint Mining Company employed twelve men; operator and owner (R. K. Neil), superintendent and manager (C. H. Bartlett), foreman (Martin Murray), eight miners and one topman. A crew was engaged in constructing a 20 stamp mill to be completed the winter of 1898 (Byrne, 1898; Montana Bureau of Agriculture, Labor and Industry; 1898).

Written documentation becomes confusing at this point, for in the August 20th edition of the 1898 Kootenai Herald, the town of Sylvanite is reported as being nearly deserted, both mills had shut down and many local residents had moved to Bonners Ferry, Idaho. The only explanation for the decline was proposed in 1909 by two geologists, "It is possible that base ore which could not be treated by the free mining process had been found in depth" (Calkins and McDonald 1909).

1899

The Keystone and Goldflint claims consolidated. The Keystone and Great Northern claims were patented. The Jim Hill claim changed owners. Mining was definitely on the decline as the Kootenai Herald announced that forfeiture notices on Yahk District were to be published.

1900

There is little news of the camp. The old mills were to be torn down to erect a 100 stamp mill, a project which never materialized. Stage runs were still traveling between Troy, Leonia, and Sylvanite (Libby News, August 2, 1900).

The 1800's mining era came in, marked by tremendous amounts of activity and remarkable rapidity and left with an almost eerie, abruptness.

The Yahk Mining Camp in the 1910's

In the period between 1900 and 1910, the only notable activity was the patenting of the Goldflint in 1904. Fritz Lang, an original prospector in the Yahk Mining District, had been serving as watchman of the townsite and mine for the Keystone Goldflint Consolidated Mining Company since 1898.

Starting with the first month of 1910, there was a flurry of activity within the Yahk Mining District. Owner of the Goldflint and Keystone, F. E. Libenow sold the claims to Canadian capitalists for $75,000 cash, but retained interest in the mine. The mining superintendent, H. I. Reynolds, predicted that 200-300 people would be employed by May 1910 (Bonners Ferry Herald, January-March 1910).

Fritz Lang hit an eight-foot-wide vein with free gold on the Blue Bell claim on Crawford Creek. The Keystone mill was reopened, managed by George Blackwell, running eight-hour shifts. A 2,400-foot-long tramway went into service. After the Keystone mill began, the 20 stamp Goldflint mill started processing ores from the 350-foot level of the Keystone adit. The ore was valued at $10.00 per ton of ore. However, within a short time both mills shut down for improvements; stamps were to be added, a flume constucted, chutes and drifts cleaned out, an electric dynamo and compressor plant installed, and winter quarters built (Troy Herald, June-July 1910).

Reports were made of the new organization of the Lincoln Gold Mining Company. The vice-president was C. R. Westgate of Montreal; R. H. Reynolds, secretary/treasurer; A. J. Cameron, bookeeper; Edward

Beaton, assayer; and the directors: C. R. Henderson, C. R. Westgate, F. E. Libenow, R. H. Reynolds, and J. H. Ehlers. The directors announced that the planned 30 stamp mill would be boosted to 45 stamps as soon as possible. They also decided that men with families would be given first priority in filling job vacancies (Troy Herald, May 1910).

J. H. Ehlers, the owner of Sylvanite, began to sell lots. The old "Tremont" house sold for $700.00, a two-story brick building was to be constucted as offices for the Lincoln Gold Mining Company and other businesses, and a merchantile business was opened. The Sylvanite Club was to serve spirits and meals. The local sawmill was scheduled to reopen.

An interesting twist occurred during the 1910 era of mining. Whereas the town of Leonia served as the major trade network for Sylvanite in the 1890's, Troy now took over that role. A telephoneline was to connect Troy with Sylvanite. The reason for the change of marketing centers is not known.

The "30 stamp mill" was constructed beside the Yahk River and was awaiting steam connection in June. Archaeological evidence of the stamp mill indicates that it did not hold 30 stamps, but only could have accommodated 20. The stamp mill never processed any ore. By August 26th, the townsite of Sylvanite and the mining camp had been destroyed by fire, leaving only the Sylvanite Hotel standing. It has been rumored that it survived only because, "a lot of liquor was stored therein and the boys fought like hell to save it" (Grush in

Friedman, Brechtel, Martarano, and Walker 1983:30). The fires began on Seventeen-Mile Creek and rushed up the valley. The Lincoln Gold Mining Company lost $40,000 in property. The townsite's losses totaled $75,000 (Troy Herald, August 1910). Only two cabin sites survived the 1910 fire [Features 19-21 and 91] and remain from the early mining eras.

Despite this overwhelming catastrophe, hope reigned. The company announced plans to rebuild the camp and expected to employ 100 men within sixty days. A sawyer, an engineer, and two others were employed to cut lumber for the Lincoln Gold Mining Company.

1911

The cutting of 150,000 board feet of lumber for the townsite of Sylvanite began in 1911. Bridges were rebuilt, the road between Troy and Sylvanite repaired, and lumber was ordered for the mills and mines. All of this was in preparation for the rebuilding of the Yahk Mining empire (Libby Herald, April-August 1911). Yet, an air of doubt surrounded these reports, in spite of Yahk promoter, J. H. Ehler's statement that "the Yahk looks bright for activity" (Libby Herald, September 26, 1911).

1912

Indeed the rebuilding never came to pass, and the last bit of mining news was a rather dismal announcement as Sheriff Baney was reported to have served papers upon the owners of the properties of the Lincoln Gold Mining Company. The details of this event are missing (Libby Herald, March 21, 1912).

The Yahk Mining Camp in the 1930's

Newspaper items about the mining activity in the Yahk District are vague and sparse. I do not believe that this necessarily reflects the real amount of activity, for there were at least nineteen large structures built (homes, stamp mills, shops, and offices) and several more outbuildings. Considerable ore must have been extracted as indicated by the new development. Rather, the scarcity of mining news likely reflects a change in perspective by the local newspapers. In the 1890's and 1910's little activity occurred locally, and national news did not reach isolated areas. To local people, the Yahk mining camp was big news during the 1890's, but by the 1930's they regularly read national and international events in the news. News of the Yahk mining development had to compete for space with news of President Roosevelt's new economic recovery programs. I discussed my speculation with a local historian who seemed to agree with me (O'Gorman 1984). Whatever the reason for the paucity of information, the mining news lost out.

1932-1934

The Keystone properties were owned by Percy Goodwin and Frank McNees. Steel rails buried in tailings piles were removed to be adapted for reuse. Joe Thornton's house was built by a carpenter described as a "big Norwegian" and a young man (Barron 1984). The young man, Don Barron, also helped by digging water line to Joe's house as well as others up on the hill.

A stamp mill built by Percy Goodwin and Carl Cummings was opened August 29th, running two shifts, operated by Frank McNees and associates. A total of fourteen men worked in the camp. They began by processing old tailings (Troy Tribune, September 1932). Goodwin and Cummings also spent much of that winter cleaning out the Keystone tunnel, replacing timbers, and building three miles of road up to the mine (Cummings 1983). The retimbering was done by using salvageable timber that survived the 1910 fire. C. Walker, M. Murphy, and G. Hoffman contracted to extract ore from the Keystone. The mine was reported to have seven floors which kept the mill running continuously, seven days a week, twenty four hours a day, with the exception of two days at Christmas. (Troy Tribune, September 1932). [See appendices 3 and 4 for illustrations]. Forty tons of ore every twenty-four hours was sent to the mill. The mill workers consisted of Stanley Bruce (general foreman), a Mr. Backus (day shift-foreman's helper), Carl Cummings (afternoon shift-foreman), Don Barron (afternoon shift-foreman's helper), Carroll DeBorde (midnight shift-foreman), and Maurice DeBorde (midnight shift-foreman's helper) (Don Barron 1984).

1935

The Keystone mine began shipping concentrates of ore via truck to Troy and then by freight car to a smelter in Helena. The ore value in gold and silver was $20.00 a ton. The Keystone had the reputation of being the largest mining operation in the district. The mine was worked in three shifts by a crew of thirty men (Bonners Ferry Herald, February 1935). The Keystone Mining Company was sold by Frank McNees to Joe Thornton of Spokane in 1937 or 1938 (Della Cummings, personal communication, 1983). He received $25,000 for his interest McNeill 1983).

1936

The Haywire Mining and Milling Company, organized by J. H. Thornton, Frank Speece, and Ray Rannells was incorporated. The company was to be capitalized at $100,000, divided into 1,000,000 shares to be marketed at 10 cents a share. The company bought a 10 stamp mill to be erected in the spring of 1936 (Bonners Ferry Herald, November 1936). Work progressed on nine claims adjacent to the Keystone.

1937

The headlines of the June 10th, 1937 Bonners Ferry Herald read, "Shiny Bars from the Keystone Mine are Exhibited Here by Thornton." Apparently the two gold bars worth $2,500 and $3,000 came from a recent "cleanup." The gold was going to be sent to the U.S. Assay Office at Seattle, Washington. In August 1937, $4,000 worth of gold sponge was to be sent to the assay office. This gold was a result of a fourteen-day run through a 10 stamp mill processing 300 tons of ore. At that time the papers reported that another 10 stamp mill would be ready for operation within ten days and would double the capacity of ore processing. This information is confusing because there is a 20 stamp mill and a 5 stamp mill standing at the site today. Announced also was the installation of a new 100 horsepower international diesel engine and a 400-foot compressor. Purchase was made of a diesel caterpillar and a bulldozer. Frank McNees apparently remained active as general manager of the Sylvanite Mining Company. (Bonners Ferry Herald, 1937).

Between 1931 and 1937, the Sylvanite mines produced 22,000 tons of ore valued at $246,000 (Johns 1970). As was mentioned, information in this era was scarce, especially that which might explain the mining decline in 1937. Therefore, we must rely heavily on the archaeological record to furnish clues that might help us.

In answer to this research question, newspaper research provides excellent time markers for "major" events of the Yahk Mining District's history; opening and closing of mines and businesses, the profits made from the ore runs. They also highlighted names of people who were a part of the power structure; the mine owners and managers. However, it took oral interview and the archaeological record to fill in the more "mundane" events.

CHAPTER IV

ENVIRONMENTAL DESCRIPTION

Examination of how man interacts with his environment has long been of major concern to archaeologists. In the 1940's, when this approach became widely applied it was referred to as "cultural ecology" and later it evolved into the "ecosystem" approach (Willey and Sabloff 1980). These studies indicate that man was intimately tied to his environment; man reacted to and manipulated his environment throughout prehistory. The application of this approach should not be limited to prehistoric man. I believe that it has diachronic application; that man in history too was molded by his environment. With this assumption the third research question asks "How did environmental factors influence decisions that the Yahk residents made?"

Geology

The site sits in the Purcell Range of the northern Rocky Mountain physiographic province. The origin of the rocks in the area goes back to the Precambrian Era when tectonic forces created an enormous basin localized in Idaho, Washington, British Columbia, and Montana (White 1983). The basin served as a drainage, where eventually sand, silt, and clay were deposited in a layer 75,000 feet deep. These deposits are known as the Belt Super Group and contain the formations as seen in Table 1 for the Yaak River Valley.

TABLE 1

Date of Deposition	Formation Name	Formation Process	Resultant Rocks
	Libby Striped Peak	Terrestrial and deep water deposition	Argillites, quartzites, and sandstones
1,150 mya	Wallace	Sedimentation in warm seas limestones	Argillites, and quartzites,
1,200 mya	Ravalli	Terrestrial deposition	Argillites and quartzites
1,350 mya	Prichard	Deep water deposition	Argillites and limestones

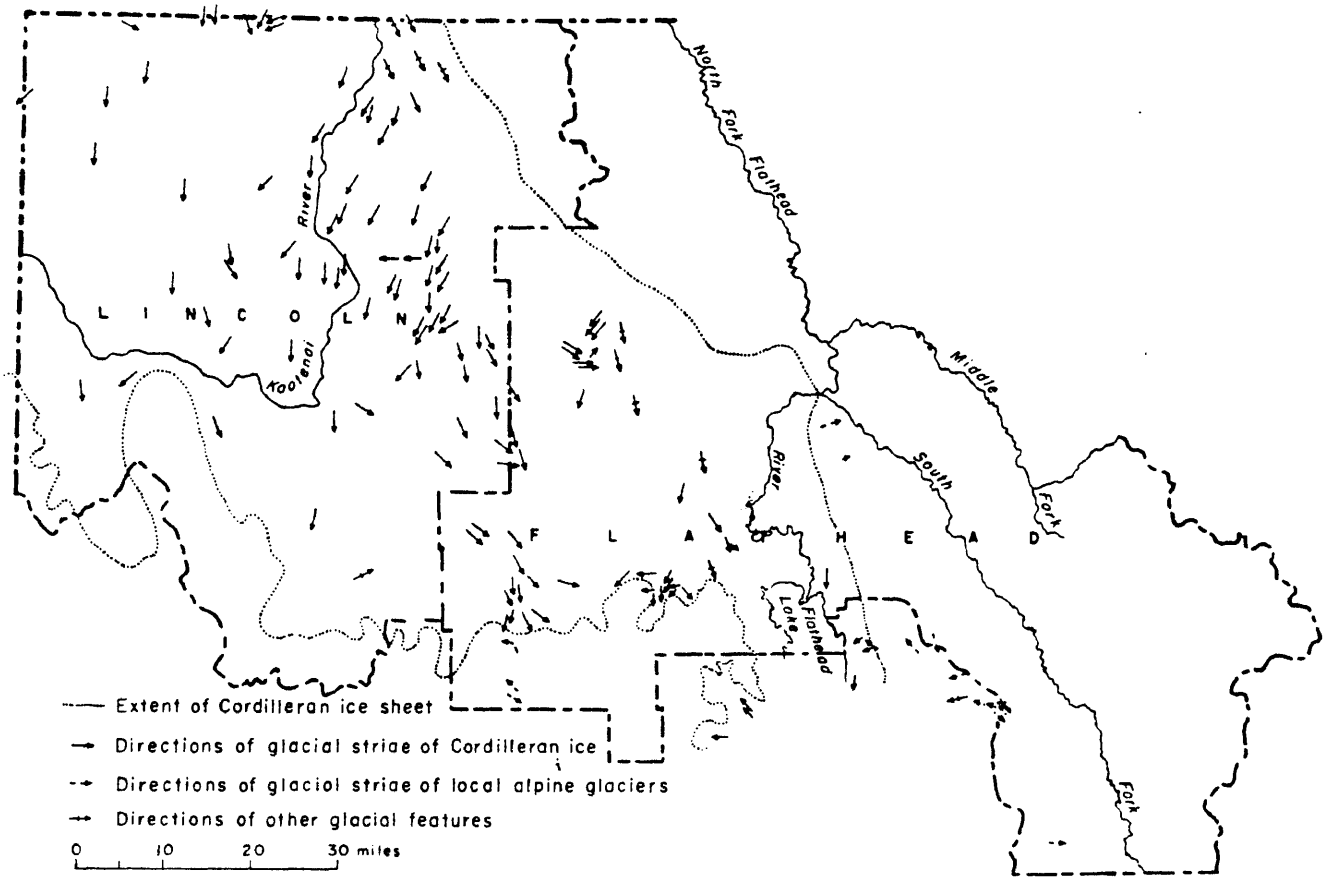
mya - million years ago (White 1983).

The valleys of the Kootenai were scoured out by the advance and retreat of the last Wisconsin Cordilleran ice sheet which affected elevations of up to 6,000 feet. Ice advanced from the north and moved southward "up the West Fork of the Yaak and also down the main Yaak Valley, but eventually overrode the divides to merge with adjacent lobes" as seen in Map 2 (Johns 1970:7). The ice carved a U-shaped valley that is known as the Yaak Valley.

The gold-silver sulfide ore body at the Sylvanite Mining District is a quartz vein, two to forty feet thick, that follows the

Glacial Movement in Northwestern Montana

Map 3



Map showing extent and direction of movement of Cordilleran ice sheet and valley glaciers.

(Johns 1970:8)

arc of the Sylvanite anticline. The "vein filled along the longitudinal faults and smaller fractures along the axis of the northwest striking Sylvanite anticline" (Johns 1970:112). The country rock is argillite and quartzite from the Prichard Formation (striking N20^{o}W and dipping 30^{o}NE) at the center of the fold, with rocks of the Ravalli Formation at the fringes (Johns 1970:69). Mineral exploration followed stratabound massive lead-zinc deposits of the Sullivan-type. These deposits are fine-grained aggregates of pyrrohtite, pyrite, sphalerite, galena, and chaleopyrite.

> The Sullivan deposit is in the Precambrian Aldredge Formation which is known as the Prichard in the U.S. The Prichard is the dominant formation exposed in the Yaak vicinity. A variety of evidence suggests that conditions in the Prichard in the Yaak area are compatible with a geologic environment in which a Sullivan-typed deposit could have formed. Although the current exploration overlaps with some areas of historic mineral activity, that overlap may be to a large degree coincidental. The Sullivan deposit is generally believed to be a volcano-sedimentary deposit formed by submarine exhalative processes coeval with sedimentary fan deposition. Such processes involves repeated expulsion of metal-bearing solutions into active sedimentation zones. Venting would have taken place along a normal fault forming the boundary between a horst that acted as the source area for sediments and a grubben into which they were deposited. A wide variey of evidence support this view. This evidence includes: (1) conformable contact between the deposit and adjacent bedding, (2) position within stratagraphic sequence, (3) small-scale soft sediment deformation structures within the sulfides, (4) lack of district relationship with faults, and (5) absence of intrusive source. (Marshall 1985)

The nature of the ore that the Yahk miner was seeking has been described as being composed of free-milling gold ore and auriferous pyrite (Calkins and McDonald 1909, Rowe 1911, Orem 1912, Johns 1959 and 1970). Free-milling gold ore is not combined with other substances, which makes the separation of the gold from its quart gangue (the material encasing the gold) relatively easy. Auriferous pyrite ore is composed of pyrite and gold. There are varing degrees to which these two minerals are interlocked. Intricately associated pyrite gold ores have been referred to as "rebellious" ores and require a more sophisticated extraction process (Egelston 1887:153).

The nature of the ores at the Yahk Mining District is clarified by making some educated deductions about the stratigraphy of the ore beds. From a study of the geological reports one can create a theoretical model of "zonation." The upper strata was composed of the free-milling gold ore contained in the quartz vein. Below that was the quartz vein containing auriferous pyrite. A lead zinc ore containing silver comprised the deepest zone (Thompson 1984).

Cultural Implications

The presence of the quartz vein rich in free gold was what originally drew the Yahk miner to the area. The "zonation" model helps to explain the decline of mining at the Yahk Mining District during the 1890's. It is likely that the 1890 Yahk miner was processing the free gold from the uppermost zone. A newspaper reporting on the camp at the time referred to the free gold throughout the 1890's (Kootenai Herald 1894-1897). A 1909 geological report verifies this information. Mining geologist, F. C. Calkins, reports "The extent of the workings would indicate that the mine had produced considerable free-milling gold ore" (Calkins and McDonald, 1909:103). By 1898, it is most probable that the miners had gone through the free-milling gold ore zone and hit the auriferous pyrite zone. Indeed Calkins verifies this contention saying "that the base ore which could not be treated by the free-milling process had been found in depth" (Calkins and McDonald 1909:103). In the 1890's the miners at the Yahk Camp probably did not possess the technology to process the ore from the auriferous pyrite zone.

Topography and Soil

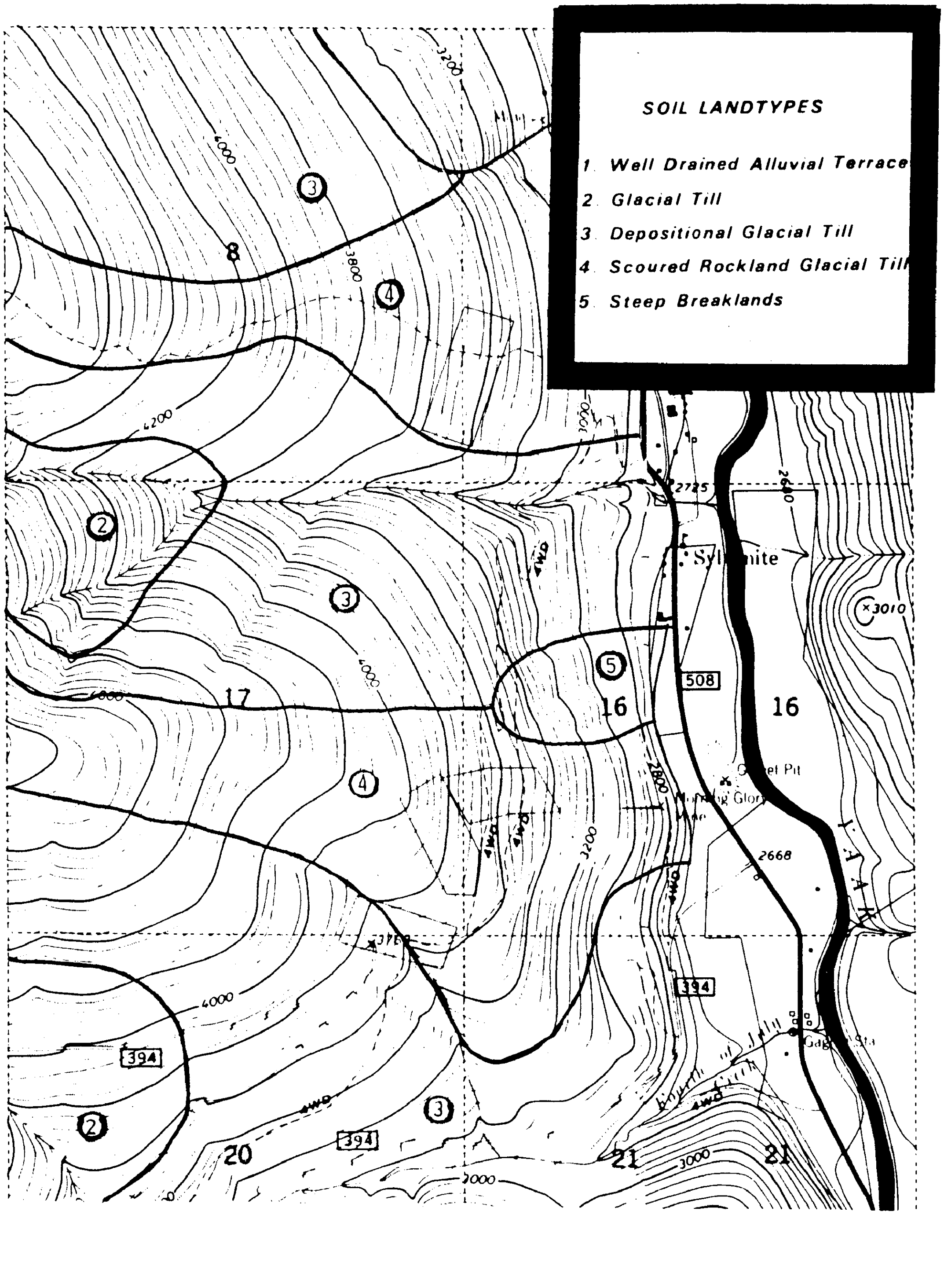
There are five landtypes identified by geomorphologic features, plant communities, and soil types that make up the area designated as the Yahk Mining District. A few details will describe these micro-environments in their relationship to topography and soil (see Map 3 for soil distinctions).

Land Type 1: Well Drained Alluvial Terrace. The general description is of "flat to gently undulating alluvial terraces at low elevations" occurring "adjacent to the major rivers." "The sandy loams developed in well drained alluvial deposits." The slopes vary from 0 to 15 percent and have variable aspects (Kuennen and Nielsen-Gerhardt 1983).

Land Type 2: Glacial Till. The general description is of "drainage heads and linear valley sideslopes," common on "continentally glaciated lands." "The silt loam topsoils and loam subsoils formed in dense glacial till overlain by a volcanic ash influences loess deposit." The slopes vary from 30 to 60 percent with a northerly aspect (Kuennen and Nielsen-Gerhardt 1983).

Land Type 3: Depositional Glacial Till. The general description is of "straight to convex low relief valley sideslopes,

Map 4


SOIL LANDTYPES
1. Well Drained Alluvial Terrace
2. Glacial Till
3. Depositional Glacial Till
4. Scoured Rockland Glacial Till
5. Steep Breaklands
8
17
16
16
20
21
21
508
394
394
394
2725
2668
3010
4000
3800
4200
3200
2800
2600
3000
4WD

associated with "continental glaciation." The silt loam topsoils and fine sandy loam subsoils are formed in dense till overlain by a volcanic ash influenced loess deposit. The slopes vary from 20 to 55 percent with northerly aspects (Kuennen and Nielsen-Gerhardt 1983).

Land Type 4: Scoured Rockland Glacial Till. The general description is of "glacially scoured convex valley sideslopes, associated with continental glaciation." "The soils are formed in dense glacial till overlain by a volcanic ash influenced loess deposit." The slopes vary from 20 to 50 percent with moist northerly aspects.

Land Type 5: The general description is of "steep breaklands with short deeply incised drainages as occur on continentally glaciated lands. The silt loam topsoil and sandy loam subsoils formed in dense glacial till overlain by a volcanic ash influences loess deposit." The slopes are 60 percent with northerly aspects (Kuennen and Nielsen-Gerhardt 1983).

Cultural Implications

An interpretation of how the topography and soils of the Yaak area might have affected the miners is somewhat difficult. Perhaps all that can be said is that the steep topography and rocky soils, especially in the area of concentration for mining and building construction (Land Type 4), provided many obstacles. Working with the steep slopes probably became a challenge when constructing roads and preparing surfaces for building platforms. Slumping of soils due to the slope no doubt remained a problem throughout the history of the camp. The glacial till underlying the shallow soils must have made excavation of adits and building sites hard work at best. Understanding that in the 1890's the technology was crude, the lure of gold must have been very strong to bring settlers into this camp and gives some insight to the drive of the early miners. Even in the 1930's, rebuilding the camp was not a light task.

Hydrology

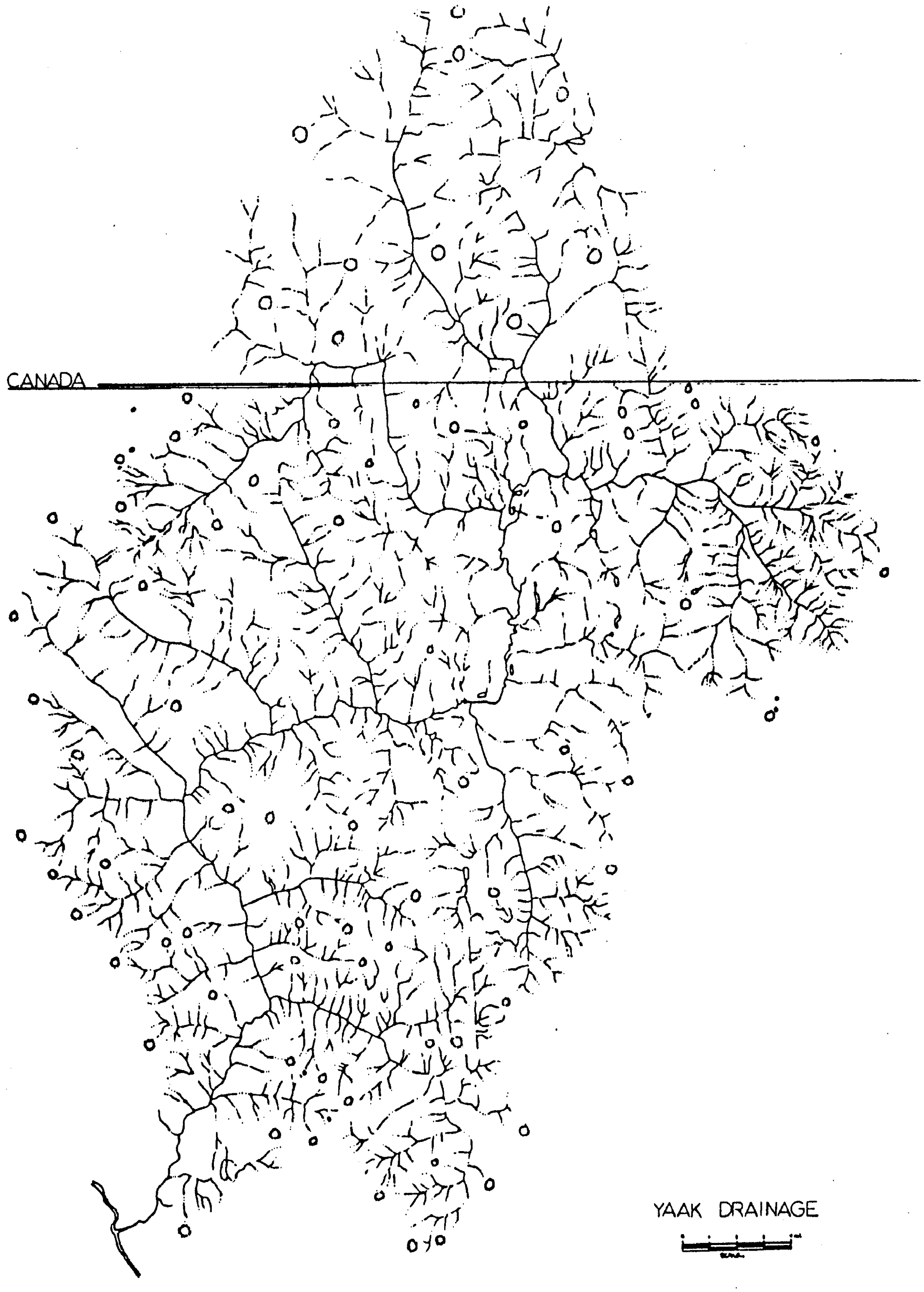
A dendritic drainage pattern characterized the hydrology of the Yaak River Valley. Map 4 illustrates this pattern (Calvi 1984). The major drainage adjacent to the Yahk Mining District is the Yaak River. The base level of the Yaak River is controlled by the Kootenai River and the bedrock keeps the Yaak River from cutting in deeply. The one intermittent drainage within the site area is Fourth of July Creek. The average annual precipitation for the area is 25 to 50 inches with 67 percent of the precipitation being snowfall and 33 percent rainfall. There are seven months each year when the area is snow free. The snow depth as measured at Friday Hill and Fourth of July Creek averages 79 inches. This figure has meaning when compared to the Troy area where the average annual snow depth is around 20 inches. The spring runoff occurs between the months of March and June. The springs in the area are reported to be more productive than are the intermittent drainages; creeks that flow only part of the year (Meshew 1983).

Cultural Implications

The heavy snow pack reported for the Yahk Mining District was a very significant environmental influence on the miner. Attempts were made throughout the history of the camp to winter in the area. To do

Drainage Pattern of the Yaak Valley

Map 5



so these miners had to reinforce living quarters to provide added protection. They also had to contend with the effects of freezing temperatures on water supply, heating fuels, and exposure of the miner to the elements. Another implication of the hydrology of the Yaak area was that the major water sources for the processing of ore were probably the springs. Indeed, springs are located at the heads of pipelines leading to the largest stamp mill.

Fisheries and Wildlife

The Yaak River is populated by rainbow trout, cutthroat trout, brook trout, and whitefish. Fourth of July Creek hosts rainbow and cutthroat trout (Lloyd 1983).

One distinguishable feature of the mining district area at present is its use by moose as winter habitat. There is a year-round use of the area by whitetail deer, mule deer, elk, and black bear.

Historically, two of those species were not indigenous to the Yaak Valley. Elk were introduced into the Rexford, Fisher River, and Trout Creek areas from Yellowstone populations (Byars 1983). Historical records also show the absence of elk, "The journals of David Thompson, Ross Cox, Alexander Ross, and W. A. Ferris, through the period from 1800 to 1830, make no mention of elk in the northwest part of Montana in what are now Lincoln, Sanders, and Mineral Counties...." (Koch 1941:366). Only 20 elk were sighted in 1936 (USFS Wildlife records). Moose are not endemic to the area. The first report of moose was in 1923 and it took until 1950 for a sizable herd to grow to 500 animals (USFS Wildlife records).

Cultural Implications

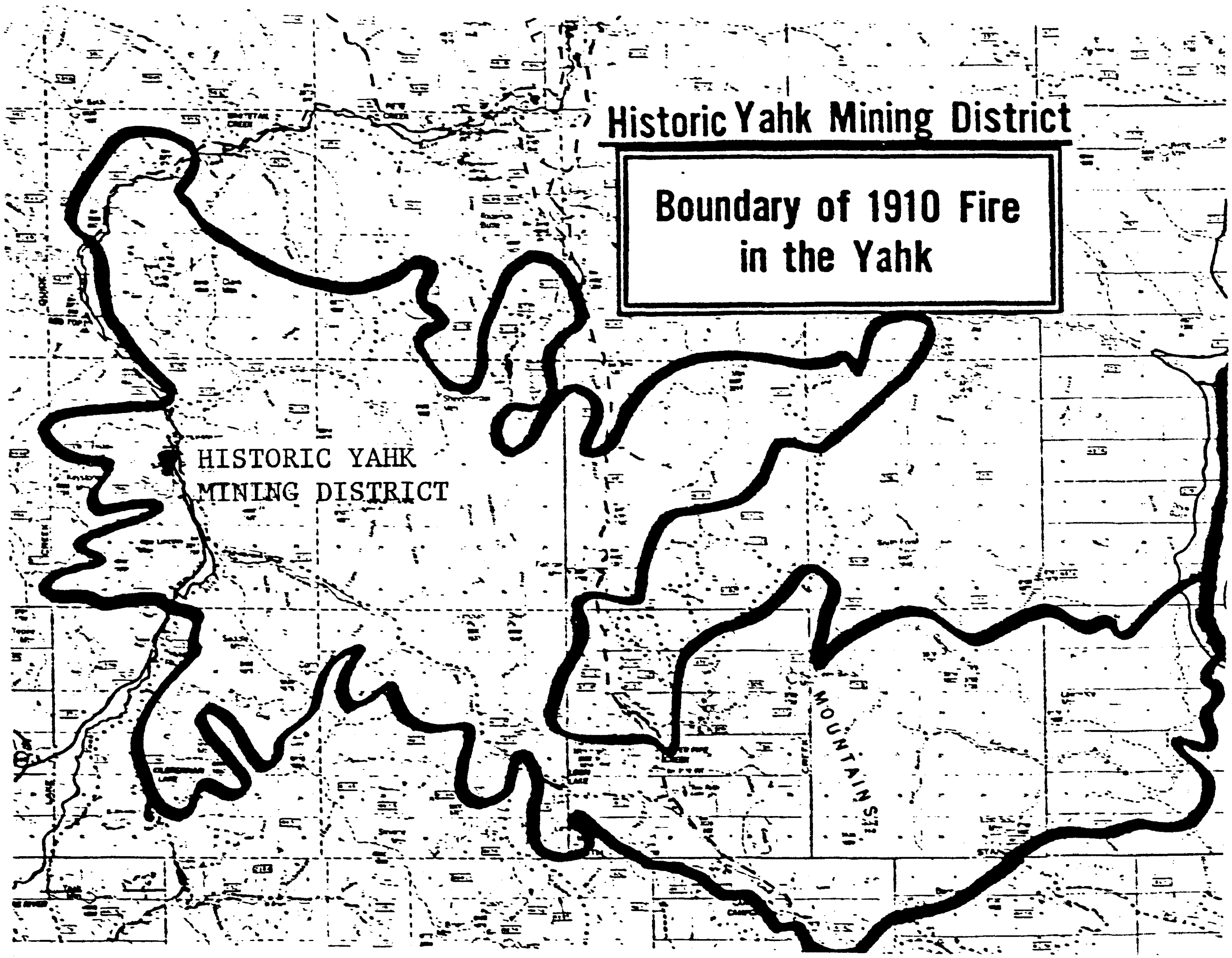
Projecting back into the environment of the late 1890's, it is unlikely that native large ungulates (deer) were present in any great numbers. Photographs taken of the Yaak prior to the 1910 fire show a dense forest of old growth timber. This type of habitat is not conducive for ungulate grazing. A fire in 1910, however, burned most of the area around the mining district, as seen in Map 5. One expects a positive response to the burn with an increase in the deer population. Indeed wildlife records from 1919 show the deer population to be high. There is no reason that this population would not remain high during the 1930's occupation of the site.

Timber and Fire History

> "The area was burned over in 1910. Only a few drainages were spared total destruction. Overall, the site was reforested naturally and consists primarily of a post-size stand today (from 5" to 7" in diameter), with lodgepole pine and larch making up this component. In the wetter areas, the lodgepole pine and larch have been replaced with a dense stand of cedar mixed with some hemlock. These areas are usually very thick. Around the rocky ledges, Douglas-fir/larch appear to be dominant. Of course there is a representation of other species within the area. White pine and some ponderosa pine may be observed, the ponderosa pine especially down low. In a few places where soil layer is thin over rock, the area appears parklike with a ground covering of pine grass and scattered lodgepole pine and Douglas-fir" (Calvi 1983).

Cultural Implications

Prior to 1910, carving out a community in the jungle-like density of the Yaak conifer forest was hard work. One positive aspect was that the forest yielded readily available construction materials. As a result log structures were prevalent house forms. After 1910, miners faced a very different challenge, the salvaging of


Historic Yahk Mining District
Boundary of 1910 Fire
in the Yahk
HISTORIC YAHK
MINING DISTRICT
MOUNTAINS

Map 6

timber from the fire to reconstruct the camp. By this time local lumber mills produced milled boards for use in reconstruction.

I have tried to speculate upon how the Yahk miner interacted with his environment. The archaeological record seems to indicate that, even in this small historical community, an intrinsic relationship between man and nature existed.

CHAPTER V

LIFESTYLE OF THE YAHK MINER

As has been stated before, anthropologists seek to record the day to day events. Commonly, this information appears in monograms under chapter headings grouped into behavioral units; religion, social organization, politics, economics, subsistence, settlement patterns. Borrowing from the ethnographer, I will present the next set of research questions using this type of organization.

Settlement Pattern

Was mining the initial impetus for peopling the Yaak River Valley? If so, what other industries did mining usher into the valley?

Prior to the 1890's mining in the Yaak Valley, it seemed that the mountains hosted only an occasional trapper. After the mining, however, the area flourished. The building of any community necessitates building materials. Especially after the turn of the nineteenth century, lumber was in demand for building up the Yahk Mining Empire. Therefore, mining had encouraged the timber industry in the valley. The causal link between the boom of the mining and the establishment of the town of Sylvanite was provided in the answer for research question. There is no question that the mining boom and subsequent development of the two communities brought people into the valley. Historian Paul Friedman agrees when he states, "Some of the first permanent settlers came to the Yaak during the Sylvanite boom" (Friedman, Brechtel, Mortorano, and Walker 1983:53).

Friedman, Brechtel, Mortorano, and Walker go on to explain:

> Most of the homesteaders came to the Yaak, however, after 1910. The first group used the road up from Troy and settled in the Sylvanite region. Others came to the Upper Yaak by way of the trail from Eureka. Johnnie Ehlers had a cabin by Yaak Falls in 1911. In the spring of 1911, Jimmy Baron and Bob Greg located homesteads near the falls. Hy Crum homesteaded on Seventeen Mile Creek that same year. Gene Grush homesteaded next to Crum in 1915 (Gene Grush, personal communication).

Two major factors influenced the settlement of the Yaak River Valley after the 1910 fire and the decline of the Sylvanite mining boom. They were the 1906 Forest Homestead Act and the construction of a wagon road from Sylvanite to Yaak. The first road to Sylvanite was cut from Troy around 1896-1897. By 1912, the Upper Yaak region could be reached by a trail extending from Eureka to Red Top Creek.

Another trail stretched from Pipe Creek up the South Fork of the Yaak. By 1915, the trail from Eureka to South Fork had been improved to a wagon road, but the section from Yaak to Sylvanite was still a primitive trail. In 1918, the Bureau of Public Roads extended the road north from Sylvanite, reaching the Upper Ford Ranger Station in 1922 and Rexford in 1926 (Doetch 1976). By 1915, ranger stations had been established at Long Meadow and Olson (now the community of Yaak), but these were little more than small log cabins used on a seasonal basis (Gene Grush, personal communication).

While the construction of passable roads up the Yaak River helped make it accessible and eased its isolation, it was the short-lived homesteading period, sparked by the Forest Homestead Act of 1906, which brought permanent settlers to the area. The Forest Homestead Act of 1906 had been the brain child of Gifford Pinchot, Chief of the Division of Forestry, who wanted permanent settlers, not land speculators, to use the forest reserves (Steen 1976). The law provided that 160 acres of land could be claimed within a national forest, under the discretion of the Secretary of Agriculture, if they were "chiefly valuable for agriculture, and which, in his opinion, may be occupied for agricultural purposes without injury to the forest reserves" (Fifty-Ninth Congress, Sess. I:Chp. 3074). The claimant had to have the property described by metes and bounds and file the survey plat with proof of residence and cultivation within five years after

> initial settlement. Because of the discretionary clause in the law, the Kootenai National Forest was only opened to agricultural settlement for a short period, up to about 1922 (Friedman, Brechtel, Mortorana, and Walker 1983:52-53).

In consideration of the peopling of the Yaak Valley, one important influence in the 1900's was the establishment of the Kootenai National Forest in 1906. Friedman, Brechtel, Mortorana, and Walker expound:

> The Forest Service exerted a strong influence on the settlement of the Yaak. Many of the homesteaders worked full or part time for the Forest Service as packers, lumber jacks, fire chasers, or trail blazers. Gene Grush worked the fires of 1910, was a smoke chaser at Long Meadow in 1920, did survey work in 1922, and was employed on and off with the Forest Service, doing maintenance, construction, telephone lines, trails, and road building until his retirement in 1952 (1983:55).

It is interesting to note that Grush later became one of the most active miners at the Jim Hill mining claim.

Subsistence

What foods did the miners eat, medicines used? Because labels on tin cans disintegrate rapidly, I could not tell what was inside the hundreds of tin cans found at the camp. Even in the 1930's it seems that canned goods proved the most practical way of storing foods. The hole-in-top tin cans from the pre-1920 eras tell the same story. Identifiable food stuffs were condensed milk, coffee, Ovaltine, potatoes, eggs, and chicken. The last two items were provided locally, for at least two chicken coops were identified at the camp (Appendix I, Features 99 and 101). Condensed milk cans can be found in great numbers in the camp's dumps.

It is unknown whether hunting of wild game provided much to the miner's diet. As is mentioned in Chapter IV, large game was probably not abundant in the 1890's. Reports of lost hunters in the newspapers attest to the occurrence of some hunting. In the 1930's game was quite abundant, but evidence of faunal remains of large game are absent from the site. The absence of ungulate bones may be due to the butchering process taking place in the field where the animal was killed. Wildlife biologist, Bob Byars suggested that butchering tools were probably crude, and that instead of disarticulating the carcass the animal was deboned on the site of the kill. This practice would also eliminate carrying extra weight back to camp.

Deterioration of metal boxes due to rusting also obscured identification of medicines that the Yahk miner used. A scarcity of medicine bottles may be due to their attractiveness to bottle collectors. We do know that aspirin and Exlax were in their medicine chest.

Social Organization

Historical accounts boasts of the prospector as a rather independent, adventurous sort; a fortune hunter, making the initial discovery, placer mining his claim, selling the claim for a fraction of its worth, then squandering the profits with wild abandon. Because hard rock mining required capital, the prospector faded out of the picture. The money came from mining companies, of which there were several involved at the Yahk Mining District. Does the pattern of the prospector fading into obscurity hold true at the Yahk Mining District?

The above scenario for the prospector holds true to the Yahk prospector to a certain extent. Independent indeed the Yahk prospector was. It was a quality required for survival in the Yaak Valley, especially in the early years; 1890-1910. Gene Grush, himself an early inhabitant of the valley, describes life in the Yaak in the 1910's as one of extreme isolation requiring an enormous amount of individual motivation. He recalls with fondness a friend who accompanied him to the valley initially. Overwhelmed by the Yaak isolation, his friend left one day unexpectedly and unannounced to return to his homeland in Pennsylvania. As for Grush it seemed that what many call isolation, he views as solitude.

The image of a transient fortune hunter does not seem to fit the Yahk prospector. There were very few, if any, "professional prospectors" whose sole livelihood depended on prospecting. Some of the Yahk prospectors probably fell into the trade via their trips through the area as trappers. Others deliberately pursued prospecting and temporarily left their former trades. Newspaper accounts tell of men who were store owners, gas station owners, ranchers, and border guards prior to hearing the call of gold in the Yaak (Kootenai Herald and Bonners Ferry Herald).

One interesting avenue for conducting further research would be to look up Yahk mining names in the cemetery records of Troy and Leonia. This might tell us a little about the movement and settlement patterns of the early prospectors. If the majority of the prospectors lived out their lives in the area then the idea of the Yahk prospector being the transient gold seeker would hold less credibility.

What is accurate in the above description is that the initial prospectors sold their claims to larger corporations for development. The original locators of the first claim in 1894 in the Yahk, A. F. Lemley and Berg consolidated their claims (the Jim Hill, Great Northern, and Lucky Boy Lodes) with three other men in 1895 (Kootenai Herald, August 3, 1895). In November 1895 capitalists from Spokane, Washington, negotiated for purchase of the Keystone from its original locators, S. J. Whitcomb and M. P. Doyle. It was not until this time that any real development at the Keystone took place. Texas capitalists were rumored to have arrived to make "deals" on the Jim Hill in December 1896 (Kootenai Herald). Again in the 1930's capital was required for development to occur. Capital came from men who organized and ran the Haywire Mining and Milling Company.

Names of original prospectors do not fade from view, however. While their role in the mining scene diminished many seemed to maintain some interest in mining, as their names turn up in relation to other aspects of local mining in later years.

Were there any delineations of economic class evident in the mining community?

The only evidence of a distinct economic class at the camp was the Thornton home. The house, inhabited by the owner of the mine and mill, definitely stands out from the others in size and construction. The house has 2,652 square feet of floor space on two levels, compared with 588 square feet of the next largest house at the camp. The quality of constuction reveals it to have been built with better materials, and more elaborate fixings; i.e. linoleum, wall, paper, electricity. It is obvious that more time and effort was given the construction of this dwelling, especially in comparison to other housing at the camp.

Were there any ethnic divisions in the mining community? There were no ethnic groups evident in either the written documentation or the archaeological record.

Mining communities are traditionally thought to be made up of a disproportionate number of males to females. Was this the case at the Yahk Mining camp?

The historical records of early mining camps report the excitement at the arrival of a female in the mining camp, especially if she was the "proper" type. We don't know if this were the case at the Yahk camp in the early days. There is no mention of women in news articles, but should not be interpreted to indicate an absence of them. In the 1910 mining era women most likely were present, as the Troy Herald announced that management at the mine would give preference to men with families (May 27). Definite evidence of women shows up in the 1930's as reflected by artifacts. China and other elaborate dishware were found in abundance near old house foundations. Such artifacts might argue for the presence of women. Knick-knacks and items of personal adornment were not found at the site.

Children also left their mark on the camp, leaving such toys as dolls, wagons, and tricycles. The household pet was part of camp life as evidenced by cat food cans and a dog collar. The family orientation of the camp is reaffirmed by local informants. Ed Gaston recalls visiting Jed and Marie Edmunson in their home on the hill (1983).

Were there education facilities available locally?

Gene Grush refers to the "Gregg School," so named in honor of a Mr. Gregg who built the one and one-half story log structure in 1911. This school was located west of the Yaak Highway at Seventeenmile Creek, approximately two miles south of the Yahk camp. Although direct testimony about the use of the school by children from the camp is lacking, I propose this as a likelihood. Gene Grush's children attended the school in the 1930's and most probably the Yahk camp children did as well. We did not find any remains of the school as it is on private property outside of our survey area.

What did the people do for entertainment? Where did they go?

Little is known about this subject. The saloons in Sylvanite most certainly provided some with entertainment in the 1890's and 1910. Certainly the folklore attests to the importance of the saloon to the local inhabitants. The 1910 fire destroyed every building in the town of Sylvanite with the exception of the Sylvanite Hotel. The reason as described earlier was the salvation of the alcohol. Grush talks about going down to valley residences for dances (1983).

An obvious gap in the written records on the Yahk Mining camp is the population of the camp in any of the eras of occupation. What then was the population of the Yahk camp?

Implications: By focusing on the physical dimensions of occupation structures at the site, we may be able to estimate the where we have established the number of occupants. One man lived alone in Feature 67 (Barron 1985). Feature 79 is well documented in the oral history as being a single family occupation; Joe Thornton, his wife and two children. Three people are reported to have occupied Feature 53 (Barron 1985). Feature 52 was occupied by the mill foreman, Stanley Bruce, his wife, and two children (Barron 1985). Feature 74 was known to house a family of four (Barron 1985). Feature 85 was nearly completely preserved and contained only one bed. That, in combination with its small size, indicated that it was occupied by one person.

TABLE 2

Population Estimate Based on Floor Area

Feature No.	Dimensions		Area (Sq. Ft.)	Known Occupants
113	13'	x 8'	104	1
53	15'	x 12'	180	3
67	15'8"	x 18'3"	272	1
74	14'8"	x 13"3"	195	4
79*	39'	x 34'6"	2652	4
52	42'	x 14'	588	4
	Total area:		3991	Total occupants: 17

AVERAGE SQUARE FEET PER PERSON: 235

Feature No.	Dimensions		Area
85	9'3"	x 15'	135
19	12'9"	x 13'2"	157
91	12'	x 17'4"	204
49	16'10"	x 15'1"	240
65	19'	x 15'6"	285
62	21'	x 17'	357
46	25'	x 16'6"	400
45	32'	x 14'	448
75	28'5"	x 16'	448

Total area: 2674 Estimated occupants: 11

TOTAL POPULATION ESTIMATE: 28

* Two-story structure

population of the camp in the 1930's; by correlating house size to number of occupants.

In order to work through this problem, criteria for labeling a structure a habitation feature was developed and an inventory of the habitation features from the 1930's was made. A total of sixteen features were identified as having been for habitation. The label "habitation" was developed by examining two attributes. The presence of certain artifacts helped to identify a structure as habitational: stove parts, plumbing, beds, toys, food items, etc. Also considered was whether or not there were any other features present that are commonly associated with houses; outhouses and/or root cellars. Of the sixteen features, only fourteen could be identifed for function and dimension. The other two were in such a state of deterioration that they could not be measured or assessed for function.

The names of occupants are known for some houses through personal communication with previous mill worker, Don Barron. However, for the remaining occupation features projections were relied upon to estimate the 1930 population at the camp. Table 3 shows the size of the occupation features along with the projected number of occupants. To make these projections, census records were checked to find the average family size in the 1930's. This search did not yield the needed information so I arrived at a figure mathematically. Knowing the number of occupants for six of the fifteen structures in the sample, a figure of amount of space (per square feet) per person was computed. Table 3 shows the results. There are six structures

Using these estimations, the total number of occupants at the Yahk Camp in the 1930's was approximately 28 people. Since it is known that there were families living at the camp, some of this population were not working members of the mine.

Political

According to an article by a landscape architect, mining communities followed similar sequences of development, stages which he specifies as camps, locations, towns, and villages. He maintains that the company-owned and -built camps could be detected by examination of the camps' physical layout. Company-built camps would exhibit an "...undeviating, orthogonal pattern....," as laid out by company mining engineers. On the other hand, "...unplatted/squatters' locations were characterized by poorly built housing strung out along haphazardly arranged streets and pathways" (Alanen 1979:51). Relative to these statements, was the layout of the Yahk camp haphazard or orderly? Could one determine from the camp plan whether it was company or individually built? If Alanen's hypothesis is true, then one might expect building style to be more homogeneous in the case of the company built camp and more heterogeneous in the case of the individually built camp. This is based on the assumption that individual builders will express different construction styles, whereas the company built construction would follow blueprints.

One major flaw with Alanen's hypothesis that the layout pattern of the camp was exclusively dependent on architectural planning is that a town can only be laid out in an orthogonal pattern if the landscape permits, as on a flat plain. The Yahk camp was constructed on steep mountain slopes and consequently the topography became the major limiting factor in how it was laid out. Architectural planning would probably not have changed the layout. The building styles and material types at the Yahk camp were homogeneous, but this reflected the limited choice of building materials available to the constructor and the most expedient practical building design for the environment. It did not reflect a company built town.

There was no written documentation verifying the camp as being a company owned community. In fact, an oral interview with a reliable source proved to the contrary. Gene Grush remembers that the individuals who owned their own homes were responsible for building those homes (1983).

What political organization did the camp develop? What were the methods of law making, enforcement of the laws, and processing of offenders?

The only evidence of political organization came from newspaper accounts of claim jumping and rumors of an organized union. In 1896, the manager of the Keystone, J. H. Jory, was accused of claim jumping. Immediately, a miners meeting was organized to handle the matter with formal officials elected (Kootenai Herald, January 12 and 25, 1896). In 1910, the Troy Herald announced that employees of the "Sylvanite" camp were organizing a union. No further mention is made of the union as the 1910 fire put an abrupt halt to all mining activity.

What part did religion play in the life of the miners?

The subject of religion was not mentioned in written documentation and the artifacts did not yield any information.

What trade networks were established for operating the camp? An archaeologist, Joel Klein, suggests that as workable ore depleted, changes in the trading networks occurred.

> "During periods of economic stress communities will increase their involvement in short-range trading networks."
>
> Implications:
>
> a) The variety of short-range commodities found at the site should increase.
>
> b) The amount of each short-range commodity found should increase.
>
> During periods of economic stress communities will decrease their involvement in long-range and local trading networks.
>
> Implications:
>
> a) The variety of long-range and local communities found at the site should decrease.
>
> b) The amount of each long-range and local commodity found should decrease (Klein 1973:76).

One would have to define "long-range," "short-range," and "local" to pursue the above problem. It seems that the above analysis can only be conducted on communities that had been established a longer period of time. The Yahk camp seemed to have established a rather simple trade network with Leonia as its market place in the 1890's with Troy as the center of enterprise in 1910 and the 1930's. To trace a community's decline through its commodities also requires that the decline be slow. The decline of the Yahk camp occurred within a period of one year in the 1890's. The total amount of time for occupation of the camp was four years in the 1890's, one in 1910, and six in the 1930's; hardly enough time to see sophisticated shifts in commodities.

While this particular approach could not be applied to the Yahk Mining District, information about the economic and social links between the two communities can be gleened from the archaeological record. An inventory of the numbers and types of features at the camp can be used to interpret its dependency upon outside networks. The types of features at the site are summarized in Table 3.

TABLE 3

Features of the Site

Features	Total Known	Recorded
MINING TECHNOLOGY RELATED		
Adit	55	32
Inclined Shaft	3	2
Glory Hole	1	1
Stamp Mills	*5	3
Water Tank	1	1
Water Line	2	1
Sluice Pond	1	1
Assay Office	1	1
Business Office	1	1
Blacksmith Shop	3	3
Powderhouse	3	2
Shop	1	0
HABITATION RELATED		
**Root Cellar	2	2
Chicken Coup	2	2
Outhouse	10	9
Occupation	17	17
Dump	15	8
RELATED TO HABITATION AND/OR TECHNOLOGY		
Bridge	2	2
Barn/Shed	2	2
Structure (unknown use)	10	7
TOTAL	137	

* Three mills are no longer standing.
** Separate from house.

Structure - Unknown function due to either not having been recorded or lack of identifying evidence to place it in the occupation category.

Dump - Only the large dumps were recorded. The smaller dumps associated with an occupation feature were described as part of that feature.

Habitation - Structures that could be positively identified as housing occupants [See discussion on population].

Further comments on the features at the site may help to put the activities at the camp into proper perspective. The number of features (77) that were directly associated with mining technology attest to the primary function of the camp as being mining. The diversity of mining features indicate that many functions were present to make the Yahk Camp a fully operational mining center. However the 1930's camp clearly lacked market related features, which can be interpreted to mean that the Yahk camp was wholly dependent on outside sources.

Economic

The town of Sylvanite is located around one mile from the camp. How is the Yahk camp connected with the town; politically, socially, and economically? Could we formulate patterns of occupation that are exclusive to each? What were the elements of choice that determined which area was chosen for residence. For example, did the more affluent or the family unit live in the town, while the poor or the single miner occupied the camp?

Some clues to these questions were derived from newspapers, local histories, and oral histories. The Sylvanite townsite was intricately tied to the mining camp. The most obvious link was economic. The mining camp began development in 1895. By 1896, the Sylvanite townsite had been surveyed and lots laid out for lease.

More evidence of the intimate link between the camp and the town is apparent in the decline of both communities at the same time. The Kootenai Herald announced in the same article that the two stamp mills had shut down and that Sylvanite was nearly deserted (August 20, 1898). The resurgence of mining in 1910 had the same effect in reawakening Sylvanite. The result was that vacated houses were sold; a general store, saloon, and hotel opened; and an office building built to accommodate the mining company (*Troy Herald*, May-June 1910). When, after the 1910 fire, the camp did not regain ground, Sylvanite too remained undeveloped.

The other questions about Sylvanite remain unanswered. It is unknown how many miners lived at the camp versus the town and what influenced those decisions. In part, my inability to find this information is caused by the newspaper reporters who did not separate the two communities in their reports. For example, the *Kootenai Herald* on October 17, 1896, reported that "seventy men are on the payroll at Sylvanite." It is unknown as to what payroll they were referring to; the town's or the mine's. Answers to some of these questions may arise through study of the archaeological remains of the town.

CHAPTER VI

STAMP MILLING TECHNOLOGY

This research question has been the most challenging, as it requires the marriage of the written record to the archaeological record. The archaeological record has proven invaluable in interpreting the technological function of the stamp mills at the Yahk Mining District. Will comparison of the written record with the archaeological materials recorded at the Keystone Stamp Mill show that the mill was constructed by using state of the art mining technology? The answer will require a discussion of stamp milling technology, as well as a description of the Yahk Mining District Mills.

A comparative evaluation of stamp mills in Montana revealed the stamp mills at the Yahk Mining District to be unique. Many other mills in Montana stand as empty shells because the milling equipment, being both durable and costly, rarely sat idle long, rather it was sold and shipped out to new mills. The Keystone Mill, however, operated in the mid to late 1930's, late in the history of stamp milling. By then stamp mills were being replaced by more modern milling methods. Consequently, the Keystone Mill equipment remained in place after the mill shut down.

This fact, in combination with information received from further inquiries, convinced me that it was necessary to study the stamp mill process. In a discussion with a Montana historian, Gary Williams, who has done considerable work on Montana mining sites, I found that there was little information on mining technology in archaeological reports. The need to fill the archaeological gap, coupled with the opportunity presented by the Keystone Mine, convinced me that I should compile information on stamp mills and stamp milling.

I reviewed the writing of two minerologists recognized as experts in the 1890's; T.A. Rickard and Thomas Egelston. Through careful reading of their treatises, I was able to understand a process which has long been obsolete.

The History of Stamp Milling

Stamp milling is an old process whereby gold and silver are separated from its surrounding material, called "gangue." The methods whereby gold could be extracted were important hallmarks that mark the growth of mining from the simple placer miners who were "wandering individuals and loose, small groups" to the hard rock miner who represented "greater population permanence and corporate structure" (Alvin 1972:24). These methods grew from simple ones requiring little manpower to complex techniques with a large work force. Initially, rock was crushed using a large stone on a pole that was dropped on the ore. Chronologically, the next technique of crushing that appeared was the use of "a bed of uncut stones arranged in a circle from 10 feet to 20 feet in diameter" ..."over which large stones were dragged by a single mule," an arrastra (Egelston 1887:23). The gold adhered to a film of mercury that lay between the stones and every so often the bed had to be dug up to remove the profits.

A close relative to the arrastra was the Chilean mill which operated on the same concept except that the ore was "crushed by one or two large circular grinding wheels made either of stone or of cast iron" (Egelston 1889:24). The last two techniques were often used in combination and the arrastra remained a viable technique for use in small operations even after more sophisticated techniques arose.

> It was not long before the eager and impatient miner found that the capacity of the arrastra and of the Chilean mill was not sufficient for the profit which he wished to get out of his ore.... The stamp mill seemed the only one (technique) likely to be of use, and this was adopted (Egelston 1887:24-25).

A good description of stamp milling is given by T. A. Rickard:

> Milling is a process of ore reduction whereby the extraction of the valuable metals is effected at a minimum of expense. Gold stamp milling is that particular process in which a heavy cylindrical body of iron is made to fall upon the ore in such a manner as to crush it, and thereby facilitate a separation between the gold and the valueless minerals by which the gold is encased. The latter weigh less than the former, and are removed by the aid of water. The gold is then collected through the agency of mercury with which it readily forms an alloy or amalgam. From this combination it is finally extracted by the distillation or retorting of the mercury (1897:1).

T.A. Rickard summarizes how the stamp milling process evolved.

> The more familiar methods of stamp milling have long ago grown out of the uncertainties of early development. How gradual and how great that development has been, can only be realized by tracing the workings of human ingenuity through many centuries of endeavor from the first conception of the simple savage with his stone implement to the completed mechanism of the modern millwright. It is a story of the survival of that which was fittest for the work of extracting that gold which has ever been the *ignis fatuus* (italics mine) of humankind; it is a tale of the adaptation of methods to different environments, which have included within their limits the arid deserts of Western Australia and the snow-clad summits of Colorado. The inquiry into the divergent practice of scattered regions has indicated clearly that the key to the apparent contradiction involved in methods which seemed so opposed in principle, is to be found in an earnest attempt to adapt methods to local conditions.

> The real principles--the bedrock ideas--of stamp milling are unchanging, but their successful application has created a growth of local variations which are discordant only when viewed without due consideration to diverse conditions (1897:238).

It is difficult to find in the literature the date when the first stamp mill appeared. However, a mining researcher and author, Otis Young, notes that by 1853 the stamp mill had become "universal in the West" (1970:195). Young saw the close of the mining frontier as being in the late 1890's, yet the stamp mill was used beyond that time. From the study of the Yahk Mining District we know that the stamp mill was being used through the 1930's. The life span of the stamp mill seems to have been about a century. The virtues attributed to the success of the stamp mill are summarized by Otis Young:

> ...they were readily transportable, comparably easy to erect upon wooden framing, cheap to operate, stressed chiefly in compression, and repairable even by a journeyman blacksmith. They required no delicacy of handling or construction, and the few moving parts could be cast well enough to obviate any need for fine machining (1970:198).

Stamp mills can be put in two different economic categories of "custom" and "integrated" (Young 1970:193). Each would seem to represent a stage in the development of a mine. A mining district, which no one independently-owned mine could, singularly, provide enough ore to warrant a stamp mill, shared a mill that ran independently from the mines. The ore was sold to the mill at a price determined by assay "minus a percentage to allow for operation, profit, recovery percentages and variable ore tenor" (Young 1970:194). This was the "custom" mill. If, on the other hand, one company owned the mines and they produced sufficient ore, a mill would be "integrated" into the operation. The Yahk mills were integrated mills.

A general figure of what a stamp mill cost in 1887 was between $700-$1000 per stamp "including house and engines" (Egelston, 1887:190). These figures would simply get a mill opened. Once running, there were costs to maintain the operation. A study of these costs in 1897 were broken down and compared among four mining districts. Table 4 is as it was presented.

TABLE 4

Analysis of Costs of Milling

District	Labor (cents)	Shoes & Dies (cents)	Water (cents)	Fuel (cents)	Supplies (cents)	Total (cents)
Black Hill, SD	15	2	20	19	14	70
Gilpin County, CO	42	5 1/2	-	10	17 1/2	75
Grass Valley, CA	82	9	81	-	8	80
Amador County, CA	20	4 1/2	17	-	4 1/2	46

Cost based on per ton of ore. (Rickard 1897:220).

Rickard analyzed the underlying causes contributing to the costs presented above. Low labor costs were affected by the presence of "labor-saving machinery" identified as being rock-breakers, and self-feeders, as well as by the softness of ore which affected the crushing capacity of the stamps. The costs of shoes and dies were based on the cost of steel and iron, which depended on where these parts were purchased. Some pieces were made locally, which reduced costs. The costs were based on the wear of the metal per ton of ore, which was highly influenced by the hardness of the ore; a harder ore caused greater wear. Water and fuel was often obtained locally; wood heat and creek water. If these resources were not available the costs varied according to local charges. Supply costs correlated with distance from a manufacturing center (1897:221-223). These costs can most likely be compared to the 1890's milling costs.

The Yahk Stamp Mills

A testament to the expected value of the ore at the Yahk Mining District can be seen in the number and the duration of the stamp mills that were established there.

As early as 1896, an announcement appeared in a local newspaper of plans to erect a 10 stamp mill in order to accommodate the Keystone's ore (Kootenai Herald, July 18, 1896). It was ordered in August of that year and completed on October 17, 1896 (Kootenai Herald, August 4, 1896 and October 17, 1896). The Keystone operation, mining and milling combined, employed thirty men (Kootenai Herald, October 17, 1896). In 1897 there were rumors of adding ten stamps, but a year later the dream disappeared when the mill shut down (Kootenai Herald, January 23, 1897 and August 20, 1898). The mill sat idle for the next twelve years until July of 1910 when the Lincoln Gold Mining Company reopened the mill (Troy Herald, July 1, 1910).

Again big plans were made; a flume to the mill, installation of an electric dynamo and compressor plant, and addition of ten stamps were scheduled to improve the mill (Troy Herald, August 5 and August 19, 1910). On August 26, 1910, a fire destroyed the mill. The physical remains of the mill are simple concrete foundations. There is little left to shed more light on the mill. For a location of the mill see Appendix I, Feature 8.

Contemporaneous with the Keystone Mill was the Goldflint Mill, erected in 1898. The history on this mill is sketchy, the only information is that it shut down in 1898 and reopened in 1910. This mill was also destroyed in 1910 by the fire. The ruins are illustrated in Appendix VI, and their location marked on Appendix I, as Feature 2.

The Keystone and Goldflint mills were to be moved to a new mill which was designed to accommodate forty-five stamps. This information suggests that the two mills had been shut down and their equipment was used for the new mill. This was not the case. For a time the forty-five stamp mill ran with twenty stamps obtained from an outside source. The mill was awaiting connection to steam power when the 1910 fire totally destroyed it. It never ran. The remains of this mill are illustrated in Appendix VII. Its location can be seen as Feature 1 on Appendix I.

The next mill to be erected in the history of the camp was built in 1932 by Carl Cummings and Percy Goodwin; the 20 stamp mill called the Keystone Mill. It opened on August 29th, operated by Frank McNees and associates, running two shifts (Troy Tribune, September

1932). The milling equipment came from dismantled stamp mills, from outside of the district (Grush 1983). This particular mill is the most complete mill of its age in the district and because of that, I will use focus my attention to that feature.

In 1937, the installation of another 10 stamp mill was reported (Bonners Ferry Herald, August 12, 1937). Here again there is a conflict of information, the newspaper report of a 10 stamp mill conflicts with the archaeological record which reveals the existence of only a five stamp mill.

> Relatively few know about this particular stamp mill. Gene Grush, a local miner, remembers some of the details behind its construction and its slide into obscurity. Clyde Thornton recruited two Troy residents, one of whom was Lee Cancer, to invest in the mill. Clyde's father and Carl Cummings built the mill. The mill had two flotation cells and was run by a Ford engine. Grush claims that Clyde never really did anything with the gold in the flotation cells. Clyde was getting ore from Gene Grush's claims to run through the mill. Joe Thornton, Clyde's uncle, found a young man whom he planned to train as a millman. According to Grush, the mill ran only one day with the new millman. Clyde told Grush that the ore produced a "nice chunk of amalgam, gold you know with quick silver, off the plate that he had there" Grush 1983:6). As Grush recalls, they never ran the mill again. He suggests the reason as being that Thornton's investors withdrew their financial support (Timmons 1984).

The mill is illustrated in Appendix VIII and appears as Feature 24 in Appendix I.

The last stamp mill built is not actually a part of the Historic Yahk Mining District but is worth mentioning as an important milling operation. The mill was built in the late 1930's and later converted into a ball mill. A ball mill is a crushing mill that utilizes a different technique. The ore is crushed in a large cylinder resembling a cement mixer. Inside are steel balls approximately five inches in diameter that are rolled around in the cylinder with the ore to affect the crushing motion. This mill used a cyanide process for final extraction different from other mills in the area. The mill was recorded earlier as part of a Federal highway survey. The description appears in Appendix IX.

The Keystone Mill

The Keystone 20 Stamp Mill, built in 1932, is the best preserved mill standing at the Yahk camp. In addition to showing some structural integrity, the mill has the quality of retaining its milling equipment. Consequently, there is a unique opportunity to evaluate the stamp milling process as it operated locally in the 1930's. Three sources will provide data to help us fully understand this process. Written historical accounts provide discussion of the stamp mill operation, as presented by Thomas Egelston in 1887 and T. A. Rickard in 1897. The second source of data comes from the careful recording of the Keystone Mill remains, and its interpretation. A third source was necessary to fill gaps in the written and archaeological record. A mining engineer, Pete Cadwell, schooled in and exposed to the stamp mill process for his entire career, lends insight into how and why the process at the Keystone mill worked. Combined, the methods provided a picture of stamp milling technology in northwestern Montana.

As described earlier, stamp milling is an old process whereby gold and silver are separated from its surrounding material--gangue. The milling process is composed of a number of techniques; gravity concentration, amalgamation, flotation, and cyanidation (Cadwell 1983). Cyanidation was dismissed as a process used at the Keystone mill (Cadwell 1983). The use of the other three processes at the mill will be used to organize the explanation of the Keystone Mill operation. An overview of the mill [Photograph 18, Figure 3].

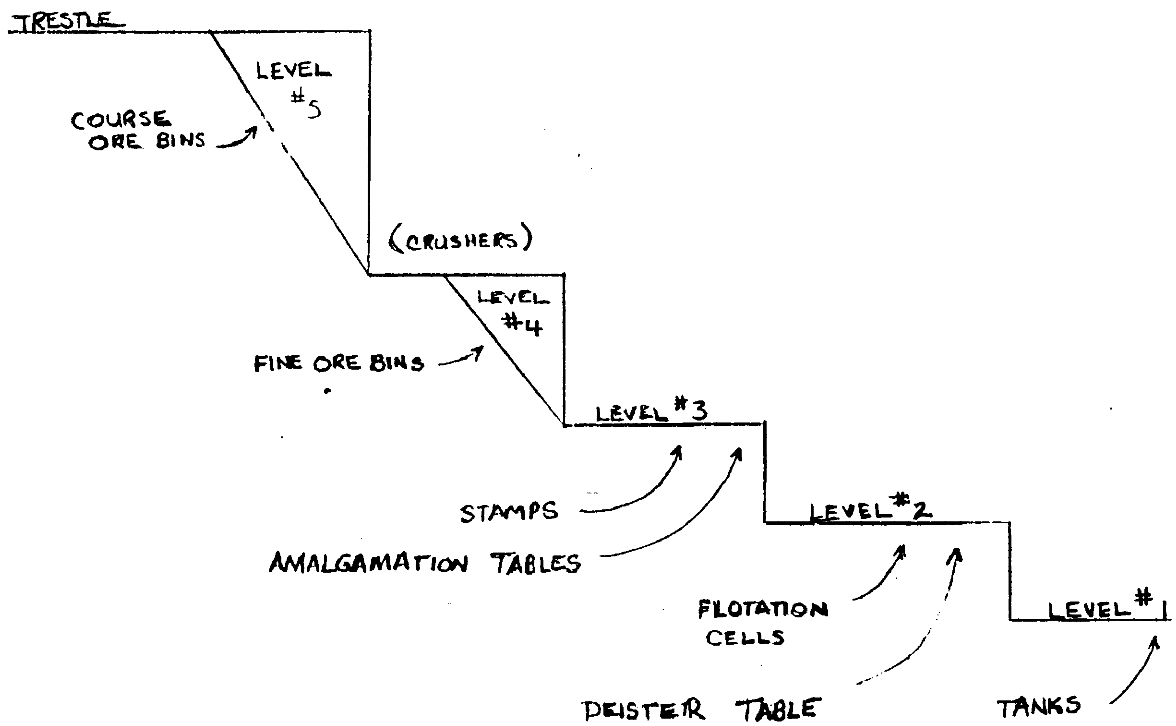
Gravity concentration was the basis for the stamp mill operation. When one examines the construction of the stamp mill, the use of gravity to facilitate mineral extraction is obvious. The mill was built on a 40 percent slope. The stamp milling process is systematically ordered, from extraction in the mines to the more refined separation of free gold that took place with the stamps' action. Figure 3 illustrates the levels.

As the miners made their way through the mine's workings, certain decisions had to be made. The vein material generally had a different look than the rock wall material and a miner changed the direction of his cut by distinguishing between the two, a process called "eye-balling" the vein (Cadwell 1983). This was not the most accurate method.

There was also a difference in quality of the vein material itself. To determine whether or not the vein material was worth milling, another procedure was followed. After a round was blasted, a sample would be taken and assayed to determine the gold/silver content. The assay results would then be passed on to the miners with instructions to either discard the ore or mill it. The discarded ore would then be dumped via an ore car and rail system [Photograph 19].

Figure 3

Levels of the Keystone Mill



These unprocessed tailings went through a discard bin, downslope to join a massive tailings pile.

When the extracted ore was considered valuable it would be dropped down one of two ore chutes available at the Keystone Mill [Photograph 20], which led to two jaw crushers. The jaw crusher was adapted from a machine invented by Eli W. Blake in 1852 (Young 1970: 195). A description of the jaw crusher is best given by Otis Young:

> Two flywheels stored and delivered the power taken by belt from a line shaft. The crankshaft which ran between the wheels was hooked by a connecting rod to the center of a toggle bolt which greatly multiplied the leverage applied to the movable inner jaw. A small, spring-loaded rod opened the jaw at the end of each stroke. Moving parts were few and rugged; tolerances were easy. Any lump of ore obdurate enough to jam the jaws had to be sufficiently small to be easily cleared by hand from the machine. Virtually all the stresses upon the moving parts were compressive, the one stress in which cast iron is remarkably strong. In short, it was impossible to improve upon the Blake machine without improving it entirely out of the economic reach of frontier millmen (1970:195).

The jaw crushers' jaws were set close together and usually made 170 strokes per minute which prepared "72 tons of rock, serving a 30 stamp mill for 24 hours" (Egelston 1887:179-180).

The purpose of the jaw crusher was to reduce the "mine run" (the ore extracted from the mine) from rock six to twelve inches in diameter to ore about two inches in diameter (Cadwell 1983). Uneven size ore that was fed directly into the stamps was what was responsible for excessive and uneven wear of the stamps (Rickard 1897:213). As the rock crushers standardized the size of the rock, they helped reduce the wear of the stamps.

The large Aurora Rock Crushers were manufactured by Western Wheeled Scraper Company, Aurora, Illinois [Photographs 21 and 22]. One crusher has larger jaws--sixteen to twenty-five inches compared with ten and one-half to sixteen inches--which means that one has a larger capacity and therefore can process more tons of ore per hour compared with the smaller crusher. The working platforms were heftily constructed to withstand the weight of the crushers and the ore fed into the crushers. It is at this level that power, other than that provided by gravity alone, is required. The power was provided by a diesel engine that sat on the level below the level of the crushers. The engine ran a large drive wheel that controlled two other pulleys [Photographs 23 and 24].

After the ore was processed through the jaw crushers it was stored in two ore bins awaiting admittance into the stamps [Photographs 25 and 26].

The next level combined two processes, crushing and amalgamation. This level contained the stamps and the amalgamation tables. Before a discussion of how this level operated, it is necessary to discuss some of the basic premises that were used to decide upon the appropriate machinery used in this process. T. A. Rickard elaborated on the importance of putting educated thought into these decisions:

> Finally we reach that most important factor of all, the character of the ore. It is a cynical truism to say that the milling process should be adapted to the nature of the ore, because, unfortunately, it reminds one at once of the scores of expensive plants which are rotting upon the hillsides of our mining regions at the consequence of a perverse disregard of this obvious

> relation. Ordinarily it is best to have a mine possessing certain ore reserves before starting to erect a mill. Moreover, it is safer to have representative lots of ore tested at a neighboring reduction plant than to design a line of treatment on the insecure basis of a few laboratory experiments. The old folly still survives. Men of intelligence try a few grains of ore in a test-tube and then hasten to telegraph the order for a $50,000 mill. English directors are particularly prone to placing blank orders for "a gold mill" in the hands of fashionable machinery firms. Many of the resultant failures are put upon the broad back of an old well-tried process, which is further loaded with the incubus of incompetent management and incomplete equipment. The average mine owner not infrequently prefers fooling with "a man and a process" to spending a thousand dollars in properly directed experiments. Consequently there are many who, complaining of the unsatisfactory extraction in the batteries of a badly arranged or incompletely equipped stamp mill, rush headlong into the maze of complicated, half-understood leaching processes. The last end is often worse than their first (1897:232-233).

For now, let's assume that those who organized the ordering, set-up, and operation of the Keystone Stamp Mill did consider the character of the ore to be processed, as reflected in the presence of proper milling equipment. The majority of the ore at the Yahk Mining District has been described by several geologists as being auriferous pyrite in a quartz gangue (Calkins and McDonald 1909; Rowe 1911; Orem 1912; Johns 1959 and 1970). The term auriferous means "containing gold" and pyrite in an iron oxide, better known as "fools gold" (American Geological Institute 1976). Therefore, auriferous pyrite is pyrite containing gold. This piece of information has far reaching implications. Mining engineer, Thomas Egelston, breaks down ores into two categories, "free milling" and "rebellious." Free milling ores are ores with such a character that they readily release their gold by the crushing and amalgamation processes. Rebellious ores are considered "not readily amalgable" (1887:31). "Amalgable" is defined as the ability of a mineral (gold) to be encapsulated by mercury, thus freeing the gold from its gangue (in this case quartz and pyrite) and creating an alloy which is later separated (retorted) (Cadwell 1983; Young 1970). While there are various degrees of an ore being rebellious, auriferous pyrite is considered to fall into this category. Pyrite does not easily release its gold content and adjustments must be made in the milling process to account for this situation. One requirement necessary to assure successful separation of the gold from the quartz/pyrite gangue was to make sure that the crushing action pulverized the ore into a fine consistency.

Pulverization was achieved through the crushing process accomplished by that part of the mill referred to as the stamps, along with its associated equipment. A detailed explanation of the parts of a stamp is necessary to understand their role in this crushing process. A battery of stamps is a set of five stamps. This is considered to be the number of stamps necessary to balance the cam shaft (Egelston 1887:180). The battery can be supplied by ore in a number of ways; from being hand fed to being supplied by an automatic feeder.

Just as the jaw crusher created greater efficiency by saving wear and tear, so did the automatic feeder. The operation of the stamp and the feeder was explained by Otis Young, Jr., "A glutted stamp disengaged itself from its lifting cam and simultaneously shutdown the feeder mechanism until the ore beneath its shoe was sufficiently diminished to re-engage both" (1970:262). In the case of the Challenge Feeder at the Keystone mill, the middle stamp of each battery was attached to a triggering mechanism which operated a cog and wheel system "feeding" the stamps in a systematic manner [Photograph 27]. The ore was most likely moved from the ore bins to the Challenge Feeder by a conveyor belt system (Cadwell 1983).

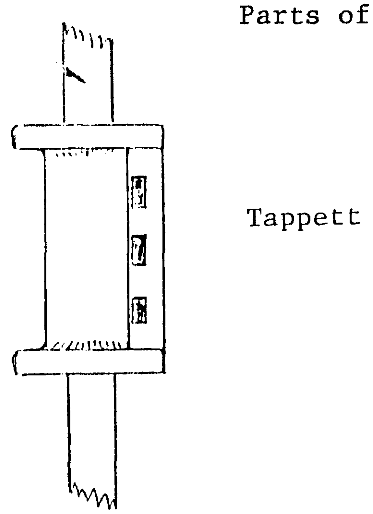
The stems of the stamp mill were often made of wrought iron, thirteen feet long, three and one-eighth inch in diameter, tapered at both ends, set eight and one-half inches apart and weighed 300-450 pounds (Egelston 1887:167). The stamp stems at the Keystone varied from these 1887 specifications; being of cast steel, seven feet long and set seven inches apart. They were three and one-eighth inches in diameter and their weight was probably 300 pounds [Photograph 28]. The distance that the stems set apart was determined by the battery guides. There were two guides per battery, one upper guide and one lower guide. As reported by Egelston these were made of the firmest wood with holes that fit the stems as close as possible to eliminate any unnecessary movement of the stems (1887:172).

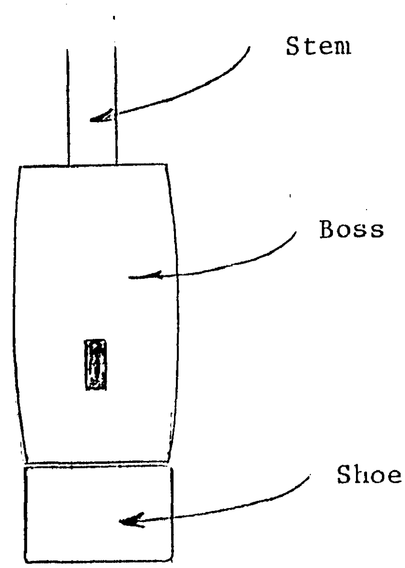
The operational part of the stamp battery, the part that lifted the stamps, were the cams. The cams as described by Egelston were:

> "made of the best cast iron...strengthened by a band of the best wrought iron. The usual form is a double cam, which is preferred, since it gives two drops of the stamps for every revolution of the shaft; it saves friction, and allows the battery to be run at a high velocity without increasing the speed of the engine. They are now cast double in a single piece, being dramatically opposite in the same hub, which is always strengthened" (1887:164-165).

Figure 4

Parts of the Stamp





The double cam at the Keystone Mill is pictured in Photograph 29. They were made of cast steel and were manufactured in Chicago, Illinois. An interesting feature on the cams was noted. The two batteries of cams were numbered one through ten. In the southern battery the cams were not arranged in order, but in the northern battery they were. An explanation for this order is not at hand. The length of the cam is a measurement that could be used in a formula to figure out how many times per minute the stamps dropped. According to Egelston:

> To get the position of a double-tool cam on the shaft its semi-circumference is divided into ten, and for a single-toed cam the whole circumference is so divided. When the distance between the centers is 5 1/2 in., the drop will be 10 in., and it will be possible to make eighty-five drops per minute. When ninety drops are required with the same cam, the fall will be 8 in., and whenever higher speed is to be attained the drop is correspondingly reduced (1887:166).

Using this formula for the 20 stamp mill, the length of the cam was twenty-seven and one-half inches, which made the drop approximately thirteen and one-half inches, indicating that the stamp drop rate was between sixty and sixty-five drops per minute.

As with the movement of all the parts of the stamps, the cams were powered by a diesel engine. The engine, through a system of belts and pulleys, powered a large drive wheel. There was one drive wheel per ten stamps for a total of two at the Keystone Mill. The northernmost wheel was six feet in diameter, made of laminated pieces of wood to a width of fourteen and one-quarter inches. This particular wheel came from an earlier mining era as it was constructed using square headed nails. Square headed nails were made up until the 1890's when they were replaced by wire nails. The southernmost wheel measured seven feet in diameter and was sixteen and one half inches thick. This wheel appears more modern in construction as determined by the wire nails. The wheels turned the cam shaft, which has been described as wrought iron at least five inches in diameter for operating ten stamps. The Keystone Mill cam shafts were of cast steel and five and one-half inches in diameter.

The cams lifted the stamps by engaging the tappets. Egleston describes the tappet as:

> A hollow cast-iron piece, almost cylindrical, weighing from 80 pounds to 125 pounds. It is bored out to fit the stem and is 8 in. to 10 in. in diameter, and 15 in. to 20 in. in height. It forms on the stem a projection about 2 1/2 in. upon which the cam catches and lifts the stamp. There are a number of forms but the one almost universally used is the gib tappet.... When its position must be changed, (on the stamp stem) it is only necessary to drive out the wedges.... The stroke of the cam turns the tappet round; it is generally calculated so as to make one-third of a revolution at every stroke. When set in a mill these tappets run within 3/4 in. of each other (1887:168-169).

The Keystone tappets are twelve and one-half to thirteen and one-half inches tall, nine inches in diameter, are one inch apart. The tappet, drive wheel, and cams of the northernmost Keystone battery [Photograph 30].

The part of the stamp that provided the weight to effect the crushing was the boss. The boss is "a cylinder of tough cast iron, from eight inches to ten inches in diameter and fifteen to twenty inches high..." and "around each end a band of wrought iron...is shrunk to prevent it from being broken by the stem or shoe. It has in both ends conical openings to receive the stem and the shoe" (Egelston 1887:169). The boss is the most endurable piece of the stamp. The boss at the Keystone Mill ranges between sixteen to nineteen and one-half inches are are around eight inches in diameter.

The parts of the stamps that experience the most extreme rates of wear are the shoes and the die. Because of this, the choice of these parts is complex and calculated. The shoe was made of either tough cast iron or of steel. The choice of material depended on three factors: the distance from the foundary, initial cost, and excellence of material. Cast iron's attributes were that it was salvable, wore more evenly, cost more in freight cost, cost between 4 to 6 cents per ton of ore crushed and wore out at a rate of 15.7 ounces (loss of the shoe) per ton of ore crushed. On the other hand, scrap steel was worthless, had a tendency to "cup", cost between seven and nine cents per ton of ore crushed but was preferred over cast iron as it was of a more even quality, and wore out at a rate of 9.3 ounces per ton of ore crushed (Egelston 1887:169; Rickard 1897:205-213, 220-221). The shoe measured eight to twelve inches in diameter and was five to six inches long and was one inch apart (Egelston 1887:169). It was reported to weigh between 90 to 160 pounds new, 45-60 pounds worn out and according to another source, 168-215 pounds new, 30 to 50 pounds worn out (Egelston 1887:169, Rickard 1897:211). The Keystone shoes were made of cast iron, were eight inches in diameter, and were about one and three-quarter inches apart. Due perhaps to the remoteness of the Yahk Mining District or to the availability of parts, the shoes were attached to the boss by wedging in wooden shams. Normally a steel key was used.

The die has been likened to an anvil and as such was ideally composed of a softer metal than the shoe (Rickard 1897:1). The die has been described as having two parts, the footplate is one and one-half to two inches thick and ten to twelve inches square and the die proper is three to five and one-half inches thick and eight to ten inches in diameter. The foot plate fit into the die seat of the mortar box, into two to three inches of sand (Egelston 1887:163).

It should be noted that the rate of wear "depends upon the quality of the material with which they are made, and on the hardness of the rock they have to treat, the charge that is put in the battery, and the speed with which it is run" (Egelston 1887:188). Rickard explains the dynamics of wear as being dependent on the rate of drop, the length of drop, the presence of ore feeders and crushers, and the hardness of the ore. The Keystone Mill had a drop rate of between sixty to sixty-five drops per minute which was a moderate drop; the drop length was between six and one-half to seventeen inches (Rickard 1897:222). The ore crushed was very hard as it was made up of mostly quartz. Combining these factors, the shoes probably lasted only twenty to thirty days, the die forty to sixty days (Egelston 1887:189).

According to a mill worker at the Keystone mill, the bosses and shoes were adjusted every half hour to insure an even splash. The cams were also greased using a "paddle stick". Adjustments and repairs could be made on one stamp at a time by "jamming the cam", a process whereby the jack or stamp brake was jammed under the cam to stop movement of the stamp (Barron 1984).

There was one mortar per battery and was the part of the mill that seats the die and accepted the ore to be crushed. It was made of cast iron and can be "cast solid when they are to be used in districts easily accessible, but when they have to be transported by wagons they are made in parts and bolted together (Egelson 1887:160). Mortar typology is based on function; whether the ore to be crushed was gold ore or silver ore and on whether or not water was to be used to facilitate separation. The same mortar was used for dry crushing of both ores. Wet crushing was more appropriate for the more rebellious ores and a wet/silver mortar differs from the wet/gold mortar in that the gold mortar had the greater capacity--needed to accommodate the copper plates. A lining of copper plates was positioned inside the mortar and coated with mercury to amalgamate with the gold. This process will be described more thoroughly later. The mortar's height was "4 ft." "4 in.," the bottom was "3 in." to "6 in." thick, and in most cases even thicker. The sides were from "1 1/2 in." to "1 3/4 in." thick. The flange at the bottom for fastening it to the mortar block was "2 1/2 in." thick and "4 in." wide (Egelston 1887:161). The mortar sits in a mortar block on a bed of sand and blankets to cushion the tremendous pounding they must withstand. The placement of the mortar in the mortar block required specific detailed instructions (Egelston 1887:156-161).

One of these specifications that is interesting is the construction of the battery frame. There were three types of construction that tended to be associated with the type of milling done; wet and dry, wet/gold, and dry/silver. Egelston maintains that two mortars were "rapidly abandoned; they allow the whole battery to spring, as they hung by means of iron rods; and both are objectionable, because they are braced on the feed side, where it is desirable to have the greatest freedom of passage" (1887:159). The bracing at the Keystone most closely resembles the mortar that was retained as functional.

The mortars at the Keystone Mill differed in dimensions. The northernmost mortars were four feet four inches tall, four feet ten inches long, one foot seven inches wide with one inch thick sides. The southernmost mortars were four feet seven inches tall, five feet long, one foot seven inches wide with one inch thick sides. The Keystone mortar is pictured in Photograph 31.

The parts of the mill that were involved in the process of crushing have been discussed but there remains a need to elaborate on this process.

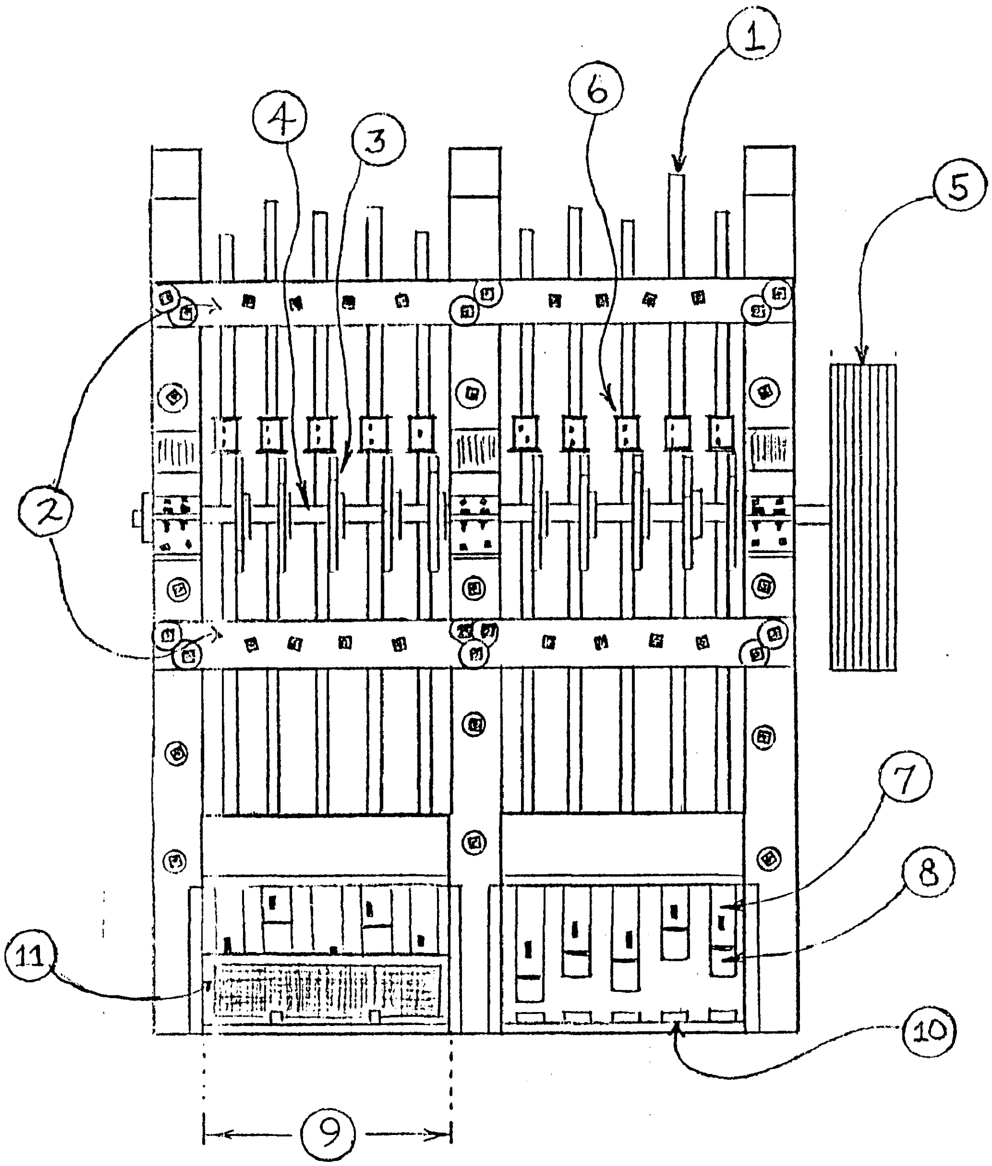
In addition to choosing the proper equipment to facilitate crushing, the mill operator/owner had to make decisions on how to run the mill to make each step efficient and effective. As T. A. Rickard says "one of the first postulates of good milling" was "to catch the gold as soon as possible." He elaborates:

> Do not send specimen ore to the battery if it can be treated in a hand mortar; do not let the gold get into the outside plates if it can be arrested within the battery itself; get it on the amalgamating tables rather than on your blankets or in your wells; do not depend on your concentrators if you can save the values by amalgamation, nor neglect the care of the vanners because the tailings are to undergo further treatment (1887:235).

How long the ore was to stay inside of the mortar depended on the nature of the ore to be treated. We have already established that the Keystone ore was a rebellious auriferous pyrite which required that the ore be pulverized in order to release the gold. Pulverization required the ore to remain inside the mortar for a prolonged period of time. Pulverization was accomplished using several features. Rickard suggested that the best way to separate gold from pyrite was to use light stamps with a long drop. This might be interpreted as using 550-pound stamps that drop seventeen inches (Rickard 1897:225-226). Another feature to consider was the depth of the discharge which was the distance covered by the splash of the water (caused by the shoe hitting the die) from the top of the die to the bottom of the screen. The screen is a piece that covers the front of the mortar and allows the pulverized ore to be ejected from the mortar when the ore is at precisely the correct grain size. The ore which sits on the die was under water. The deeper the water that the stamp has to move through the less intense the blow of the stamp, and the less forceful the splash, which means the slower the ejection of

Figure 5

Parts of the Stamp Battery



1. stem
2. guide
3. cam
4. cam shaft
5. drive wheel
6. tappett
7. boss
8. shoe
9. mortar
10. die
11. screen

the ore through the screens. A slower ejection rate assures a finer pulverization of the ore. An example of a slow depth of discharge would be fourteen inches and a rapid, violent discharge depth would be four inches.

Some of these standards could not be observed at the Keystone Mill. The weight of the stamp was impossible to get and the depth of discharge could not be determined because the dies were gone. The only known standard is the length of drop which appears to have been eleven inches at the Keystone.

Another feature that determined the efficiency of the Keystone Mill operation was the order in which the stamps were dropped. Egelston explains:

> The order of drop is different in dry and wet crushing, and different in different mills of each kind. There are evidently two extremes, which are, dropping all the stamps at once, which would probably break the screens, strain the engines, and would in a very short time rack the stamp frame to pieces; and dropping them in serial order 1, 2, 3, 4, 5, which would drive the ore to one end of the mortar and make the stamps there do nearly all the work. The orders 3, 4, 2, 1, 5 - 2, 4, 5, 3, 1 - 3, 5, 1, 4, 2 - 3, 4, 5, 2, 1, are generally used in the Nevada and California mills, the last one particularly makes a wave backward and forward and keeps the mortar very evenly filled. On this account all of these orders are very much used. In other mills, however, the order of dropping the end stamps first is very much preferred, which would be 1, 5, 2, 4, 3, which is the drop used at the Eureka mill, and 1, 5, 4, 2, 3, which is also extensively used and seems to be equally advantageous with the other. The object to be secured in all cases is to have an equal amount of ore under each stamp, so that each one shall do the same amount of work, and produce an equal discharge from each screen. A maximum discharge seems to be secured by allowing the middle stamp to drop first. The maximum amount of work appears to be done by allowing the end stamps to drop first; hence there are at least six or seven ways, all of which have their advocates, which seem to be, so far as the general

> working and the wear and tear of the mill are concerned, about equally good. In all crushing the objects to be secured are, first, the equal distribution of the ore between the shoes and dies so as to give an equal power to each stamp; and second, a maximum discharge of pulp from the screens (1887:180-181).

If we evaluate this reasoning and how it was applied at the Keystone Mill, an interesting pattern arises. Due to the character of the Keystone Mill, discharge of the ore from the mortars had to be slow to effect fine pulverization of the ore. To do so necessitated a minimum amount of discharge which required the maximum amount of work. According to the above statement, in order to accomplish minimum discharge and maximum work the dropping order necessary was to drop the end stamps (1 and 5) first. The order of drop, moving from the northernmost battery to the southernmost battery was as follows: 5-3-1-4-2, 1-3-5-2-4, 5-1-4-2-3, 1-5-2-4-3. The order seems to comply with Egelston's rules for pulverizing the ore. To facilitate repair of the stamps, devices called "jacks" of wrought iron or steel-protected hardwood shafts, served as brakes. "In the middle of their length is fastened a leather strap or wrought iron handle.... When it is desirable to hand up a whole battery, or a single stamp the cam is allowed to act until at its highest point, the jack is then slipped beneath it" (Egelston 1887:173). To restart the firing order a millworker would simply pull out on the handles in the order desired, starting the motion again. Photograph 32 illustrates the Keystone jacks. This function as well as other maintenance of the stamps was done behind the stamp batteries from a work platform.

Screens are most accurately part of both the crushing and amalgamating process. As part of the crushing process it regulates the discharge rate from the mortars. The screen is attached to the front of the mortar "with iron keys so that they may be easily removed" (Egelston 1887:177). To best facilitate wet crushing it was suggested that it was best to have screens on both the back and the front of the mortar. The screens were put at a 10 degree angle to the mortar (Egelston 1887:176-177). There were many different types of screens. The number of holes or slots per square inch determined the size of the particles emitted and the rate of discharge. For wet crushing Egelston recommended sheet steel with holes or slots. At one time there were two kinds of screens, clean and indented. The indented was thought to be best as it was rough on the interior of the mortar so that when the slots became wider with use they could be pounded to make the screen last longer. In reality, it was discovered that the life of the screen was limited only to the quality of iron with which it was made (Egelston 1887:174). Egelston recommended a slotted screen with slots three-eights of an inch long and one thirty-second of an inch in diameter for gold milling (1887:174). Rickard was more specific in making recommendations. He relates:

> The finest pulverization is accomplished by the mills of Gilpin (Colorado) because the intimate association of the gold and pyrites requires such treatment in order to compel a separation. The screens of the district...are made of iron plate punched with alternate burr slots of such a number and size that the chances of effecting an exit are as 1 in 34... The capacity of the mill suffers, but conditions are obtained suited to the separation of the fine gold from its envelopment of pyrites (1897:228).

Rickard notes that there were two types of screens, punched plate, and wire. He contests that the woven wire cloth was the best as it provided "conditions promoting uniformity of pulverization and a high crushing capacity" (1897:229). Its drawbacks were that it was more delicate and got choked by the pulp easier. The screens lasted about seven days which worked out to one cent per ton of ore crushed (Rickard 1897:229).

The two types of screen were found at the Keystone, wire cloth and punched plate. It was observed by Pete Cadwell that the diameter of the slots was one twentieth of an inch in diameter, a bit larger than that recommended by Egelston. The punched plate had slanted slots that were vertical and horizontal to each other. The screens and batteries were cleaned every few days by the day shift at the Keystone mill (Barron 1984) [Photograph 33].

As Rickard clarifies, "the stamp mill is both a crushing machine and an amalgamating contrivance" (1897:3). Prior to the ore reaching the stamp it has gone through the crushing process only. Once it was admitted to the mortar it was subjected to both crushing and amalgamating. Table 5 shows the important features of the stamps used to compare and evaluate the effectiveness of the process up to this point.

TABLE 5

Details of the Keystone Stamps

	Manufacturer	
Specifications	Risdon Iron Works San Francisco, CA 1896	Frazer & Chalmers Chicago, IL No. 44
No. of Stamps	10	10
Diameter of Stem	8"	3"
Length of Stem	6'10"	5' 2"
Material of Stem	Cast Steel	Cast Steel
Length of Stamp Guide	4'11"	4' 6"
Width of Stamp Guide	11 1/2"	1' 2"
Distance Between Guide Holes	6 1/2"	7"
Height of Tappet	1' 1 1/2"	1' 1/2"
Diameter of Tappet	9"	5"
Distance Between Tappets	1"	3"
Length of Cam	2' 3 3/4"	2' 3 1/4"
Diameter of Drive Shaft	5 3/8"	5 1/2"
Diameter of Drive Wheel	6' 7"	6'
Width of Drive Wheel	1' 4 1/2"	1' 2 1/4"
Diameter of Boss	8 3/4"	8"
Height of Boss	1' 4 1/2"	1' 6 1/2"
Diameter of Shoe	8 3/4"	8"
Height of Shoe	3 1/2"-5"	3 1/4"-7 1/4"
Material of Shoe	Cast Iron	Cast Iron
Distance Between Shoes	1 1/2"	1 1/2"
Height of Mortar	4' 7"	4' 4"
Length of Mortar	4'11"	4' 6"
Width of Mortar	1' 7"	1' 7"
Thickness of Mortar Sides	1"	1"
Length of Screens	4'	4'
Width of Screens	9"	9"
Width of Battery	5'	4' 9"
Total Width of 10 Stamp Unit	13'1"	12'8"

After the pulverized ore was expelled from the mortars a series of different amalgamation methods were used to retrieve the gold. A discussion of the methods will focus on the process at the Keystone.

A short history of amalgamation sheds light on its necessity and its growth.

> Miners in hard rock could also boast of being modern experts in an ancient craft. The refining had been pioneered centuries before by the Spaniards in Mexico and Peru. There, the stones crushed the ore with iron battering rams, and mules ground it into a mud-like slurry by dragging flat boulders around a wet stone pavement called an arrastra. The Spanish miners then trod salt, copper sulphate and mercury into the slurry to amalgamate with the gold and silver. Finally they gathered up the amalgam and boiled off the chemicals, freeing the precious metals (Wallace 1976:90).

Young elaborates on the process:

> There is no record of the first discovery that mercury would amalgamate with silver and gold, although that also was doubtless quite an early discovery (Figure 22). Mercury combines with gold and silver by a unique wetting process to form a pasty, silvery pseudoalloy of striking--and, to some, mysterious properties. When squeezed, the amalgam produces loud, mouselike squeaks impossible to describe but familiar to anyone who has had a tooth filled with this favorite material of dentists. Also when a cloth or wet chamois bag filled with the amalgam is squeezed, droplets of pure mercury are pushed through the pores, the gold and silver being mysteriously retained within. Separation of the components is done by retorting, carried on with amalgam in much of the same manner as the reduction of cinnabar, the mercury being driven off as a vapor while the gold and silver remain behind as retort sponge (1970:94).

One of the primary ingredients of the amalgamation process was mercury. Mercury adheres to certain metals (copper) and encapsulates others (gold and silver). A surface coated with copper is an excellent surface upon which mercury would evenly spread out.

Cadwell described the application as taking "a small bottle with a piece of chamois over the top," and shaking it out. "The mercury goes right through the chamois and would hit onto the amalgamation plates and spread out" (1983:1). Young evaluated the use of mercury and noted that "The ability of mercury to seize upon and amalgamate gold dust...would seem to suggest itself as an ideal placering or milling technique; yet strangely enough there is no record of its use as such until the Renaissance" (1970:96).

While an ideal alloy, mercury was prone to becoming "floured" and "sickened" which made the mercury unable to amalgamate with gold or silver. Flouring was defined as the "subdivision of mercury into minute globules" (Rickard 1897:216). Once this occurred any foreign materials could adhere to the globules; i.e., sickening (Rickard 1897:216). Many sources of sickening were substances used in the stamp milling process: grease, varnish, ore clays, country rock, solvents. However, these situations of "flouring" and "sickening" were identified and dealt with promptly as mercury was expensive. Mercury consumption amounted to around five grains per ton of ore (Rickard 1897:231).

In addition to using mercury on plates inside the mortars the Keystone Mill had two amalgamation tables. Young describes the table.

> The concentrating table, which quickly replaced the bumper, was more acutely inclined, vibrated continually in a back-and-forth lateral motion, and was equipped with shallow vertical riffle bars which terminated before lower-end exit ports. The pulps and a trickle of water were led over one corner of the upper end, from which they flowed down the surface. As a table "snapped," the gangue was urged sideways across the riffle bars, whereas

the concentrate or amalgam remained on its own side, ultimately dropping through the exit port (1970:200).

T. A. Rickard provides further description of the table by dividing the table into two parts. The apron was the part directly under the stamp screens and measured four feet to six feet in width and two feet to sixteen feet in length. The lower table was called the sluice or tailplate and measured two feet wide and ten to twenty feet in length. The design was taken from the placer miner's sluice box (Rickard 1897:239-240).

The Keystone tables were vibrating tables as indicated by two small motor mounts. There was one apron per battery of stamps but the two aprons ran into only one table. Thus there were only two tables in operation at the mill.

The tables had to be cleaned periodically to retrieve the amalgam--the gold and mercury. Young described the process.

> Crude sampling techniques were used to evaluate the process as it progressed. With a special curved spatula a specimen of amalgam was removed and carefully washed clean, and its condition was scrutinized. If the mercury globules were bright, ran together readily, and were soft either the ore was lean or else the batch required more chemical digestives, which at that time meant common salt and little else. If, on the other hand, the globules were crisp and had a frosty appearance, they were fully charged with gold and silver. In that case, it was time to clean up the machine and put additional mercury into the amalgamating barrel (1970:200).

A more informative description of cleaning the amalgamation plates was given by Pete Cadwell. A simple visual observation of the plates indicated when to hang up the stamps. The tables were then cleaned with a whisk broom, securing the amalgam. The amalgam was then squeezed through a chamois to separate the mercury (1983). Every few days, the tables at the Keystone stamp mill were cleaned and the mercury retorted (Barron 1985).

The process of amalgamation alone did not succeed in producing the desired results at the Keystone. The gold that escaped the mercury was referred to as "float" (Egelston (1887:28). To recover the gold the float went through a series of flotation processes.

From the amalgamation tables the remaining material went into the unit cell. An intermediate step was the mixing of certain chemicals in a conditioning tank. A large agitator at the bottom of the tank mixed the chemicals. The concentrating tank is pictured in Photograph 34. It appeared that perhaps a belt entered the tank from the side to operate the agitator. Chemicals were added which would later facilitate the removal of the gold. Lime was added to bring the pH balance of the water to the desirable level of nine. This was a level necessary to maintain control over the chemical process. Cadwell predicted the pH balance of the Yahk water to be around seven. Potassium amylxanthate, an organic chemical, was added because of its affinity for sulfides, which in the case of the Keystone ore was the pyrite, gold, and silver. Three hundredths of a pound of xanthate was used per ton of pyrite containing ore. Thus, the xanthate selectively floated sulfide (Thompson 1984). A pine oil was added as a frother to produce a bubbly layer that floats the sulfides. Five hundredths of a pound of pine oil was used per ton of ore.

The unit cell served to float the sulfides. The heavy unwanted solutions sank to the bottom of the cell and was discarded out by a paddle as tailings. The unit cell can be seen in Photograph 35. The concentrates were transferred to the scavenger cell, as seen in Photograph 36. The unit was powered by the main engine. The scavenger cell did basically the same thing as the unit cell. The scavenger cell had three compartments or cells. The first cell that the concentrates went into was the "rougher," the next the "cleaner," and the final cell the "recleaner." Each cell had an agitator paddle that created movement to help sink the tailings for discard and float the concentrates. By the time the concentrates had reached the recleaner they were high grade concentrates. In addition to the tailings and the concentrates was a third solution of half concentrate and half tailing called middlings. The tailings were discarded out through holes at the lower half of the tanks.

The concentrates went directly into the filter and the middlings went out onto a Deister diagonal-deck table, as pictured in Photograph 37. The table had a linoleum surface with wooden riffles a quarter of an inch square that were laid diagonally from one corner of the table to another on top of the linoleum. A feed trough let out the middlings on the table across the top of the table. The water trough ran down one side and had wooden pegs that pivoted to control the water flow. A wheel adjusted the tilt of the table and a small motor bumped the table (Cadwell 1983). The philosophy behind the operation of the table is the same as that of the Wilfrey table.

> To move ahead a bit, it might be said that in the days before flotation and cyanidation came of age, the Wilfrey table was regarded as the capstone of all concentrating technology. Its origins clearly lay in the old concentrating table--and doubtless in the observation that heterogenous mineral concentrates did not pile up randomly behind the latter's riffle bars but rather that a higher percentage of the heavier minerals were trapped behind the nearer bars in uniform proportion to their occurrence in the ore. The lighter minerals, pyrites, for example, tended to be found behind the farther bars. All one had to do, therefore, was to adjust matters so that the separation was clean-cut rather than statistical, each mineral being trapped behind its assigned riffle bar and then marshaled away to its planned destination. The trick was not easy--even to describe--but a Wilfrey table dancing its hula-hula was by all accounts fascinating to watch, as each streak of mineral piled up at its predestined bar, only to be jigged away in a steady band to its exit port. Yet the Wilfrey died out, being both temperamental in itself and more expensive than differential flotation. Nevertheless, in its day, the Wilfrey was the answer to a concentrator's prayers since it increased substantially the side profits from metals which had hitherto been merely dumped as tailings or lost in slag (Young 1970:201).

The only difference in the tables, as observed through their mechanization, was that the Wilfrey table shook laterally and the Deister table shook diagonally.

From the table the tailings would be disposed of and the concentrates would go into the filter. The filter's power probably also came from the main power source. The filter served the purpose of removing the water. It would filter the concentrates down to 15 percent water. The water was probably reused as it contained the chemicals that could be reused for flotation (Cadwell 1983) [Photographs 38-40].

The last step in the flotation process involved a series of amalgamation pans.

> From bumper or concentrating table (which could be used either before or after amalgamation) the depleted pulps were next led to a cascade of amalgamation pans, changed very little from those invented by Velasco. These were arranged stairstep fashion so that the pulp of the highest pans would overflow down into the next, and so on. The only latter-day innovation was the inclusion of mechanical paddles which slowly stirred and agitated the pulps with the intent of bringing each particle sooner or later into contact with the mercury film which coated the pan's copper interior (Young 1970-201).

At the Keystone Mill there were four tanks. After a period of settling during which time the tailings would settle to the bottom, and the concentrate or pulp would overflow into the next lower pan. Holes in the sides of the pans were for releasing the water. The concentrate was drained to 10 percent water to reduce the freight cost. The tanks are pictured in Photograph 41.

This was the final process that took place at the Keystone Mill. The ore concentrates were trucked to Troy, Montana, and were then shipped to the Helena, Montana, smelter via freight car (<u>Bonners Ferry Herald</u>, February 7, 1935). By June 10, 1937, occasional shipments of concentrates were still being sent to the smelter (<u>Bonners Ferry Herald</u>). The Keystone was reported as one of the heaviest producers in the district (<u>Bonners Ferry Herald</u>, June 10, 1937). According to Pete Cadwell, the smelter purchasing the concentrates would pay for 92 percent of the gold and silver. If the concentrates contained lead, which was difficult to smelt, the smelter would pay only 62 percent of the gold and silver (Cadwell 1983). Indeed the Keystone concentrates contained values in its silver content. In 1935 the Keystone was making a profit of twenty dollars to the ton. If the mill produced around forty tons of ore per day it was likely that the Keystone was getting a maximum of four tons of concentrates from that forty tons (Cadwell 1983). Thus, one could estimate 10 percent of the ore crushed ended up as concentrates.

The remaining topic of interest about the Keystone Mill operation is the number of people it took to run the mill. Pete Cadwell has witnessed the operation of stamp mills throughout his career and has estimated a total of eight employees; one on the crusher running one eight-hour shift (1), one on the stamps per eight-hour shift--running twenty-four hours a day (3), one on the concentrating/flotation equipment per eight-hour shift--running twenty-four hours a day (3), and one foreman. This would mean that about six to eight men worked the mill with twenty-two to twenty-four men working underground. A newspaper article on employees written in 1935 reports that the mine was working three shifts with a crew of thirty (Bonners Ferry Herald, February 7, 1935). An informant says that the mill ran two shifts--a day shift and a night shift (Cummings 1984). Della Cummings notes that "the old stamp mill could be heard day and night" (1984).

The question remains, "Was the Keystone Mill built to efficiently process the ore"?

To reiterate, auriferous pyrite is a rebellious ore where the gold is intricately encased by the mineral pyrite. This type of ore calls for intense pulverization in order to release the gold followed by amalgamation and concentration (Rickard 1897:1-7). To accomplish pulverization the ore was to remain in the mortar long enough to be crushed to pulp. Retaining the ore for a longer period of time was done by:

1. Increasing the drop of the stamp to increase the depth of discharge (the distance the pulp has to splash to hit the screen and be expelled) (Rickard 1897:1-7). Fourteen inches was considered a long drop.

2. Using a lighter stamp to avoid excessive, unnecessary wear and to assure amalgamation (Rickard 1897:225-226).

3. Using a slower rate of drop to slow up the rate that the pulp is discharged. Thirty drops per minute was considered very slow (Rickard 1897:226).

4. Controlling the depth of the water to control expulsion of the pulp.

5. Choosing screens to accomplish pulverization by controlling the type of screen. Discharge of the pulp "depends upon the relation between the thickness of the wire" (Rickard 1887:229). Rickard describes two screens that have the correct combination to accomplish pulverization, punched iron plate with slots one

thirty-second of an inch wide and 24 mesh wire cloth.

Further efficiency in the process was accomplished by:

6. Installing two vanners (a type of amalgamation table) per battery to capture the gold by amalgamation (Rickard 1897:234).

7. Using an intensive concentration process; i.e., cyanide or flotation.

8. Installation of jaw crushers to standardize the size of the ore.

9. Installation of automatic feeders to regulate amount of ore to the stamps.

10. Setting the order of the drop for the stamps to spread out the ore evenly in the mortar.

Comparing these guidelines to the operation at the Keystone Mill disclosed interesting results as indicated in Table 6.

TABLE 6

Comparison of Stamp Mill Attributes

Guidelines	Keystone Mill	Verification*
Long drop of stamp (14")	17"	Measurement
Slow rate of drop (30 per min)	60 per minute	Calculation
Lightweight stamp (550 lbs)	Unknown	None
Punched iron plate (1/32")	1/32"	Measurement
or 24 mesh wire cloth	20 mesh wire cloth	Cadwell 1983
2 vanners per battery	1 per 2 batteries	Observation
Intensive concentration (cyanidation or flotation)	Flotation	Cadwell 1983
Crushers	Present	Observation
Depth of water	Unknown	None
Order of drop of stamps	5-3-1-4-2 1-3-5-2-4 5-1-4-2-3 1-5-2-4-3	Observation
Automatic Feeders	Present	Observation

*Verification is indicated to give the source of information.

The Keystone has an even longer drop of stamp than that recommended. The calculated rate of drop is not as slow as recommended, however, with range of drop between thirty and ninety it was in the mid-range. There were two types of screens observed at the Keystone Mill, both identical to those screens recommended. The Keystone clearly had fewer amalgamation tables than recommended, however, it appears that they are frue vanners which are heralded for their efficiency when using concentration (Young 1970:130). The concentration system can be considered to be intensive. Intensity of the process is acknowledged in the five part process of flotation at the Keystone; concentrating tank, unit cell, scavenger cell, Deister-diagonal table, amalgamation pans. Crushers and automatic feeders were installed to increase efficiency.

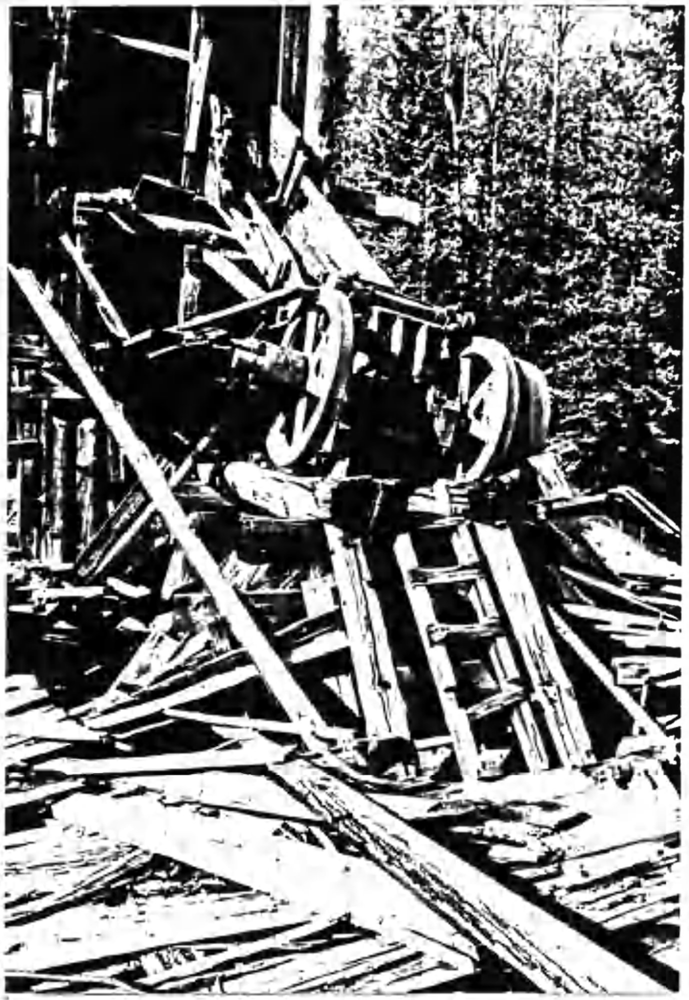
In conclusion, it would seem that the Keystone Mill operation was an efficient ore processing system based on expert knowledge and good logic. The Bonners Ferry Herald referred to an employed mining engineer, Rannells (November 19, 1936). Perhaps one could credit Rannells' knowledge about stamp milling for the efficient design and operation of the Keystone.

Photograph 18. Overview of stamp mill.

Photograph 19. Ore rails.

Photograph 20. Ore chute.

Photograph 21. Jaw crusher.



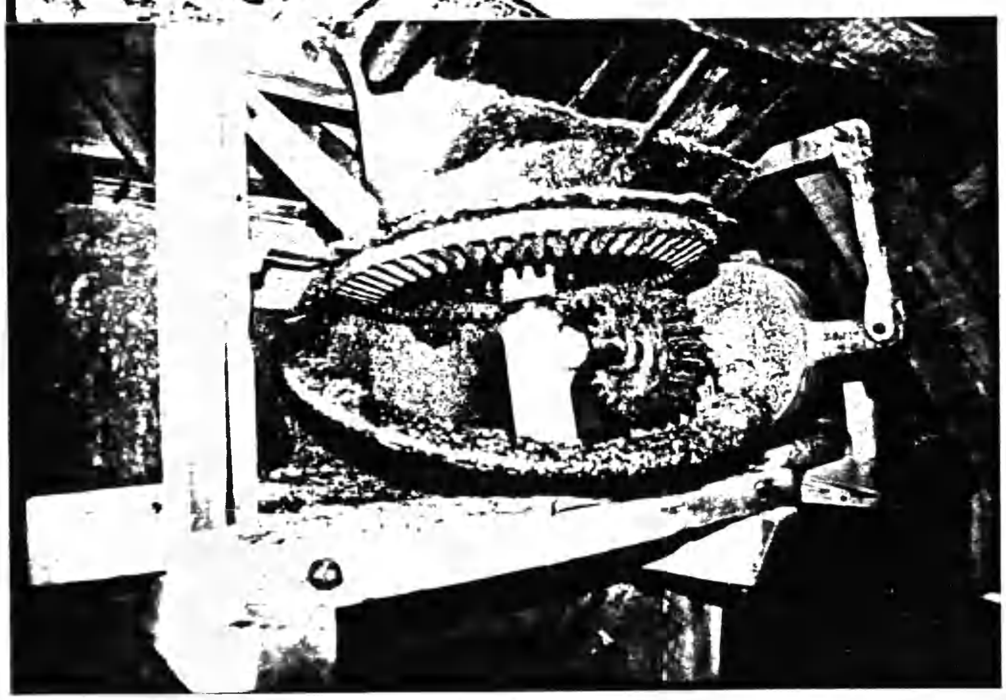
Photograph 22.
Jaw crusher.

Photograph 23. Drive wheel.

Photograph 24. Drive wheel.

Photograph 25. Ore bin.

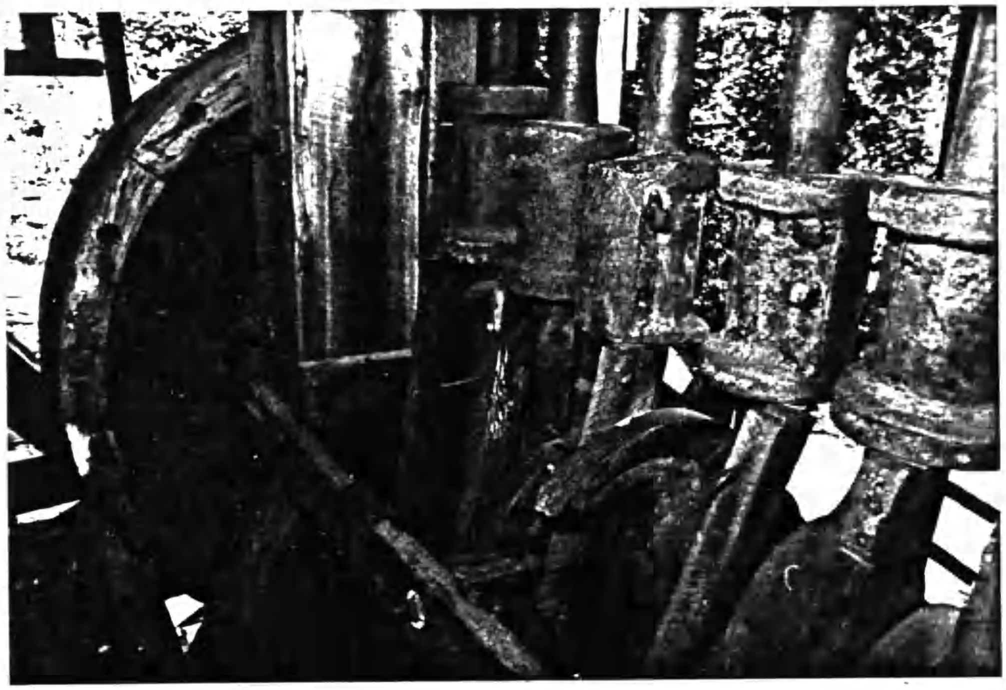
Photograph 26.
Ore bin.



Photograph 27. Challenge feeder

Photograph 28.
Stamp stems.

Photograph 29.
Stamp cams.



Photograph 30. Tappets, cams, and drive wheel.

Photograph 31. Mortar.

Photograph 32.
Stamp jacks.

Photograph 33. Screens.

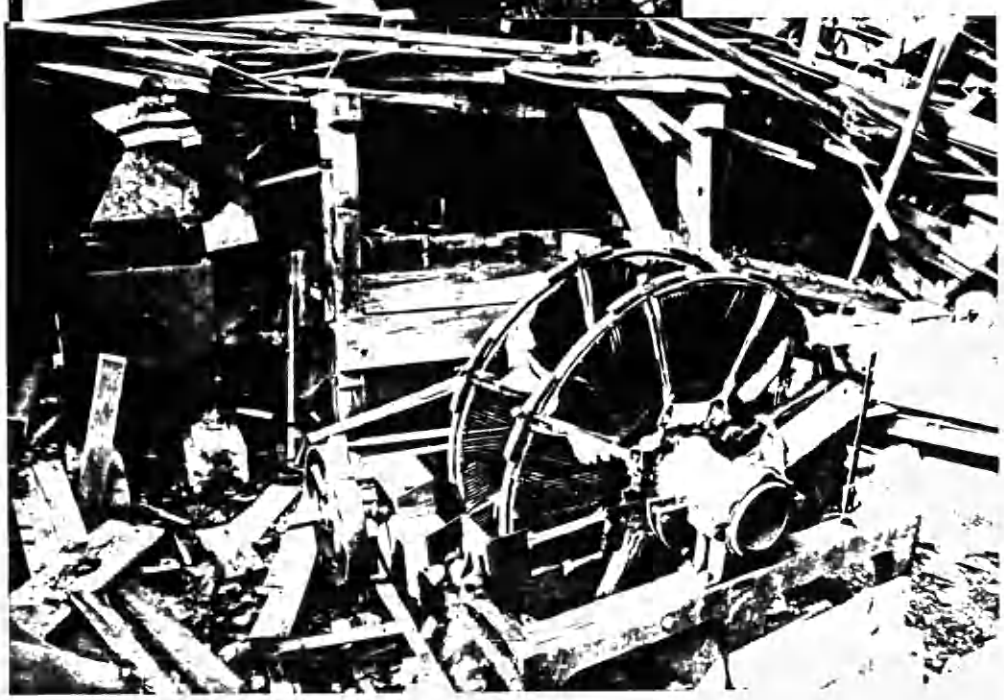
Photograph 34.
Concentrating tank.

Photograph 35.
Unit cell.

Photograph 36. Scavenger cell.

Photograph 37. Deister diagonal-deck table.

Photograph 38.
Ore filter.



Photograph 39. Ore filter

Photograph 40.
Ore filter logo.

Photograph 41.
Amalgamation pans.

CHAPTER VII

SUMMARY

There were three major areas of mining at the Yahk Mining District. The first era began in 1894 and ended in 1898, with the major claims held by capitalists from Spokane, Washington (Bonners Ferry Herald, 1895). Its close may have been due to having run out of freemilling gold which was easily milled. The second era began and ended in 1910 with operation taken over by Canadian capitalists (Troy Herald, 1910). The 1910 fire in the Yaak destroyed all mining interests which accounts for its abrupt close. The third era opened in 1932, owned locally at first and turned over to a Spokane man in 1935. Its close is more mysterious but most likely due to lack of capital to expand operations.

The mining camp was set up to extract and to mill the ore. Thirty-three adits and a total of five stamp mills put in throughout occupation of the site lend verification to the camp's extensive mining activity. It also served to house local miners. Two log homes survived the 1910 fire to represent the two earlier eras, and at least fifteen houses remain from the 1930's occupation.

Placement of the Yahk camp within a more general context gives perspective to the site. Montana mining got its start in 1860 and has continued development up to present times. The Yahk camp began operations in the 1890's, after Butte had become Montana's major mining center. Refugees from Butte wandered into the Yaak Valley in search of more solitude in pursuit of mining (Solem 1984). The Yahk Mining District is unusual in the context of Montana mining because of its location. The majority of early Montana mining seemed to be concentrated in the southern half of the state.

Within a context of mining in general the Yahk Mining District was both typical and atypical. It was typical in that its hard rock mining phase was precluded by extensive placer mining. In terms of the organization of mining laws and regulations and demand of strict compliance to these rules, the district maintained consistency. Typical housing, described as impermanent and haphazard at mining camps, seemed to be the rule at the Yahk camp in the 1930's. Most atypical was the Yahk camp's deviation from the norm in a discussion of the role of the family. Normally, mining camps were described as predominantly male with only a few women, and those of ill repute. The Yahk camp was made up of family units: women, children, cats, dogs. The discrepancy may be that the "normal" description is of early camps and the Yahk camp represents a 1930's community.

Mining has been proven to be a major impetus to westward expansion in the United States. There is no doubt that development of the Yahk Mining District aided expansion into the Yaak Valley and thus was a major impetus for movement.

More broadly yet is a matter of the Yahk Mining technology as a model of technology placed in the anthropological realm. Technological systems from the first lithic technology up to computer technology has shown a pattern over time. Changes in lithic technology often took thousands of years. Computer technology is changing every day. A noticeable acceleration in the occurrence of change is obvious. An initial look into the technology of modern mining reveals a startling discovery. Certain aspects of mining technology has changed little over the last 150 years. Just as Rickard had commented in 1897, the stamp mill was a remarkably efficient process that lived in the mainstream of mining for almost a century. The Keystone Mill was no exception and its relatively late occurrence in the existence of the stamp mill is a testament to its continued use. By the 1930's a new milling process had been introduced in the form of the ball mill, and yet that the stamp mill was erected at the Keystone attested to its retained popularity, as well as to its economic advantages. A used stamp mill was probably cheaper for a low budget operation than a new ball mill. The ball mill is the kind of mill in use at the Troy, Montana, ASARCO operation, the third largest silver producing mine in the United States. The four processes that have dictated mining technology--gravity concentration, amalgamation, cyanidation, and flotation--are still in use. The chemicals--xanthate and pine oil--are still in use in the flotation process. The processes are becoming more sophisticated in their ability to increase efficiency of extraction by pulling out even more of the precious metals. They are also becoming more labor efficient with the introduction of automation but they are essentially the same processes. It seems remarkable that parts of this technology could be so stable fir over 150 years in a 19th and 20th century technology. In 1897, T. A. Rickard predicted a long life for the stamp mill, which continued to operate for at least another forty years, probably a result of an inability to improve upon the system. Perhaps like the stamp mill, mining technology in general, a technology rich in its effectiveness and simple in its operation, is hard to improve upon.

When I took it upon myself to produce a culture history of the Historic Yahk Mining District, I'm afraid that I drastically underestimated the task at hand. One feature , one informant, one document, lead to other in what seemed to be and endless maze of information. The integration of this information became the major challenge. I realize now that a goal of this sort is never fully realized, only worked towards.

GLOSSARY OF TERMS

adit: A horizontal or nearly horizontal passage driven from the surface for the working or unwatering of a mine.

alluvial: A general term for all detrital deposits resulting from the operations of modern rivers.

amalgamation: A process using mercury to collect fine particles of gold or silver from pulverized ore. Both precious metals dissolve in the silvery liquid, while rock does not; they can later be released by applying heat or pressure to the mercury.

anticline: A fold that is convex upward or had such an altitude at some stage of development... that folds with older rocks toward the center of curvature.

assay: To determine the proportion of metals in ores by smelting.

auriferous pyrite: A sulfide mineral ore containing gold.

breaklands: The broken land at the border of an upland that is dissected by ravines.

base level: The level of erosion of a portion of the earth's land surface.

battery: A unit with five stamps.

concentrates: The pure minerals minus the useless materials.

country rock: The strata or rock through which the vein or lode traverses.

crucible: A clay pot used for separating the ore from the surrounding rock.

cupel: A small, round bowl made of sheep bone used to separate the precious metals from the lead using high heat.

cyanidation: A process of extracting the last particle of gold from tailings using cyanide.

dendritic: A drainage pattern characterized by irregular branching in all directions with the tributaries joining the main stream at all angles.

district: In the states and territories west of the Missouri (prior to 1880), a vaguely bounded and temporary division and organization made by the inhabitants of a mining region. A district has one code of mining laws and one recorder. (A district may be either "organized" or "unorganized." An organized district is described above. An unorganized district is an area using the federal mining laws of 1872 as their basis of organization. No local mining laws were needed. The unorganized district was more prevalent after 1880.)

double jacking: A drilling method conducted by two or three men, with one turning the steel while the others pounded in a disciplined, rhythmic succession.

dregs: Any waste or worthless residue.

fault: A fracture or fracture zone along which there has been displacement of the sides relative to one another parallel to the fracture.

flotation: A process of separating the metallic sulfides from tailings by raising the sulfides to the surface and floating these off.

hard rock mining: The mining of rock which requires drilling and blasting for its economical removal.

inclined shaft: A passage that dips at an angle from the surface down.

inquart silver: Added silver in the assay process to assure reliability of results.

loess: A homogeneous, nonstratified deposit consisting of silt with subordinate amounts of very fine sand and/or clay.

long tom: A placer mining device developed to wash very coarse pay dirt. Its upper component was a broad wooden deck, tapering somewhat to a riddle sheet or mesh screen at the low end.

middlings: Half tailings and half concentrates.

ore body: Generally, a solid and fairly continuous mass of ore, which may include low-grade ore and waste as well as pay ore, but is individualized by form or character from adjoining country rock.

portal: Any entrance to a mine.

rebellious ores: Ores that are not easily separated and amalgamated.

rocker: A placer mining device designed to process quantities of pay dirt. The device was a riffle box mounted upon traverse rockers with a removable hopper at one end and a slanting canvas apron from the hopper to the riffle box.

shaft: A vertical excavation made for finding or mining ore, or coal, raising water, ore, or coal, hoisting and lowering men and material or ventilating underground workings.

slag: Vitrified mineral waste removed in the reduction of metals from their ores.

sluice: A placer mining device, a shallow trench in its crudest form, more refined. A box equipped with riffles that trap the heavier minerals on the floor of the box.

stamp mill: An apparatus (also the building containing the apparatus) in which rock is crushed by descending pestles (stamps), operated by waterpower or steam power.

stamp milling: The processing of ore using machinery for crushing the ores with the presence of water.

tailings: The waste products of the milling process.

tectonic: Of, pertaining to, or designating the rock structure and external forms resulting from the deformation of the earth's crust.

till: Nonsorted, nonstratified sediment carried or deposited by a glacier.

topman: An encompassing term which would refer to anyone working at a mine or mill who is not an underground miner.

tunnel: A horizontal passage in a mine open at both ends.

Wisconsin ice sheet: The last of the four classical glacial stages in the Pleistocene of North America.

Yaak: The current spelling of the river and its valley.

Yahk: A historic spelling for the valley and the mining district located in northwestern Montana. At some point in time there were two different location with the same spelling, so the spelling was changed to its present status, Yaak (Grush 1983).

Yahk Mining District: The title will refer to site chosen for study. It is an "unorganized" district. Term will be used interchangeably with "site" and "universe" in the text of the proposal.

APPENDICES

Appendices II, III, and IV are oversized documents and can be found in the pocket on the back binder.

Appendix I

Map in Back Pocket

KEY TO MAP FOR
HISTORIC YAHK MINING DISTRICT

Map #	Description	Feature # Section-Feature #	Field ID	Recorded
1	Goldflint Mill #2	16-37		
2	Goldflint Mill #1	16-41		
3	Habitation	16-38		
4	Adit with rails	16-39		
5	Dump	16-58		
6	Adit with rails	16-40		X
7	Adit	16-59		
8	Keystone Mill #1	21-7		
9	Thornton-occupation	21-9		X
10	Thornton-dump	21-25		X
11	Thornton-adit	21-11		X
12	Thornton-adit	21-12		X
13	Thornton-blacksmith shop	21-10		X
14	Thornton-occupation	21-13		X
15	Thornton-occupation	21-14		X
16	Thornton-powder house	21-21		X
17	Thornton-bridge	21-22		X
18	Occupation	21-8		
19	Occupation	21-1		X
20	Outhouse	21-3		X
21	Shed/Barn	21-2		X
22	Adit	20-5		
23	Adit	20-6		
24	5 stamp mill	20-7		X
25	Dump	20-8		X

Map #	Description	Feature # Section-Feature #	Field ID	Recorded
26	Adit	20-9		
27	Occupation	20-10		
28	Adit	20-11		
29	Adit	21-15	(F-F) 194^{o}-1900'	X
30	Adit	20-12		
31	Adit	21-16	(F-G) 194^{o}-1900'	X
32	Dump	20-4		
33	Adit with rails	21-4		
34	Adit	20-3		X
35	Adit	20-2		
36	Adit	20-1		X
37	Adit	21-5		X
38	Inclined Shaft	16-48	Destroyed	X
40	Adit	16-47		X
41	Dump	16-2		
42	Adit	16-46		
43	Inclined Shaft	16-60		
44	Outhouse	16-25	(F-A) 224^{o}-300'	X
45	Occupation	16-24	(F-H) 224^{o}-300'	X
46	Occupation	17-11	254^{o}-300'	X
47	Occupation	16-31	(F-J) 224^{o}-300'	X
48	Powder house	16-45		
49	Occupation	16-30	(F-L) 224^{o}-300'	X
50	Occupation	16-26	(F-E) 224^{o}-300'	X
51	Outhouse	16-28	(F-I) 224^{o}-300'	X
52	Occupation	16-29		X

Map #	Description	Feature # Section-Feature #	Field ID	Recorded
53	Occupation	17-8		X
54	Dump	17-16	(F-F) 284^{o}-450'	X
55	Blacksmith shop	17-9		X
56	Powder house	17-10		X
57	Adit with rails	17-6	(F-H)	X
58	Glory Hole	17-3		X
59	Dump	17-15		
60	Inclined Shaft	17-4		X
61	Dump	17-16	(F-F) 284^{o}-450'	
62	Occupation	16-23	(F-A) 284^{o}-150'	X
63	Outhouse	16-21		X
64	Outhouse	16-20	(F-B) 284^{o}-150'	X
65	Occupation	16-19	(F-C) 344^{o}-225'	X
66	Outhouse	16-18	(F-D) 344^{o}-225'	X
67	Occupation	16-17	(F-B) 344^{o}-225'	X
68	Water Tank	16-4	(F-A) 194^{o}-75'	X
69	Structure	16-5	(F-B) 194^{o}-75	X
70	Keystone Adit	16-7	284^{o}-54'	X
71	20 Stamp Mill Keystone #2	16-6		X
72	Dump	16-61		
73	Assay Office	16-9	74^{o}-150'	X
74	Barn	16-16	(F-E) 344^{o}-285'	X
75	Occupation	16-15	(F-E) 344^{o}-326'	X
76	Business Office	16-10		X

Map #	Description	Feature # Section-Feature #	Field ID	Recorded
77	Outhouse	16-14		
78	Adit	16-13		X
79	Boarding house	16-11		X
80	Stone Walls	16-56		
81	Dump	16-57		
82	Adit	16-35		
83	Adit	17-5		
84	Adit	16-32		
85	Occupation	16-49		X
86	Adit with rails	16-33		X
87	Adit	17-13		
88	Shop	16-34		
89	Adit with rails	16-36	(F-A)	X
90	Adit	16-1		
91	Occupation	17-2	Destroyed	X
92	Dump	21-17	(F-E) 194^{o}-1900'	X
93	Adit	21-19		X
94	Adit	21-18		X
95	Dump	21-20		X
96	Structure	16-53	(F-D) 224^{o}-150'	X
97	Dump	16-43		X
98	Outhouse	17-12		X
99	Chicken Coop	17-7		X
100	Trench and Tailings	16-42	(F-A) 104^{o}-450'	X
101	Chicken Coop	16-12		X
102	Trench (pipe)	17-14		X
103	Occupation	17-13		X

Map #	Description	Feature # Section-Feature #	Field ID	Recorded
104	Forge Area	16-3	(F-D) 194^{o}-75'	X
105	Structure	16-8	(F-C) 284^{o}-357'	X
106	Adit	21-8		X
107	Dump	17-15	314^{o}-375'	X
108	Water line			
109	Adit	21-26	164^{o}-3226'	X
110	Platform			X
111	Root Cellar		(F-A1)283^{o}-150'	X
112	Outhouse			X
113	Structure			X
114	Bridge			X
115	Dump			X
116	Adit			X
117	Adit			X
118	Adit			X
119	Adit			X
120	Shaft			X
121	Adit			X
122	Adit			X
123	Adit			
124	Adit			
125	Adit			
126	Adit			
127	Adit			
128	Adit			
129	Adit			
130	Adit			

Map#	Description	Feature # Section-Feature #	Field ID	Recorded
131	Adit			X
132	Adit			X
133	Adit			X
134	Adit			X
135	Shaft			X
136	Adit			X
137	Adit			X

Artifact Catalog Sheet Appendix V

HABITATION	Catalog of Artifacts
Food Containers	
modern tin cans	Cans that post date 1920 in manufacturing technique.
hole-in-top cans	Cans with hole-in-top manufacting technique (pre-1920).
glass jars	Canning and food jars.
bottles	Food bottles.
misc.	Bottle fragments not identified.
Kitchen Wares	
utensils	Forks, knives, spoons.
wood stove	May be fragments.
plates	China and tin.
cups	China and tin.
saucers	China and tin.
bowls	Serving as well as cereal-type bowls.
crockery	Pieces of pottery also.
glasses	
glass dishes	Transparent glass.
misc.	Misc. kitchen ware.
Medicine	Bottles or tins
Alcoholic Containers	
beer cans	
beer bottles	
wine bottles	
liquor bottles	Gin, whiskey, etc.
unknown	
misc.	
Clothing/Buttons	Clothe fragments, leather fragments.
Footwear	Leather and rubber.
Household Adornment	
vases/nic-nacs	NOTE: *Artifacts in association with Feature +exact no. not counted.
misc.	

1890's	1930's	Category	Description
		HABITATION	
		Personal Adornment	Perfume bottles, cold cream, talcums.
		Toys	
		boy's	Trucks, cars.
		girl's	Dolls.
		unknown	Wagons, tricycles.
		Non-food Containers	
		cleaning	Purex bottles.
		tobacco	Mostly tins.
		misc.	Any barrel, bucket, pail, box with no label.
		Structural Fittings	Construction materials - hinges, nails, boards, window glass.
		Floral Remains	Fruit pits.
		Faunal Remains	Animal bones.
		Tools	Tools other than associated with mining.
		Adaptive Reuse	Household adaptations (ex: birdhouse made from dynamite box).
		Misc.	Category for misc. habitation artifacts (ex: beds).
		INDUSTRIAL	
		Mining	
		ore location	Claim posts.
		ore extraction	Drill bits, ore cars, ore car rails, shovels.
		ore processing	Artifacts associated with stamp milling.
		unknown	Associated with mining but unidentified.
		misc.	
		Mining Related	
		assaying	Cupels, crucibles.
		blacksmith	Forge.
		transportation	Associated with trucks, cars, etc.
		misc.	
		Adaptive Reuse	Technological adaptations (ex: dynamite box fragments used to shim up stamps).
		Reuse	Using an obvious older artifacts in a later era.
		Misc.	Category for misc. industrial artifacts.

HABITATION Sample 1 Circles	14^{0} 150'	44^{0} 75'	44^{0} 150'	44^{0} 600'	74^{0} 225'	104^{0} 225'	104^{0} 300'	104^{0} 450'	134^{0} 75'	13 22
Personal Adornment										
Toys										
boy's										
girl's										
unknown										
Non-food Containers										
cleaning										
tobacco										
misc.			1			1	1			1
Structural Fittings		3	6			3				
Floral Remains										
Faunal Remains										
Tools										1
Adaptive Reuse										
Misc.										
1890's 1930's INDUSTRIAL										
Mining										
ore location										
ore extraction									1	
ore processing										
unknown										
misc.										
Mining Related										
assaying										
blacksmith										
transportation			3							
misc.										
Adaptive Reuse										
Reuse										
Misc.	2	1	1	1	1	2		1		1

HABITATION Sample 1 Circles	14° 150'	44° 75'	44° 150'	44° 600'	74° 225'	104° 225'	104° 300'	104° 450'	134° 75'	134° 225'
Food Containers										
modern tin cans										
hole-in-top cans										
glass jars	1									
bottles										
misc.										
Kitchen Wares										
utensils										
wood stove										
plates										
cups										
saucers										
bowls										
crockery										
glasses										
glass dishes										
misc.										
Medicine										
Alcoholic Containers										
beer cans										
beer bottles										
wine bottles										
liquor bottles					1					
unknown										
misc.										
Clothing/Buttons										
Footwear										
Household Adornment										
vases/nic-nacs										
misc.										

	HABITATION Sample 2 Circles	164° 75'	194° 75'	194° 185'	224° 75'	224° 150'	224° 300'	224° 675'	254° 225'	254° 300'
	Personal Adornment						1			
	Toys									
	boy's									
	girl's									
	unknown									
	Non-food Containers									
	cleaning									
	tobacco									
	misc.		2	2	3					
	Structural Fittings		21		2	5	2			
	Floral Remains									
	Faunal Remains						1			
	Tools		1	1						
	Adaptive Reuse									
	Misc.						1			
1890's 1930's	INDUSTRIAL									
	Mining									
	ore location							1		
	ore extraction				2					
	ore processing				1					
	unknown									
	misc.									
	Mining Related									
	assaying									
	blacksmith									
	transportation				2					
	misc.		1							
	Adaptive Reuse		2	1						
	Reuse									
	Misc.	1	1		7					

HABITATION Sample 2 Circles	164° 75'	194° 75'	194° 185'	224° 75'	224° 150'	224° 300'	224° 675'	254° 225'	254° 300'	
Food Containers										
modern tin cans			8			30		1	2	
hole-in-top cans										
glass jars						3				
bottles						2		1		
misc.			1			1				
Kitchen Wares										
utensils										
wood stove			1	1						
plates										
cups						1				
saucers										
bowls						1				
crockery										
glasses										
glass dishes										
misc.			2							
Medicine										
Alcoholic Containers										
beer cans										
beer bottles										
wine bottles										
liquor bottles										
unknown										
misc.										
Clothing/Buttons										
Footwear						2				
Household Adornment										
vases/nic-nacs										
misc.										

1890's 1930's

HABITATION Sample 3 Circles	254° 375'	254° 450'	254° 525'	284° 150'	284° 375'	284° 450'	314° 225'	314° 375'	344° 75'	344° 150'
Personal Adornment										
Toys										
boy's										
girl's										
unknown				1	1			3		
Non-food Containers										
cleaning										
tobacco				6						
misc.					1	1				
Structural Fittings			1			1				
Floral Remains										
Faunal Remains			1							
Tools						1				
Adaptive Reuse										
Misc.			1		1					
INDUSTRIAL										
Mining										
ore location										
ore extraction		1								
ore processing										
unknown										
misc.										
Mining Related										
assaying										
blacksmith										
transportation					1				1	1
misc.									1	
Adaptive Reuse										
Reuse										
Misc.	2					3	1			1

HABITATION

Samples 3 Circles	254° 375'	254° 450'	254° 525'	284° 150'	284° 375'	284° 450'	314° 225'	314° 375'	344° 75'	344° 150'
Food Containers										
modern tin cans	2		154	174	42		1	2	2	
hole-in-top cans					1					
glass jars				1	1					
bottles			5	7	15			4		
misc.			1	1						
Kitchen Wares										
utensils										
wood stove	1									
plates										
cups										
saucers										
bowls			2	1			1			
crockery				1						
glasses										
glass dishes			2							
misc.				1	2					
Medicine				2						
Alcoholic Containers										
beer cans			3	1	1cone			1		
beer bottles			3							
wine bottles										
liquor bottles					1					
unknown										
misc.										
Clothing/Buttons							2			
Footwear			1							
Household Adornment										
vases/nic-nacs										
misc.										

HABITATION Sample 4 Circles	344P 225'	344P 300'	344P 450'							
Personal Adornment										
Toys										
boy's										
girl's	1									
unknown										
Non-food Containers										
cleaning										
tobacco										
misc.			1							
Structural Fittings	1	1								
Floral Remains										
Faunal Remains										
Tools										
Adaptive Reuse		1								
Misc.										
1890's 1930's INDUSTRIAL										
Mining										
ore location										
ore extraction										
ore processing										
unknown										
misc.										
Mining Related										
assaying										
blacksmith										
transportation										
misc.										
Adaptive Reuse										
Reuse										
Misc.	1									

HABITATION

Sample 4 Circles	344^{o} 225'	344^{o} 300'	344^{o} 450'							
Food Containers										
modern tin cans	1									
hole-in-top cans										
glass jars										
bottles										
misc.										
Kitchen Wares										
utensils										
wood stove										
plates										
cups										
saucers										
bowls										
crockery										
glasses										
glass dishes										
misc.										
Medicine										
Alcoholic Containers										
beer cans										
beer bottles										
wine bottles										
liquor bottles										
unknown										
misc.										
Clothing/Buttons										
Footwear										
Household Adornment										
vases/nic-nacs										
misc.										
Tobacco										

1890's 1930's

HABITATION Features	6	24	25	37& 39 *	45	46	47 *	49	50 In	50 Out
Personal Adornment										
Toys										
boy's										
girl's										
unknown										
Non-food Containers										
cleaning			2		1				1	
tobacco							3			
misc.				1		5	1			
Structural Fittings	1				1	1			2	1
Floral Remains										
Faunal Remains						1				
Tools										
Adaptive Reuse										
Misc.				1		1	2			1
INDUSTRIAL										
Mining										
ore location										
ore extraction										
ore processing		1								
unknown					1					
misc.										
Mining Related										
assaying										
blacksmith										
transportation										
misc.										
Adaptive Reuse										
Reuse										
Misc.							2			

HABITATION Features	6	24	25	37& 39	45	46	47 *	49	50 In	50 Out
Food Containers										
modern tin cans			171	106	4					
hole-in-top cans			16				3			
glass jars					4		5			
bottles				3	1		5		1	
misc.					1				1	
Kitchen Wares										
utensils										
wood stove	1	1		1	1					
plates										
cups			1							
saucers										
bowls							1			1
crockery										1
glasses										
glass dishes										
misc.							3	1	1	
Medicine					2					
Alcoholic Containers										
beer cans				8cone	4		19cone			
beer bottles										
wine bottles										
liquor bottles							2			
unkaown										
misc.										
Clothing/Buttons										
Footwear										2
Household Adornment										
vases/nic-nacs									1	
misc.										
Tobacco										

		HABITATION Features	51	52	53	54	55	56	57	59 ** W-1	59 W-2	59 W-3
		Personal Adornment										
		Toys										
		boy's										
		girl's										
		unknown		1							3	
		Non-food Containers										
		cleaning										
		tobacco					1				1	
		misc.				2	1					
		Structural Fittings		3	+	2+		1	2			
		Floral Remains										
		Faunal Remains					1					
		Tools										
		Adaptive Reuse										
		Misc.		1								
1890's	1930's	INDUSTRIAL										
		Mining										
		ore location										
		ore extraction										
		ore processing				2						
		unknown										
		misc.				+						
		Mining Related										
		assaying										
		blacksmith					1					
		transportation		1		2				1		
		misc.					2					
		Adaptive Reuse					1					
		Reuse										
		Misc.				4+	1					

HABITATION Features	51	52	53	54	55	56	57	59 ** W-1	59 W-2	59 W-3
Food Containers										
modern tin cans			+					31	43	77
hole-in-top cans		2								
glass jars									2	2
bottles			+			+			3	
misc.	1	1								5
Kitchen Wares										
utensils										
wood stove										
plates										1
cups								1		
saucers									1	
bowls										
crockery						+				
glasses										
glass dishes										
misc.		1								
Medicine										
Alcoholic Containers										
beer cans										
beer bottles										
wine bottles										
liquor bottles										
unknown										
misc.										
Clothing/Buttons										
Footwear		2								
Household Adornment										
vases/nic-nacs										
misc.										
Tobacco										

HABITATION Features	59 W-4	59 W-5	59 W-6	59 W-7	59 W-8	60	65	66	67	69
Personal Adornment										
Toys										
boy's										
girl's										
unknown		1								
Non-food Containers										
cleaning	17	1							3	
tobacco	1	2	1	2					1	
misc.					1		1		6	
Structural Fittings				3			1	1		
Floral Remains										
Faunal Remains										
Tools										
Adaptive Reuse										
Misc.	3						1		6	1
INDUSTRIAL										
Mining										
ore location										
ore extraction						2				1
ore processing										
unknown										
misc.										1
Mining Related										
assaying										
blacksmith										
transportation									1	
misc.										
Adaptive Reuse										
Reuse										
Misc.										4

1890's 1930's

HABITATION

Features	59 W-4	59 W-5	59 W-6	59 W-7	59 W-8	60	65	66	67	69
Food Containers										
modern tin cans	54	63	64	49	29		3+	+	206	+
hole-in-top cans									1	91
glass jars	2	4		4	1	1	+		2	
bottles								1	8	
misc.		9	1	2			+	1	1	+
Kitchen Wares										
utensils										
wood stove									1	
plates		4		1	1				1	
cups	1			2	1					
saucers		1								
bowls		3		4	3		1		1	
crockery				2	1					
glasses					1					
glass dishes									1	
misc.		2		1			1		2	
Medicine	3									
Alcoholic Containers										
beer cans		1							3	
beer bottles									25	
wine bottles										
liquor bottles							1		1	
unknown										
misc.										
Clothing/Buttons							1			1
Footwear									1	1
Household Adornment										
vases/nic-nacs										
misc.										
Tobacco										

		HABITATION Features	71 L-7	71 L-8	73	76	78	~~79~~ In	79 Out	95	*96 A-2 L-1 W-6-7	96 A-2 L-2
		Personal Adornment									2	
		Toys										
		boy's										
		girl's										
		unknown										
		Non-food Containers										
		cleaning									1	
		tobacco		1		3		1			2	
		misc.					1	1				
		Structural Fittings	2		3	2		6				
		Floral Remains										
		Faunal Remains	2									
		Tools										
		Adaptive Reuse						1				
		Misc.							1			
1890's	1930's	INDUSTRIAL										
		Mining										
		ore location		1								1
		ore extraction	25	8				1				
		ore processing	9	4				1				
		unknown	3									
		misc.										
		Mining Related										
		assaying	1		39fragments 4							
		blacksmith										
		transportation			4							
		misc.			15							
		Adaptive Reuse										
		Reuse										
		Misc.			2	1		1				4

HABITATION Features	71 L-7	71 L-8	73	76	78	79 In	79 Out	95	*96 A-2 L-1 W-6-7	96 A-2 L-2
Food Containers										
modern tin cans	2					2	1		97	41
hole-in-top cans								95		
glass jars				1					2	1
bottles					2	1				6
misc.							1			
Kitchen Wares										
utensils										1
wood stove			1	2		1				
plates										
cups				1		1				
saucers										
bowls										
crockery										
glasses										
glass dishes						1				
misc.							1			
Medicine										
Alcoholic Containers										
beer cans										
beer bottles									1	
wine bottles										
liquor bottles									1	
unknown										
misc.										
Clothing/Buttons						2				
Footwear						1			1	2
Household Adornment										
vases/nic-nacs									1	
misc.										
Tobacco										

		HABITATION Features	97	98	101	104	107					
		Personal Adornment										
		Toys										
		boy's										
		girl's										
		unknown					3					
		Non-food Containers										
		cleaning					2					
		tobacco	2									
		misc.	1									
		Structural Fittings	1				3					
		Floral Remains										
		Faunal Remains										
		Tools										
		Adaptive Reuse	3									
		Misc.					4					
1890's	1930's	INDUSTRIAL										
		Mining										
		ore location										
		ore extraction										
		ore processing										
		unknown	1									
		misc.										
		Mining Related										
		assaying										
		blacksmith				6						
		transportation	2			3	2					
		misc.										
		Adaptive Reuse				1						
		Reuse										
		Misc.	4			1						

HABITATION

Features	97	98	101	104	107
Food Containers					
modern tin cans	16	104	16		315
hole-in-top cans					4
glass jars	5				11
bottles	19	1			8
misc.	10		1		8
Kitchen Wares					
utensils					
wood stove	3				
plates		1			5
cups	1				5
saucers					1
bowls	1				5
crockery	2				2
glasses					
glass dishes	2				4
misc.	10	1			1
Medicine		2			3
Alcoholic Containers					
beer cans	5				
beer bottles					1
wine bottles					
liquor bottles	1				
unknown					
misc.					
Clothing/Buttons					
Footwear	4	1			
Household Adornment					
vases/nic-nacs					1
misc.					
Tobacco					7

Map #2

MONTANA HISTORIC ARCHITECTURAL INVENTORY

CONTACT PHOTO

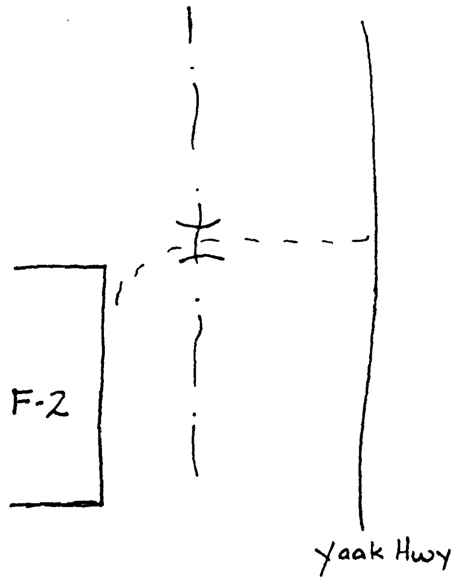
N NE E SE S SW W NW
ROLL ______ FRAME ______

LEGAL LOCATION Township34North Range33West DATE 1/10/86
NE¼ of NE¼ of SW¼ of Section 18

OWNERSHIP
☒ PUBLIC
☐ PRIVATE

NAME Kootenai National Forest
ADDRESS U.S. Hwy. 2 Box AS Libby, Montana

SKETCH PLAN WITH ARROW NORTH



HISTORIC NAME Yahk Mining District
ORIGINAL OWNER
DATE OF CONSTRUCTION 1897
☐ DOCUMENTED ☒ ESTIMATED
COMMON NAME Sylvanite Mining District
ARCHITECT/BUILDER Unknown
ORIGINAL USE Mining Technology/Stamp Mill
PRESENT USE None

RETENTION OF ORIGINAL DESIGN: ☒ ALTERED
☒ MAJOR ☐ MINOR ☐ UNALTERED

CONDITION: ☐ EXCELLENT ☐ GOOD ☐ FAIR
☐ DETERIORATED ☐ IN RUINS
☒ NO LONGER EXISTS

ENVIRONMENTAL/ECONOMIC THREATS TO SURVIVAL:
☐ PRIVATE DEVELOPMENT ☐ ZONING
☐ PUBLIC WORKS PROJECTS ☐ VANADALISM
☐ DETERIORATION ☐ OTHER (SPECIFY)

SURROUNDING ENVIRONMENT: ☐ RESIDENTIAL
☒ OPEN LAND ☐ AGRICULTURAL
☐ COMMERCIAL ☐ SCATTERED BUILDINGS
☐ HIGH BUILDING DENSITY ☐ INDUSTRIAL

NUMBER OF STORIES: 1 1-1/2 2 2-1/2 N/A
CHIMNEYS: POSITION AND NUMBER N/A
FOUNDATION: ☐ SILL ON BARE GROUND ☒ OTHER

BUILDING TYPE/ARCHITECTURAL STYLE: Unknown

EXTERIOR MATERIALS: Unknown
☐ BRICK (COURSING & COLOR) ______ ☐ CLAPBOARD
☐ LOG (NOTCH TYPE) ______ ☐ SHIPLAP
☐ SHINGLE (EDGE TYPE) ______
☐ OTHER ______

ROOF: (TYPE) ☐ GABLE ☐ HIPPED ☐ FLAT ☐ SHED ☒ OTHER Unknown
(COVERING) ☐ WOOD SHINGLE ☐ METAL ☐ WOOD SHAKE ☐ ASPHALT ☐ OTHER ______

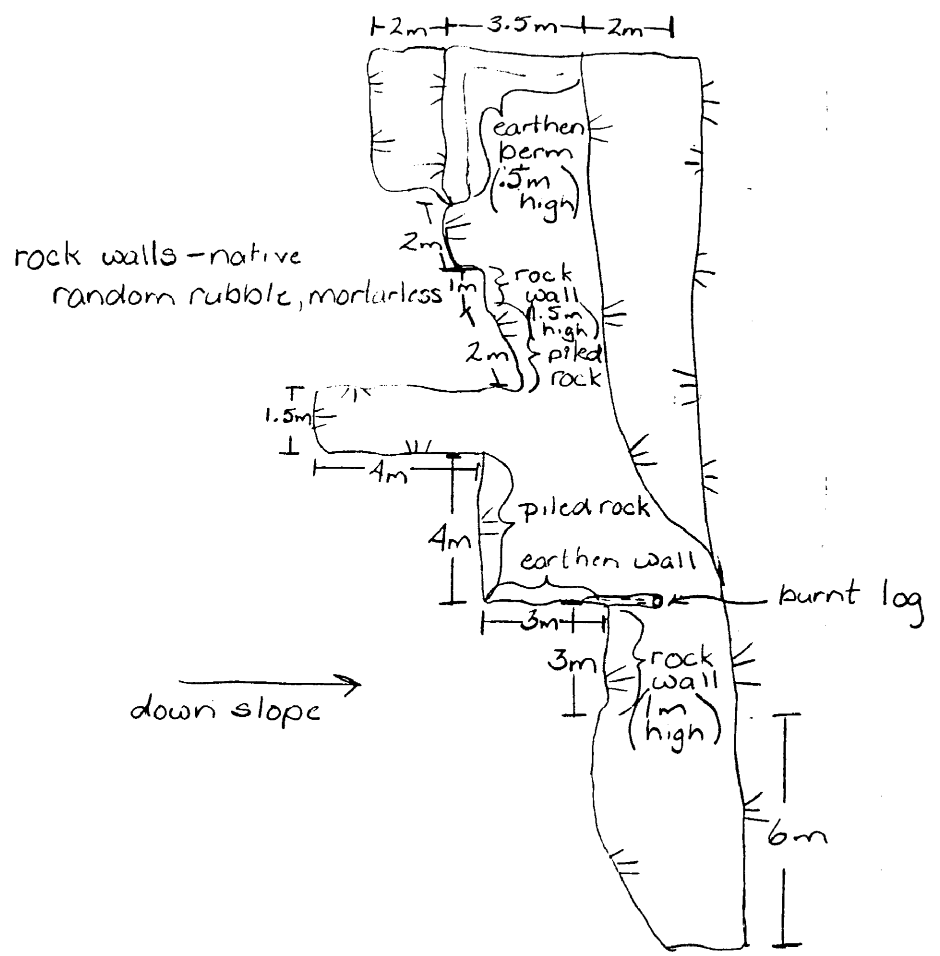
WINDOWS: (TYPE) ☐ DOUBLE HUNG ☐ CASEMENT ☐ FIXED
(SASH ARRANGEMENT) ☐ 1/1 ☐ 2/2 ☐ 4/4 ☐ 2/1 ☐ 3/1 ☐ 4/1 ☒ OTHER Unknown

OUTBUILDINGS: ☐ BARNS ☐ SHEDS ☐ GARAGE ☒ OTHER Unknown

DESCRIBE SIGNIFICANT ARCHITECTURAL FEATURES AND NOTE ANY ADDITIONS, ALTERNATIONS, & CHANGES IN MATERIALS. PHYSICAL DESCRIPTION

The only remaining evidence of the stamp mill is the foundation outline (See map).

Feature 2 Goldflint Stamp Mill



MONTANA HISTORIC ARCHITECTURAL INVENTORY

LEGAL LOCATION Township34North Range 33West DATE 1/20/84
NW¼ of NW¼ of SE¼ of section 16

OWNERSHIP
[X] PUBLIC NAME US Forest Service
[ ] PRIVATE ADDRESS US Hwy. 2, Box AS, Libby, Montana

CONTACT PHOTO

N NE E SE S SW W NW
ROLL ______ FRAME ______

SKETCH PLAN WITH ARROW NORTH
(See Continuation Sheet)

HISTORIC NAME Yahk Mining District
ORIGINAL OWNER Lincoln Gold Mining Company
DATE OF CONSTRUCTION 1910
[X] DOCUMENTED [ ] ESTIMATED
COMMON NAME Sylvanite Mining District
ARCHITECT/BUILDER
ORIGINAL USE Mining Technology/Ore Processing
PRESENT USE None known
RETENTION OF ORIGINAL DESIGN: [X] ALTERED
[X] MAJOR [ ] MINOR [ ] UNALTERED
CONDITION: [ ] EXCELLENT [ ] GOOD [ ] FAIR
[ ] DETERIORATED [X] IN RUINS
[ ] NO LONGER EXISTS
ENVIRONMENTAL/ECONOMIC THREATS TO SURVIVAL:
[ ] PRIVATE DEVELOPMENT [ ] ZONING
[ ] PUBLIC WORKS PROJECTS [X] VANADALISM
[X] DETERIORATION [ ] OTHER (SPECIFY)
SURROUNDING ENVIRONMENT: [ ] RESIDENTIAL
[X] OPEN LAND [ ] AGRICULTURAL
[ ] COMMERCIAL [ ] SCATTERED BUILDINGS
[ ] HIGH BUILDING DENSITY [ ] INDUSTRIAL
NUMBER OF STORIES: 1 1-1/2 2 2-1/2 N/A
CHIMNEYS: POSITION AND NUMBER N/A
FOUNDATION: [ ] SILL ON BARE GROUND [ ] OTHER

BUILDING TYPE/ARCHITECTURAL STYLE: Remains of 30 stamp mill

EXTERIOR MATERIALS:
[ ] BRICK (COURSING & COLOR) ______ [ ] CLAPBOARD
[ ] LOG (NOTCH TYPE) ______ [ ] SHIPLAP
[ ] SHINGLE (EDGE TYPE) ______
[X] OTHER Unknown

ROOF: (TYPE) [ ] GABLE [ ] HIPPED [ ] FLAT [ ] SHED [X] OTHER Unknown
(COVERING) [ ] WOOD SHINGLE [ ] METAL [ ] WOOD SHAKE [ ] ASPHALT [X] OTHER Unknown

WINDOWS: (TYPE) [ ] DOUBLE HUNG [ ] CASEMENT [ ] FIXED
(SASH ARRANGEMENT) [ ] 1/1 [ ] 2/2 [ ] 4/4 [ ] 2/1 [ ] 3/1 [ ] 4/1 [X] OTHER Unknown

OUTBUILDINGS: [ ] BARNS [ ] SHEDS [ ] GARAGE [ ] OTHER ______

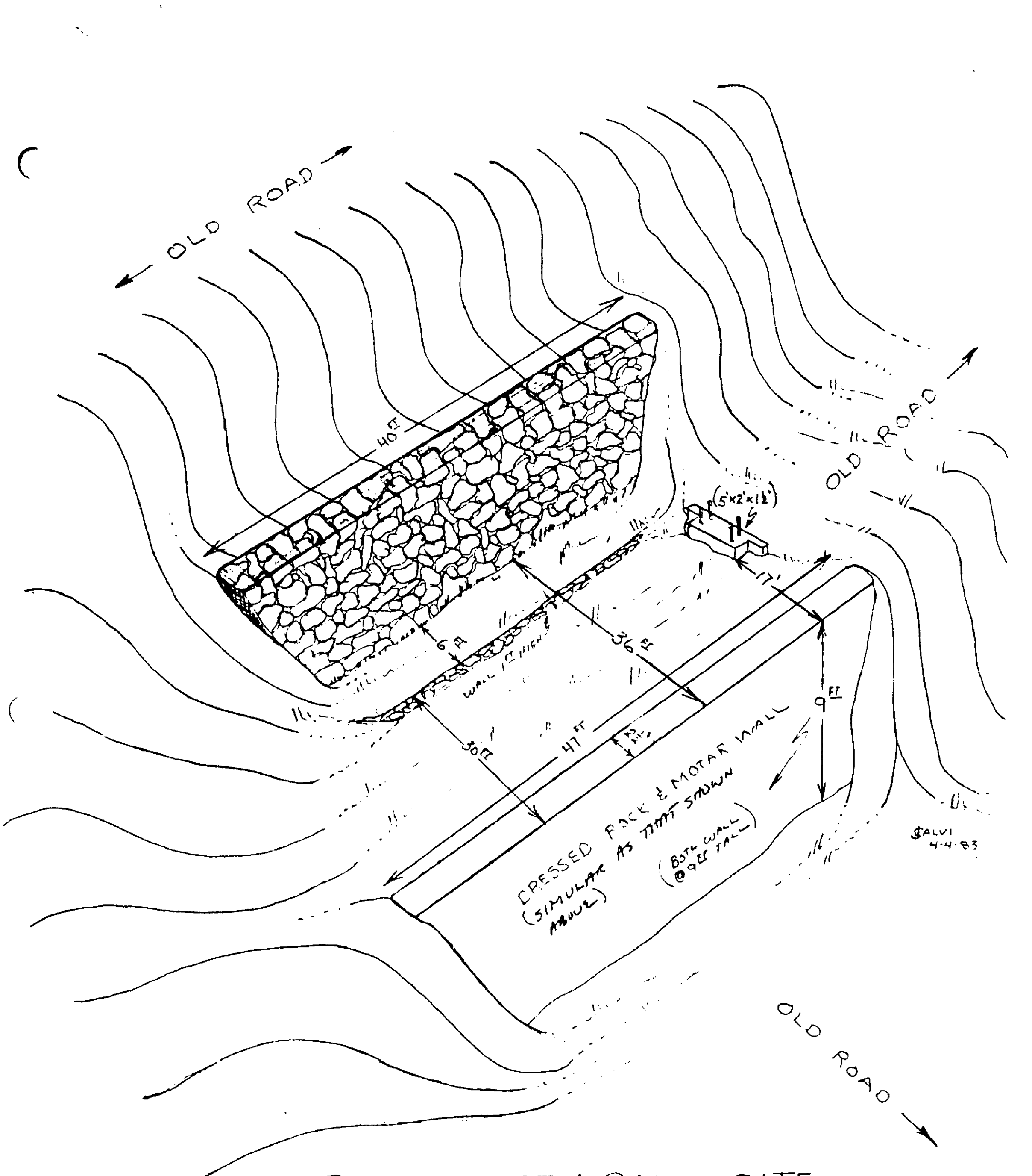
DESCRIBE SIGNIFICANT ARCHITECTURAL FEATURES AND NOTE ANY ADDITIONS, ALTERNATIONS, & CHANGES IN MATERIALS. PHYSICAL DESCRIPTION
What remains of this feature are two large and one small retaining walls of random native rubble. Details of the remains are illustrated on the attached continuation sheet.

CONTINUATION SHEET

Feature #1

Historical Significance

The 30 stamp mill was constructed the summer of 1910. A newspaper account in June of 1910 reports that the stamp mill is awaiting the installation of the power source (steam). The forest fire destroyed the mill on August 26, 1910, before the mill ever ran. The mining equipment was salvaged. (Troy Herald May-August, 1910)



GOLOFLINT STAMP MILL SITE

(YAHK VALLEY STAMP MILL)

5-Stamp Mill

Appendix VIII

MONTANA HISTORIC ARCHITECTURAL INVENTORY

CONTACT PHOTO

LEGAL LOCATION Township34North Range33West DATE 12/5/83

SW¼ of SE¼ of NE¼ of Section 20

OWNERSHIP

☒ PUBLIC NAME Kootenai National Forest

and ☒ PRIVATE ADDRESS U.S. Hwy. 2 Box AS Libby, Montana

N NE E SE S SW W NW

ROLL ____ FRAME ____

SKETCH PLAN WITH ARROW NORTH

(See Continuation Sheet)

HISTORIC NAME Yahk Mining District

ORIGINAL OWNER Unknown

DATE OF CONSTRUCTION 1931-1937

☐ DOCUMENTED ☒ ESTIMATED

COMMON NAME Sylvanite Mining District

ARCHITECT/BUILDER

ORIGINAL USE Mining Technology/Ore Processing

PRESENT USE

RETENTION OF ORIGINAL DESIGN: ☒ ALTERED ☒ MAJOR ☐ MINOR ☐ UNALTERED

CONDITION: ☐ EXCELLENT ☐ GOOD ☐ FAIR ☒ DETERIORATED ☐ IN RUINS ☐ NO LONGER EXISTS

ENVIRONMENTAL/ECONOMIC THREATS TO SURVIVAL: ☒ PRIVATE DEVELOPMENT ☐ ZONING ☐ PUBLIC WORKS PROJECTS ☒ VANADALISM ☒ DETERIORATION ☐ OTHER (SPECIFY)

SURROUNDING ENVIRONMENT: ☐ RESIDENTIAL ☒ OPEN LAND ☐ AGRICULTURAL ☐ COMMERCIAL ☐ SCATTERED BUILDINGS ☐ HIGH BUILDING DENSITY ☒ INDUSTRIAL

NUMBER OF STORIES: 1 1-1/2 2 2-1/2 5 levels

CHIMNEYS: POSITION AND NUMBER None

FOUNDATION: ☒ SILL ON BARE GROUND ☐ OTHER

BUILDING TYPE/ARCHITECTURAL STYLE: Pole and Frame Structure

EXTERIOR MATERIALS:

☐ BRICK (COURSING & COLOR) ☐ CLAPBOARD

☐ LOG (NOTCH TYPE) ☐ SHIPLAP

☐ SHINGLE (EDGE TYPE)

☒ OTHER horizontal and vertical plank

ROOF: (TYPE) ☒ GABLE ☐ HIPPED ☐ FLAT ☒ SHED ☐ OTHER

(COVERING) ☐ WOOD SHINGLE ☐ METAL ☐ WOOD SHAKE ☐ ASPHALT ☐ OTHER

WINDOWS: (TYPE) ☐ DOUBLE HUNG ☐ CASEMENT ☐ FIXED

(SASH ARRANGEMENT) ☐ 1/1 ☐ 2/2 ☐ 4/4 ☐ 2/1 ☐ 3/1 ☐ 4/1 ☐ OTHER

OUTBUILDINGS: ☐ BARNS ☐ SHEDS ☐ GARAGE ☐ OTHER

DESCRIBE SIGNIFICANT ARCHITECTURAL FEATURES AND NOTE ANY ADDITIONS, ALTERNATIONS, & CHANGES IN MATERIALS. PHYSICAL DESCRIPTION

This feature is what remains of a 5 stamp mill. The mill had five levels to process ore. The power for the operation came from a Ford automobile engine. Description is best handled through illustrations and notes (See Following Pages).

HISTORICAL SIGNIFICANCE: DESCRIBE IMPORTANT PERSONS, EVENTS, AND/OR HISTORICAL PATTERNS ASSOCIATED WITH STRUCTURE, SITE AND SURROUNDING AREA.

The advent of mining impacted pecples' lives in far reaching ways. The location of a mine was limited only by the existence of an ore body, which was not attentive to rough terrain or harsh climate. The Yahk Mining District displays this drive to pioneer uninhabited areas in search of precious metals, as the Yahk mining initiated settlement of the valley. Even the most simple of mining techniques precipitated the construction of living quarters. The introduction of hardrock mining, complete with processing mills, was almost a sure indication that a community of some sort would follow to accommodate the miner. This meant the construction of living quarters, barns, sheds, blacksmith shops, powderhouses, root cellars, outhouses, and other assorted structures. Two separate, but closely associated communitities served the Yahk Mining District; the town of Sylvanite (burnt in the 1910 fire) and the Yahk Camp (here reported). (See Continuation Sheet)

ARCHITECTURAL SIGNIFICANCE: EXPLAIN HOW LOCATION, DESIGN, MATERIALS, AND/OR WORKMANSHIP CONTRIBUTE TO THE PROPERTY'S SIGNIFICANCE.

The mining camp, as described in various histories, constructed its buildings expediently, using the easiest methods and the most accessible building materials (Young, 1970; Smith, 1967; Backus, 1969). Once a profitable mine had been located the necessary structures were built. Little time was spent in this process as time spent away from mining meant loss of money. If this description is accurate, then the architecture of the Yahk Camp should reflect this attitude.

INFORMATION VALUE: EXPLAIN HOW THE EXTANT STRUCTURE/SITE MAY DEMONSTRATE OR YIELD INFORMATION ABOUT ITS HISTORIC USE OR CONSTRUCTION. Several other problems can be addressed using information provided by structures at a mining camp. The layout of a mining camp's structures can answer questions about settlement patterns. It can also lend itself to questions about the level of organization for construction of the camp. The number of structures can provide some information on the number of people living and working at the camp. The artifacts found in association with the structures may enlighten us to the makeup of the population at the camp (single men, families, etc.). The economic divisions may be detected through the observation of a structure's elaborateness or simplicity

CONTRIBUTION TO A DISTRICT: DESCRIBE THE VISUAL AND HISTORIC RELATIONSHIP BETWEEN THE STRUCTURE/SITE AND THE SURROUNDING AREA.

The Yahk Mining District is unique in its ability to represent a complete array of aspects of the mining life-style. One aspect is the domestic realm, evident by the several structures at the Yahk Camp. The structures may also reflect mining related aspects (powderhouses, blacksmith shops). Therefore the structures contribution to the Yahk Mining District are in their ability to provide a holistic view of the mining community.

FORM PREPARED BY:

NAME Rebecca S. Timmons, Forest Archaeologist TELEPHONE NUMBER 406-293-6211

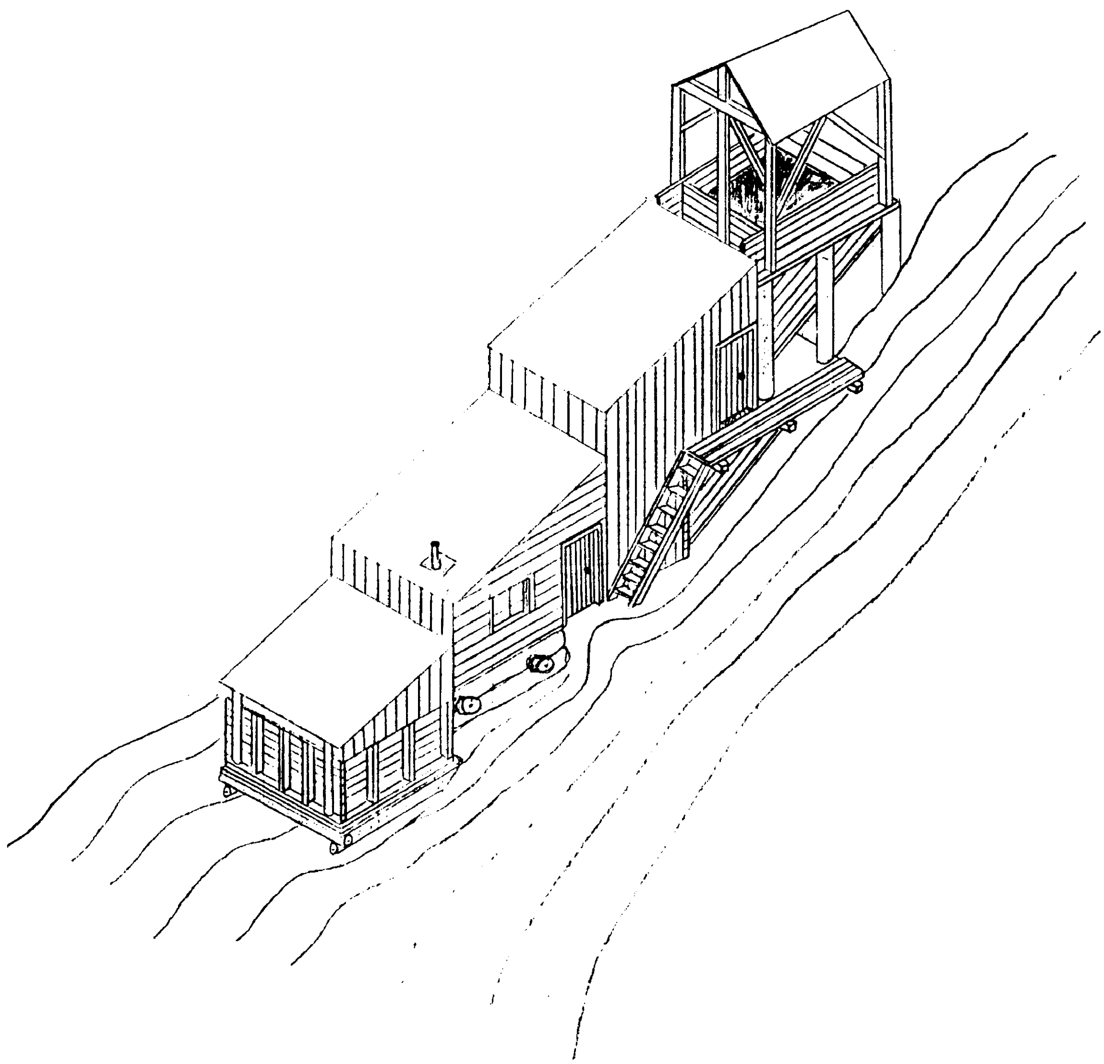
ADDRESS Hwy. 2, P.O. Box AS, Libby, Montana 59923 DATE Dec. 5, 1983

SHPO COMMENTS

UTM REFERENCE ~~E 91 950 E 91 990mE~~ 53 94 330-53 94 360mN Newton Mtn. 20 34N 33W

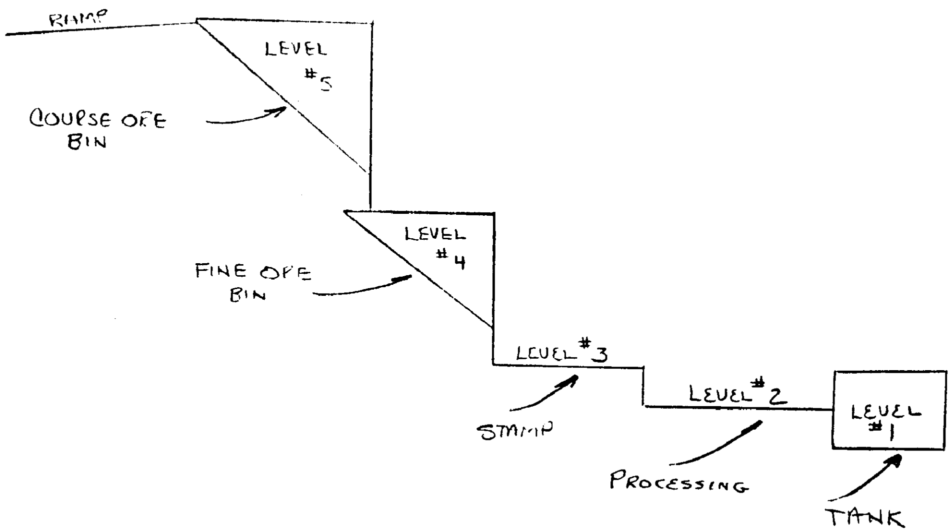
4TH OF JULY STAMP MILL

J. Calvi
7/6/83



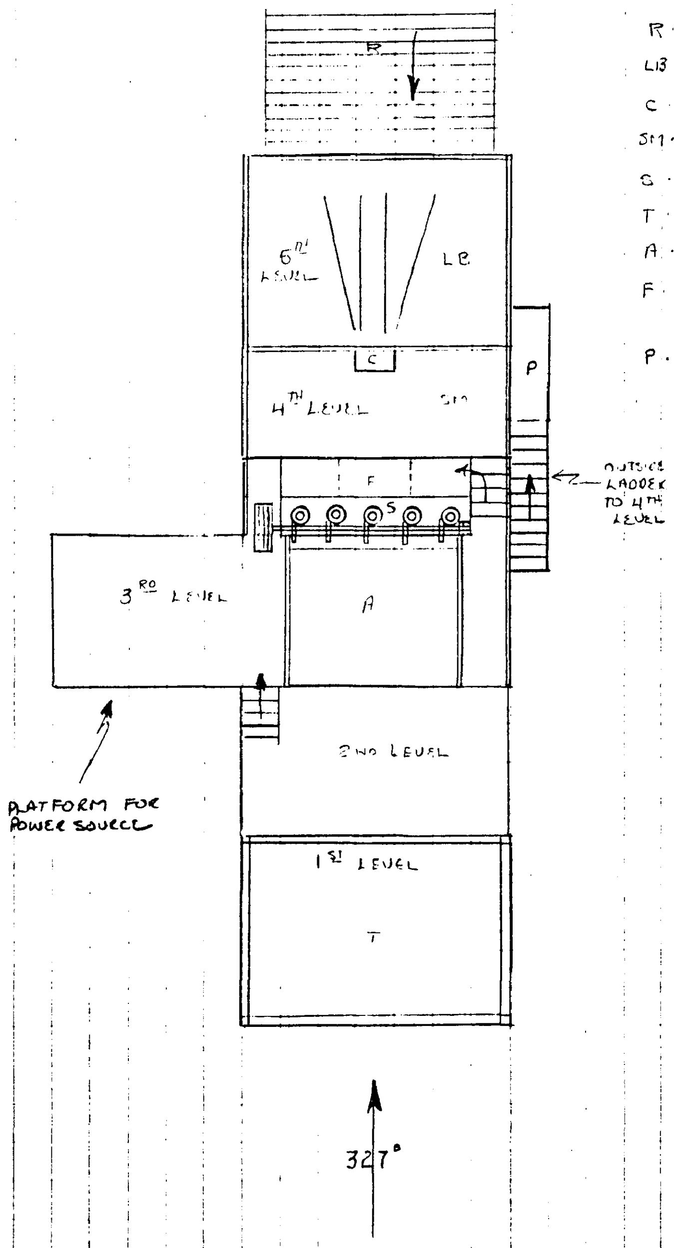
1 26
Calvi
4/18/83

4TH OF JULY STAMP MILL



2 26
Calvin
4/18/83

4TH OF JULY 5 STAMP MILL



R ···· RAMP
LB ···· LARGE ORE BIN (COURSE)
C ···· ORE CHUTE
SM ···· SMALL ORE BIN (FINE)
S ···· STAMP MILL (5 STAMPS)
T ···· LARGE WOODEN TANK
A ···· ALGIMATION TABLE
F ···· ORE FEEDER TO STAMPS LOCATED UNDER RANCING BEHIND STAMPS
P ··· PLATFORM OR CAT WALK

7100-71 (7/68)

Keystone Ball Mill

CULTURAL SITE RECORDS

FIELD # (optional) Y106 STATE #: 24LN263
MAP: USGS Newton Mt. Quad, 7.5', 1966 AERIAL USFS 1974 Line 28N No. 75
COUNTY: Lincoln CONTOUR: > 2700; < 2900; ≈2750-2850 feet + Msl
MERIDIAN: Principle T 34N, R 33W, NW ¼ of NW ¼, Sec. 9
U.T.M.G.: Zone 11 ; 582420 mE/ 5397900 mN
LAT./LONG. (optional): ° ' " W Long/ ° ' " N Lat.
SITE LOCATION (give bearings and distances wherever possible): The site sits on the first bench and the slope below the first bench above the west bank flood plain of the Yaak River. The site is approximately ½ mile north of the Sylvanite Ranger Station.

(#1) ACCESS: From the Kootenai National Forest Supervisor's Office travel north and west on Highway 2 approximately 29 miles to the junction with Highway 92 (Yaak River Road). Turn right. Proceed north approximately 16 miles. The site is on the immediate west side of the highway.

(#2) SITE DESCRIPTION (Be thorough, explicit and concise; this may be the only record ever made of this resource.): The site consists of a mining complex containing an adit, a dwelling and out-building, and an ore mill (ball type). In total, 14 features were identified. (See "Features" for descriptions of the individual features.) The mine adit is located at the southwestern corner of the site. A road connects this area to the mill in the eastcentral portion of the site. The road continues beyond the mill to a residential area in the northwestern corner of the site.

SITE TYPE: Historic mining complex
DIMENSIONS: 180 meters NE - SW x 130 meters SE - NW (cf. plan)
ESTIMATED AREA: 23,400 square meters. DESCRIBE THE METHOD USED TO DETERMINE SITE EXTENT AND BOUNDARIES: The boundaries were established at the extreme parameters of the features. Measurements were taken by pacing.

DEPTH OF CULTURAL DEPOSIT: Maximum cm; Mean cm. Unknown
DESCRIBE METHOD USED TO DETERMINE DEPTH:
N/A

BIOTIC SETTING (Life zones, communities, and habitats):

COMMON ON-SITE VEGETATION: Cedar, grand fir, Douglas-fir, lodgepole pine, larch

SITE #: Y106

SURROUNDING VEGETATION: Same as above

LOCAL FAUNA: Deer (white-tailed), elk, moose, bear

SOIL OF SITE: Red-orange clay loam scree

ADJACENT SOIL: Same as above

CULTURAL GEOLOGY: The site is in an area of historically known deposits of silver and gold

LANDFORM SETTING: The site sits on the slope and bench of the first terrace above the flood plain of the Yaak River.

EXPOSURE TO SUN: The site receives a fair east/southeast exposure

EXPOSURE TO PREVAILING WIND: The site is moderately protected from the prevailing north and south winds

NEARBY WATER: Distance 200 meters; Direction west

Nature of water source Unnamed spring

SITE MODIFICATIONS (cultural or natural, including cuts, erosion, pot-hunting, construction, etc.): Some alterations have been done on the log house; other modifications are generally natural deterioration and revegetation

PREVIOUS STUDY (Nature of work, date, investigator, reference): None known

ARTIFACTS (Describe; note whether collected or left in situ): No artifacts were collected. Numerous cans, bottles, boards, nails, metal hardware, stove parts etc. were found throughout the area with concentrations occurring in the vicinity of features 1, 6, 7, 13, and 14. In addition, all of the machinery involved in the milling process is in the mill and reportedly functional.

SITE #: Y106

(#3) FEATURES (Describe briefly; attach supplemental data as needed): Feature 1 is an intact and reportedly functional ball type ore mill. The feature extends from the base of the slope up to the middle of the terrace.

The western-most extention of the feature is an earthen ramp beginning near the

(#4) CULTURE HISTORICAL INFERENCES: The Haywire Mine is one of several major operations in the Yaak area during the early part of the Twentieth Century. Invoices given to us by local residents show the mine to have been in operation at least until 1940.

APPARENT SIGNIFICANCE OF SITE: The site represents an unusually intact example of early Twentieth Century mining activity.

NATIONAL REGISTER STATUS: Presumed eligible

POTENTIAL IMPACTS TO SITE AND/OR ITS INTEGRITY: The site may be impacted by the proposed Yaak Highway improvement project.

COMMENTS:

OWNER (Name and address): Clyde Thornton Estate

TENANT: None

PHOTOGRAPHS (Number b/w, color, chrome; subjects):

PHOTO REPOSITORY: Supervisor's Office, Kootenai National Forest, Libby, Montana

PHOTO CATALOGUE Nos.: See appended document A

SITE RECORDER(S): Mary Collins and Rebecca Timmons

DATE: May 21, 1981

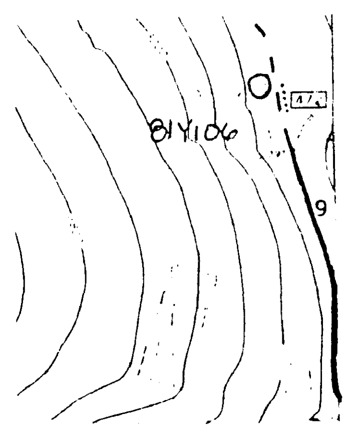
LIST OF APPENDED DOCUMENTS:

A Photographic Data Sheet

B Log Structure Survey Form

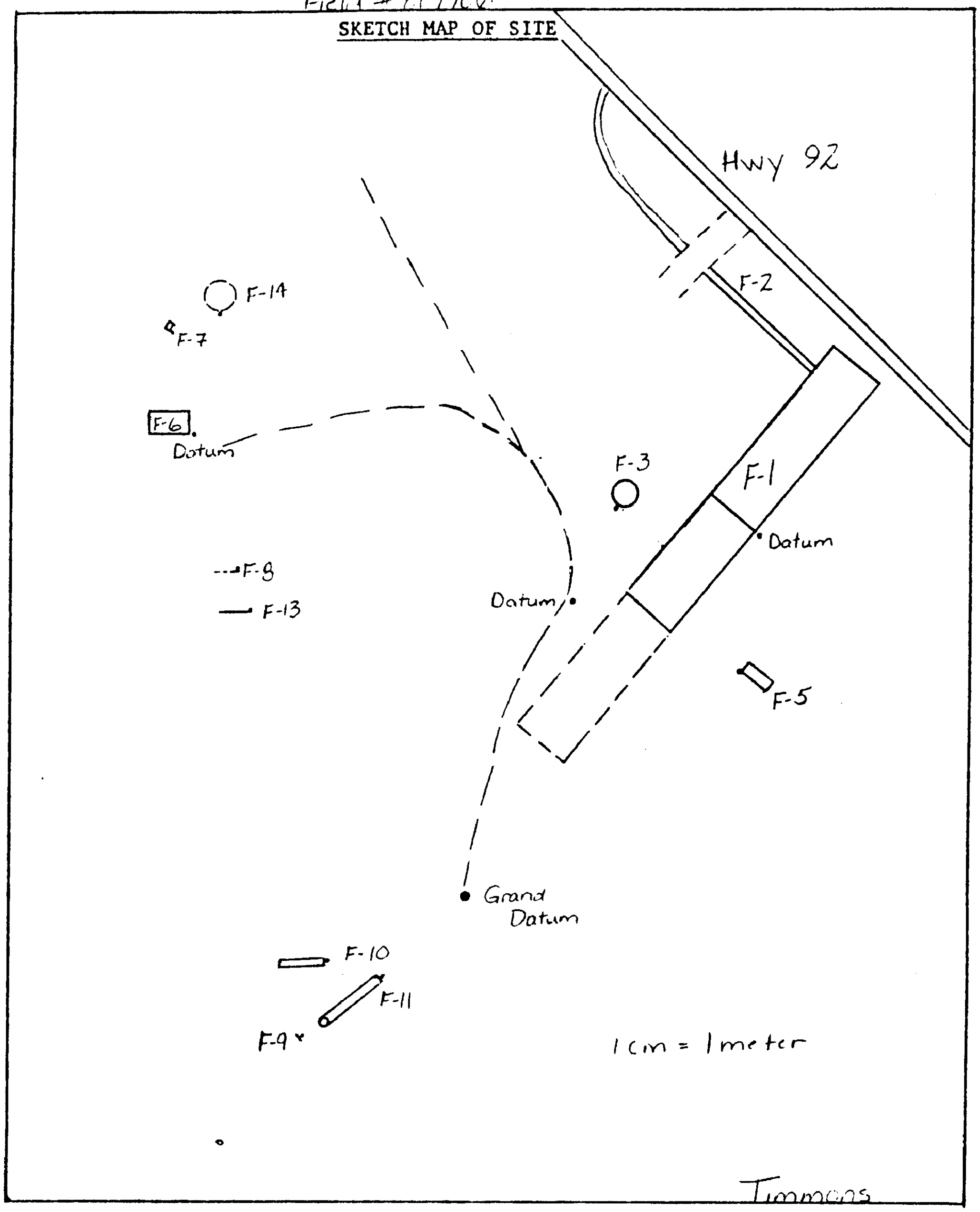
PORTION OF U.S.G.S.

MAP SHOWING SITE LOCATION



SITE #:______________

Field # 81Y/06



(1) Indicate magnetic north. (2) Show scale, if appropriate. (3) Use conventional U.S.G.S. map symbols to the extent possible. (4) Clearly identify all special use symbols. COMMENTS:

CULTURAL SITE INVENTORY RECORD
CONTINUATION SHEET

Field #: Y106 State#:

Item#	CONTINUED DATA
(#3) Features	center of the terrace and trending east to the terrace edge. The earthen ramp leads up to a wooden ramp constructed of native timbered logs and milled 2 X 12 cross members supporting a platform of 2 X 12 planks lain across 12 X 12 beams.
	The wooden platform is connected to a steel hopper. The west end of the hopper is supported by steel girders, the east end by milled 10 X 10 beams. A roof slopes down from the hopper to a covered conveyor belt. Attached to the south edge of the lean-to roof is a three-sided enclosure of 1 X 12 horizontal milled planking with a corrugated metal roof.
	Connected to the sloping roof on the east side is a covered conveyor belt. This structure is made of 1 X 12 horizontal planking on 2 X 4 framing. The roof is a lean-to style of overlapped 1 X 12's. The structure is 8 feet high on the south side and 6 feet high on the north.
	The covered conveyor belt passes under another, perhaps older, wooden hopper. The wooden hopper is supported by six native logs and 10 X 10 milled beams. A platform frame of 10 X 16 beams supports the hopper which is constructed of vertical 2 X 12's and corrugated metal.
	The interior of the mill is arranged on nine levels. The first level receives the conveyor belt. A chute on the south side descends to level 2. Level 2 has a covered hole in the center, possibly for adding lime to the crushed ore passing beneath the floor. Numerous bags of lime are stored about. A small door in the northeast corner leads to a set of stairs descending to level 3. Level 3 is a landing with partial walls, all the lower levels can be observed from this level.
	Level 4 contains the ball mill equipment. It is one of six different levels contained in the single largest room of the mill. Level 5 is a walkway around some machinery in the central area of the room. Level 6 is a platform below levels 4 and 5. It contains a single large table-like piece of machinery. Level 7 is a walkway connecting levels 8 and 9. Level 8 is the lowest level in the northeast corner. It contains two large funnel-shaped machines which empty into two large saucer-like metal containers. Several chairs and bottles of chemicals are adjacent to the walls. Level 9 is the lowest level. It contains a boiler and numerous boxes of paraphernalia collected and stored by the owner. See accompanying plan view drawing for sizes, distances, and relationships.

Field #: Y106 State #: ____________

Item #	Continued Data
(#3) Features	Feature 2 is a water conduit at the base of the slope on the northeastern corner of the site. The conduit is a north by south trending wooden trough 10 inches wide, 7 inches deep, and 26 meters long to an abandoned roadway. It then extends 30 meters beyond the road to a modern culvert. The conduit is constructed of 1 X 10 milled plank sides and 1 X 12 milled planked bottom. A 4-inch diameter pipe extends from the mill wall 4 meters down to the trough.
	Feature 3 is a water reservoir on the eastern edge of the bench. The reservoir is a large open-top cylinder, 7 feet tall and 16 feet in diameter. The construction is of vertical milled 3 X 6's with eight rounds of inch cable binding the planks together. The floor of the reservoir is of milled planks 6 inches wide and of an undetermined thickness. The reservoir sits on a foundation of 12 X 12 beams of assorted lengths.
	Feature 4 is a concrete slab foundation on an artificial earthen ledge at the base of the slope in the southeastern corner of the site. The slab measures 9 meters north by south and 5 meters east by west. In the center of the slab is a raised concrete block 2 meters square. Off the southwest corner of the raised block is a semisunken trough 16 inches deep and 12 inches wide. The trough has concrete sides 4 inches below the surface of the slab and 12 inches above. The trough is lined with milled 1 X 10's. 1.5 meters north of the northwest corner of the raised block is a wooden, plywood cover which when lifted revealed only unexcavated earth.
	Feature 5 is a large (1,000 gallon?) tank sitting on the eastern edge of the bench just south of the mill. It is lying in a north by south trending position. The tank is 18 feet long and 7 feet in diameter.
	Feature 6 is a log residence described in the accompanying log structure survey form.
	Feature 7 is the outhouse associated with feature 6. The structure has fallen to the northwest. The structure is constructed of vertically placed milled 1 X 12's. The roof

CULTURAL SITE INVENTORY RECORD
CONTINUATION SHEET

Field #: Y106 State #: ____________

Item #	Continued Data
(#3) Features	and door are cut from sheets of corrugated metal. The door extends the full height and width of the front wall. The building is 3 feet square and 8 feet tall.

Feature 8 is a pole fence southwest of feature 6. It consists of five peeled poles nailed between two trees. It is 4 feet high and 10 feet long.

Feature 9 is an adit in the southwest corner of the site at the western side (back) of the terrace. The opening measures 6 feet high and 4 feet wide. The adit extends south (at 230 degrees) for about 30 feet before making a sharp bend south beyond visibility. Locals say the adit extends at least several hundred additional feet.

Feature 10 is a trench immediately north of feature 9. It is one meter wide (north by south) and 8 meters long (east by west). It has an average depth of 43 inches. It sits on a 45 degree slope.

Feature 11 is a trench and vertical shaft immediately east of feature 9. The trench is 6 feet wide, 4 feet deep, and 42 feet long in a northeast by southwest trending direction. At the western end of the trench is a water-filled vertical shaft 6 feet in diameter and 5 feet deep before the water line. Two 2-inch pipes project from the center of the shaft. The upper portion is lined with logs. A back dirt pile from the excavation sits between features 10 and 11. Two 2 X 6's span the trench near its center. Additional milled lumber pieces and axed log fragments are strewn about.

Feature 12 is a road connecting the activity areas on the terrace. The road travels east from the adit to the mill. From the mill a spur heads southeast to the highway. A second spur travels northwest to the cabin area, feature 6. The road is about 130 meters long in total.

Feature 13 is a spring southwest of feature 6. The spring is about 200 meters up a steep cedar-covered slope. A 2-inch pipe runs down the slope to the terrace where it enters a trench. Several pieces of 1 X 6 tongue-and-groove lumber have been placed to create a small dam 2 feet wide and 6 inches high. A 50-gallon drum sits in the impounded area.

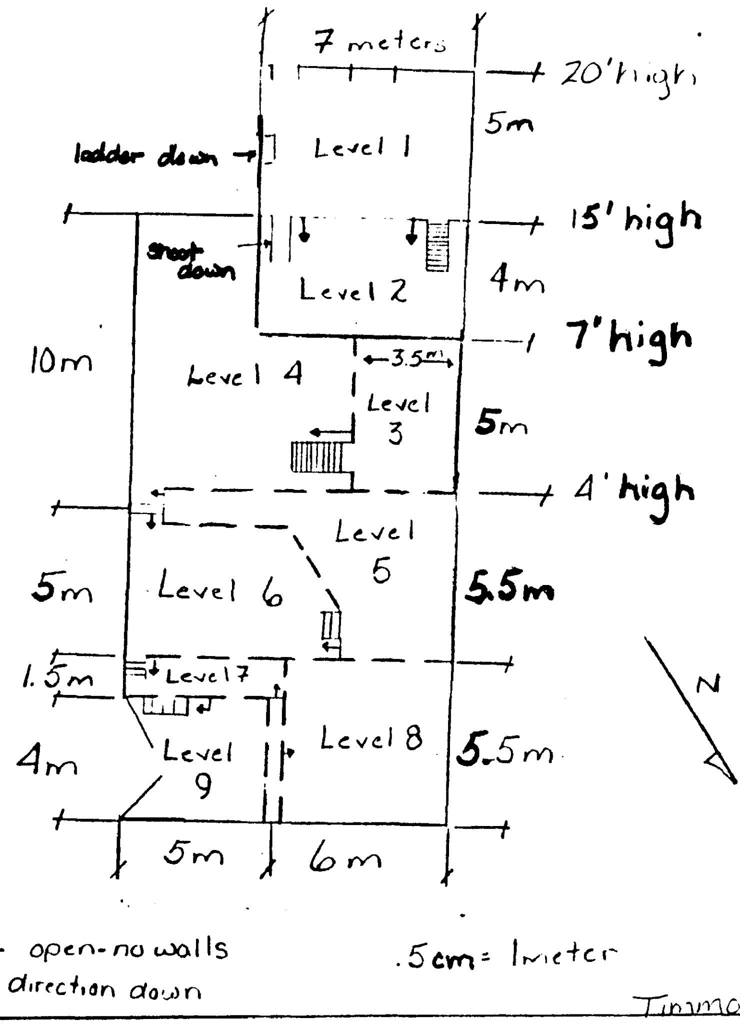
CULTURAL SITE INVENTORY RECORD
CONTINUATION SHEET

Field #: Y106 State #: ____________

Item #	Continued Data
(#3) Features	Feature 14 is a large prospecting pit north of feature 6. The pit is 20 feet in diameter and about 15 feet deep. The pit has been partially filled with trash, including pieces of corrugated metal, 50-gallon drums, stove parts, cans, and bottles.

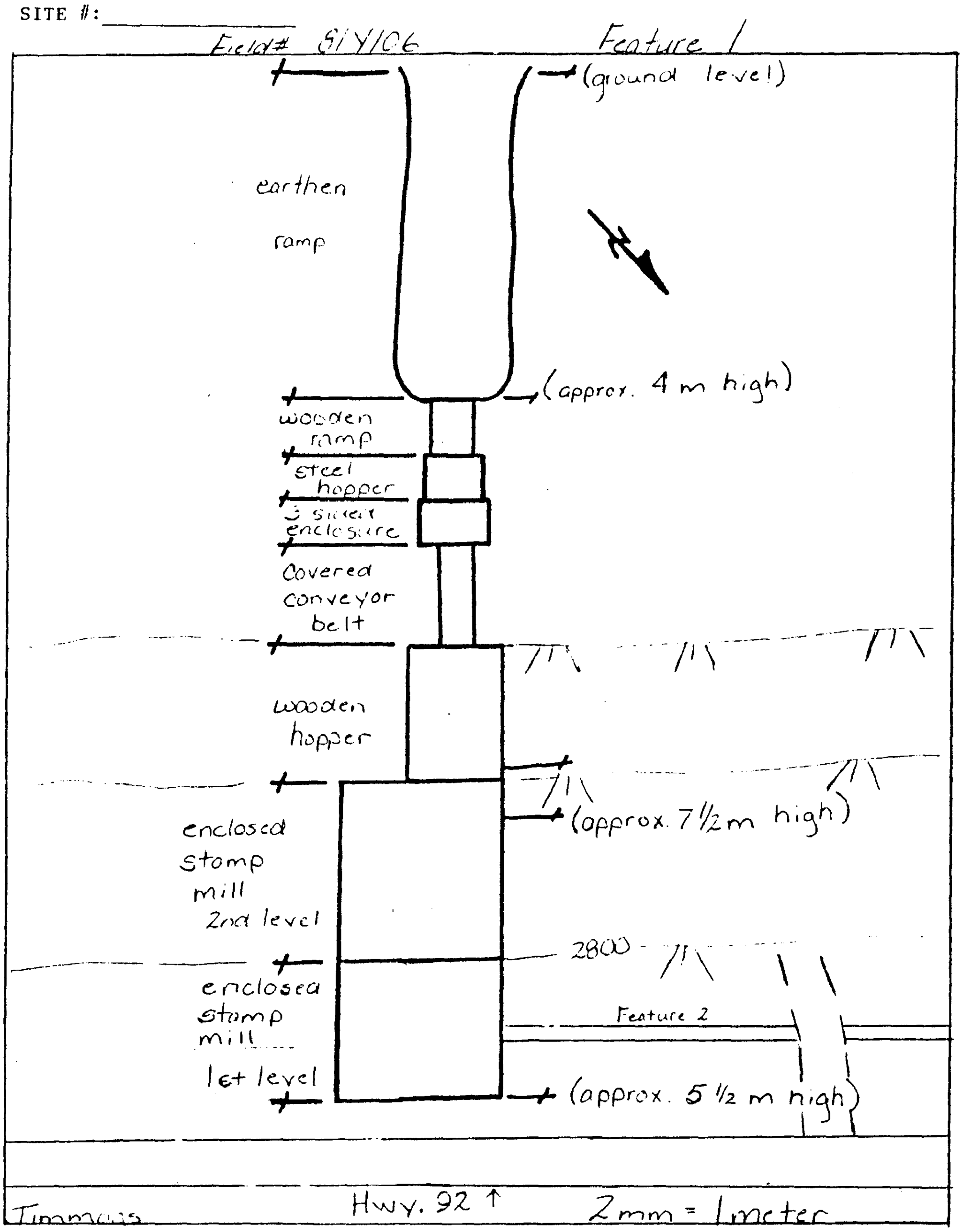
SITE #:________________ FIELD # 81106

SKETCH MAP OF SITE



(1) Indicate magnetic north. (2) Show scale, if appropriate. (3) Use conventional U.S.G.S. map symbols to the extent possible. (4) Clearly identify all special use symbols. COMMENTS:

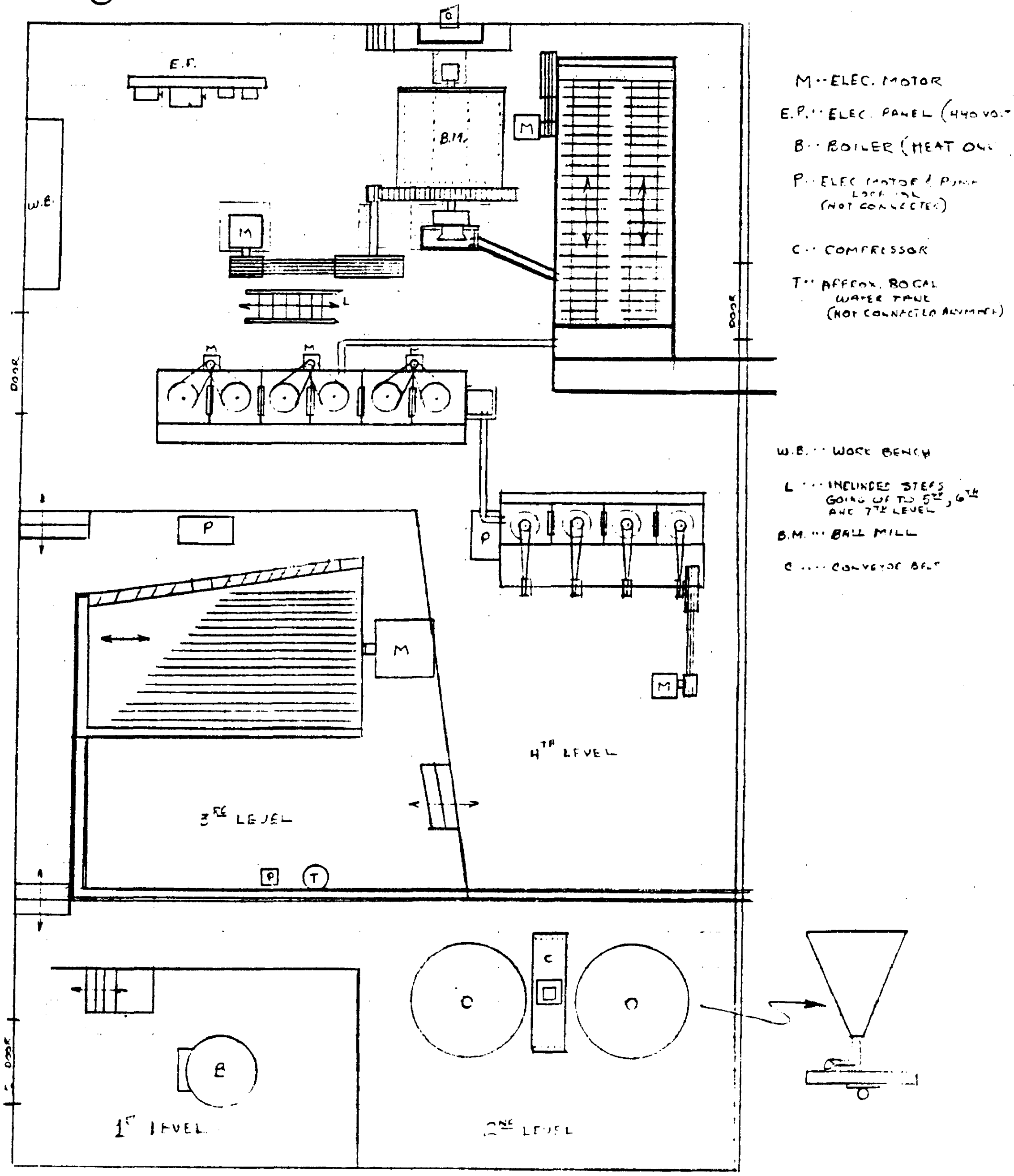
SITE #: ____________



(1) Indicate magnetic north. (2) Show scale, if appropriate. (3) Use conventional U.S.G.S. map symbols to the extent possible. (4) Clearly identify all special use symbols. COMMENTS:

4/3/82

BALL MILL @ HAYWIRE MINE



1ST LEVEL — BOILER
2ND LEVEL — CHEMICAL PROCESSING AREA
3RD LEVEL — TABLE (SHAKING)
4TH LEVEL — BALL MILL & PROCESSING EQUIPMENT
5TH LEVEL — BALCONY AREA OVERLOOKING LEVELS 1, 2, 3 & 4
6TH LEVEL — METERING ROOM — STORED MATERIAL THAT WAS METERED THROUGH THE ROOF INTO BALL MILL
7TH LEVEL — LARGE ROOM ON TOP — LOCATION SITE OF ORIGINAL STAMPS BEFORE CONVERTING TO BALL MILL. NOW IS END OF CONVEYOR BELT WHICH BRINGS IN ORE FROM CRUSHER LOCATED UNDER ROOF, OUTSIDE
8TH LEVEL — CRUSHER, RAMP & BIN

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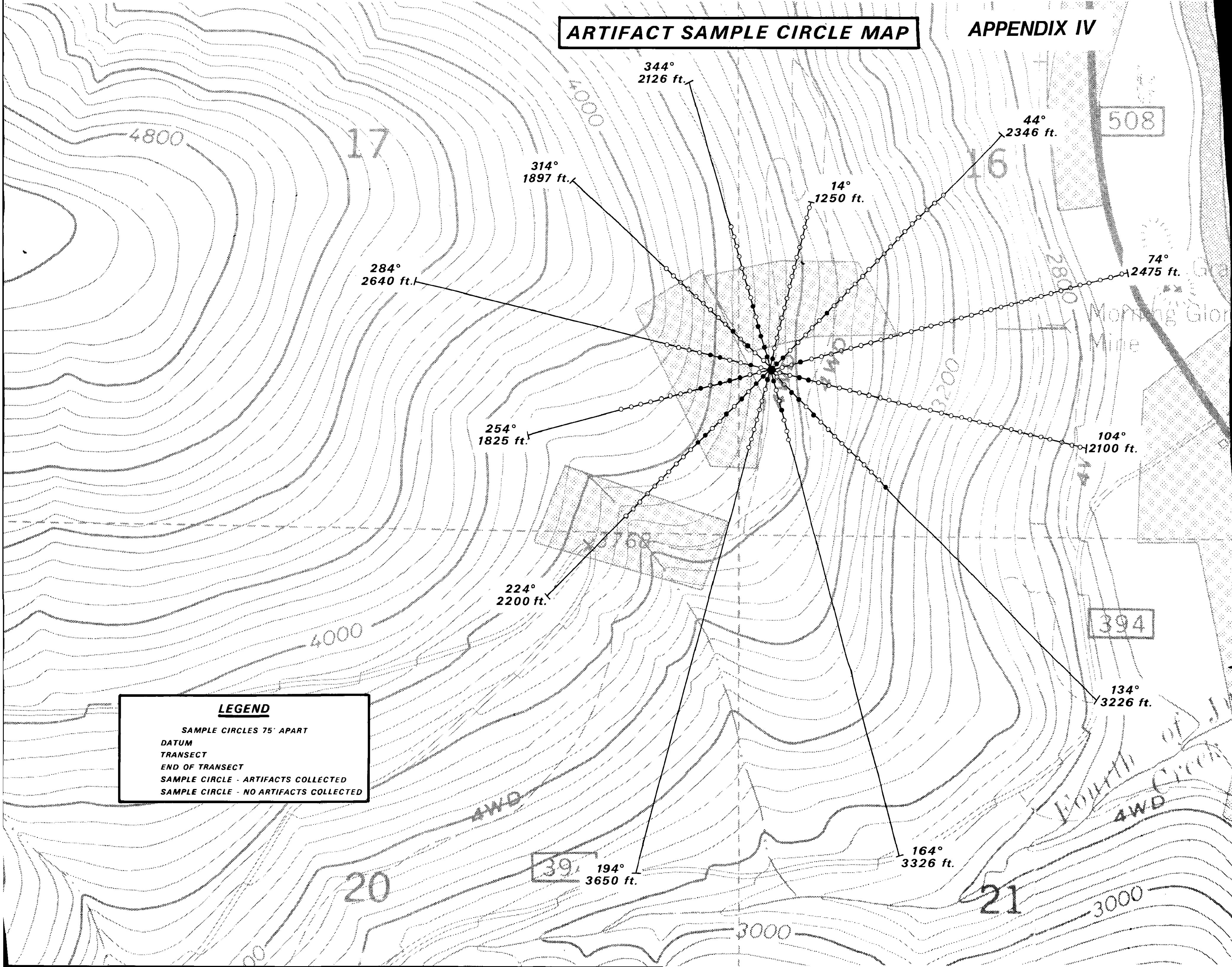
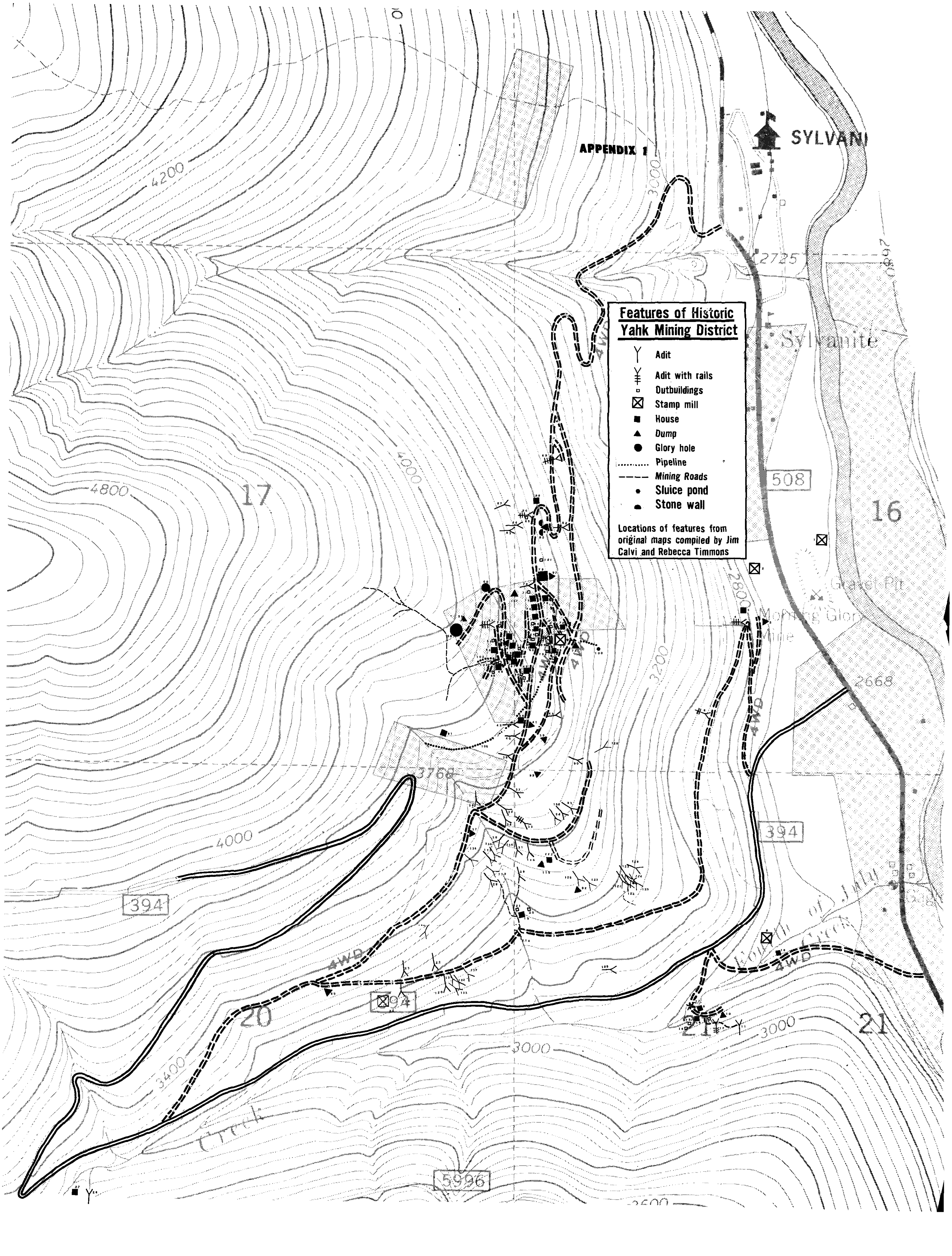
Troy Herald	1909-1911
Troy Tribune	1931-1937
Western News	1931-1937

APPENDIX IV

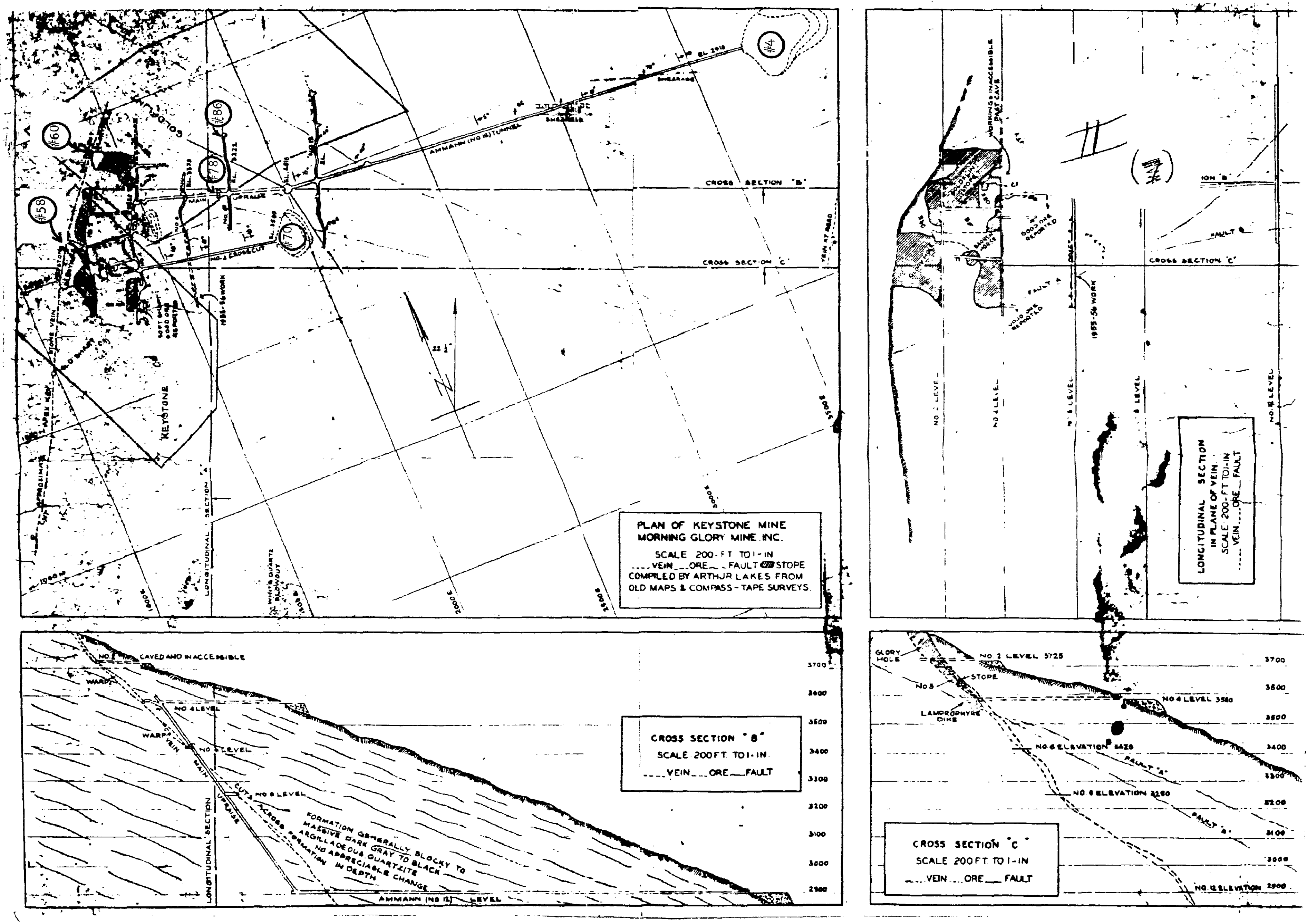
ARTIFACT SAMPLE CIRCLE MAP



APPENDIX 1



Features of Historic Yahk Mining District
Adit
Adit with rails
Outbuildings
Stamp mill
House
Dump
Glory hole
Pipeline
Mining Roads
Sluice pond
Stone wall
Locations of features from original maps compiled by Jim Calvi and Rebecca Timmons
SYLVANI
Sylvanite
4200
4000
4800
3000
3200
3768
3400
2725
2668
2800
17
16
20
21
508
394
5996
4WD
Gravel Pit
Morning Glory Mine
Creek


PLAN OF KEYSTONE MINE
MORNING GLORY MINE, INC.
SCALE 200-FT. TO 1-IN.
VEIN ORE FAULT STOPE
COMPILED BY ARTHUR LAKES FROM
OLD MAPS & COMPASS-TAPE SURVEYS.
KEYSTONE
AMMANN (NO 12) TUNNEL
CROSS SECTION "B"
CROSS SECTION "C"
NO 4 CROSSCUT
MAIN UPRAISE
1955-56 WORK
LONGITUDINAL SECTION
#4
#86
#60
#78
#58
#70
CROSS SECTION "B"
SCALE 200 FT. TO 1-IN.
VEIN ORE FAULT
CAVED AND INACCESSIBLE
NO 4 LEVEL
NO 8 LEVEL
MAIN UPRAISE
CUTS ACROSS FORMATION
FORMATION GENERALLY BLOCKY TO MASSIVE DARK GRAY TO BLACK ARGILLACEOUS QUARTZITE
NO APPRECIABLE CHANGE IN DEPTH
AMMANN (NO 12) LEVEL
LONGITUDINAL SECTION
IN PLANE OF VEIN.
SCALE 200-FT TO 1-IN
VEIN ORE FAULT
WORKINGS INACCESSIBLE PAST CAVE
GOOD ORE REPORTED
FAULT A
1955-56 WORK
CROSS SECTION "C"
SCALE 200 FT. TO 1-IN
VEIN ORE FAULT
GLORY HOLE
NO 2 LEVEL 3725
STOPE
LAMPROPHYRE DIKE
NO 4 LEVEL 3580
NO 6 ELEVATION 3420
FAULT "A"
NO 8 ELEVATION 3260
NO 12 ELEVATION 2900
3700
3600
3500
3400
3300
3200
3100
3000
2900

Details of Keystone Levels