A History of Phosphate Mining in Southeastern Idaho

By William H. Lee[1]

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[1] Idaho State Office, Bureau of Land Management, 1387 S. Vinnell Way, Boise, Idaho 83709

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INTRODUCTION

Purpose and Background

The purpose of preparing this treatise on the history of phosphate mining in the Idaho portion of the western phosphate field is two-fold. First, while there have been partial histories written before (Hansen, 1964, Service, 1967), neither covered the complete history of the field; and secondly, this paper was prepared in support of current on-going investigations in the phosphate field. Background material was gathered and research into the history of phosphate mining in southeastern Idaho was initiated while the author was working for the Conservation Division of the U. S. Geological Survey (USGS), 1972 to 1983. Research consisted of extensive bibliographic studies, examination of the field notes of "old-time" geologists, records of the Conservation Division, land and patent records of the Bureau of Land Management (BLM), and many interviews with long-experienced phosphate workers and mine superintendents.

After a basic, general discussion of the early history of the area and some of the early phosphate development problems, each mine is discussed in the order of initial development. The discussions include mine (or lease) ownership, history of prospecting and development, actual mining, and mine closure. Discussions of individual mine geology have been held to a minimum since the geology of the phosphate field has been extensively and expertly covered in many other papers. Also, there is very little discussion about the actual production of each mine. With the early, mostly private, mines, production statistics are not available, and with the later mines on Federal lands, the production is proprietary. Anecdotal information was used when available and appropriate to make the whole paper more readable.

Figure 1 is a generalized map of the eastern portion of Idaho and shows the relational location of the phosphate mines that are discussed in this paper. Plate 1 (in pocket) is a chronological time line showing each of the mines from the initiation of mining development to closure of the mine and how they individually relate to the development of the entire phosphate field in Idaho.

Early Exploration

From pioneer times to the present, southeastern Idaho has been the site of many ventures, adventures, expeditions and visitations. The area was originally the realm of the Shoshoni, Bannock and the Northern Paiute tribes of Native Americans. Although there was a continuous pattern of raid and rivalry between the Nez Perce and Shoshoni bands, the area was relatively peaceful. Starting in the early 1800's, explorers began encroaching from the east. John Jacob Astor's Astorians, under Wilson Price Hunt, entered what would become the Idaho territory as early as 1811, but did not reach southeast Idaho until 1813 while developing a route to the mouth of the Columbia River. They recognized the bountiful fur resources of the area and this attracted the mountain men and Indian traders to this peaceful corner of the world.

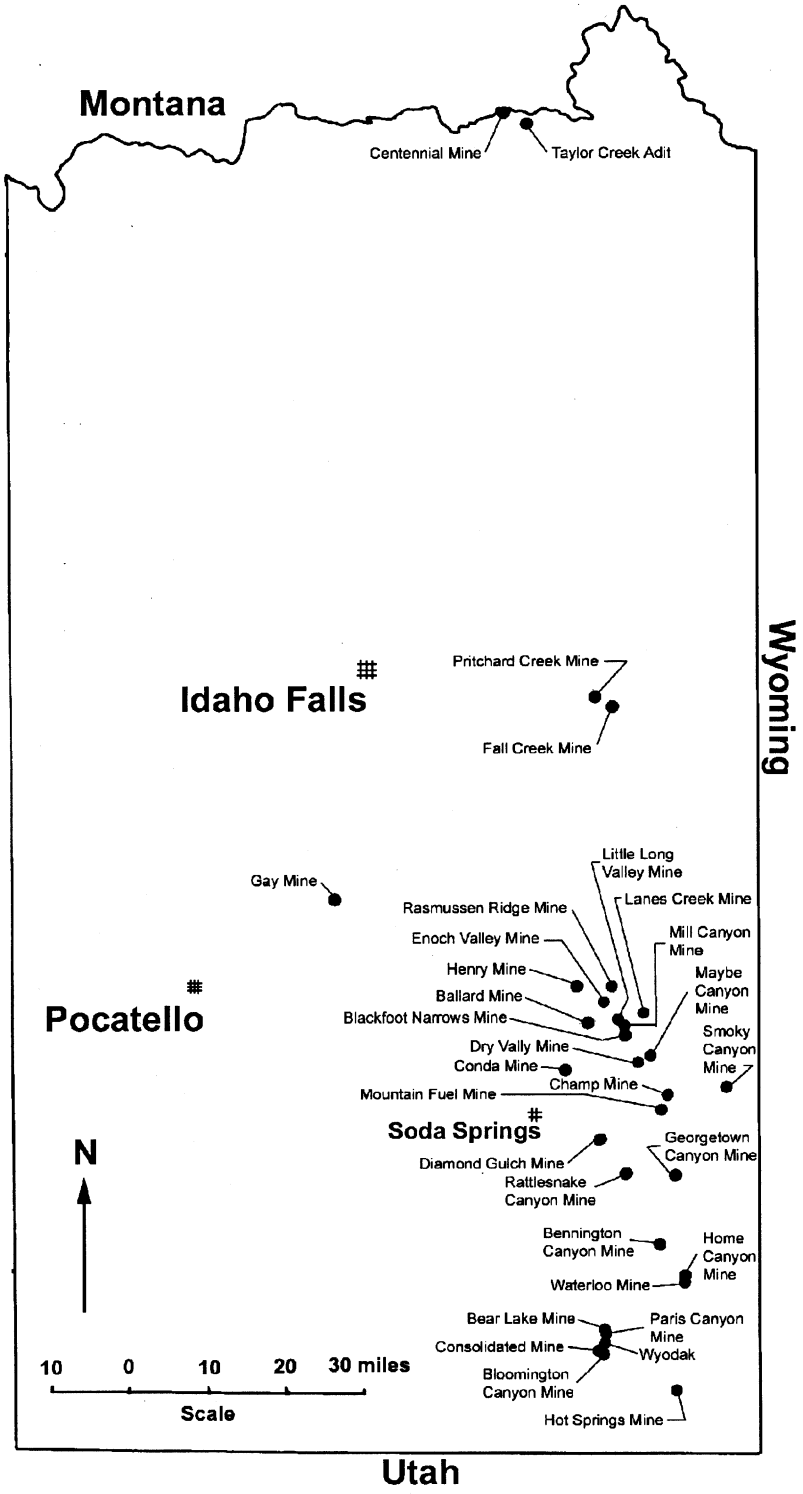

Figure 1. Generalized location map showing phosphate mines in southeastern Idaho.

In 1832-33, Captain Benjamin Louis Eulalie de Bonneville passed through the Bear Lake Valley on his way to the area near present-day Soda Springs and points beyond. Bonneville's party included hired and free trappers and Indians, an altogether colorful assemblage. Washington Irving (1849) in his biography of Bonneville relates the expedition's encounters with Indian raiding parties and buffalo hunting. Bonneville also described the area around "Beer Springs" (today known as Soda Springs).

In 1834, Nathaniel J. Wyeth, a Boston trader, led an expedition of trappers into the area and established Fort Hall as a trading post. Fort Hall was the first permanent American outpost west of the Continental Divide and functioned as a center of activity and commerce. Wyeth was also the region's first chronicler of geologic features, describing "strong volcanic appearance" and "streams that occupy what appear to be cracks of an overheated surface" (Peterson, 1994).

Starting about 1841 and continuing to 1870, emigrants on the Oregon Trail passed through Montpelier, Georgetown Summit and Soda Springs on their way to the Oregon Territory. This corner of today's Idaho was a highway for one of the greatest episodes of human migration. In 1843, John C. Fremont arrived in southeast Idaho and further solidified the route of the Oregon Trail. Fort Hall became a supply and rest point on the trail.

Gold was discovered in 1861 near Pierce, in north-central Idaho, and in 1862 in the Boise Basin. This had an immediate impact on southeast Idaho, as there was a large increase in traffic on the Oregon Trail as would-be miners traveled to the new discoveries.

Not all the people who migrated along the Oregon Trail were gold seekers; some stayed in this corner of Idaho. These settlers were primarily Mormons moving north from Utah into the fertile valleys of Bear Lake County and Old Bannock County (later divided into Bannock and Caribou Counties). Small communities, such as Franklin (1860) and Montpelier and Bennington (1864) lent a note of stability to the region. These towns turned into centers of ranching and farming.

Early Scientific Surveys

In the 1870's, this part of Idaho entered into another phase of exploration. Disenchanted miners from the California and northern Idaho gold fields had spread out into all corners of the territory to search for the elusive Eldorado. Gold was discovered in Caribou Basin in 1870, and prospectors covered all of southeastern Idaho in their quest for the yellow metal.

In the years 1871-1877, the first formal, scientific expedition visited southeastern Idaho. This was the famous Geological and Geographical Survey of the Territories, popularly called the Hayden Survey. Ferdinand Vandeveer Hayden led an assemblage of geologists, paleontologists, mineralogists, topographers, artists and photographers in exploring, mapping and documenting this part of the West (they also put Yellowstone on the map). One of the geologists, A. C. Peale, documented his many

findings of the geology and minerals of southeast Idaho in the annual reports of the Survey to Congress (Peale, 1879).

The Hayden Survey established the basic geologic framework for southeastern Idaho. Formations were discovered and described, geographic characteristics were identified, and some mineral deposits were discovered. However, even the scientific experts of this formidable expedition failed to recognize the one mineral that was to make southeast Idaho famous.

Discovery of Phosphate

With the passage of the Lode Law of 1866 and the Placer Law of 1870 and the later consolidation into the General Mining Law of 1872, mining claims were located in various places in southeastern Idaho. The claims were even being staked on phosphate rock, but not for phosphate. Those early claims were located mistakenly for either copper glance (chalcocite) or coal because of the black, earthy nature of phosphate. No one suspected that the black rock really was valuable for phosphate. Many of those claims were developed by prospects and in some cases, extensive tunneling. Of course, none of the intended minerals were found and the prospectors went elsewhere, leaving numerous pits and tunnels behind.

There is some controversy about when phosphate rock was finally recognized. Albert Richter, a prospector from Salt Lake City, claims to have recognized the phosphate deposits northeast of Ogden, Utah as early as 1889. He located claims and excavated a number of discovery pits (Richter, 1911). In 1897, R. A. Pidcock found some older workings on a black, soft formation in Rich County, Utah (Jones, 1907; Hansen, 1964). Thinking that he had found a gold mine, he located a number of claims and sampled the "ore." The samples were analyzed and were shown to contain no gold or silver, but did contain phosphoric acid in large amounts (32%). This was the first specific documentation of phosphate rock. At the time of the phosphate discovery, there was no market and no great "rush" occurred to stake out the deposit.

Charles Colcock Jones, a mining engineer from Los Angeles, California, working for the Mountain Copper Company, Ltd., examined Pidcock's discovery in 1903. Based on his knowledge and experience in the region, Jones recognized other phosphate deposits scattered throughout that part of Utah (Jones, 1907, 1913). In 1903, Jones heard of a deposit that was being worked for coal near Montpelier, Idaho. Upon examination of a 250-foot shaft found on the property, Jones determined that the "coal" was really the phosphate ore he had seen in Utah. In subsequent years, Jones went on to describe phosphate deposits near Hot Springs, Soda Springs, Bennington, and Bloomington, Idaho; Cokeville and Sage Station, Wyoming; and other areas throughout southeastern Idaho, southwestern Wyoming, and northern Utah (Jones, 1907, 1913).

Regardless of who should be given the credit of recognizing phosphate ore and the great extent of the phosphate formation, there remained one very large obstacle to developing the discovery, a viable market! Both Richter and Jones recognized the value of the ore for fertilizer, but at the turn of the

century there was no economical way to transport the ore to the fertilizer manufacturers in the East or on the west coast. Known phosphate deposits in Tennessee and the Carolinas were cheaply transported to eastern markets making the western phosphate field uneconomic. But times would change.

MINING CLAIMS AND PATENTS

After the value of the western phosphate was recognized (1889), mining claims were located specifically for the commodity throughout northern Utah, southeastern Idaho and southwestern Wyoming. The Lode Law of July 26, 1866 (14 Stat. 251) established the process for locating minerals contained in a "vein or lode of quartz, or other rock in place" that bore gold, silver, cinnabar, or copper. The Placer Act of July 9, 1870 (16 Stat. 217) amended the previous act to allow mining claims to be located for deposits "usually called "placers," including all forms of deposit, excepting veins of quartz, or other rock in place." The Mining Law of May 10, 1872 (17 Stat. 91) consolidated the two previous laws and broadened the scope of minerals that could be located under the law.

Practically speaking, a lode is formed by the deposition of metallic minerals from metal-rich solutions invading cracks and fissures in the host rock. The deposition is primarily a chemical process and secondarily a mechanical process. A placer deposit is usually a material that is derived from erosion and disaggregation of existing rock and deposition by either wind or running water (Weeks, 1908).

A problem quickly surfaced because the phosphate formation does not specifically fit the requirements of either the lode or placer provisions of the Mining Law. The phosphate ore is part of a sedimentary rock sequence that was deposited at the bottom of a shallow sea. The source of the phosphate is from chemical precipitation of organisms living in the sea. The bedded character of the phosphate rock doesn't fit the definition of a lode or placer deposit. This caused confusion as to the type of location that was appropriate for phosphate. The mining claims were located both ways, and, in some cases, top-filed as lode and placer claims by either the same or rival claimants.

Most locations for phosphate were filed as lodes, utilizing the "rock in place" definition contained in the Mining Law. But enough placer claims were located to bring the matter to litigation in the courts of the day, and concern in the halls of Congress.

As early as May 12, 1908, Congress recognized the problem in how to claim phosphate deposits. Congressman Franklin W. Mondell, R-WY, introduced a bill (H. R. 21873) to the 60th Congress, 2nd Session in an attempt to solve the conflict. The bill stated that phosphate was to be located as a placer claim, but grandfathered existing lode claims. The bill went on to eliminate the provisions of extra-lateral rights for the existing phosphate lode claims. A third provision of the bill resolved the conflict between phosphate lode and placer locations by establishing the concept of "first in time, first in right." Unfortunately, this bill ran into difficulty with supporters of the phosphate lode claimants and never made it out of committee.

In December, 1908, the Secretary of the Interior withdrew phosphate-bearing lands in the west from entry, bringing to a close the opportunity to locate mining claims for this commodity. This Secretarial withdrawal was later reinforced by the passage of the Pickett Act of June 25, 1910 (36 Stat. 847). The withdrawal was primarily in support of land classification which will be discussed at length later in this report. Phosphate mining claim locations that met all of the requirements and provisions of the Mining Law and were located prior to the effective date of the withdrawal remained in force and could be patented.

Shortly after the Secretary of the Interior withdrew the phosphate lands, Congress again became involved. On January 26, 1909, a bill was introduced in the Senate by Frank P. Flint, R-CA, that provided for the utilization and disposition of the phosphate deposits. This bill was of interest because it not only gave direction for the classification and restoration of the withdrawn lands, but it also outlined a leasing system for the federal phosphate deposits. The bill went on to remove extra-lateral rights from existing phosphate lode claims and required the Secretary of the Interior to reserve phosphate for the government in grants and patents for lands identified as containing phosphate. Apparently ahead of its time, the bill never got out of the Senate.

The Director of the USGS, George Otis Smith, in a letter to the Chairman of the Senate Committee on the Public Lands, endorsed another bill (Senate Bill S. 8609, February 9, 1909) which besides addressing the lode versus placer problem, also tried to establish the idea of "first in time, first in right." This bill also tried to ban the exportation of domestic phosphate. That particular clause probably doomed the bill, which never got out of the Senate.

The formal policy of the Department of the Interior was succinctly stated in a letter from Frank Pierce, First Assistant Secretary to the Honorable E. B. Critchlow, a judge in Salt Lake City, Utah, dated June 3, 1909. The letter stated:

> "*Scientific men differ upon the character and formation of these phosphate deposits. On account of this difference of opinion, I have announced that the claims could be patented under either act and the patents will be valid. If the first locations of the ground are under the placer act, placer patents will be issued. If, however, the first are under the lode act, lode patents will be issued. My point is, that the first locator, whether his location be made as a placer or as a lode, ought to and will be protected"*

While it was the stated opinion and policy of both the U. S. Congress and the Department of the Interior through 1910 that phosphate locations should be made under the placer laws, the first wavering of this conviction appeared early in 1911. In a February 9, 1911, House Committee on the Public Lands report on bill H. R. 31651, it was stated:

> *"It is the opinion of the Committee on the Public Lands that locations on lands valuable for their phosphate deposits should all have been made under the placer*

mining law, but it is not deemed wise to attempt to interfere with rights and claims asserted by original locators under the lode law; therefore the provision that in case of conflict between placer and lode locators on locations heretofore made, respective claims of the locators shall be determined as though locations as either placer or lode were valid at the time made."

During the period from 1911 through 1912, there were several bills introduced in both the Senate and the House that tried to establish the requirements for the classification and restoration of the phosphate withdrawals, and to establish the proper manner of the location and disposition of the phosphate deposits on Federal lands. All of the bills seemed to have problems and none became law.

The first litigation to address phosphate lode versus placer locations was in the District Court for Wyoming (*Morse S. Duffield and Lewis A. Jeffs v. San Francisco Chemical Co., Civ. Nos. 568, 569, D. Wyo., Jan. 15, 1912*). These names would become all too familiar in phosphate claim litigation. In these cases, the complainants (Duffield & Jeffs) held lode claims over the same ground where San Francisco Chemical Company (SFCC) had placer claims. The judge decreed in favor of the lode claimants in both civil actions. The decrees were appealed to the Eighth Circuit Court of Appeals (201 F. 830). Even though the placer locations were located two years earlier that the conflicting lode claims, the Appeals Court affirmed the lower Court's decision that the lode claims would prevail. Extensive discussion as to past case law and definitions of lode and placer deposits are contained in the Appeals Court decision.

The next suit to determine the correct way to locate claims on phosphate rock occurred in Bear Lake County, Idaho. In a case entitled *Duffield et al. v. San Francisco Chemical Company, September 3, 1912 (198 F. 942)*, SFCC located placer claims in 1904 and 1905 and were top-filed by Duffield and Jeffs' lode claims in 1907. The District Court essentially dodged the issue of lode versus placer and determined "first in time, first in right" of possession and found for the defendant, SFCC. This case was appealed to the Ninth Circuit Court of Appeals (205 F. 481). After a discussion of the character of the phosphate deposit and the jurisdictional responsibilities, the Appeals Court reversed the lower Court decision and again found for the lode claimants.

The next litigation appeared before the Secretary of the Interior in a Public Land Decision of December 12, 1912 (41 L.D. 403). In this case, a patent was applied for a lode claim located on phosphate rock in Utah. The entrymen in this case were Duffield and Jeffs. The patent application proceedings were adjudged to be regular in all respects with the only question being as to the patentability of the land and under which set of rules to patent, lode or placer. The Secretarial decision in this case was that the deposit should be patented under the lode provisions of the Mining Law. But in arriving at that decision, the case attempted to define what constitutes a lode. Several citations are made as follows: *Stevens v. Williams (1 McCrary 480, 488)* held that, "In general, it may be said, that a lode or vein is a body of mineral or mineral body of rock, within defined boundaries, in the general mass of the mountain." In *Hayes et al. v. Lavagnino (53 Pac., 1029)*, the court noted, "the term "vein" and "lode" apply to all deposits of mineralized matter within any zone or belt of mineralized rock separated

from the neighboring rock by well-defined boundaries." And finally, in *Beals v. Cone (62 Pac., 948, 953)*, the court stated, "a vein is a continuous body of mineral-bearing rock in place, in the general mass of the surrounding formation."

Building on the above case, the Department decision established two things:

> *"A mineral deposit in vein or lode formation-in place in the general mass of the mountain-whether the mineral it bears be metallic or nonmetallic, is subject to disposition only under the provisions of the lode mining laws."*

Secondly:

> *"A deposit of phosphate rock confined between well-defined boundaries constitutes a vein or lode of mineral-bearing rock in place and is subject to disposition only under the provisions of the lode mining laws."*

In light of the Department and District Court decisions discussed above, Congress again made attempts to resolve the issue. On April 8, 1913, Senate Bill S. 475 was introduced by Asle J. Gronna, R-ND. This bill attempted to establish a prospecting, leasing, and licensing system for developing federal phosphate. The bill outlined terms and conditions for prospecting permits and leases. The bill also established royalty and rental, bonding, and other leasing features. Again, the leasing concept was ahead of its time and the bill died in the Senate.

In a letter dated July 18, 1914, from A. A. Jones, First Assistant Secretary to the Honorable Scott Ferris, Chairman of the House Committee on the Public Lands, new department policy was stated:

> *"In the absence of remedial legislation these locations (placer) can not be passed to entry and patent. The only relief the Department, under the condition of the law as it now exists, is able to extend to such placer locators is to permit them after a modification of the outstanding phosphate withdrawal has been secured to re-form their locations or make new locations under the lode-mining laws, and thereupon to proceed to entry and patent. Prior to 1912, it was the practice of the Department to permit locations under either the lode or the placer-mining laws to pass to patent, but consideration of the Harry Lode mining claim decision, and the position of Federal Courts preclude further pursuit of such a practice."*

Because of the continuing confusion of phosphate lode vs. placer claims and all the litigation and the potential for further court actions, Congress finally stepped in and validated placer locations for deposits of phosphate rock. Senator Reed Smoot, R-UT, introduced Senate Bill S. 6106 on July 23, 1914. The bill simply validated all of the outstanding placer claims with no qualifications or extra features. The House of Representatives, after minor changes, approved the Bill and it became law as 38 Stat. 792b on January 11, 1915. On March 31, 1915, the Secretary of the Interior issued

authorization to process patents for phosphate placer locations under the placer rules of the Mining Law, thereby bringing to a close the contest between phosphate lode and placer claims.

Congress again entered into the phosphate picture and, on February 25, 1920, passed the Mineral Leasing Act (41 Stat. 437). This act removed certain minerals, including phosphate, from the provisions of the Mining Law of 1872 and created a leasing system for mining these minerals. The act also established a royalty system that would create income for the Federal government. Section 37 of the act provided that mining claims for phosphate (and other Leasing Act minerals) that were properly located and maintained under the Mining Law would remain under the requirements of that law until final disposition, patent or relinquishment. In fact, several phosphate mining claims were patented after the passage of the Leasing Act. Phosphate remains under the provisions of this act today.

PHOSPHATE WITHDRAWALS, CLASSIFICATIONS AND RESTORATIONS

During the period from 1890 to about 1915, a movement started to protect and conserve the resources on the public lands, particularly those in the west. This movement was known as the "conservation crusade" (Brunelle, 1978). The administrations of Theodore Roosevelt (1901-1909) and William Howard Taft (1909-1913) were the focus of this trend.

Several laws that dealt with resources on the public lands were passed. These included the designation of forest reserves (1897), the Reclamation Act of 1902, the creation of the first National Monuments (1906), the Antiquities Act of 1906, the Enlarged Homestead Act of 1909 (reserved minerals to the government), the Pickett Act of 1910 (giving the Executive the power to withdraw public lands from entry), the Stock-Raising Homestead Act of 1916 (reserving mineral rights), and the mineral leasing acts of 1917 and 1920.

On December 9, 1908, Secretary of the Interior James Rudolph Garfield issued a Secretarial Order to the Commissioner of the General Land Office, Fred Dennett. The Order read:

> *"In aid of proposed legislation affecting the disposal of phosphate deposits in the public lands of the United States, all the public lands embraced in the attached list, which have been reported as containing such deposits, are hereby withdrawn from all forms of location and disposal under the public-land laws, subject, however, to valid existing rights, and you are directed to take appropriate action hereunder."*

The Secretarial Order created a "temporary" phosphate reserve of 4,541,300 acres in Idaho, Utah and Wyoming. These lands had been identified by the USGS as either containing or having the potential for phosphate deposits. This secretarial withdrawal was done under the guise of "implied executive authority." There were three further secretarial withdrawal actions in 1908 and 1909 that added approximately 460,558 acres to the phosphate reserve, bringing the total to approximately 5,001,858 acres. The underlying reasons for these withdrawal actions were not only to support developing

legislation, but to protect the phosphate resource from appropriation under the Homestead laws and the Mining Law of 1872. (Under the Mining Law, 23 lode claims for phosphate involving about 440 acres and 43 placer claims for phosphate involving about 6,050 acres were patented in Idaho (Brunelle, 1978).) There was also a need to protect the phosphate resource from unscrupulous developers. Another underlying reason for this withdrawal was to give the USGS time to investigate the phosphate resource and classify the withdrawn lands as either "mineral" or "non-mineral" in character.

Because the secretarial orders withdrew the phosphate lands from all forms of entry and appropriation, Congress tried to find ways that the withdrawn lands could be freed of those restrictions. On January 19, 1909, Senator Reed Smoot, R-UT, introduced a bill (S. 8609) that required the Secretary of the Interior, after examination and classification by the USGS, "to restore to entry, selection and location, such of these lands as he may deem may to so restore without prejudice to the interests of the United States." The bill also required the Secretary to appoint a commission to clear title of the lands classified as phosphate lands of all entries, claims and locations and to test the validity of those claims.

While this bill did not become law, it did provide the secretary the idea to create a group of experts to classify the withdrawn lands. To accomplish this task, the USGS formed the Land Classification Board on December 18, 1908 as a section of the Geologic Branch. The Board was not only charged with the responsibility to classify the lands but also to make appropriate recommendations of revocation and restoration to the General Land Office.

During this time, there were four restorations of these temporary reserves. Approximately 2,326,950 acres in Idaho, Utah and Wyoming were restored without classification as the land did not contain any possibility for phosphate resources.

On June 25, 1910, President Taft signed into law the Pickett Act (36 Stat. 847). This act gave the executive the power to withdraw public lands to protect the public interests. Specifically, this act was limited to coal, oil, gas, and phosphate resources. Metallic minerals were excluded. The Act of August 24, 1912 (37 Stat. 497) amended the Pickett Act by extending withdrawal authority to all non-metalliferous minerals.

One of the underlying and fundamental reasons for the need for executive withdrawal powers was to protect the western phosphate resources from foreign acquisition. The eastern phosphate deposits in Tennessee and the Carolinas were owned or controlled by European companies and most, if not all, of that ore was being exported for the use of European farmers (Brunelle, 1978). It was widely recognized that domestic sources of phosphate for domestic fertilizer manufacture and use was vital to the development of this country, and that we should not be dependant on European suppliers (principally German).

Under the Pickett Act as amended, Presidents Taft and Wilson withdrew approximately 2,595,000 acres in Idaho, Utah and Wyoming (1910-1917) and formally created the western phosphate reserve.

These withdrawn lands included and formalized the lands that remained temporarily withdrawn under the existing secretarial orders.

As with the preceding withdrawals, the USGS was charged with the responsibility to investigate the lands for phosphate resources, to classify the lands as to their phosphate content, and to recommend specific restorations to the General Land Office. The original phosphate withdrawals were based on the best information and maps of the day, that is, the maps generated by the Hayden Survey in 1877. While those maps were an amazing compilation of information about the geology and mineral resources of eastern Idaho, western Wyoming and northern Utah, they were not specific enough to provide detailed information about the phosphate deposits. Remember that phosphate rock was not recognized as a resource until about 1889, well after the Hayden Surveys. Specifically, the Hayden maps showing Paleozoic rocks were used to withdraw entire townships for phosphate (Hansen, 1964).

Because the Pickett Act withdrawals were from all forms of entry except valid mining claims, serious problems developed concerning homestead and other agricultural entries. Even State selections under the in lieu selection provisions of the State Admissions Act (26 Stat. 215) excluded the phosphate withdrawals. The problems with state selections of in lieu lands were resolved with the passage of the Act of February 27, 1913 (37 Stat. 687) that gave the State of Idaho the right to select lands within the withdrawn area with the phosphate reserved to the United States. The passage of the Act of July 17, 1914 (38 Stat. 509) resolved the issue concerning agricultural entries on withdrawn phosphate lands by splitting the mineral estate from the surface estate and reserving the phosphate (and selected other minerals) to the United States.

All of this meant that there was a tremendous job ahead for the USGS to identify the western phosphate resources. Starting about 1909 and extending to World War I in 1914, USGS geologists initiated extensive and detailed studies of the phosphate rock deposits of the withdrawn area (Mansfield, 1927). These studies included mapping, trenching, sampling, and eventually the classification of the phosphate. The Phosphoria Formation (Richards and Mansfield, 1912) was discovered to be wide-spread and relatively consistent in its phosphate content and quality. Figures 2 and 3 show typical trenches hand dug in 1916 that exposed fresh phosphate rock for sampling and analysis. Table 1 lists the published locations of the USGS trenches, prospects, pits, tunnels, and drill holes for the periods of pre-1924, 1938-1963, and 1970-1985.

For a short time after WWI, the USGS resumed its studies of the withdrawn area. Between 1920 and about 1942, there was little field work in the western phosphate reserve. This was a period of classification actions and publication of previous field studies. Beginning about 1942, a renewed interest in the reserve started, not for phosphorous, but for vanadium, and, in 1947, the uranium content of the phosphate ore (Montgomery and Cheney, 1967). As a result of this vanadium-uranium interest in the 1940's and 1950's, more classifications of the phosphate withdrawals as mineral or non-mineral were made with resulting restorations of the withdrawn lands. Table 1, part 1938-1963, lists the published locations of the trenches and drill holes from this phase of the phosphate reserve study.

Figure 2. USGS phosphate prospect in SE¼ Section 34, T. 4 S., R. 40 E. (Cranes Flat Quadrangle). Fred (right) and Lewis Campbell, teamster and cook respectively, September 1, 1916. Photo by G. R. Mansfield, #327, USGS Photographic Library.

Figure 3. P. V. Roundy in trench, Fred and Lewis Campbell, NE¼ Section 30, T. 5 S., R. 40 E. (Portneuf Quadrangle), September 7, 1916. Photo by G. R. Mansfield, #330, USGS Photographic Library.

Table 1. - USGS phosphate trenches, prospects, pits, tunnels, and drill holes.

Pre-1924

Trench, Prospect or Tunnel	Township, Range	Section/Subdivision	Year	Reference
prospect	T. 4 S., R. 37 E.	NW¼NE¼ Section 11	?	USGS Bull. 713, p. 86
trench	T. 5 S., R. 37 E.	NE¼NE¼ Section 13	1913	USGS Bull. 803, p. 71; USGS Bull. 713, p. 91
trench and 6 prospect pits	T. 5 S., R. 38 E.	NE¼SE¼ Section 36	1913	USGS Bull. 803, p. 70; USGS Bull. 713, p. 103
trench	T. 1 S., R. 39 E.	NW¼ Section 29	1913	USGS Prof. Paper 238
prospects	T. 1 S., R. 39 E.	NW¼NW¼ Section 30	1913	USGS Prof. Paper 238
prospects	T. 1 S., R. 39 E.	NE¼SE¼ Section 31	1913	USGS Prof. Paper 238
trench	T. 1 S., R. 39 E.	NE¼SE¼ Section 33	1913	USGS Prof. Paper 238
trench	T. 2 S., R. 39 E.	NW¼NW¼ Section 22	1913	USGS Prof. paper 238
prospect	T. 5 S., R. 39 E.	NE¼SW¼ Section 31	<1913	USGS Bull. 803, p. 75
prospect	T. 5 S., R. 39 E.	NW¼SE¼ Section 31	<1913	USGS Bull. 803, p. 76
trench	T. 6 S., R. 39 E.	NW¼ Section 17	1923	USGS Bull. 803, p. 79
trench	T. 6 S., R. 39 E.	NE¼ Section 18	1923	USGS Bull. 803, p. 79
trench	T. 4 S., R. 40 E.	SE¼SE¼ Section 34 (see Figure 2)	1916	USGS Prof. Paper 238; USGS Bull. 803, p. 84; USGS Prof. Paper 152, p. 221
prospects	T. 5 S., R. 40 E.	SE¼NW¼ Section 30	1916	USGS Bull. 803, p. 76
trenches (4)	T. 5 S., R. 40 E.	SE¼NE¼ Section 30 (see Figure 3)	1916	USGS Bull. 803, p. 82; USGS Prof. Paper 152, p. 223
prospect	T. 6 S., R. 40 E.	NE¼ Section 30	1916	USGS Prof. Paper 152, p. 226
trench	T. 4 S., R. 41 E.	SE¼SE¼ Section 20	1916	USGS Prof. Paper 152, p. 227
trench	T. 4 S., R. 41 E.	NE¼SE¼ Section 32	1916	USGS Prof. Paper 152, p. 227
trenches (3)	T. 5 S., R. 41 E.	SE¼SE¼ Section 19	1916	USGS Prof. Paper 152, p. 228
trench	T. 6 S., R. 41 E.	NE¼NE¼ Section 30	1916	USGS Bull. 803. p. 87-88; USGS Prof. Paper 152, p. 229
trench	T. 5 S., R. 42 E.	NW¼SE¼ Section 29	1916	USGS Prof. Paper 152, p. 231
trench	T. 6 S., R. 42 E.	NE¼SE¼ Section 10	1912	USGS Prof. Paper 152, p. 232
Anaconda tunnel	T. 8 S., R. 42 E.	NE¼SE¼ Section 15	1920	USGS Prof. Paper 152, p. 235

Trench, Prospect or Tunnel	Township, Range	Section/Subdivision	Year	Reference
prospect	T. 8 S., R. 42 E.	SE¼SW¼ Section 23	1910	USGS Bull. 470, p. 405
prospects (2)	T. 6 S., R. 43 E.	NE¼SW¼ Section 16	<1912	USGS Prof. Paper 152, p. 240
prospects (3)	T. 6 S., R. 43 E.	NE¼NW¼ Section 26	1912	USGS Prof. Paper 152, p. 241
trench	T. 7 S., R. 43 E.	NE¼SW¼ Section 7	1912	USGS Prof. Paper 152, p. 242
trench	T. 8 S., R. 43 E.	E½E½ Section 12	1912	USGS Prof. Paper 152, p. 243
prospects (3)	T. 8 S., R. 43 E.	Lot 2, Section 31	1910	USGS Prof. Paper 152, p. 243; USGS Bull. 470, p. 412
prospects	T. 9 S., R. 43 E.	NW¼ Section 6	1910	USGS Bull. 470, p. 421
prospects	T. 9 S., R. 43 E.	SE¼SE¼ Section 17	1910	USGS Prof. Paper 152, p. 247; USGS Bull. 470, p. 421, 424
prospects	T. 9 S., R. 43 E.	SW¼NW¼ Section 17	1910	USGS Bull. 470, p. 421, 424
prospects	T. 9 S., R. 43 E.	SW¼ Section 21	1910	USGS Prof. Paper 152, p. 247; USGS Bull. 470, p. 421, 424
SFCC tunnel	T. 9 S., R. 43 E.	NE¼SE¼ Section 29	1910	USGS Prof. Paper 152, p. 245
SFCC tunnel	T. 9 S., R. 43 E.	NW¼SE¼ Section 29	1910	USGS Prof. Paper 152, p. 247; USGS Bull. 470, p. 422
prospects	T. 9 S., R. 43 E.	SW¼ Section 29	1910	USGS Bull. 470, p. 421
prospects, tunnel	T. 9 S., R. 43 E.	NW¼NW¼ Section 33	1910	USGS Bull. 470, p. 423-424; USGS Prof. Paper 152, p. 246; USGS Bull. 470, p. 388
prospects	T. 9 S., R. 43 E.	SW¼ Section 33	1910	USGS Bull. 470, p. 421
tunnel, prospects	T. 10 S., R. 43 E.	NE¼SE¼ Section 3	1910	USGS Prof. Paper 152, p. 248; USGS Bull. 470, p. 428
prospects	T. 10 S., R. 43 E.	Section 3	?	USGS Bull. 470, p. 427
prospect	T. 10 S., R. 43 E.	NW¼NW¼ Section 11	1910	USGS Prof. Paper 152, p. 249
tunnel	T. 10 S., R. 43 E.	NW¼NW¼ Section 11	1910	USGS Bull. 470, p. 428
tunnels (2)	T. 14 S., R. 43 E.	SE¼ Section 8	1913	USGS Prof. Paper 152, p. 252-253
Spomberg's tunnel	T. 14 S., R. 43 E.	SE¼NE¼ Section 21	<1910	USGS Prof. Paper 152, p. 252-253
prospects (2)	T. 14 S., R. 43 E.	SE¼SE¼ Section 21	<1910	USGS Prof. Paper 152. p. 252-253
prospect	T. 14 S., R. 43 E.	NW¼NE¼ Section 28	1920	USGS Prof. Paper 152, p. 252
prospects (2)	T. 7 S., R. 44 E.	SE¼NW¼ Section 9	1912	USGS Prof. Paper 152, p. 256

Trench, Prospect or Tunnel	Township, Range	Section/Subdivision	Year	Reference
prospect	T. 8 S., R. 44 E.	SW¼SW¼ Section 7	1910	USGS Bull. 577, p. 40; USGS Prof. Paper 152, p. 258
prospects (3)	T. 8 S., R. 44 E.	SW¼SE¼ Section 14	1911	USGS Bull. 577, p. 40; USGS Prof. Paper 152, p. 258
trench	T. 9 S., R. 44 E.	NW¼NE¼ Section 16	1911	USGS Bull. 577, p. 44; USGS Prof. Paper 152, p. 260
prospect	T. 10 S., R. 44 E.	NE¼SE¼ Section 25	<1911	USGS Bull. 577, p. 47; Prof. Paper 152, p. 262
trench	T. 10 S., R. 44 E.	NE¼SE¼ Section 25	1909	USGS Bull. 430, p. 487
tunnels (2)	T. 10 S., R. 44 E.	Superior Extension Claim	?	USGS Bull. 577, p. 48; Prof. Paper 152, p. 262
tunnel	T. 10 S., R. 44 E.	Highland #2 Claim	?	USGS Bull. 577, p. 48; Prof. Paper 152, p. 262
prospects (2)	T. 11 S., R. 44 E.	NW¼NW¼ Section 1	?	USGS Bull. 577, p. 51
prospects (2)	T. 11 S., R. 44 E.	SE¼SW¼ Section 1	<1910	USGS Bull. 577, p. 51-52; USGS Prof. Paper 152, p. 264
tunnel	T. 11 S., R. 44 E.	NW¼ Section 1	1909	USGS Prof. Paper 152, p. 266; USGS Bull. 430, p. 487
tunnel	T. 11 S., R. 44 E.	UF&CM Co. claim, Section 12	?	USGS Bull. 577, p. 52
tunnel	T. 11 S., R. 44 E.	UF&CM Co. claim, Section 12	?	USGS Bull. 577, p. 52-53
tunnels (2)	T. 11 S., R. 44 E.	UF&CM Co. claim, Section 12	?	USGS Bull. 577, p. 53-54
tunnel	T. 11 S., R. 44 E.	SW¼NW¼NE¼ Section 12	<1910	USGS Prof. Paper 152, p. 265
tunnel	T. 11 S., R. 44 E.	SW¼NE¼NW¼ Section 12	<1910	USGS Prof. Paper 152, p. 265
tunnels (2)	T. 11 S., R. 44 E.	SW¼SW¼NW¼ Section 12	<1910	USGS Prof. Paper 152, p. 265
prospects	T. 12 S., R. 44 E.	Section 14	<1909	USGS Prof. Paper 152, p. 267
North Lake tunnel	T. 15 S., R. 44 E.	NE¼SW¼ Section 12	<1912	USGS Prof. Paper 152, p. 270
tunnels (2)	T. 15 S., R. 44 E.	NW¼NE¼ Section 24	<1909	USGS Prof. Paper 152, p. 269; USGS Bull. 430, p. 496
trench	T. 10 S., R. 45 E.	SE¼ Section 7	<1912	USGS Prof. Paper 152, p. 273

Trench, Prospect or Tunnel	Township, Range	Section/Subdivision	Year	Reference
trench	T. 10 S., R. 45 E.	NW¼NW¼ Section 8	?	USGS Prof. Paper 313A
trench	T. 10 S., R. 45 E.	SE¼NW¼ Section 30	<1912	USGS Prof. Paper 152, p. 273-274
prospects	T. 12 S., R. 45 E.	Sections 30 & 31	<1912	USGS Prof. Paper 152, p. 277-279
prospects	T. 13 S., R. 45 E.	Section 6	<1912	USGS Prof. Paper 152, p. 280
trench	T. 8 S., R. 46 E.	SE¼NW¼ Section 29	1914	USGS Prof. Paper 152, p. 283-284

1938-1963

Trench, Tunnel or Drill Hole	Township, Range	Section/Subdivision	Year	Reference
drill hole	T. 4 S., R. 37 E.	Section 14	1948	USGS Circular 208, Lot #1279
drill hole	T. 4 S., R. 37 E.	Section 14	1948	USGS Circular 208, Lot #1280
trench	T. 4 S., R. 37 E.	Section 23	1951	USGS Circular 327, Lot #1349
trench	T. 6 S., R. 38 E.	NE¼ Section 1	1949	USGS Circular 305, Lot #1304
trench	T. 1 S., R. 39 E.	SE¼NW¼ Section 31	1950	USGS Circular 327, Lot #1322
trench	T. 6 S., R. 40 E.	SE¼ Section 12	1949	USGS Circular 305, Lot #1315
trench	T. 5 S., R. 41 E.	Section 20	1949	USGS Circular 305, Lot #1313
trench	T. 4 N., R. 42 E.	W½SE¼ Section 24	1963	USGS Bull. 1205, p. 109
trench	T. 6 S., R. 42 E.	SE¼ Section 10	1949	USGS Circular 305, Lot #1309
trench	T. 6 S., R. 42 E.	Section 24	1948	USGS Circular 301, Lot #1230
trench	T. 7 S., R. 42 E.	NW¼ Section 26	1948	USGS Circular 262, Lot #1262
crosscut, Conda Mine	T. 8 S., R. 42 E.	Section 13	1947	USGS Circular 208, Lot #1200
trenches (2)	T. 4 N., R. 43 E.	NW¼SW¼ Section 35	1961	USGS Bull. 1205, p. 105
trench (CP-7)	T. 1 N., R. 43 E.	SW¼SW¼ Section 6	1961	USGS Map MF-277
trench	T. 1 N., R. 43 E.	NW¼ Section 17	1947?	USGS OFR 76-577, p. 27
trench	T. 1 N., R. 43 E.	SW¼ Section 18	1950	USGS Circular 327, Lot #1338
trench	T. 5 S., R. 43 E.	Section 34	1949	USGS Circular 305, Lot #1308
trench	T. 7 S., R. 43 E.	NE¼ Section 10	1953	USGS Circular 375, Lot #1391
trench	T. 7 S., R. 43 E.	Section 24	1948	USGS Circular 262, Lot #1261
trench	T. 8 S., R. 43 E.	Section 1	1948	USGS Circular 208, Lot #1280

Trench, Tunnel or Drill Hole	Township, Range	Section/Subdivision	Year	Reference
trench	T. 8 S., R. 43 E.	SE¼ Section 23	1947	USGS Circular 301, Lot #1209
trench	T. 8 S., R. 43 E.	NW¼NW¼ Section 30	1947	USGS Circular 301, Lot #1206
drill hole	T. 9 S., R. 43 E.	Section 8	1948	USGS Circular 208, Lot #1274
drill hole	T. 9 S., R. 43 E.	Section 8	1948	USGS Circular 208, Lot #1275
drill hole	T. 9 S., R. 43 E.	Section 9	1948	USGS Circular 208, Lot #1276
trench	T. 9 S., R. 43 E.	NE¼SW¼ Section 29	1948	USGS Circular 208, Lot #1265
trench	T. 14 S., R. 43 E.	Section 8	1948	USGS Circular 262, Lot #1266
drill hole	T. 14 S., R. 43 E.	Section 21	1948	USGS Circular 262, Lot #1272
trench	T. 4 N., R. 44 E.	NE¼NE¼ Section 18	1938	USGS Bull. 944-A, trench E; USGS Bull. 1205, p. 107
trench	T. 4 N., R. 44 E.	NE¼ Section 22	1938	USGS Bull. 944-A, trench D
trench	T. 4 N., R. 44 E.	SW¼SW¼ Section 34	1947?	USGS OFR 76-577, p. 29
trench	T. 4 N., R. 44 E.	NW¼ Section 34	1938	USGS Bull. 944-A, trench F
trench	T. 7 S., R. 44 E.	Section 6	1948	USGS Circular 301, Lot #1233
trench	T. 7 S., R. 44 E.	Section 9	1948	USGS Circular 301, Lot #1232
trench	T. 7 S., R. 44 E.	Section 28	1948	USGS Circular 262, Lot #1258
trench	T. 7 S., R. 44 E.	Section 31	1948	USGS Circular 262, Lot #1259
trench	T. 8 S., R. 44 E.	NW¼NE¼ Section 10	1947	USGS Circular 208, Lot #1210
drill hole	T. 8 S., R. 44 E.	Section 30	1948	USGS Circular 208, Lot #1277
drill hole	T. 8 S., R. 44 E.	Section 30	1948	USGS Circular 262, Lot #1278
trench	T. 9 S., R. 44 E.	NE¼SE¼ Section 14	1947	USGS Circular 301, Lot #1211
trench	T. 9 S., R. 44 E.	NE¼SE¼ Section 19	1947	USGS Circular 301, Lot #1208
trench	T. 9 S., R. 44 E.	NE¼NE¼ Section 20	1947	USGS Circular 208, Lot #1212
trench	T.10 S., R. 44 E.	SE¼ Section 1	1948	USGS Circular 262, Lot #1264
trench	T. 14 S., R. 44 E.	SE¼ Section 36	1949	USGS Circular 304, Lot #1293
crosscut, Hot Sprg. Mine	T. 15 S., R. 44 E.	Section 13	?	USGS Circular 304, Lot #1317
trench	T. 2 N., R. 45 E.	W½ Section 27	1940	USGS Bull. 944-A, trench G

Trench, Tunnel or Drill Hole	Township, Range	Section/Subdivision	Year	Reference
trench	T. 8 S., R. 45 E.	S½ Section 21	1949	USGS Circular 304, Lot #1310
trench	T. 8 S., R. 45 E.	SE¼SE¼ Section 31	1949	USGS Circular 304, Lot #1306
trench	T. 8 S., R. 45 E.	SE¼ Section 33	1949	USGS Bull. 1217, Lot #1298 USGS Circular 304, Lot #1298
trench	T. 9 S., R. 45 E.	SW¼ Section 8	<1958	USGS Bull. 1217, Lot #1306A
trench	T. 9 S., R. 45 E.	SE¼NE¼ Section 32	1944	USGS Bull. 955-C, trench A; USGS Bull. 982-A, trench A
trench	T. 9 S., R. 45 E.	SE¼NE¼ Section 32	1944	USGS Bull. 955-C, trench B; USGS Bull. 982-A, trench B
trench	T. 9 S., R. 45 E.	SE¼NE¼ Section 32	1944	USGS Bull. 955-C, trench C; USGS Bull. 982-A, trench C
trench	T. 9 S., R. 45 E.	S½SW¼ Section 34	1948	USGS Circular 208, Lot #1268
trench	T. 9 S., R. 45 E.	SW¼SW¼ Section 34	1944	USGS Bull. 955-C, trench I; USGS Bull. 982-A, trench I
trench	T. 10 S., R. 45 E.	NW¼NE¼ Section 5	1944	USGS Bull. 955-C, trench D; USGS Bull. 982-A, trench D
trench	T. 10 S., R. 45 E.	NW¼NE¼ Section 9	1944	USGS Bull. 955-C, trench E; USGS Bull. 982-A, trench E
trench	T. 10 S., R. 45 E.	SW¼SW¼ Section 9	1944	USGS Bull. 955-C, trench F; USGS Bull. 982-A, trench F
trench	T. 10 S., R. 45 E.	SW¼SW¼ Section 9	1944	USGS Bull. 955-C, trench G; USGS Bull. 982-A, trench G
trench	T. 10 S., R. 45 E.	NE¼NW¼ Section 9	1944	USGS Bull. 955-C, trench H; USGS Bull. 982-A, trench H
trench	T. 10 S., R.45 E.	SW¼SE¼ Section 16	1953	USGS Circular 375, Lot #1392
trench	T. 10 S., R. 45 E.	NE¼NW¼ Section 30	1948	USGS Circular 262, Lot #1267
drill hole	T. 10 S., R. 45 E.	NE¼NW¼ Section 30	1949	USGS Circular 304, Lot #1320
trench	T. 10 S., R. 45 E.	NE¼NW¼ Section 30	1953	USGS Circular 375, Lot #1267A
trench	T. 12 S., R. 45 E.	Section 31	1947	USGS Circular 301, Lot #1207
trench	T. 3 N., R. 46 E.	Lot 4, Section 6	1938	USGS Bull. 944-A, trench C
trench	T. 1 N., R. 46 E.	SW¼ Section 6	1940	USGS Bull. 944-A, trench I

Trench, Tunnel or Drill Hole	Township, Range	Section/Subdivision	Year	Reference
trench	T. 1 N., R. 46 E.	NE¼ Section 19	1940	USGS Bull. 944-A, trench H
trench	T. 1 N., R. 46 E.	NE¼ Section 35	1940	USGS Bull. 944-A, trench K
trench	T. 8 S., R. 46 E.	SE¼ Section 31	1949	USGS Circular 304, Lot #1303

1970-1985

Trench, Prospect or Drill Hole	Township, Range	Section/Subdivision	Year	Reference
trenches (2)	T. 16 N., R. 27 E.	SE¼SW¼ Section 24	1976	CP-71, USGS OFR 79-1283; USGS OFR 86-427
trench	T. 16 N., R. 27 E.	SE¼NW¼ Section 36	1973?	USGS OFR 76-577, p. 29
trench	T. 16 N., R. 27 E.	Center Section 36	1976	CP-72, USGS OFR 79-1283
trench	T. 6 S., R. 43 E.	SE¼SE¼ Section 30	1978	CP-73, USGS OFR 83-245
trench	T. 9 S., R. 45 E.	NW¼NE¼ Section 10	1982	CP-75, USGS OFR 85-730
trench	T. 9 S., R. 45 E.	SW¼SE¼ Section 15	1984	IP-1, IGS Tech. Rpt. 90-7

The passage of the Mineral Leasing Act of February 25, 1920 (41 Stat. 437) brought the curtain down on the acquisition of phosphate through the Mining Law and rendered moot the need for the phosphate withdrawal and classification actions. Phosphate (and selected other minerals) could now be acquired only through a leasing system controlled by the Secretary of the Interior.

The last government sponsored investigation for phosphate classifications began in the 1960's and continued into the 1980's. Under this program, Known Phosphate Leasing Areas (KPLA) were defined. KPLA's are areas where the phosphate resource is available only through the competitive leasing provisions of the Mineral Leasing Act. Along with these new definitions, some field work supported further classification and restoration of withdrawn phosphate lands. The latter efforts were made in part to clean up the land records. Table 1, part 1970-1985, lists the location of those trenches and drill holes. As of the writing of this report, overall, by 2000 there have been four restoration actions on the temporary (secretarial) withdrawn lands, and 13 restoration actions on the Pickett Act withdrawal lands in Idaho.

THE MINES

Waterloo Mine

The Waterloo Mine is the oldest phosphate mine in the Idaho-Utah-Wyoming (western) phosphate field (Figure 4). The earliest known mining activity was reported by Charles Colcock Jones (1907, 1913). Mr. Jones learned that someone was mining for coal near Montpelier, Idaho in August of 1903. When he visited the site, he found that an inclined shaft had been put down 250 feet into phosphate rock by Thomas L. Glenn and others. Mr. Glenn and his associates apparently were exploring without any legal notification for there is no record of a mining claim being filed in the area in or before August, 1903.

The first mining claim of record for phosphate in what was to become the Waterloo Mine was an association placer claim called the Wellington Mining Claim. The Wellington claim was located September 29, 1903 by Charles Colcock Jones, Elizabeth Clayton Jones, Willard L. Coles, Augustus S. Haskell, Walter B. Raintree, Fredrick O. Hurt, John A. Balch, and Jesse A. Bell. The claim was duly recorded with Bear Lake County on October 2, 1903. The Wellington claim covered the SE¼NW¼, E½SW¼ of Section 6, and the NE¼NW¼ of Section 7, T. 13 S., R. 45 E., BM.

The above locators quit claim deeded the Wellington claim to the Iron Mountain Investment Company, Charles P. Eells, Pres., and Frances Shan, Sec., on January 26, 1904. The Iron Mountain Investment Company then quit claim deeded the Wellington claim to William S. Goodfellow, Hugh Goodfellow, Arthur W. Goodfellow, R. W. Hart, John Shepard Eells, H. L. Atkinson, Richard M. Lyman, and Joseph J. Taylor on July 5, 1904. The lands of the original Wellington placer claim were relocated and the name was changed to the Waterloo placer mining claim on July 8, 1904. These men were employed by the San Francisco Chemical Company (SFCC), which at that time was the operating subsidiary of the Mountain Copper Company, Ltd., a British firm (Jones, 1907). As an aside, the California office of the above locators was destroyed in the earthquake and fire in San Francisco on April 18, 1906. All of the record copies of the Waterloo claim were destroyed and new copies had to be made from the original records from the General Land Office.

Charles Colcock Jones, one of the original Wellington placer claim locators, was not happy about the deal struck in deeding the Wellington claim to the Iron Mountain Investment Co. and then the Goodfellow group. Jones top filed a series of lode claims for phosphate over the Waterloo claim on July 11, 1904. On September 15, 1904, Jones filed an adverse claim and contest suit to the Waterloo placer claim in State court. That suit was soon moved to the United States Circuit Court where the parties involved agreed that the only question involved was as to whether the phosphate deposits should be located as lode claims or as placer claims. Considerable testimony on both sides was submitted. Before judgement was rendered, a motion was filed that action be suspended until the U. S. Department of the Interior could order a hearing and pass upon the character of the land. The motion to suspend was allowed by the Circuit Court but before any action was taken by the Department of the

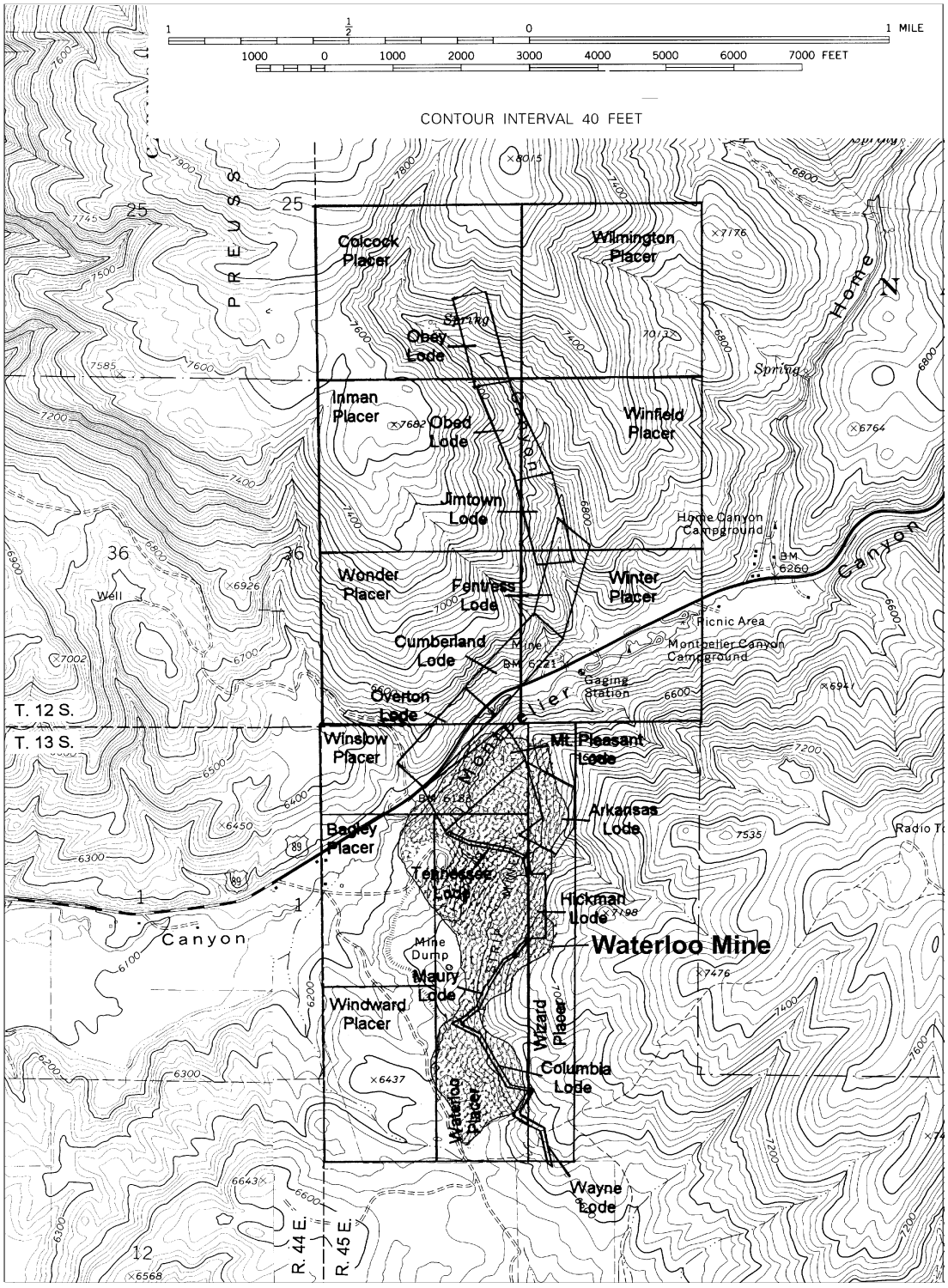

Figure 4. Map showing the location of the Waterloo Mine and associated mining claims and mineral patents, Bear Lake County, Idaho.

Interior, Jones withdrew his protest and adverse claim (October 18, 1905). If it had proceeded, this case might have been the first legal determination of the proper method of locating phosphate.

Charles Colcock Jones was an interesting and principal character in the earliest phosphate mining. In 1902, Jones, a consulting mining engineer and metallurgist working for Mountain Copper Company, Ltd., grappled with the problem of the enormous waste of sulphur in copper processing, and suggested to the company that excess sulphuric acid could be used in the production of phosphate fertilizer for use on California farms. At that time, Mountain Copper was having trouble with local farmers because of smelter fumes (Bell, 1913). To solve that problem, the company installed a sulphuric acid plant to reduce the fumes, but the new production caused a glut on the acid market. The company was interested in Jones' idea of fertilizer production and sent him out to track down rumors and reports of a western source of phosphate. Working from an advertisement in the January, 1903 issue of the *Mining and Scientific Press*, Jones was led to Rich County, Utah. There he examined the phosphate rock that had been found by Pidcock and Richter (see page 4, this report). Throughout the period of 1903 to June, 1904, Jones visited and reported on many phosphate locations throughout Idaho, Wyoming, and Utah, all the while representing the Mountain Copper Company, Ltd. In June, 1904, he left Mountain Copper Company because of "irreconcilable differences", and became a private consultant. He soon acquired phosphate interests and properties throughout the western phosphate field for himself. About 1906-1907, Jones sold his phosphate interests and holdings to the United States Phosphate Company of San Francisco, California, a bitter rival of the San Francisco Chemical Company. Jones, in a letter to President Theodore Roosevelt, October 16, 1906 (Jones, 1913), suggested that the phosphate resource of the west that he was so familiar with, be preserved by withdrawing the resource from entry, similar to what had been done for coal. As noted earlier in this report, phosphate was eventually withdrawn, in no small part because of Jones' suggestion.

The filing of the Waterloo mining claim lead to the filing of other association placers. San Francisco Chemical Company located the Windward placer claim and nine others in the immediate vicinity of the Waterloo in 1904-1906 (see Table 2). The Waterloo placer mining claim was patented on January 24, 1906 and the Windward placer mining claim on November 9, 1911. Both were patented under the Mining Law of 1872. None of the remaining nine claims were ever patented. Starting in November of 1907, Lewis A. Jeffs and Morse S. Duffield, prospectors working for the United States Phosphate Company top filed lode claims over the existing placer location (see Table 2 and Figure 4). They did this because of the uncertainty in how to properly locate phosphate (as discussed earlier in this report) and the desire to wrest control of the resource in this area from the San Francisco Chemical Company. However, the lode locations over the Waterloo claim were filed after the placer patent had been issued and the claim became private property. Those lode claims were invalidated, but, eight of the top-filed lode locations eventually went to patent (Table 2).

Actual underground mining of phosphate rock started in 1907 from a spot near the center of the Waterloo claim, with the first reported shipment of 735 tons to San Francisco in 1909 (Service, 1967). Prior to 1907, limited amounts of phosphate rock had been produced from hand-dug pits (Figures 5

and 6) where high-grade ore was found at the surface (Service, 1966). The first mining operation was an open-cut about 200 feet square with two tunnels and two shafts developed later beneath the cut (Mansfield, 1927; Gale and Richards, 1910). These early operations were all done by hand. Buildings at the Waterloo mine included an office, blacksmith shop, carpenter shop, and a stable. About 21 men were employed at the mine and daily wages were about average for the industry with muckers earning $3.25 per 8-hour shift and miners $3.50 per shift (Gidel, 1919b). The superintendent of operations for

Table 2. Mining claims and mineral patents at the Waterloo Mine.

Claim Name	Date of Claim Location	Claimant or Patentee	Mineral Certificate/ Survey No.	General Land Office Serial Number (Blackfoot)	Patent Number	Date of Patent
Waterloo Placer	July 8, 1904	Goodfellow, et al (Patentee)	MC-8	N/A	43829	Jan. 24, 1906
Windward Placer	Unknown	San Francisco Chemical Co.	N/A	BL 08620	233347	Nov. 9, 1911
Obey, Obed, Jimtown, Fentress, Cumberland, Overton, Mt.Pleasant, Arkansas Lodes	Nov. 14-15, 1907	L. A. Jeffs for United States Phosphate Co.	MS 2538	BL 015582	456436	Feb. 3, 1915
Bagley, Winslow, Wizard, Wonder, Winter, Inman, Winfield, Colcock, Wilmington Placers	June 11, 1904	C. C. Jones for San Francisco Chemical Co.	N/A	N/A	Never patented	N/A
Wayne, Columbia, Maury, Hickman, Tennessee Lodes	Nov. 15-16, 1907	M. S. Duffield for United States Phosphate Co.	MS 2537	N/A	Never Patented	N/A

the San Francisco Chemical Company was Joseph J. Taylor, one of the Waterloo claim locators. Taylor described the early mining as open quarry work followed by the driving of three cross-cut

Figure 5. Black phosphate bed opened by surface stripping at Waterloo Mine. Photo by V. R. D. Kirkham, courtesy of the Idaho Geological Survey.

Figure 6. Prospect at south end of the Waterloo Claim, T. 13 S., R. 45 E., Section 6, showing local displacement in phosphate shales. Photo by R. W. Richards, #262a, USGS Photographic Library.

tunnels into the hill and more tunnels (drifts) being driven on the deposit (Mansfield, 1927) (Figures 7 and 8). Raises and stopes were excavated, in fact almost all the mine production was by stoping. The phosphate ore proved to be sufficiently soft to be mined by pick and shovel. Underground openings were advanced with a breast auger drill (Figure 9).

Figure 7. The Waterloo phosphate mine 4 miles east of Montpelier, Idaho, 1909. Photo by H. S. Gale, #462, USGS Photographic Library.

Mining had also started on the adjacent patented Windward placer claim. In 1910, the mine was developed by a 65-foot deep, 6 x 8-foot shaft and a 6-inch bore hole 148 feet deep (unpublished USGS data). The Waterloo and Windward claims (plus other adjacent lands) were joined to form the Waterloo Mine proper.

In the period of 1910 to 1917, the Waterloo was the only large phosphate producer in Idaho (Maughan and Raymond, 1980). Initially, ore was trammed from the portal to the truck loading facility (Figure 10), then loaded onto trucks (Figure 11), and transported to the rail facilities at Montpelier where rail cars to California were loaded (Figures 12 and 13). Bell (1911) reports that the Waterloo mine, since opening, shipped about 5,000 tons of phosphate rock annually to the San Francisco Chemical Company's chemical works at Martinez, California. Bell goes on to describe the workings of the mine as a cross-cut tunnel 1,000 feet in length and 500 feet below the outcrop with connecting raises to a shallower adit level and an open quarry. In 1916, Bell (1916) says workings had progressed to a depth of 800 feet on the dip of the ore, and reported that the company shipped an

Figure 8. The Waterloo phosphate mine 4 miles east of Montpelier, Idaho, 1909.
Photo by H. S. Gale, #463, USGS Photographic Library.

average of 100 tons per day to the acid works in California. In 1918, Bell notes that the San Francisco Chemical Company's acid works was overstocked and that operation at the mine was suspended. By

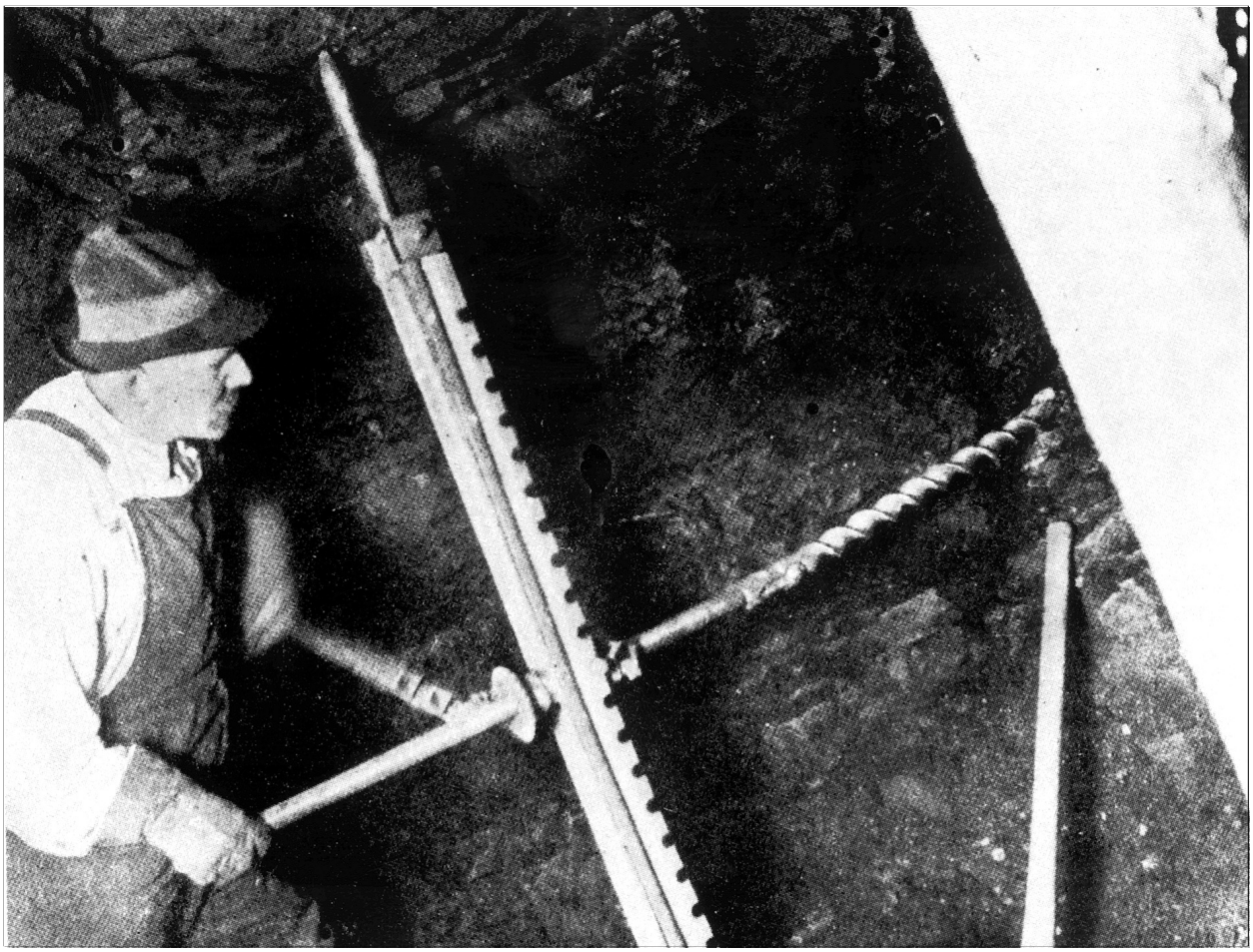

Figure 9. Hand auger drilling in a stope in the Waterloo Mine, about 1915. Photo from Service, 1966, p. 22.

the next year the mine was back in production and the underground workings had been extended to total 1,500 feet of short cross-cuts, drift and raise connections to the surface (Figure 14) (Bell, 1919). In late 1920, operations were suspended again and the mine idled (Kirkham, 1925). At that time underground development was 3,000 feet of tunnels and drifts accessed by three adits. The mine remained idle until 1929, when it was permanently closed as an underground operation.

The Waterloo remained closed until 1945, when it was reopened as a surface operation by the San Francisco Chemical Company. The mine was worked intermittently between 1945 and 1960 (USGS, 1977). Beginning in June of 1945, the company shipped approximately 675,000 tons of phosphate rock before suspending operations in September, 1947 (Butner, 1949). Reserves were depleted and the mine was closed in 1958, briefly reopened in early 1960, and then permanently closed later that year, never to reopen (Figure 15). The mine workings disturbed about 212 acres and produced approximately 1¼ million tons of ore over its life. On February 16, 1971, the 400 acres of patented

Figure 10. Waterloo Mine tramway, about 1925. Photo by V. R. D. Kirkham, courtesy of the Idaho Geological Survey.

mining claims at the Waterloo Mine were donated to the Idaho Fish and Game Department (IF&G) by the Stauffer Chemical Company, the successor of the San Francisco Chemical Company. The IF&G had plans to use the site as deer winter range, but that use never developed. Part of the donation was an option for the city of Montpelier to use part of the site as a landfill, which is being done. The IF&G

Figure 11. Trucking phosphate rock from mine bins to railroad, Waterloo Mine. Photo by V. R. D. Kirkham, 1925, courtesy of the Idaho Geological Survey.

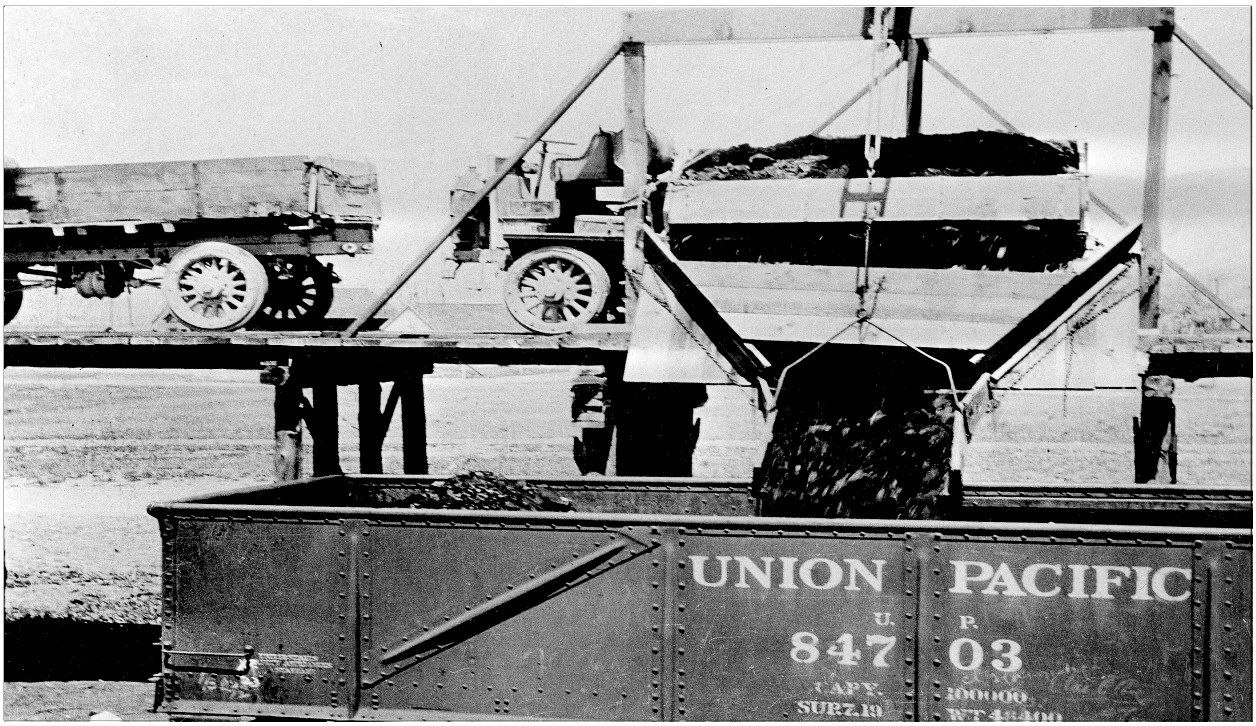

Figure 12. Unloading phosphate rock from truck to car, side view, Montpelier, Idaho, 1925. Photo by V. R. D. Kirkham, courtesy of the Idaho Geological Survey.

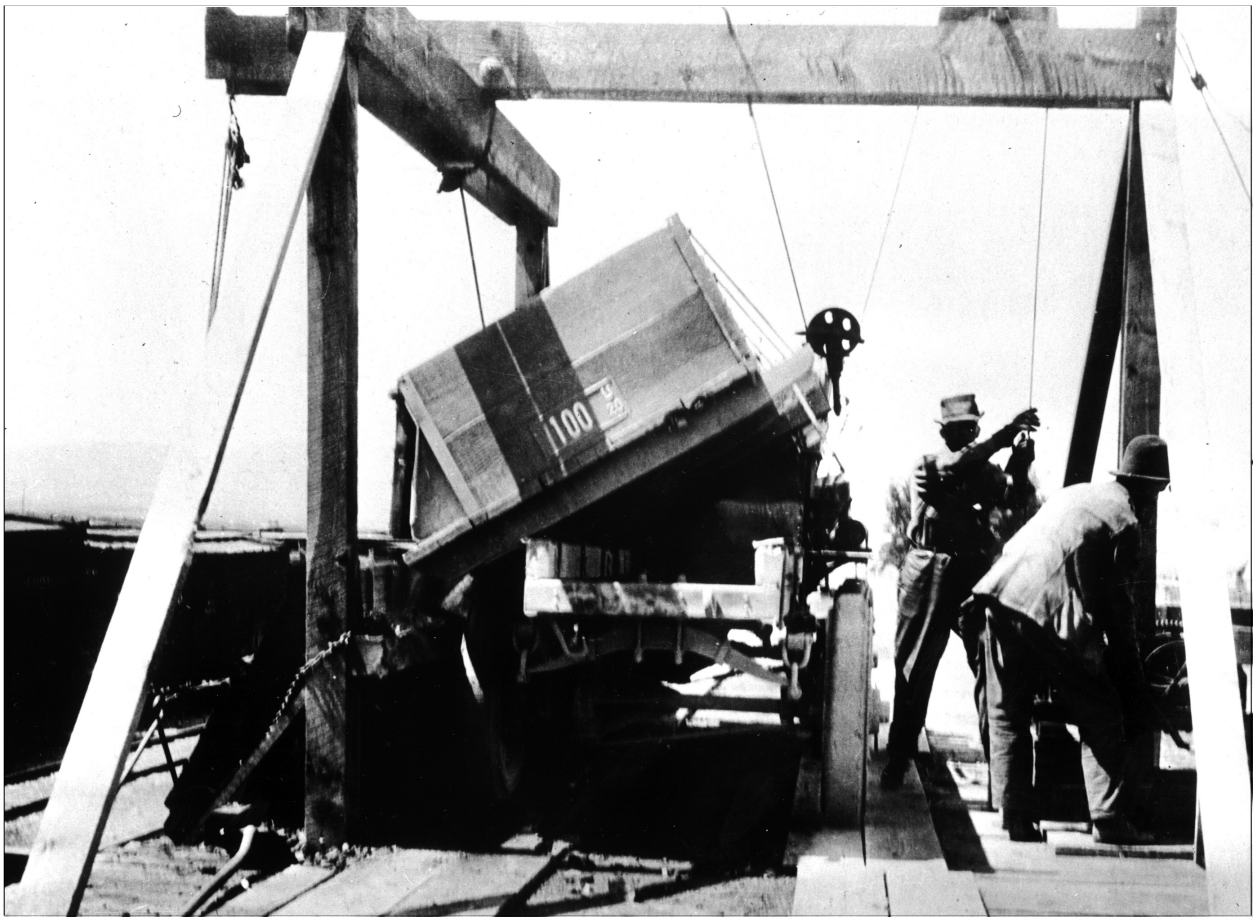

Figure 13. Unloading phosphate rock from truck to car, end view, Montpelier, Idaho, 1925. Photo by V. R. D. Kirkham, courtesy of the Idaho Geological Survey.

is exploring other options for the mine, (IF&G, personal communications, 1998). So goes the saga of the historical Waterloo Mine (1903-1996).

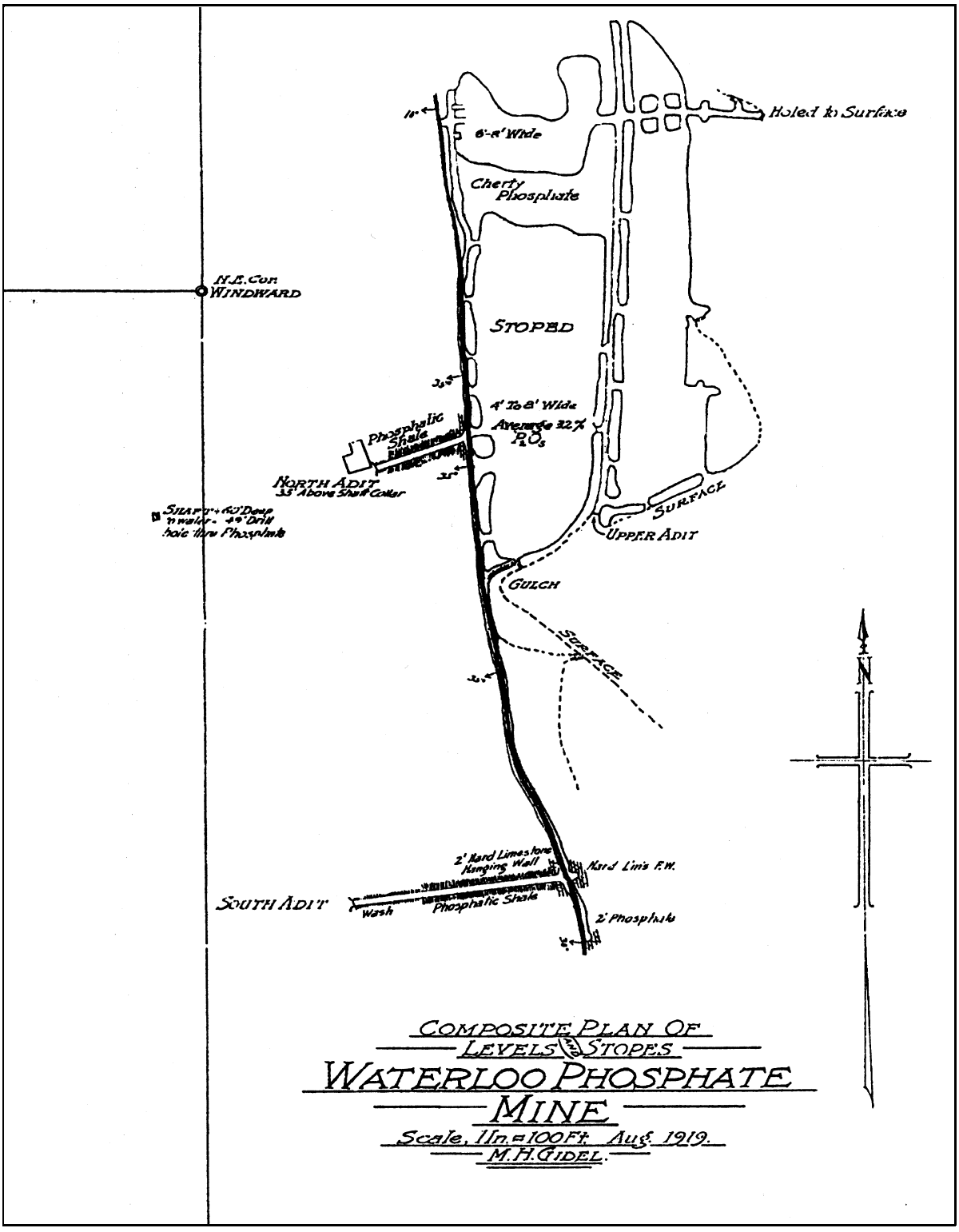

Figure 14. Underground workings, Waterloo Mine, August, 1919. Map courtesy of the Anaconda Collection, American Heritage Center, Laramie, Wyoming.

Figure 15. Waterloo Mine east of Montpelier, Idaho, August, 1975. Photo by Peter Oberlindacher, BLM.

Hot Springs Mine

The Hot Springs Mine is located in T. 15 S., R. 44 W., Sections 1, 12, 13, and 24, Bear Lake County, Idaho. There are several tunnels and prospect pits in the area of the mine. The original property consisted of 12 patented lode claims, four unpatented lode claims, and one unpatented mill site (Table 3, Figure 16). The locators of the claims were Morse S. Duffield and Lewis A. Jeffs (Figure 17), both figured prominently in phosphate claim litigation elsewhere in the phosphate field (see chapter on Mining Claims and Patents).

Table 3. - Patented mining claims of the Hot Springs Mine.

Claim Name	Date of Location	Mineral Survey Number	General Land Office Serial Number (Blackfoot)	Patent Number	Date of Patent
Nashville Lode	November 8, 1907	2371	BL-069	240273	December 28, 1911
Ely Lode	November 9, 1907	2600	BL-010985	478704	June 17, 1915
Murfreesboro Lode	November 8, 1907	2601	BL-010984	488041	August 25, 1915
Chickamanga Lode	November 8, 1907	2601	BL-010984	488041	August 25, 1915
Chattanooga Lode	November 8, 1907	2601	BL-010984	488041	August 25, 1915
Lebanon Lode	September 18, 1908	2601	BL-010984	488041	August 25, 1915
Carthage Lode	November 8, 1907	2601	BL-010984	488041	August 25, 1915
Hermitage Lode	August 24, 1908	2601	BL-010984	488041	August 25, 1915
Gallatin Lode	November 9, 1907	2601	BL-010984	488041	August 25, 1915
Treadwell Lode	November 9, 1907	2601	BL-025209	586238	May 28, 1917
Robinson Lode	November 9, 1907	2601	BL-025209	586238	May 28, 1917
Campbird Lode	November 9, 1907	2601	BL-025209	586238	May 28, 1917
Mohawk Lode	November 9, 1907	2632A	BL-012751	N/A	Never Patented
Broken Hill Lode	November 9, 1907	2632A	BL-012751	N/A	Never Patented
Original Lode	November 9, 1907	2632A	BL-012751	N/A	Never Patented
Bingham Lode	November 9, 1907	2632A	BL-012751	N/A	Never Patented
North Lake Mill Site	October 26, 1911	2632B	BL-012751	N/A	Never Patented

All of the lode mining claims were located by Morse S. Duffield and Lewis A. Jeffs. The North Lake Mill Site claim was located by Albert Walter, agent for the Union Phosphate Company. All patents except the Nashville Lode were issued to the Union Phosphate Company. The Nashville lode mining claim was patented by Duffield and Jeffs. The patent applicant for the Mohawk, Broken Hill, Original, and Bingham Lodes was August Vogt, agent for the Union Phosphate Company; applications for patent were withdrawn.

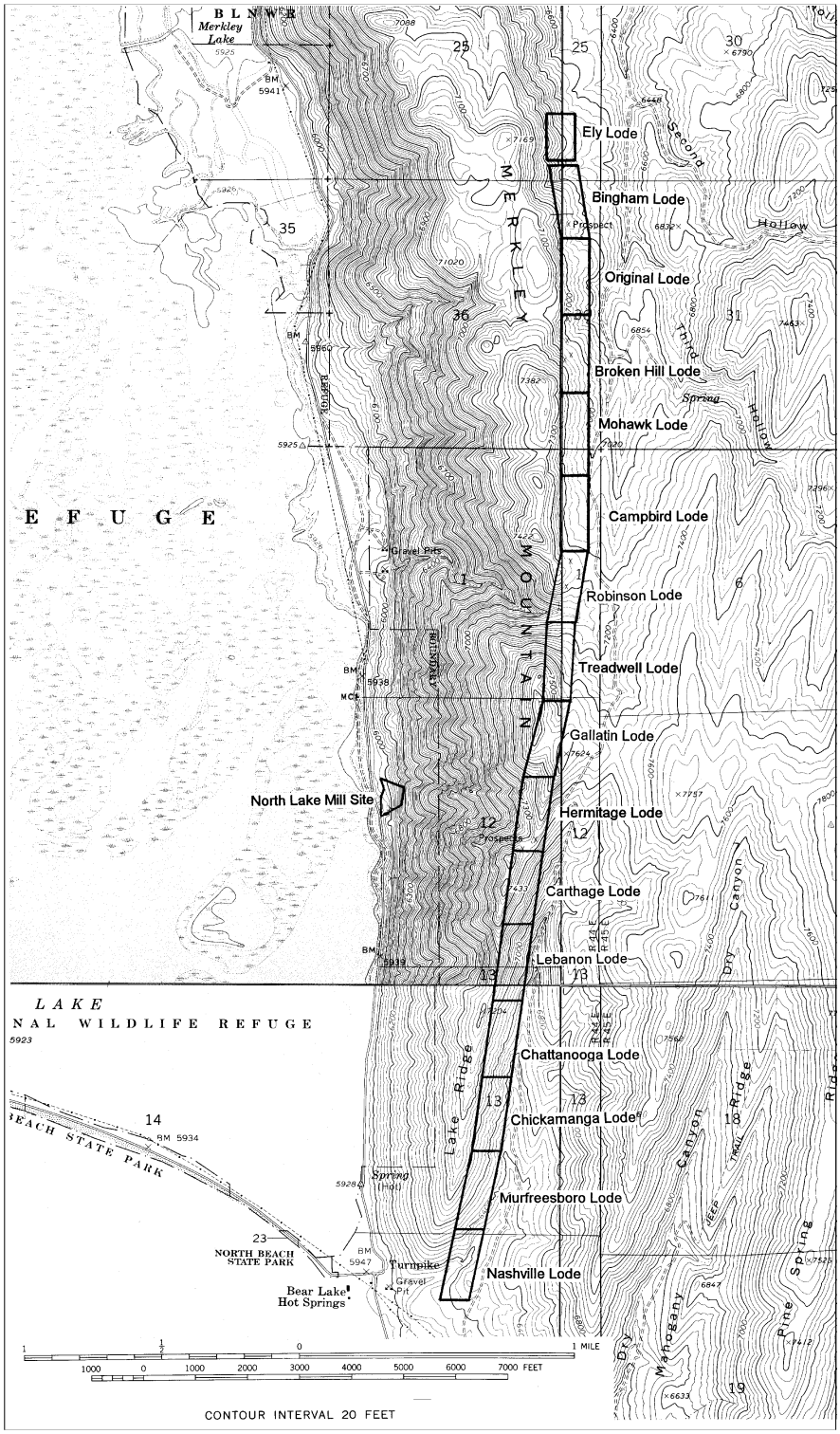

Figure 16. Map showing the location of the patented mining claims of the Hot Springs Mine, Bear Lake County, Idaho.

Figure 17. Hot Springs Mine, at Heritage Discovery, 9,000 feet north of the Nashville Lode Mining Claim, looking south, 1911. Individuals are possibly Lewis Jeffs and Morris Duffield. Photo from the patent case files, General Land Office, National Archives and Records Service, Washington, D. C.

The earliest known exploration was the assessment and development work performed on the lode claims. This work included several open cuts and tunnels of varying lengths. Unpublished records of the BLM show that these tunnels measured five feet to 477 feet in length (Figure 18). The most extensive work was done on the Nashville Lode, probably because of better access to loading and shipping facilities. Also, in 1911, the North Lake tunnel (Mansfield, 1927) was under construction near the site of the North Lake Mill Site (Figure 16). At the time of the survey, this tunnel was 216 feet long. The tunnel was intended to cut the phosphate ore at several locations at a greater depth than earlier tunnels nearer the surface. After the tunnel intersected the ore, drifts were to be driven north and south along strike. The tunnel was abandoned at 220 feet in 1912, and never came close to intersecting the ore body.

An unusual situation developed on the Nashville claim. Gale and Richards (1910) and Mansfield (1927) reported that there was a double set of entry tunnels into the phosphate rock at nearly the same place, a small gulch one half-mile east of the old Turnpike post office (Figures 19 and 20). These two tunnels were apparently constructed by Morse S. Duffield and Lewis A. Jeffs as lode locators and the Union Phosphate Company as placer claimants. The western tunnel belonging to the lode locators was excavated to a reported depth of 95 feet at the time of the mineral survey in June, 1908 and to a depth of 238 feet with 199 feet of crosscuts at the time of patent in 1911. The eastern

Figure 18. Discovery tunnel of the Nashville Lode Mining Claim, 1911. Photo from the patent case files, General Land Office, National Archives and Records Service, Washington, D. C.

tunnel belonging to the placer locators was 182 feet long with a 15 foot crosscut in 1908 and was 477 feet long at the time of patent in 1911. The conflict between the locators was resolved in some fashion as the patent to the claim was issued to Duffield and Jeffs in December, 1911. The successful claimants continued to lengthen the tunnels and by 1916 had extended the underground workings to 700 feet (Figure 21) (Gidel, 1916a).

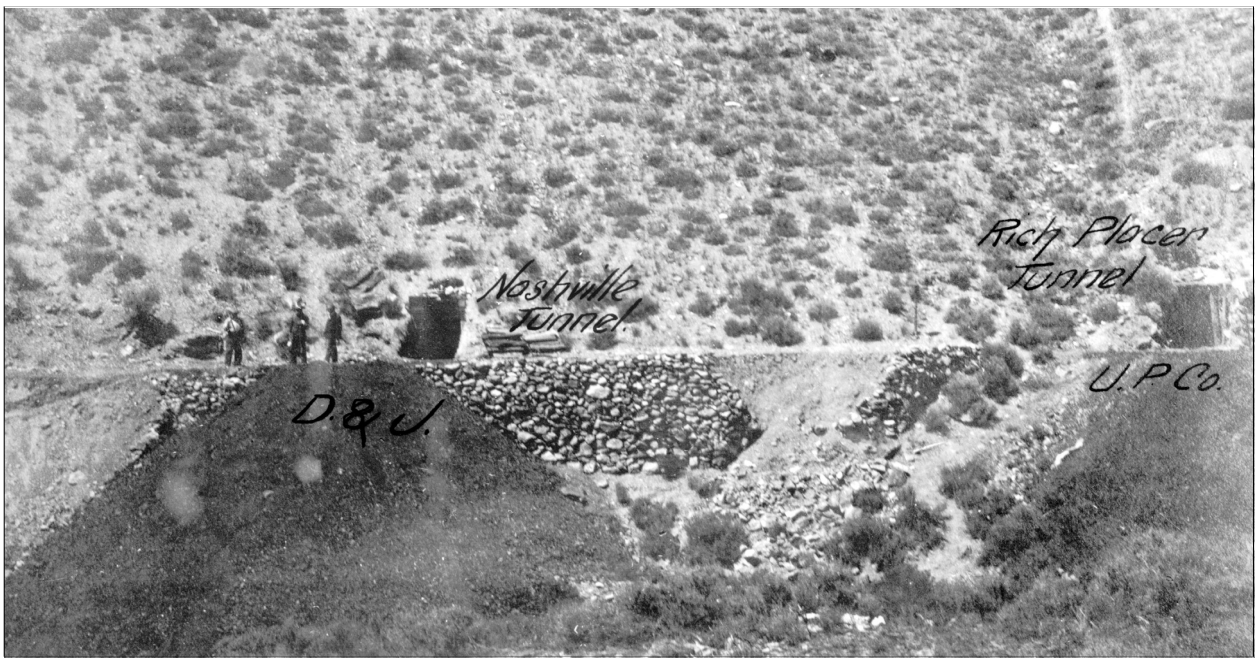

Figure 19. Union Phosphate Company's tunnel on the right (Rich Placer Claim) and the Nashville Lode Mining Claim tunnel on the left, 1911. Photo from the patent case files, General Land Office, National Archives and Records Service, Washington, D. C.

Figure 20. Union Phosphate Company's tunnel on the right (Rich Placer Claim) and the Nashville Lode Mining Claim tunnel on the left, September 9, 1996. Photo by the author.

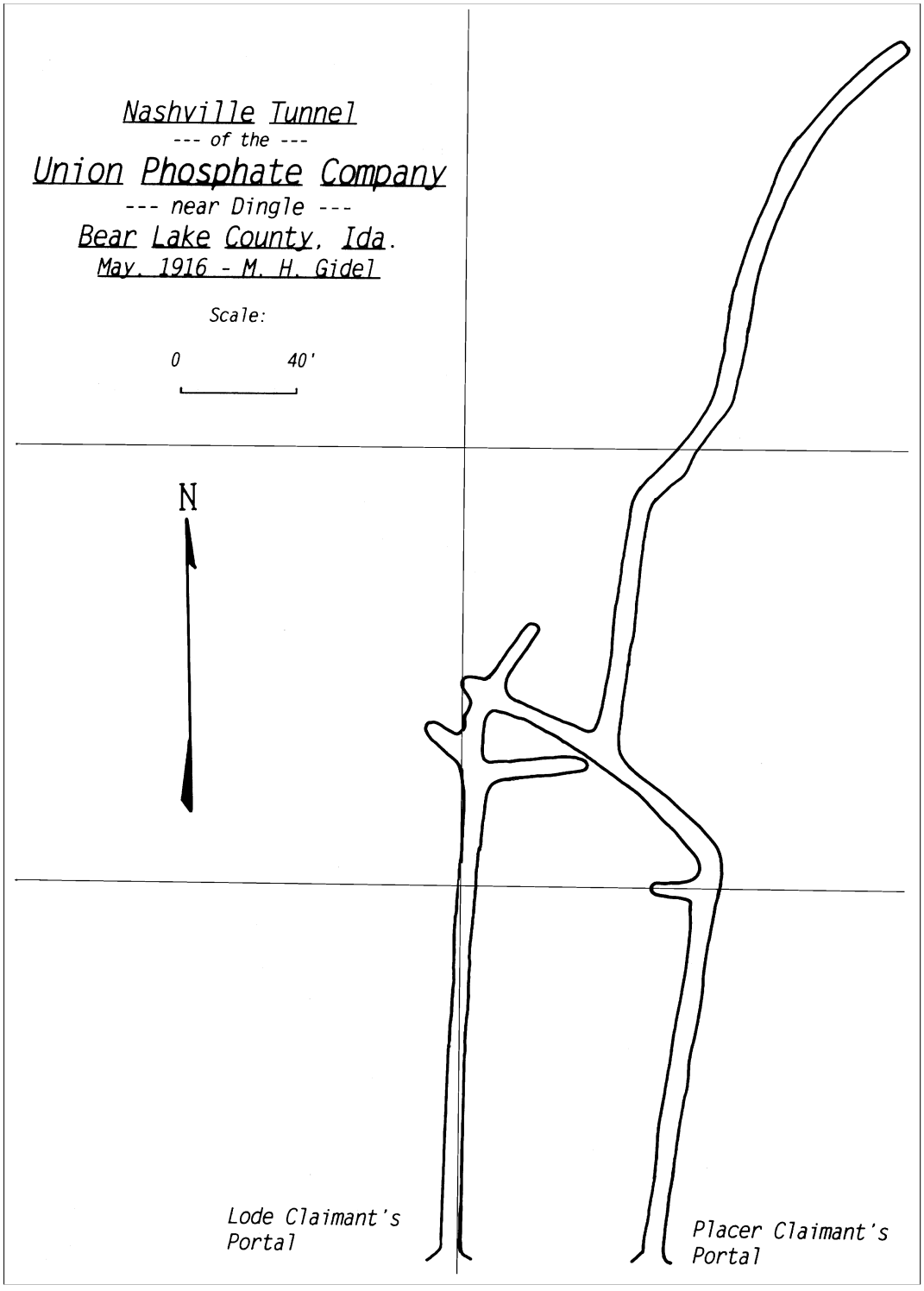

Figure 21. Underground mine map of the two tunnels on the Nashville Lode Mining Claim. Map from the Anaconda Collection, File 20111, American Heritage Center, Laramie, Wyoming.

Sometime between the patenting of the Nashville Lode in 1911 and the patenting of the other lode claims in 1915 and 1917, Duffield and Jeffs and the Union Phosphate company resolved their differences because all the lode claims and the patented Nashville Lode were sold to the Union Phosphate Company. The Union Phosphate Company took all of the remaining lode claims, except Mohawk, Broken Hill, Original, and Bingham lodes, to patent. Records in the Idaho Secretary of State's office indicate that the Union Phosphate Company forfeited the right to conduct business in Idaho on December 1, 1912. This meant that they could not mine or develop their claims after that date. However, the company was still active across the state line at Leefe, Wyoming.

The exploration on the patented claims (Figure 22) showed that the phosphate ore was severely faulted and that mining conditions would be difficult (Service, 1966). Eventually, the exploration program was abandoned and about 1920-21, the patented lode claims were sold to the San Francisco Chemical Company. The property lay dormant until 1954, when the San Francisco Chemical Company started development and exploration near the middle of the phosphate exposure (Service, 1966). The work consisted of a crosscut adit (Figure 23) 1,600 feet long with drifts north and south and a raise to the surface. Significant phosphate reserves were proved with this exploration but a very limited production was achieved. The ore was unaltered and hard. When crushed in a rod mill, the flint-like ore chewed up the rods (Gordon Aland, personal communication, 2001). All work was suspended in 1956, and the property has been dormant since then.

Figure 22. Trench above the Hot Springs Mine, on the Hermitage Lode Mining Claim, June 25, 1996. Photo by Peter Oberlindacher, BLM.

The owners of the patented lode claims have changed several times since location and patenting. After acquiring the patented claims from the Union Phosphate Company in 1920 or 1921, the San Francisco Chemical Company held them until 1969 when they reorganized and changed their name to the Stauffer Chemical Company. Stauffer held the claims until 1987 when they were acquired by the Rhône-Poulenc Basic Chemicals Company. On January 1, 1998, Rhône-Poulenc reorganized and formed a subsidiary company entitled Rhodia, Inc. which still owns the Hot Springs Mine.

Figure 23. Hot Springs Mine portal, exploring the Carthage and Hermitage Lode Mining Claims, June 25, 1996. Photo by the author.

Paris Canyon Mine
(Western Phosphate Mine, Idaho Phosphate Mine, McIlwee Mine)

On November 6, 1901, Margarette Grandi, widow of Pietro Grandi, received a homestead patent from the General Land Office (GLO) for the E½SE¼ of Section 8, T. 14 S., R. 43 E., BM (Figure 24). This tract is located about 2½ miles west of Paris, Idaho. On November 8, 1913, Mrs. Grandi received another homestead patent from the GLO for adjacent acreage in Section 8 and Section 17. These two contiguous patents formed what would become the Paris Canyon Mine.

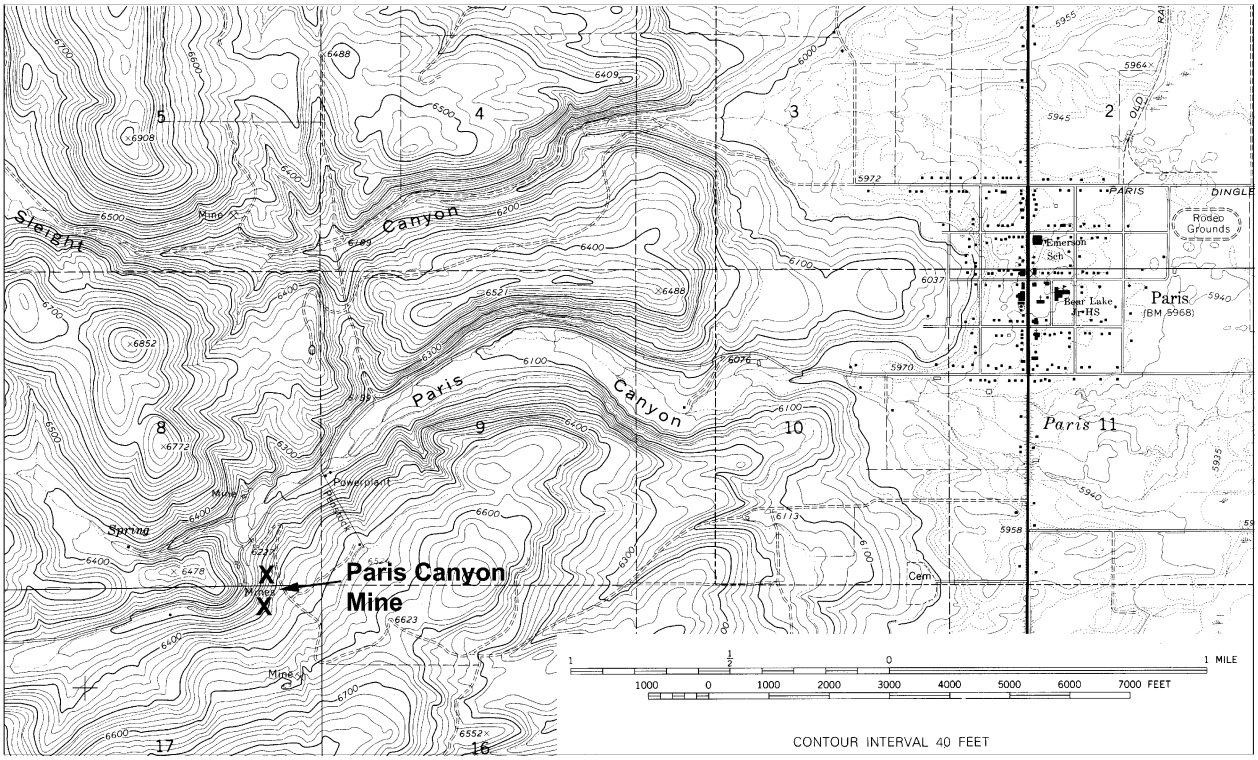

Figure 24. Map showing the location of the Paris Canyon Mine, Bear Lake County, Idaho.

In 1913, Leo W. Bach explored for phosphate on and around the Grandi (sometimes spelled Grandy) homestead. Phosphate beds were accidentally exposed by erosion caused by a breached ditch that provided water for irrigation and waterpower. The ditch was owned by the Utah Power and Light Company. Bach opened three prospects near the new exposure. One prospect consisted of a 130-foot tunnel next to the exposure in which 100 feet of phosphate was opened. This tunnel was apparently unsupported because by August, 1914, it was in too bad a condition to reenter (Mansfield, 1927). Another prospect was the cleanup and enlargement of the accidental exposure itself and the third prospect was a 60-foot long entry on the north side of the canyon but it was entirely in low grade black shales with no main bed exposed (Mansfield, 1927, p. 252-254). There were also two crosscut trenches in the area of the adits (Gidel, 1916b). Mr. Bach had other phosphate experts visit the Grandi

farm and all concurred that the beds were of the best quality and could be easily mined. Mr. Bach, characterized as "a man who talks but little unless he has something to say" (Paris Post, 1915), felt confident that there were millions of tons of the phosphate ore on the property. There was also additional extensive surface prospecting and limited hand trenching done (Service, 1966). The Paris Post (1915) reported that there were some very flattering offers made for the purchase of Mrs. Grandi's property. A shipment of phosphate ore was sent to Los Angeles on July 23, 1915 and a second shipment to Los Angeles was made on August 2, 1915. This phosphate ore was probably surface or near surface material and was shipped for testing purposes. Also, a carload of phosphate ore was shipped to the Anaconda Copper Mining Company for testing in March, 1916 (Nichols, 1916).

In May 25, 1917, papers were filed in the Bear Lake County Courthouse that created a new phosphate mining company entitled the Western Phosphate Mining and Manufacturing Company of Salt Lake City, Utah. The officers of the fledgling company were Lewis A. Jeffs, president, J. Russell Shephard, vice-president, and DeWitt Knox, secretary-treasurer. The board of directors also consisted of Margarette Grandi and Roy A. Welker. Mrs. Grandi's homestead property was purchased by the new company at that time (Paris Post, 1917). It is interesting to note that Lewis Jeffs, president of the new company, was at the same time, vice-president and western agent for the United States Phosphate Company of Detroit, Michigan, which was in the process of patenting phosphate mining claims in Little Canyon, southwest of Paris and which would become the Consolidated Mine. Jeffs envisioned opening up a new mine and installing a 200-ton per day mill in Paris Canyon. This mining project was being backed by a number of Salt Lake City venture capitalists (Paris Post, 1917). Electricity to the new mine and mill would come from a near-by waterpower facility owned by the Utah Power and Light Company, and, in fact, Western Phosphate Mining and Manufacturing Company constructed a transmission line to the property in June, 1917. Transportation of ore to the railroad in Paris would be by surface tram.

The actual development of the mine property started in August, 1917 (Mansfield, 1927; Service, 1967; Bennett and others, 1989) and the initial shipment from the new mine was made to the west coast in October of that year. With this production, the Paris Canyon Mine became only the second mine in Idaho to produce and ship phosphate ore (Service, 1966). In February, 1918, 21 rail cars of phosphate ore were shipped to Honolulu (Bell, 1918) and the average production was up to about one carload a day. A description of the current mine workings was given in the April 12 issue of the local newspaper (Paris Post, 1918a), as follows:

> *"The main working tunnel was started at a point on the south side of the Paris Creek and cut the hanging wall vein at a slight angle within a distance of ninety feet from the portal, giving fifty feet of stopping ground on the vein. From this point the tunnel followed the vein for a distance of 300 feet, gaining twenty-five feet additional depth for each 100 feet of tunnel and will continue to add this*

additional depth as the work progresses for a distance of about 300 feet. Raises, 50 to 100 feet high, have been opened at intervals of 50 feet along the tunnel."

The Paris Post (1918b) reported that a tunnel was being started on the same vein as the main mine but on the north side of Paris Creek. This tunnel was to develop additional ore on the north extension of the phosphate bed. The main tunnel of the Paris Canyon mine had been advanced to 600 feet by August, 1918 and was advancing at an average of 5 feet per day (Paris Post, 1919). Gidel (1919a) reported that there was some trouble in mining the first 400-500 feet of the drift and stopes because of a clay and soft shale hanging wall. Phosphate ore was hauled to Paris by teams and loaded into rail cars for shipment. Bell (1919) reported that about 60,000 tons of ore had been produced since the opening of the mine and that the bulk of that tonnage was shipped to Hawaii and Japan, as well as the Pacific Guano and Fertilizer Company in California (Gidel, 1919a).

In January, 1920, the Western Phosphate Mining and Manufacturing Company held a special reorganization meeting. At this meeting, the name of the company was changed to Western Phosphate Company. This was done because of a change in principal stockholders. James A. McIlwee was one of the principal stockholders and became involved in the running of the mining company. The capital stock offering of the company was changed from 300,000 shares at $1 par value to 400,000 shares at $1 par value. It was about this time that the mine started to be called the McIlwee Mine.

One of the more popular attractions in the Paris area, the mine offered tours to the interested public. One of the things of interest to see at the mine was the transportation of the ore in cars pulled by mules. On some occasions, the mine provided light dancing and music along with food for touring guests and transportation to the mine and return from Paris by sleigh (Paris Post, 1920b).

On February 12, 1920, the new Western Phosphate Company's 300-ton per day mill began operation at the mine (Figure 25). The mill was 159 feet long by 40 feet wide and at the same elevation as the tunnel. The ore was trammed about 800 feet from tunnel to mill. This tramway was eventually covered by a snowshed to facilitate winter operations (Figure 26).

In March, 1920, the first full trainload of phosphate left Paris for Portland where it was to be shipped to Hawaii and Japan (Hansen, 1964). The Western Phosphate Company celebrated the event by attaching placards describing the phosphate and where it was mined to each rail car (Paris Post, 1920e, f).

The Paris Post (1920g, h) reported three significant events concerning the Paris Canyon Mine. First, a 3½-mile long railway spur was completed up Paris Canyon from Paris to the mine (also Bell, 1920; Mansfield, 1927) (Figure 27). Second, a 250-ton per day drying plant was completed at the mine. And third, the same ditch that allowed Leo Bach to discover phosphate on the property in 1913, caused a major cave-in of the main tunnel of the mine. Apparently, the ditch wetted enough ground above the tunnel to increase the weight of the overburden and exceeded the carrying capacity of the

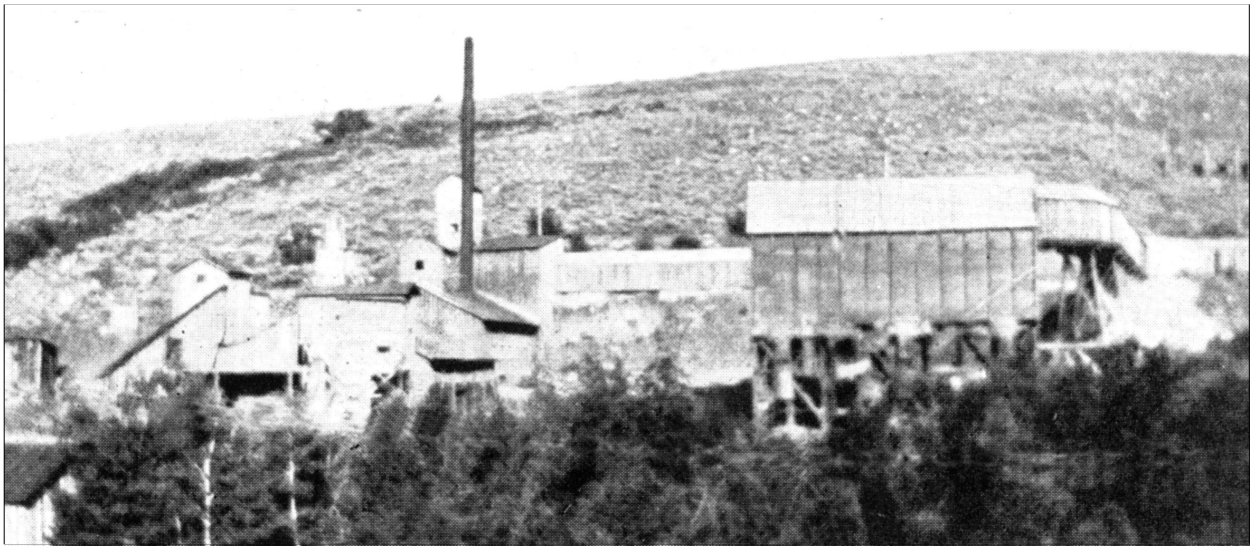

Figure 25. General view of the pulverizing mill and crude rock storage bins of the Idaho Phosphate Company. This photo has been reprinted with the express written permission of Rock Products Magazine. Reprinted from the June 26, 1926 issue of Rock Products Magazine.

Figure 26. Overview of the Paris Canyon Mine showing the snowshed over the tramway, August 31, 1920. Photo by G. R. Mansfield, #478,479, USGS Photographic Library.

mine timbering. About 50 feet of tunnel was destroyed. A crew of men had been retimbering to support the ground and had just left for lunch hour when the collapse occurred. There were no injuries or fatalities in the incident. The mine was closed for about 5 days while the tunnel was repaired. The report stated that a flume would probably be constructed over the mine to prevent future cave-ins.

In June, 1920, the mine was reported to be 1,400 feet long with numerous stopes and that the main tunnel was being enlarged to a double-track 7 x 8-foot entry. Working in the mines and mills in the 1920's was a hazardous occupation and the Paris Canyon Mine was no exception. The mine recorded

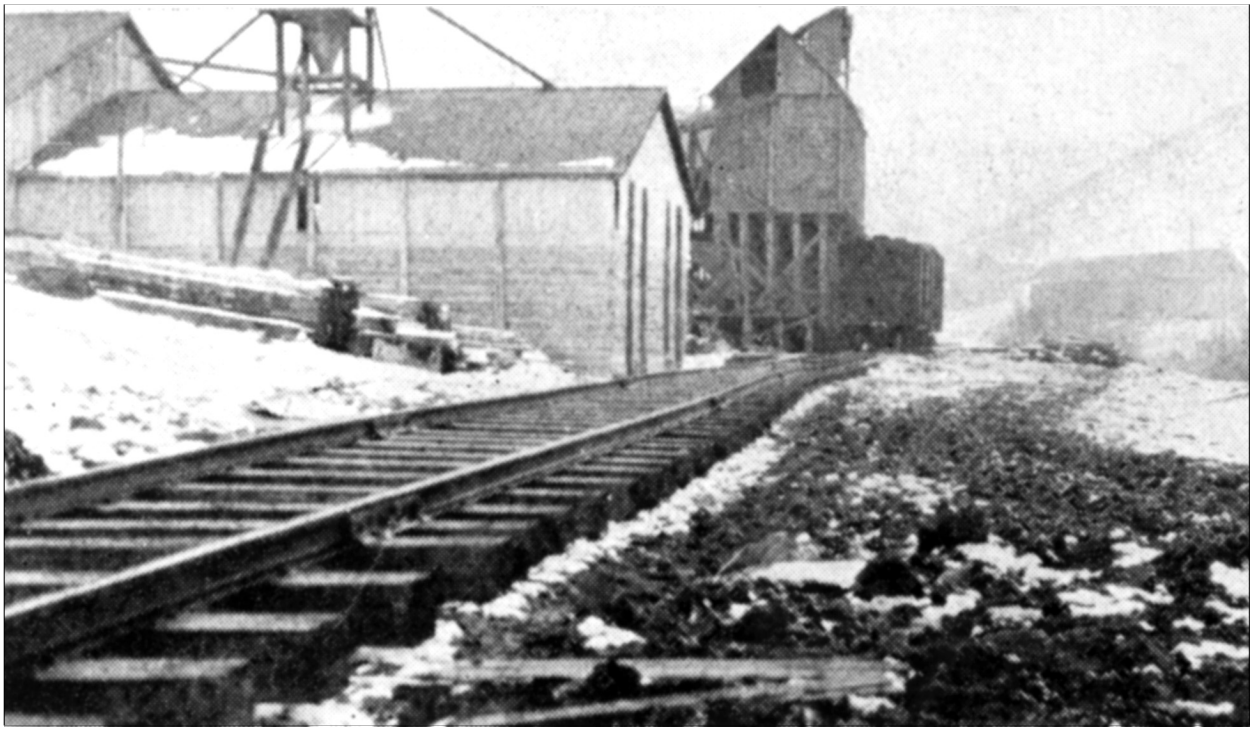

Figure 27. Cars at crude rock bins. This photo has been reprinted with the express written permission of Rock Products Magazine. Reprinted from the June 26, 1926 issue of Rock Products Magazine.

its first fatality on July 18, 1920. Henry Perrett got caught up in a screw conveyor in the mill and received fatal injuries (Paris Post, 1920i). The accident, as was all fatal accidents in the Idaho mining industry, was investigated by the Idaho Inspector of Mines (Bell, 1920).

Labor unrest was not unknown in the mining industry either, with the mine experiencing its first workers strike on September 3, 1920. The strike lasted 3 days and was called over equitable treatment of workers and pay increases (Paris Post, 1920j). At the time of the strike in September, Mansfield (1927) and Service (1966) reported that the mine consisted of an entry 2,000 feet long with an exploratory crosscut 1,000 feet from the portal and 200 feet long. About 53 stopes at 50-foot intervals had been made. Mansfield also noted that there were facilities at the mine for quartering the employees as well as mess halls and stores (Figure 28). A report in Rock Products Magazine, a trade journal (Anonymous, 1926), stated that in addition to complete mining, milling, and pulverizing equipment, suitable housing conditions for offices, a boarding house and living quarters for the labor force was also available at the mine site.

A second strike at the mine was called on November 6 and lasted until November 12, 1920. This strike was called over a cut in wages and the failure of the company to make the adjustments agreed to from the first strike (Paris Post, 1920l, m).

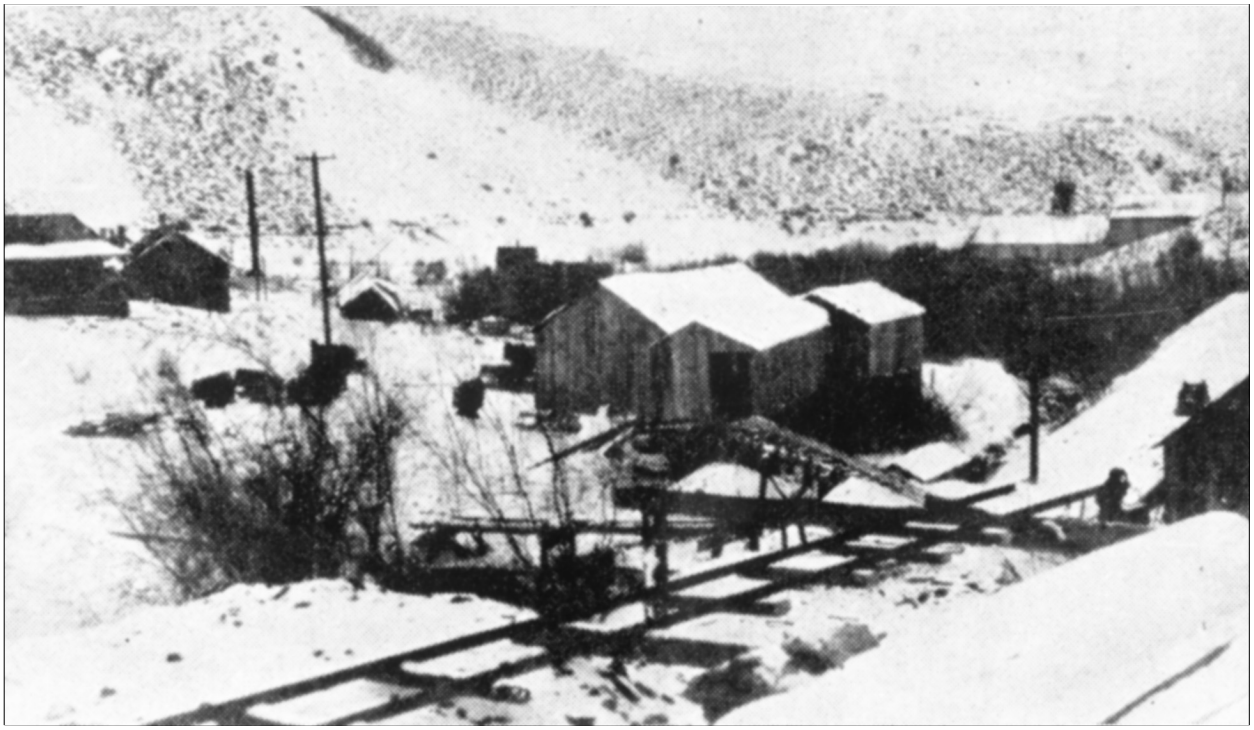

Figure 28. View from the Paris Canyon Mine entrance showing storehouse, employee's cottages, and part of the mill. This photo has been reprinted with the express written permission of Rock Products Magazine. Reprinted from the June 26, 1926 issue of Rock Products Magazine.

The mine closed down in December, 1920 (Mansfield, 1927; Service, 1966), partly because of financial difficulties and partly due to a down-turn in the phosphate market. This placed several hundred men out of employment. Ninety-four of the men filed labor liens against the company in January, 1921 (Paris Post, 1921b). On October 27, 1921, the Western Phosphate Company filed bankruptcy proceeding in the Federal District Court (Paris Post, 1921c, d, e) and a bankruptcy sale was held in Salt Lake City on November 22, 1921. The Paris Canyon Mine property went to the best bidder, James A. McIlwee. McIlwee, although a stockholder in the bankrupt Western Phosphate Company, had been ruled exempt from the bankruptcy proceeding, thus allowing him to bid for ownership. As a condition of sale, McIlwee had to agree to pay off the lien holders (Paris Post, 1921f).

James A. McIlwee formed a new company to mine the phosphate at the Paris Canyon Mine, now known as the Idaho Phosphate Mine (Campbell, 1921). This company was called the Idaho Phosphate Company and filed to do business in Idaho on January 6, 1922. Ray C. McIlwee, son of James A. McIlwee, was the new mine manager (Figure 29).

The Idaho Phosphate Mine resumed operations in August, 1922, after closing down nearly two years. The mine was in reported good condition and did not require extensive repair and maintenance.

Figure 29. Ray C. McIlwee, General Manager, Paris Canyon Mine. This photo has been reprinted with the express written permission of Rock Products Magazine. Reprinted from the June 26, 1926 issue of Rock Products Magazine.

Apparently, the mine closed shortly after it reopened and did not resume operations until September, 1923 (Paris Post, 1923). Favorable market conditions kept the mine open and shipments of phosphate ore began leaving the mine site in November, 1923. The mine closed down for the winter months. The Paris Post (1924) reported that repair work started in the spring of 1924 with retimbering the main tunnel and preparing to drive another new tunnel. However, another down-turn in the volatile phosphate market kept the mine closed and it wasn't until June, 1926 that the mine resumed operation on a small scale. The mine closed again shortly after it opened and it was to never produce ore again. Kirkham (1925) reported that the mine development in 1925 consisted of 3,000 feet of tunnels, drifts, crosscuts, and winzes beside several stopes (Figure 30).

Although the mine remained closed, there was more to the story connected to the mine. Sometime in the period 1927 to 1938, the name of the Idaho Phosphate Company was changed to the McIlwee Phosphate Company. In an article published in the Paris Post (1938), James A. McIlwee made a pitch for the Tennessee Valley Authority (TVA) to extend their phosphate mining and milling to the Bear Lake phosphate deposits. In an open letter to President Roosevelt and to Senator Borah, McIlwee offered free use of the rail spur up Paris Canyon and the Grandy Flat site for TVA's operations. The article went on to explain how the deposits could by mined and milled easily and cheaply. There is no record that McIlwee was ever taken seriously by the Federal Government or TVA.

In April, 1939, the McIlwee Phosphate Company reorganized and changed their name to the McIlwee Idaho Phosphate Company, a Nevada corporation (McDowell, 1948). This new company had filed to do business in Idaho on March 24, 1939. All real property (254 acres) was transferred from J. A. McIlwee to the McIlwee Idaho Phosphate Company by a warranty deed of March 23, 1939 (Wyodak, 1943). The reorganization and the new company did not guarantee that the mine would open and in fact, it did not. In May, 1942, as part of the war effort, the rails up Paris Canyon were torn up and were in all probability relaid at some Army facility (Paris Post, 1942a). During the war years, some of the mine buildings (bunkhouses, boarding house, mill facilities) were torn down and reused as farm buildings in the area around Paris. Most of the remaining buildings were vandalized and burned over the next few years (Figures 31, 32, and 33). In December, 1942, the Metals Reserve Company leased, with an option to buy, the McIlwee property in Paris Canyon. The Metals Reserve Company was a government agency formed to stockpile strategic metals for the war effort. Further discussion of the Paris Canyon phosphate deposits will be made in the section on the Wyodak Mining and Manufacturing portion of this report.

After Wyodak explored in and around the Paris Canyon deposits, there were other companies interested in the phosphate. McDowell (1950) reports that the property was sold to L. W. McGann who had been the president of the McIlwee Idaho Phosphate Company. In 1957, the Potash Company of America carried out experimental and development work on the mine property but nothing came of that work (McDowell, 1957, p. 86, 153-154). In 1973, the McGann property was acquired by the current owner, Earth Science Incorporated. In 1994, Bennett (1994) reported that Carlson

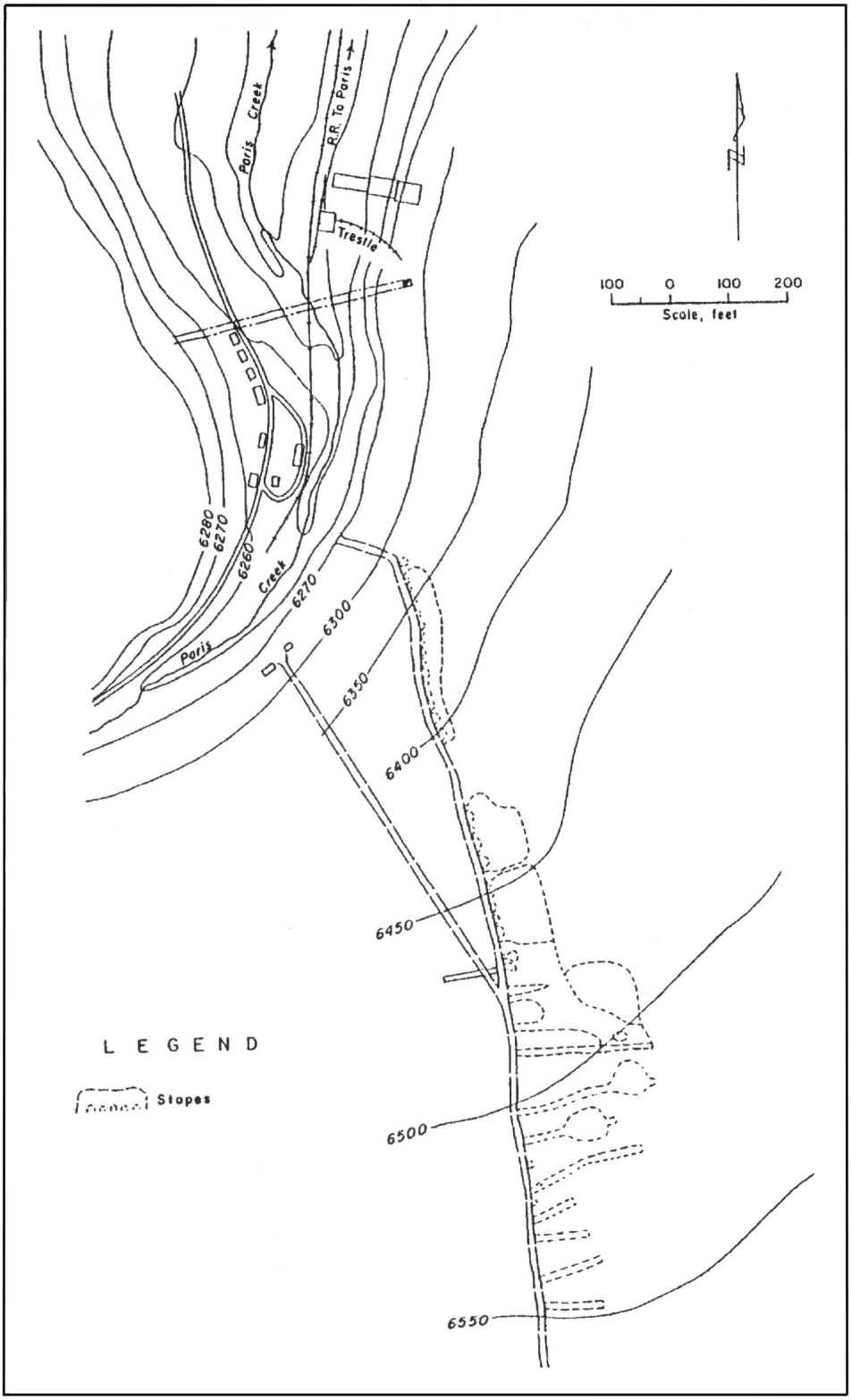

Figure 30. Map of underground development, Paris Canyon Mine. Map from Wyodak, 1943.

Figure 31. Paris Canyon Mine, about 1943, view southeast. The dump of the Paris adit and winze is at left. The mill of the old McIlwee phosphate operation is at right. Photo from Wyodak, 1943.

Figure 32. Paris Canyon Mine, about 1943, view southwest, showing portal and dump of Paris adit with mill and camp buildings of the McIlwee phosphate operation in the background. Photo from Wyodak, 1943.

Figure 33. Paris Canyon Mine, view southwest, September, 1975. Photo by Peter Oberlindacher, BLM.

Food, Ltd., of Calgary, Canada had applied for a special use permit from the Bear Lake County Planning and Zoning Commission for trucking about 50 loads of phosphate ore from the mine site for testing and market studies. The Planning and Zoning Commission stated that the work was never done and no ore was trucked (personal communication, 1996).

Rattlesnake Canyon Mine

On June 13, 1906, David Follick, E. V. Bridges, Sarah E. Follick, John Hancock, Marian Follick, John R. George, T. P. Bridges, and Ray George, all of Montpelier, Idaho, filed three association placer mining claims for phosphate with the county recorder of Bear Lake County. These three placer mining claims, Mud Spring, Lava, and Mountain View, were located in Sections 14 and 23, T. 10 S., R. 43 E., northeast of the Georgetown Summit (Figure 34).

Mansfield (1927) stated that two prospects were situated in the area embraced by the mining claims. J. H. Bridges (related to the claimants?) examined these prospects at the site of the claims in 1910. Mr. Bridges described the phosphate rock and measured a short section of phosphate ore in the NE¼SE¼ Section 23. When Mansfield visited the site in 1914, he reported no further development in phosphate exploration was in evidence.

The phosphate mining claims lay dormant, save for annual assessment work, until 1920. The mining claimants contracted with the Merriman Potash Products Company of Merriman, Nebraska, to open a mine on the claims and produce phosphate ore. Merriman Potash Products Company indeed opened a small mine in the SW¼SE¼ Section 14, T. 10 S., R. 43 E. (Mansfield, 1927; Service, 1966; Service, 1967). The company mined and shipped a small experimental tonnage of ore back to their fertilizer processing facility in Nebraska (Service, 1966). The tonnage was shipped from the Cavanaugh siding of the Oregon Short Line rail, just a few miles southwest of the mine site. The Paris Post (1920g) reported the Merriman phosphate operation as follows:

> *"A few miles northwest of Montpelier, near Georgetown Canyon, the Merriman Potash Products Company of Merriman, Nebraska, has purchased two phosphate deposits and has been rapidly pushing their development since last December. They are now making an output of nearly a carload a day from development work, an amount that they anticipate being able to increase very materially as their development work progresses."*

The report in the Paris Post did not prove to be very prophetic. Mining began early in 1920, and by the summer of that year, the company ceased operations; there is no further record of activity (Mansfield, 1927). That was the only phosphate mining performed on the three placer mining claims by the Merriman Company, which had never been licensed to do business in Idaho (records of the Secretary of State's office, 1996).

The last record of assessment filings on these three placer claims was in July 31, 1926. After that date, the mining claims were apparently abandoned by the claimants. There was no further phosphate activity in the area until November 30, 1954, when Grant J. Murdock of Montpelier, Idaho filed an application to lease phosphate non-competitively in sections 14, 23, and 24, T. 10 S., R. 43 E. The BLM/USGS determined that a competitive sale was necessary because phosphate was known to exist

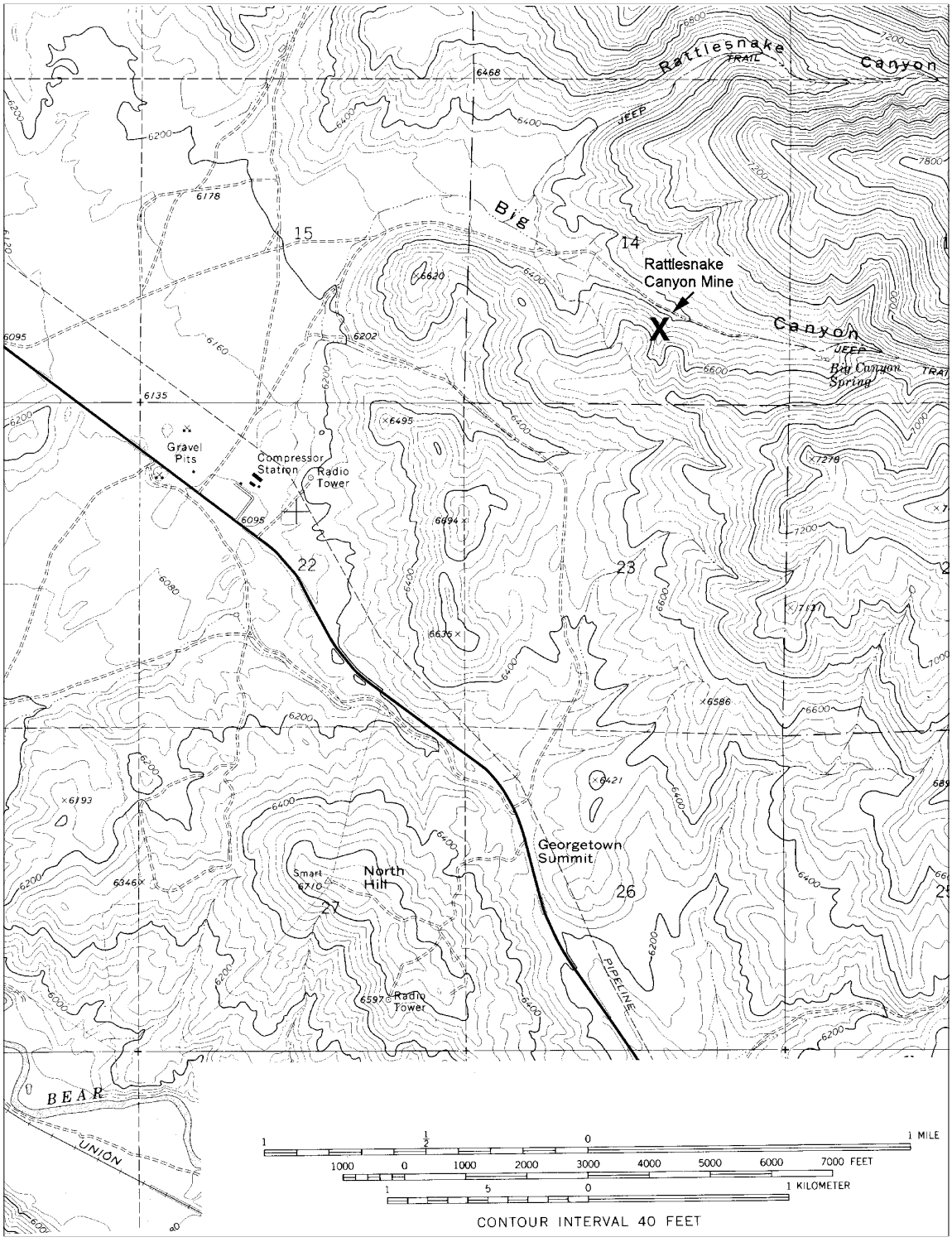

Figure 34. Map showing the location of the Rattlesnake Canyon Mine, Bear Lake County, Idaho.

Accordingly, Mr. Murdock's application was closed and a lease sale was scheduled for July 19, 1956. The sealed bid sale was held, and there were no bidders, therefore the entire case was closed on August 2, 1956.

Because of the lease application by Mr. Murdock, geologists of the USGS visited the site during May, 1955. In an report dated August 8, 1955 (unpublished BLM records), the geology of the area was discussed along with a mention of "an abandoned mine tunnel that was found in the SW¼SE¼ of Section 14. The tunnel was driven along the strike of beds in the upper middle part of the phosphatic shale member." This site visit along with the aborted leasing activity represent the last interest in the phosphate in this area.

Today, not very much remains of the early mining venture and the hillside occupied by the mine is overgrown with a dense cover of trees and brush (Figures 35, 36, and 37).

Figure 35. Remains of the trestle, Rattlesnake Canyon Mine, June 24, 1996. Photo by the author.

Figure 36. Remains of the trestle, Rattlesnake Canyon Mine, June 24, 1996. Photo by the author.

Figure 37. Caved portal, Rattlesnake Canyon Mine, June 24, 1996. Photo by the author.

Bear Lake Mine
(Keystone Mine, Sleight Canyon Mine)

On December 17, 1914, Walter H. Lewis of Paris, Idaho applied to the U. S. General Land Office for an enlarged homestead entry under the Act of June 17, 1910 (36 Stat. 531) for the NE¼SE¼ and S½SE¼ of Section 5 and the N½NE¼ and SE¼NE¼ of Section 8, T. 14 S., R. 43 E., B.M. (240 acres). Mr. Lewis gained a patent to the property on September 2, 1919. He apparently had more in mind for the land in this tract than simple homesteading because on December 26, 1919, just under four months after patenting, the first work to open a phosphate mine started (Figure 38) (Paris Post, 1920n). Unfortunately for Mr. Lewis, this tract of land had been classified by the USGS as containing phosphate and the phosphate had been reserved to the United States. This meant that the newly started mining venture for the phosphate ore was not legal. Legal or not, work continued until in March, 1920, ore was encountered in the tunnel. During this early mining operation, all work was done by hand from the drilling of shot holes to hauling the muck out of the mine by wheelbarrow (Paris Post, 1920o). It wasn't until track was laid that ore could be removed from the mine with any degree of efficiency. During this period of development, Walter Lewis contracted to sell his homesteaded lands to a new phosphate mining company called the Bear Lake Phosphate Company. The Bear Lake Phosphate Company, an Idaho corporation, was organized in January, 1920 (Paris Post, 1920a) and filed to do business in Idaho on December 24, 1920.

On February 25, 1920, Congress passed and the President signed the Mineral Leasing Act (41 Stat. 437) thereby creating a means to issue leases for the development and mining of Federal phosphate and other minerals. In March, the phosphate company made the final payment to Walter Lewis for his homesteaded lands (Paris Post, 1920e). Recognizing that the reserved Federal phosphate on this particular tract of land was now available by leasing, J. Russell Shephard and Leo W. Bach, agents for the Bear Lake Phosphate Company, attempted to legitimize the mining operation by applying for a Federal lease on March 13, 1920 (lease application BL-034591). Because there were no implementing regulations in place at that time, the lease application was withdrawn on June 21, 1920 and replaced with another application, this time with the Bear Lake Phosphate Company as the applicant (lease application BL-034988).

Mining continued during 1920 and by the end of the year, underground development totaled about 1,000 feet of double tracked tunnel, several ventilation raises, and trestling (Mansfield, 1927) (Figure 39). The produced phosphate ore was hauled in horse-drawn wagons in summer and sleighs in winter (Paris Post, 1921a) down the Sleight Canyon road to the rail siding at Paris, a distance of about 2½ miles (Service, 1966). As an aside, on October 31, 1920, Leo Bach, mine superintendent, was accidentally shot by a stray bullet on his way home from the mine. He did not suffer any serious injury because the bullet was stopped by two time-keeping books in his pocket (Paris Post, 1920k).

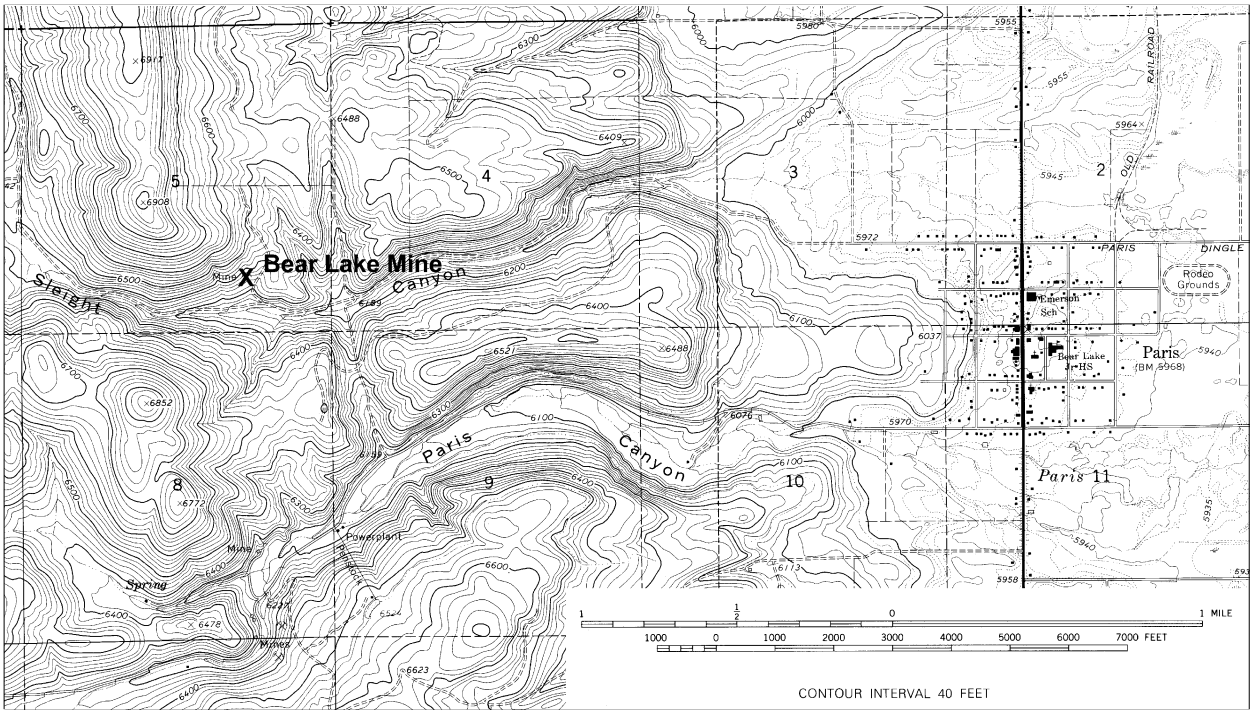

Figure 38. Map showing the location of the Bear Lake Mine, Bear Lake County, Idaho.

Figure 39. Bear Lake Mine, August 30, 1920. Photo by G. R. Mansfield, #476, 477, USGS Photographic Library.

In January and February, 1921, small shipments of phosphate ore were made to a fertilizer plant near San Francisco (Mansfield, 1927, p. 295). The mine closed in March, 1921 because of apparent poor business conditions. Campbell (1921) reported that the underground workings consisted of 900 feet of 7 x 7-foot double tracked tunnel and approximately 1,200 feet of other workings and that the mine was awaiting conditions to warrant production. In fact, the mine was waiting the issuance of the Federal phosphate lease before proceeding. On February 21, 1921, Federal phosphate lease BL-034988 was

finally issued for 360 acres of reserved phosphate to the Bear Lake Phosphate Company. This was the first Federal phosphate lease issued in Idaho and finally legitimized the mining operation in Sleight Canyon. Ironically, the lease was issued during a period when the mine was being shut down for a lack of a market for phosphate.

The mine remained closed during the rest of 1921 and most of 1922 and 1923 with only short events of maintenance and repair. At this time, the underground workings consisted of 1,200 feet of double track tunnel, and raises, crosscuts and drifts totaling approximately 1,500 feet (Kirkham, 1925). Service (1967) stated that there was no reported production after 1922, however, there was a small stockpile of ore outside the mine that provided material for sporadic shipments (Figure 40). In November, 1923, there was a report in the Paris Post that an offer to purchase the mine was made by a Pacific Coast fertilizer company but apparently nothing came of it. On November 30, 1925, the Bear Lake Phosphate Company forfeited their right to do business in Idaho.

Figure 40. Bear Lake Mine, Western Phosphate Company, 1925. Photo by V. R. D. Kirkham, courtesy of the Idaho Geological Survey.

The Bear Lake Mine was sold to the Keystone Phosphate Company in September, 1926 (Paris Post, 1926a). The Keystone Phosphate Company, an Idaho corporation, was organized in April of 1926 and filed to do business in Idaho on May 4, 1926. F. S. Irwin and C. A. Serrot of Nampa, Idaho were the principal officers of Keystone. After the purchase, the renamed Keystone Mine opened in October, 1926 and started rehabilitation work and ore shipments to the west coast (Paris Post, 1926b, c). Litigation resulting from the transfer of ownership and lack of payroll closed the mine in November,

1926. Campbell (1928) reported that the property was idle and that there was an active attempt to refinance the operation.

The litigation, Frank Athay, et al vs. Keystone Phosphate Company, et al, was over 24 liens to recover wages by the plaintiff, Mr. Athay. The decision in this case found for the plaintiff and rendered judgement against all of the defendants except Mary Stucki, a shareholder of the Federal phosphate lease. The litigation was settled in May, 1929. During the period of litigation, there was no mining activity conducted, and in fact, Campbell (1927, 1928) reported the mine idle in 1927 and 1928. Also during this time period, the Keystone Phosphate Company reorganized (Paris Post, 1926d) and the company formulated plans for a grinding mill and a mixing and powder plant to be located in Paris. This mill was never constructed. Campbell (1929) reported that the property was idle and that there was an active attempt to sell stock.

In September, 1930, the Federal phosphate lease was assigned from the Bear Lake Phosphate Company (lessee of record) to Mary Stucki and others. In June, 1930, Leo W. Bach and Lewis A. Jeffs, acting as agents for the Keystone Phosphate Company, quit claimed deeded the lands in Section 8 that contained the mine to Agricultural Potassium Phosphate Company of California (APPC) (BLM, unpublished information). This company, a Delaware corporation, filed to do business in Idaho on December 18, 1930. Mary Stucki and her partners subleased the Federal phosphate lease to APPC during this same time period. With the transfer of ownership of both the land and the Federal phosphate lease, Keystone went out of business, forfeiting the right to do business in Idaho on November 30, 1931.

In November, 1930, the mine was reopened and rehabilitation started (Paris Post, 1930c). In December of 1930, APPC released plans to open a mill in Paris that would use a proprietary process for the phosphate called the Kreiss process (Paris Post, 1930d; 1931). Active mining operations started and a small amount of ore was produced during 1931. This ore was shipped to the company's plant facility in San Pedro, California (Campbell, 1930). Due to a poor financial picture for the phosphate industry, the mine closed during the latter part of 1931 and remained idle during 1932 (Campbell, 1932). In fact, the mine was to never operate and produce again, with the surface structures largely removed and the mine property allowed to become overgrown (Figures 41 and 42).

The end of active mining and phosphate production did not signal the end of the interest in the Federal phosphate in and around the Bear Lake/Keystone Mine. Table 4 presents a summary of phosphate permitting and leasing for the Federal phosphate in and around and including the mine.

Figure 41. Bear Lake Mine, July, 1966. BLM file photo.

Figure 42. Site of Bear Lake Mine, September 9, 1996. Photo by the author.

Table 4. Permit/lease summary for Federally-owned phosphate in and around Bear Lake Mine.

GLO/BLM Serial No.	Lease or Permit	Applicant or Lessee	Date of Appln.	Remarks
BL-034591	Lease Appln.	J.R. Shephard & Leo W. Bach	3/13/20	Application withdrawn on 6/21/20 because of lack of implementing regulations
BL-034988	Lease Appln.	Bear Lake Phosphate Co.	6/21/20	Lease issued for 360 acres on 2/21/21; lease assigned to Mary Stucki et al Sept. 1930; terminated 2/26/38
BL-052909	Lease Appln.	R.S. Hartnell	5/2/38	Protest filed 6/13/38; sale held 9/24/53, no bids
BL-054694	Lease Appln.	Walter Heyde	2/7/44	Sale held 5/16/46, Idaho Organic Fertilizer Co. high bidder ($201); lease issued 4/1/47; relinquished 11/20/50
I-06065	Lease Appln.	Potash Co. of America	5/16/55	Sale held 9/14/55, voided; sale re-held 11/2/55, Potash Co. of America high bidder ($1,906.80); lease issued 5/1/56; relinquished 12/30/60
I-017198	Prospecting Permit Appln.	K. Davis & E. Young	3/11/66	Permit never issued, case closed 2/17/67
I-017277	Prospecting Permit Appln.	K. Davis & E. Young	4/7/66	Permit never issued, case closed 2/17/67
I-3557	Prospecting Permit Appln.	Eldon Young	5/15/70	Permit issued 9/27/71; permit assigned to Earth Science Inc., 12/1/72; Pref. Right Lease applied for 9/26/75, rejected 3/21/95; appealed to IBLA
I-9066	Prospecting Permit Appln.	G.E. Fowler & C.F. Murer	11/29/74	Application withdrawn and case closed 3/24/75
I-9357	Prospecting Permit Appln.	C.F. Murer	3/24/75	Permit never issued, case closed 10/13/81

Conda Mine

In October, 1906, the Brown, Perkins Company located a group of 23 association placer claims for phosphate about six miles northeast and east of Soda Springs, Idaho (Figure 43, Table 5). The company consisted of eleven individuals, and was a mining claim location service that, at the time of location of these claims, was either an independent locator or was working for the Southern California Orange Grove Fertilizer Company. There is some indication that, although the mining claims were located as placer-type claims, there was some lode claims top-filed. Mansfield (1927, p. 234) reports that in 1912, his field crew found a claim corner in the SW¼SE¼ of Section 35, T. 7 S., R. 42 E., in the name of Brown, Perkins and Berch (Birch?). This was on the Deer Placer claim but the corner was for a claim 1,500 feet long and 600 feet wide, the dimensions of a lode claim. The dual location as placer and as lode was not uncommon due to the uncertainties explained previously in this report. This group of placer claims was acquired by the Southern California Orange Grove Fertilizer Company from the original locators shortly after location, as that company filed proof of assessment for the claim group in 1907 (Hansen, 1964).

The Southern California Orange Grove Fertilizer Company was a growers' co-operative that was formed to explore for and develop fertilizer sources for the members of the co-operative. The company was drawn to this area of Idaho because of the reported finding of rich phosphate rock by C. C. Jones in his explorations of 1903-1904 (Jones, 1907, 1913).

The claim group was explored by a series of open cuts, pits, trenches, and approximately 22 short tunnels prior to patenting. The Brown, Perkins Company, acting as an agent for the Southern California Orange Grove Fertilizer Company, mined and shipped a 40-ton test load of ore to California in 1910 (unpublished BLM records). This ore came from a pit in the SE¼SW¼ of Section 23, T. 8 S., R. 42 W., B.M., on the Agnes Placer mining claim (Figure 44).

The Southern California Orange Grove Fertilizer Company patented the 23 placer mining claims between October 3, 1916 and December 18, 1917. The co-operative apparently was not particularly interested in developing the deposit themselves and when the Anaconda Copper Mining Company expressed an interest in the properties in 1917, negotiations were started for purchasing the patented claims by the copper company. The Anaconda Copper Mining Company was, at that time, faced with a large excess of sulphuric acid derived from smelter fumes from their copper smelting operations in Montana. The production of fertilizer was a logical use of this excess acid and Anaconda started investigating phosphate deposits throughout the newly defined western phosphate field. The company constructed a fertilizer plant at Anaconda, Montana and started purchasing phosphate rock (principally from the Paris Canyon Mine, Idaho) while they investigated deposits of their own (Larison, 1934, Service, 1967). Local Montana phosphate deposits were quickly ruled out, due to lower overall grade. After a period of negotiation, the Anaconda Copper Mining Company bought all 23 patented placer mining claims from the Southern California Orange Grove Fertilizer Company. The first deed to

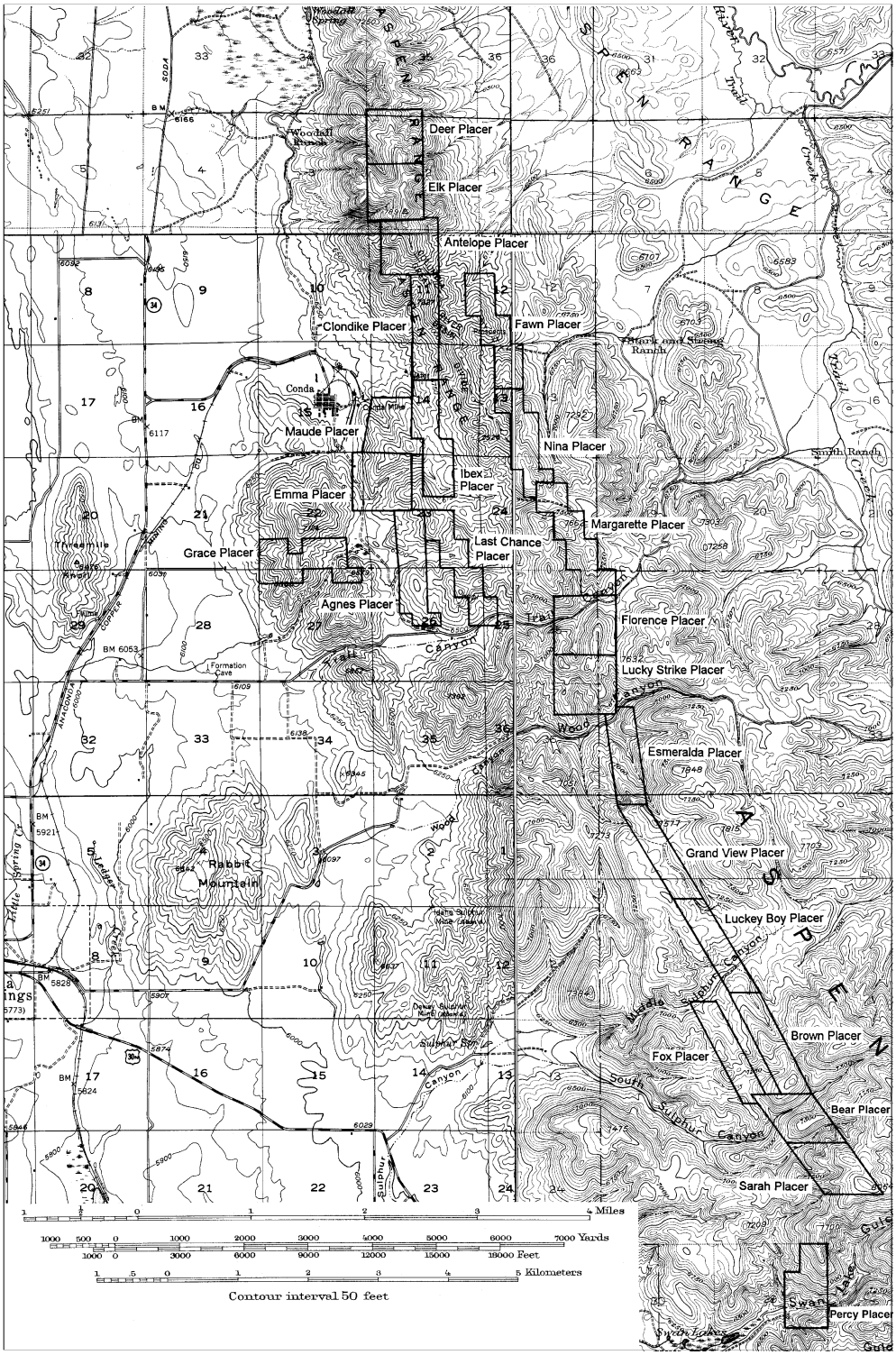

Figure 43. Map showing the location of the Conda townsite and the patented mining claims of the Conda Mine, Caribou County, Idaho.

Table 5. Patented mining claims of the Conda Mine

Claim Name	Date of Location	Mineral Survey Number	General Land Office Serial Number (Blackfoot)	Patent Number	Date of Patent
Ibex Placer	Unknown	N/A	BL 022673	548592	October 3, 1916
Agnes Placer	Unknown	N/A	BL 022673	548592	October 3, 1916
Deer Placer	Unknown	N/A	BL 022673	548592	October 3, 1916
Clondike Placer	Unknown	N/A	BL 022673	548592	October 3, 1916
Elk Placer	Unknown	N/A	BL 022673	548592	October 3, 1916
Antelope Placer	Unknown	N/A	BL 022673	548592	October 3, 1916
Maud Placer	Unknown	N/A	BL 022673	548592	October 3, 1916
Emma Placer	Unknown	N/A	BL 022673	548592	October 3, 1916
Last Chance Placer	Unknown	N/A	BL 022674	548593	October 3, 1916
Grace Placer	Unknown	N/A	BL 022675	548594	October 3, 1916
Nina Placer	Unknown	N/A	BL 022676	555876	November 24, 1916
Fawn Placer	Unknown	N/A	BL 022676	555876	November 24, 1916
Sarah Placer	October 20, 1906	2771	BL 023011	555877	November 24, 1916
Fox Placer	October 22, 1906	2771	BL 023011	555877	November 24, 1916
Bear Placer	October 22, 1906	2771	BL 023011	555877	November 24, 1916
Brown Placer	October 22, 1906	2771	BL 023011	555877	November 24, 1916
Luckey Boy Placer	October 23, 1906	2771	BL 023011	555877	November 24, 1916
Grand View Placer	October 23, 1906	2771	BL 023011	555877	November 24, 1916
Esmeralda Placer	October 23, 1906	2771	BL 023011	555877	November 24, 1916
Lucky Strike Placer	October 29, 1906	2771	BL 023011	555877	November 24, 1916
Florence Placer	October 30, 1906	2771	BL 023011	555877	November 24, 1916
Margarette Placer	October 31, 1906	2771	BL 023011	555877	November 24, 1916
Percy Placer	Unknown	N/A	BL 025601	611957	December 18, 1917

Note: All the above claims were located by the Brown, Perkins Company (S. M. Brown, G. C. Brown, S. P. Brown, Percy Brown, Lucius P. Brown, Robert A. Birch, Marion Perkins, Maggie Perkins, Joseph C. Rich, O. V. Birch, and D. H. Rowley) for the Southern California Orange Grove Fertilizer Company. The patentee for all claims was the Southern California Orange Grove Fertilizer Company.

Anaconda was dated October 27, 1919, and was for the Maud and Emma patented claims in the amount of $60,000. Robert J. Shields, acting as the head and part owner of the Southern California

Figure 44. Panorama of R. J. Shields phosphate pit in Formation Canyon in Section 23, T. 8 S., R. 42 E., September 12, 1920. Photo by G. R. Mansfield, #522, 523, USGS Photographic Library.

Orange Grove Fertilizer Company, offered Anaconda a proposition that if the Anaconda company would build a branch rail line from the main railroad to the mine, develop the property to a capacity of 500 tons per day and erect a mill of a daily capacity of 200 tons, then he would give the Anaconda company half interest in the remaining 21 patented claims. Shields also offered to sell the remaining 21 claims outright for $540,000. Anaconda decided to purchase the patented claims and they were deeded to Anaconda on February 10, 1920 (Hansen, 1964).

On April 1, 1920, Anaconda started underground mining by developing a mine on the Emma and Maud patents. A tunnel in the NE¼SE¼ of Section 15, T. 8 S., R. 42 E., was started to develop the phosphate ore on the westernmost anticline, known as the Emma anticline (Mansfield, 1927) (Figure 45). Also in 1920, Anaconda started to construct a rail line north from Soda Springs, a distance of about eight miles. In late 1920 and on into 1921, Anaconda started construction of a townsite and adjacent crushing and screening plant to support the mine. The town was called Conda (Figures 46 and 47). The first shipment of Conda phosphate ore to the mill at Anaconda, Montana, was made in March, 1921 (Larison, 1934). It was found that due to a high organic content, the Conda ore had to be calcined before further processing could occur.

In 1921-22, the Anaconda company was exploring for markets for the fertilizer product. A descriptive book and photograph set was put together that described the mine, the town, the mill, and the geology of the Conda area (unpublished data, Anaconda Collection, 1922). The description of the mine and town in 1922 follows:

"*The present development and mining is being undertaken along the legs of an eroded anticline which lies immediately south of the plant. The main bed, along which the Company has a chain nearly ten miles long, lies about eight thousand feet to the east and will be opened through No. 1 Adit. The mine is opened up through two cross-cut adits a half-mile apart. These adits are 45 feet above the*

Figure 45. Panorama of portal of Anaconda Copper Mining Company's phosphate mine in Section 15, T. 8 S., R. 42 E., September 12, 1920. Mr. C. E. Nighman of ACM Co. standing above portal. Photo by G. R. Mansfield, #520, 521, USGS Photographic Library.

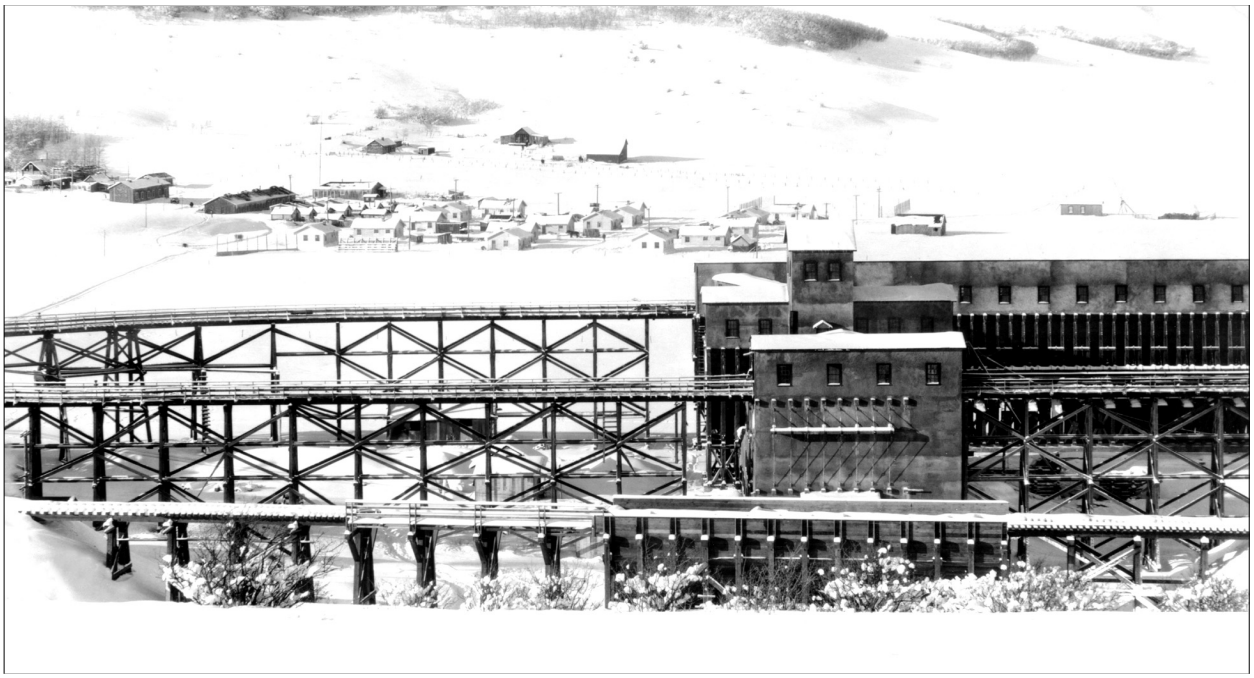

Figure 46. Conda town and phosphate mill, 1921. Photo courtesy of the Anaconda Collection, American Heritage Center, Laramie, Wyoming.

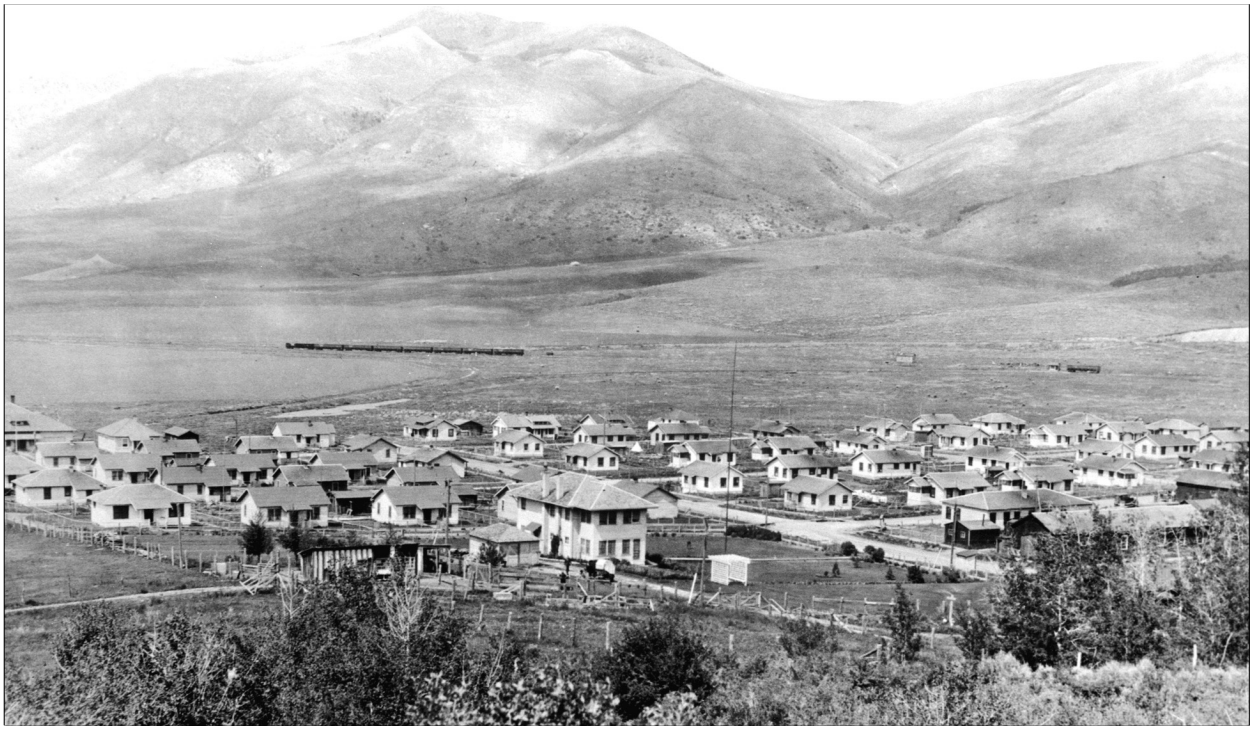

Figure 47. Conda, Idaho. Photo from the "Copper Commando", Anaconda Copper Mining Company's in-house newsletter, volume 3, number 12, February 2, 1945.

railroad track level and are connected with the mill feed bins and the storage bins by large trestles (Figure 48). The adits are nine feet by nine in the clear, inside the timbers. They are heavily timbered, and are electrically lighted and ventilated by fans. From the adits, advance or development headings about six feet by eight feet (largely untimbered) are driven long the bed; these heading are subsequently enlarged, and are timbered the same as the adits. Raises for ventilation are put up about one thousand feet apart. All mining is done above the level of the adits. Compressed-air-operated mucking machines are used in the headings (Figure 49). Twenty-five ton rails and two ton roller-bearing side-dump cars are used in the advance or development headings. Rock from mining operations is hauled to the mill in heavy steel side-dump cars of ten tons capacity (Figures 50 and 51). These cars are equipped with standard railroad wheels and journals, couplers and hand brakes. Haulage is done with two very large storage battery locomotives each of which is capable of hauling a hundred ton net load at a speed of four to seven miles per hour, depending on the grade (Figure 52).

"A small town has been built about a half-mile from the mine (Figure 53). The Company has constructed a number of modern homes which are rented to the employees at nominal figures; additional houses are now being constructed.

Figure 48. Conda Mine, mill, and bins. Photo from the "Copper Commando", Anaconda Copper Mining Company's in-house newsletter, volume 3, number 12, February 2, 1945.

> *A well equipped store, and a recreation hall in which moving pictures are shown and dances and various community meetings are held, are all maintained by the Company. A United States Post Office has also been established in the settlement."*

Conda was sited on property that was originally homesteaded by Charles Stiles and used by Mr. Stiles as a sheep ranch (Norris, 1944). The planned community consisted of lots that were 60 by 80 feet, eight houses per block, and with central alleys for deliveries and waste removal (Nighman, 1923). The houses were equipped with electric lights, running water, and sewer connections. They were rented to the mine and mill employees at a nominal rent ($12 a month) that just covered upkeep expenses. This monthly rent included water for domestic use and gardens. Electric light, power, and fuel were supplied at company cost (Norris, 1944). All told, 82 houses were built for the employees.

In addition to the homes, there was the mine superintendent's residence (Figure 54), bunkhouses, offices, a boarding house, a community store, a post office, and a recreation hall. The community store profits were paid back to employees semi-annually as rebates based on percentages of dollar amounts of purchases (Norris, 1944). The recreation hall also doubled as a center for religious services, dances, community parties, and motion pictures. In 1923, a two room grade school was constructed,

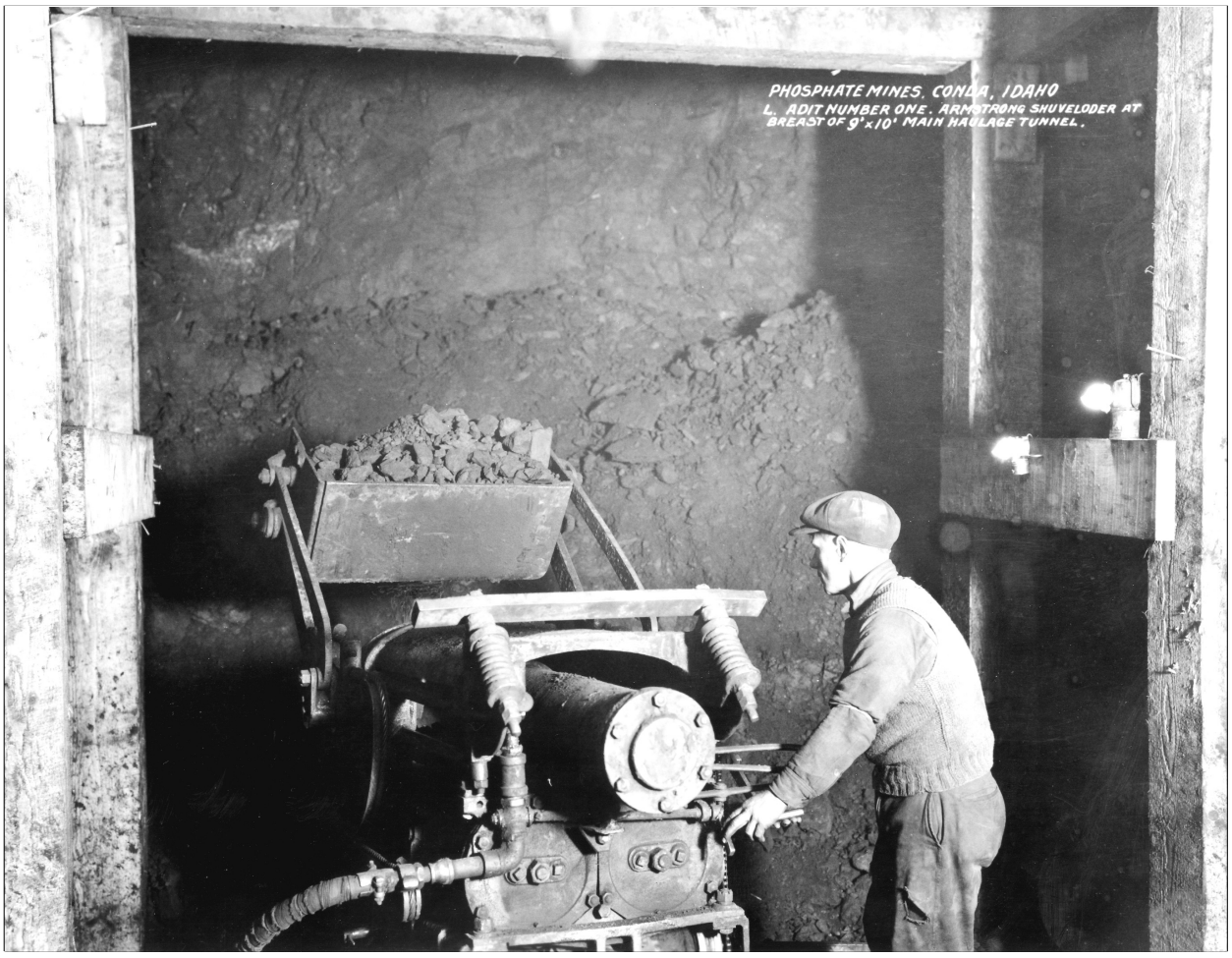

Figure 49. Armstrong Shuveloader, Conda Mine, circa 1922. Photo from the Idaho State Historical Archives, #62-181.23.

high school students were taken to Soda Springs daily by school bus. A rail tram, called the Galloping Goose, operated on the rail lines to Soda Springs between 1922 and 1936 (Figure 55). Outdoor recreation facilities such as tennis courts and a baseball diamond were also constructed for the use of the employees. Figure 56 is an aerial view of the townsite and shows the relationship to the mine.

The phosphate mill at Conda was for screening, crushing, washing, and drying the phosphate rock (Figures 57 and 58) in preparation for rail shipment to the Anaconda Company's processing plant at Anaconda, Montana. There, the phosphate was processed and sold as a concentrate of triple super-phosphate fertilizer. As time went on, the plant at Conda was enlarged to keep pace with the advances in the mine and the increasing volume of phosphate ore being removed.

In 1924, after only being in operation for about three years, the underground workings consisted of 1,335 feet of drifts, 3,050 feet of crosscuts and tunnels, and more than 500 feet of raises (Kirkham,

Figure 50. Series of 10-ton ore cars, Conda Mine, 1925. Unknown individuals. Photo by V. R. D. Kirkham, courtesy of the Idaho Geological Survey.

Figure 51. Adit Number One, Conda Mine, circa 1922. Photo courtesy of the Anaconda Collection, American Heritage Center, Laramie, Wyoming.

Figure 52. Adit Number Two, Conda Mine. Photo courtesy of the Anaconda Collection, American Heritage Center, Laramie, Wyoming.

1925). The underground mine would eventually be developed and enlarged until 1952 when the underground operation started being phased out. It consisted of three main adits and crosscuts, drifts, tunnels, raises, and shafts totaling about 150,000 feet (Service, 1966, 1967). In 1941, it was reported (Campbell, 1941) that the Anaconda Copper Mining Company was leasing phosphate land from the estate of Charles J. Kelly. Charles Kelly held Federal lease BL-039942 and had the distinction of being the first to produce phosphate on a Federal lease in Idaho. The Kelly lease was initially developed by two tunnels called the North and South Development D Tunnels. A cross-cut was developed between the two tunnels.

As early as November, 1947, there were discussions within Anaconda about beginning strip mine operations at the Conda Mine. The actual transition from being an underground mine to that of surface operations started in 1952 (Aro, 1960). In that year, Anaconda began an exploratory strip mining operation near the center of Section 14, T. 8 S., R. 43 E. (Gidel, 1947). Also in 1952, the Anaconda

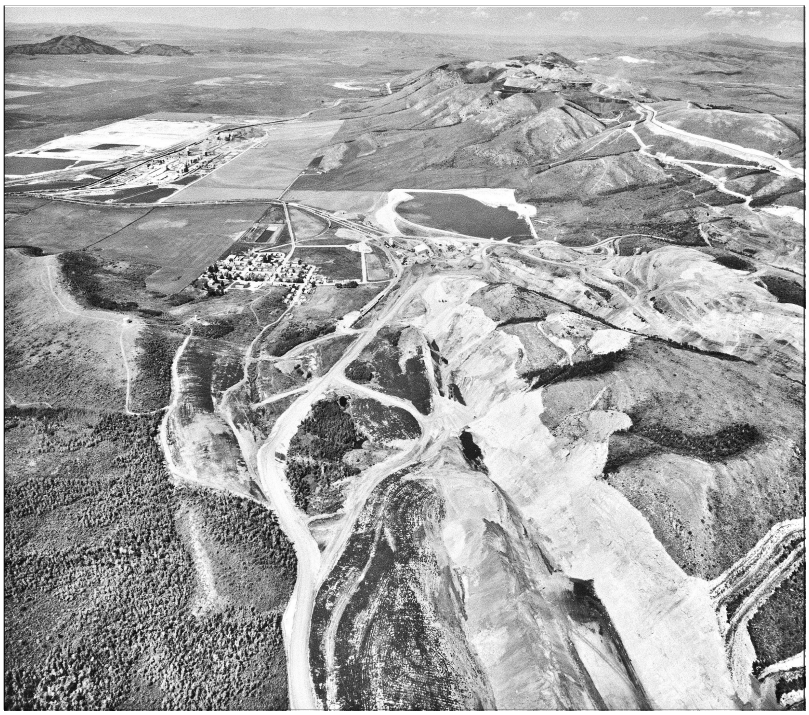

Figure 53. Conda Mine and townsite, view north, 1975. BLM file photo.

Figure 54. Conda Mine superintendent's house, formerly located at Conda, Idaho, now near Bancroft, Idaho, June 8, 1998. Photo by the author.

Figure 55. The "Galloping Goose". Photo by Tony Varilone, U. S. Forest Service.

Figure 56. Conda townsite and mine, view east, 1975. BLM file photo.

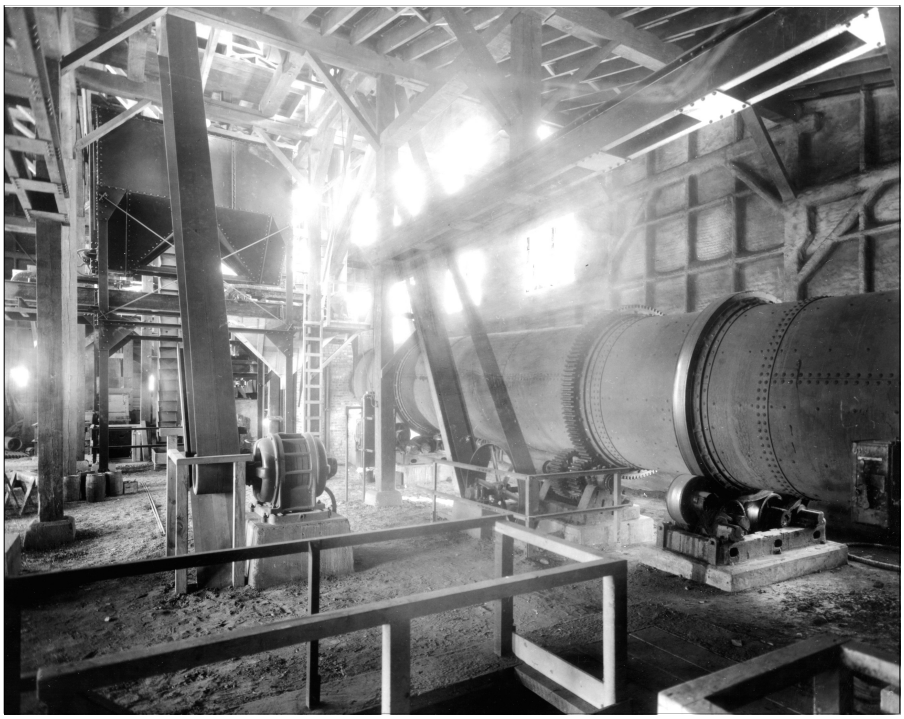

Figure 57. Crushing and drying plant, Conda Mine, circa 1922. Photo courtesy of the Anaconda Collection, American Heritage Center, Laramie, Wyoming.

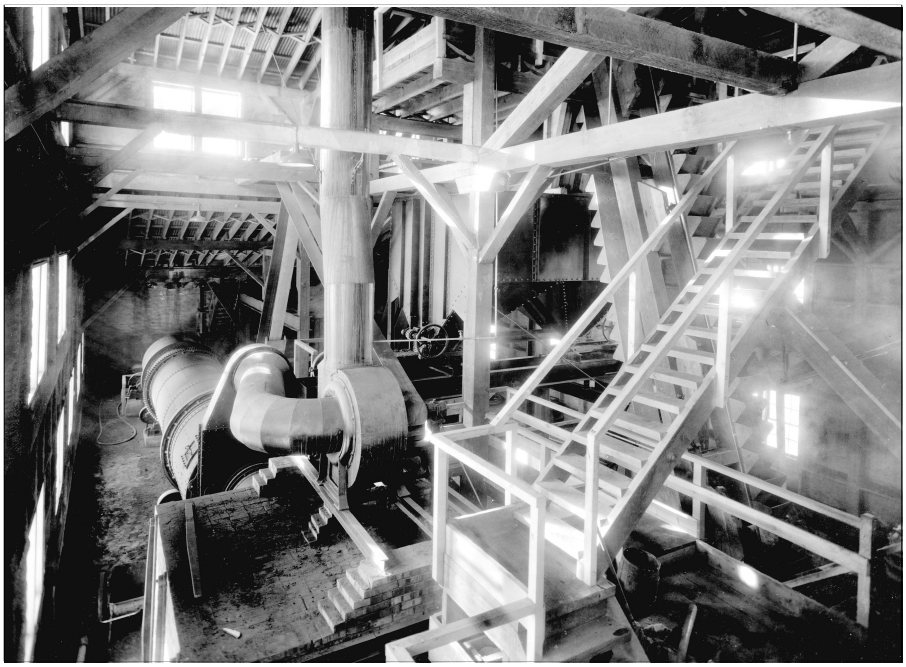

Figure 58. Crushing and drying plant, Conda Mine, circa 1922. Photo courtesy of the Anaconda Collection, American Heritage Center, Laramie, Wyoming.

Company acquired a Federal phosphate lease (I-01603) on property in Middle Sulphur Canyon, and in 1954, the company acquired Federal phosphate lease I-04494. These two leases were adjacent to the patented mining claims of Anaconda and increased their reserve base for future mining.

On April 1, 1956, underground operations ceased permanently. From that point, all production came from surface open-pit mining. Also in 1956, the plant at Conda went through an upgrading with the addition of a new washing plant. From 1952 to 1958, the Anaconda Company subcontracted the surface mining operations to the Morrison Knudsen Company (Schwarze, 1967).

In April, 1959, the Minerals and Chemical Division of the J. R. Simplot Company and the Anaconda Copper Mining Company entered into negotiations to create a joint venture. The joint venture agreement between the Simplot company and the Anaconda company was created under which Simplot took over management and operation of the mine and supplied both partners to the agreement with their rock requirements (Aro, 1960). In 1960, the Anaconda company made the decision to get out of the fertilizer business altogether, at least for the immediate future. An arrangement was worked out whereby the joint venture with Simplot and the ancillary agreements which accomplished it were terminated, all of Anaconda's fertilizer production facilities were sold outright to Simplot, and the mines in Idaho were leased to Simplot on a long-term royalty basis. After the conclusion of these agreements, the fertilizer plant at Anaconda, Montana, was dismantled and shipped to Idaho, where it was reassembled and put into operation by Simplot. On April 1, 1961, the Simplot Company acquired 80% of the two Federal leases that were held by the Anaconda Company. In 1965, after long use, the old mill at Conda was no longer adequate and a new mill was constructed by the Simplot Company. On August 1, 1965, two additional Federal phosphate leases (I-015523 and I-015820) were issued in the area of the Conda Mine. They were issued to the Ruby Company, a subsidiary of the J. R. Simplot Company.

In the case of lease I-015523, the Ruby Company assigned the lease to the Anaconda Company on May 1, 1967, and 80% of the lease was quickly reassigned to the J. R. Simplot Company on July 1, 1967. It wasn't until July 1, 1984, that the Simplot Company gained the remaining 20% of the lease as well as the remaining 20% of the two earlier leases, I-01603 and I-04494.

In addition to the surface mining on the patented mining claims at Conda, surface mining was conducted on two of the four Federal leases (Figures 59, 60, and 61). Mining started on lease I-04494 in 1955 and the last minable ore was removed in April of 1984. Mining started on lease I-015523 in 1970 and the ore was depleted in 1972. Overall mining at the Conda Mine ceased in January of 1984, however, much of the reserves on the patented mining claims and on two of the adjacent Federal leases remain untouched, available for future mining. Over the period from 1984, when the mine closed, to 1987 when operations at Conda were shut down, the town was vacated and eventually was torn down or moved out, leaving only a memory (Figure 62).

Figure 59. Conda Mine, date unknown. Photo courtesy of the FMC Corporation.

Figure 60. Conda Mine, showing highwall, date unknown. Photo courtesy of the FMC Corporation.

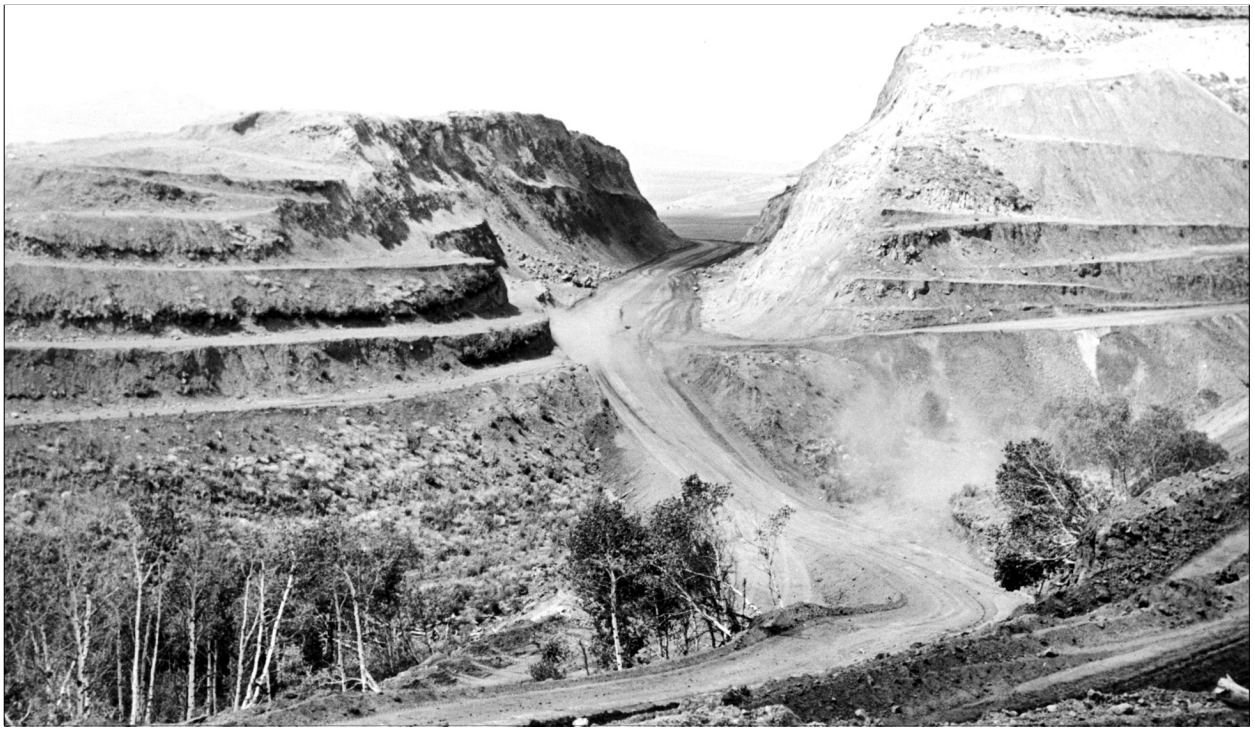

Figure 61. Conda Mine, footwall and ore bed at right, benched waste area to left, date unknown. Photo courtesy of the FMC Corporation.

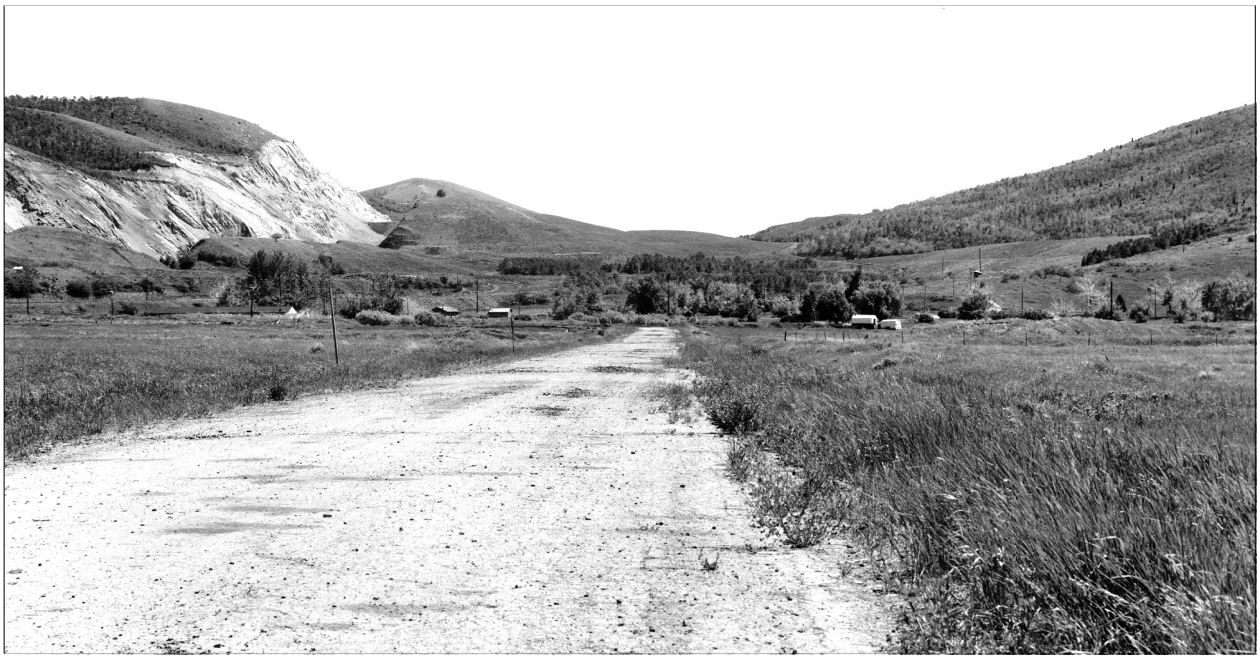

Figure 62. Conda townsite and main street, June 24, 1996. Photo by the author.

Home Canyon Mine
(Cumberland Mine)

The Home Canyon Mine is located about 4½ miles east of Montpelier, Idaho at the junction of Gertch Canyon and Montpelier Canyon. This location is immediately north of the Waterloo Mine (Figure 63). Development of this mine started in late 1916 on patented lode claims owned by the San Francisco Chemical Company (Bell, 1916), and consisted of several short adits, the longest of which was 190 feet (Gidel, 1919b). This adit was located on the Cumberland Lode claim in such a manner as to allow construction of a high ore bin and to also provide gravity loading facilities. While this 190-foot adit was entirely in footwall limestone, by turning the adit slightly westward, the ore zone would have been cut. In February, 1920, J. F. Nibley, Carlyle Nibley, E. L. Newhouse, C. W. Stimpson and H. Reed Smoot of Salt Lake City, Utah, filed articles of incorporation for the American Phosphate Company (a Utah-based corporation) with the county clerk of Bear Lake County (Paris Post, 1920c). It is interesting to note that at the time of incorporation of the American Phosphate Company, H. Reed Smoot was a U. S. Senator from Utah. The American Phosphate Company also filed to do business in Idaho with the Secretary of State on February 11, 1920 (unpublished State of Idaho records, 1996). This new company then entered into a 10-year lease for five of the patented lode claims from the San Francisco Chemical Company (Mansfield, 1927). These five claims, the Cumberland, Fentress, Jimtown, Obed, and Obey Lodes, had been acquired by the San Francisco Chemical Company in late 1915 or early 1916 from the patentee, the arch-rival United States Phosphate Company. Gidel (1919b) reported that these five claims were highly developable because of easier accessibility, steeper dip of the phosphate ore and good adit sites in Gertch Hollow (Canyon). The Overton Lode claim was of lesser importance because it had no phosphate above creek level but it could provide a right-of-way for a proposed rail spur to the property.

Plans for a railroad up Montpelier Canyon to serve both the Waterloo Mine and the Home Canyon Mine were being considered by the Bear Lake County commissioners (Paris Post, 1920d). By August 30, 1920, the American Phosphate Company had driven an entry about 400 feet along strike of the phosphate bed and had opened six 100-foot stopes (Mansfield, 1927). Ore was being shipped by truck at the rate of about 64 to 72 tons per day to the railhead in Montpelier and then on to a mill facility in California. Construction of a plant facility at the mine started in December, 1920 (Figure 64).

Development of the property and production continued until 1924. The on-site mill facility (Figure 65) consisted of complete crushing and drying equipment and employed an average of 4 to 6 men (Kirkham, 1925). By 1922, the underground development consisted of about 2,000 feet of drifts and tunnels (Kirkham, 1925; Service, 1966, 1967). In 1925, the property was idle and the American Phosphate Company relinquished its lease back to the San Francisco Chemical Company. The total production from the Home Canyon Mine at the time of lease relinquishment was about 20,000 tons (Service, 1966, 1967). The American Phosphate Company forfeited the rights to do business in Idaho on November 30, 1926 (unpublished State of Idaho records, 1996).

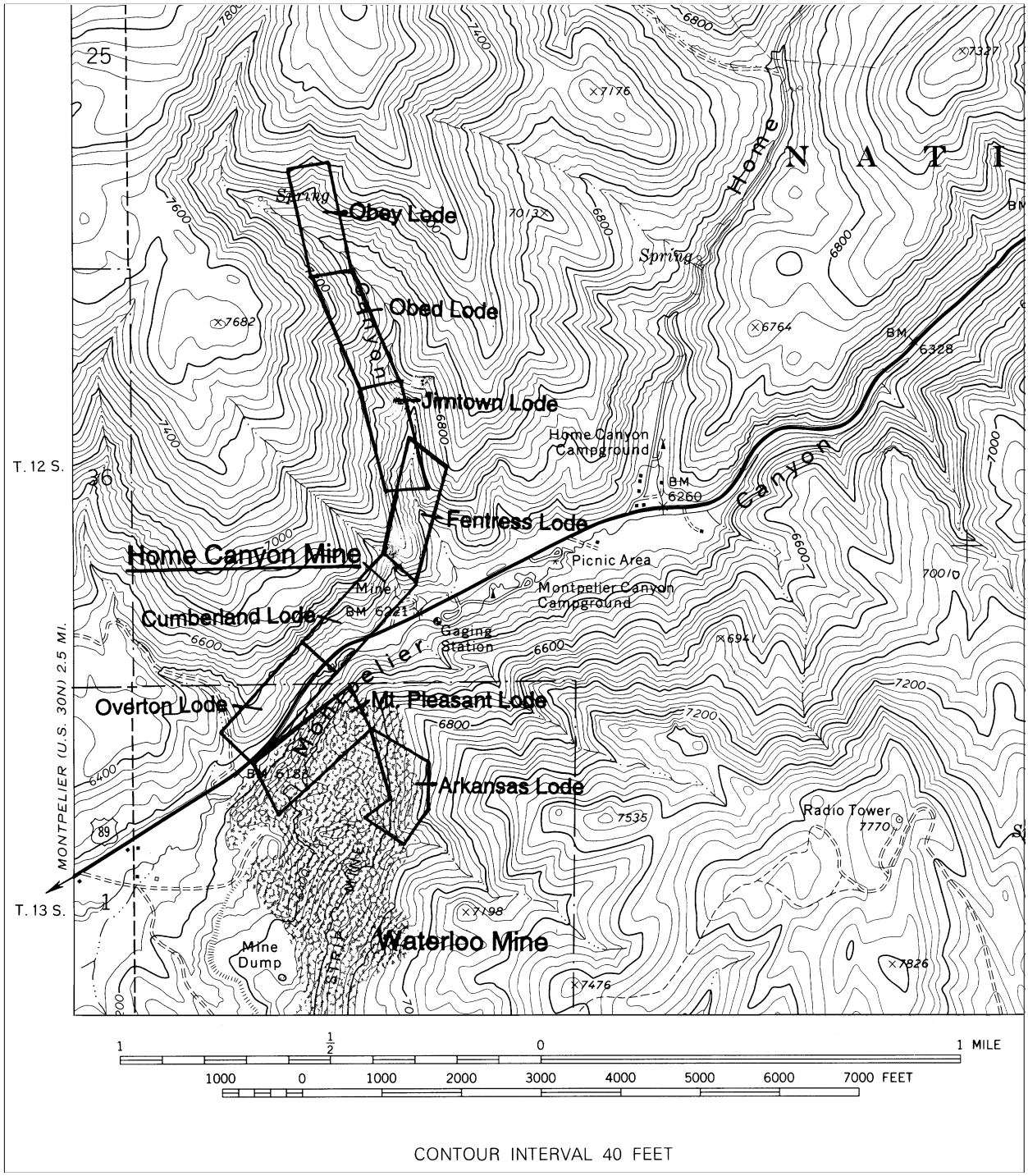

Figure 63. Map showing the location of the Home Canyon Mine and associated patented lode mining claims, Bear Lake County, Idaho.

Figure 64. Home Canyon Mine, American Phosphate Corporation plant under construction, 1921. Photo by V. R. D. Kirkham, courtesy of the Idaho Geological Survey.

Figure 65. Home Canyon Mine and plant of the American Phosphate Corporation , circa 1923. Photo by V. R. D. Kirkham, courtesy of the Idaho Geological Survey.

In 1953, The San Francisco Chemical Company reentered the old working of the Home Canyon Mine. The company drove the Cumberland crosscut and some drifting at a total expense of $120,000 in order to prove some additional reserves to their holdings across the canyon at the Waterloo Mine (Service, 1966, 1967). There was no production associated with this activity. These operations were abandoned when the new mining activity ran into the old underground workings. Nothing came of this venture and the property went idle once again. The mill facilities were removed and the mine site abandoned. Today, nothing remains at the site except a caved adit (Figure 66).

Figure 66. Caved Home Canyon Mine portal, June 24, 1996. Photo by the author.

Consolidated Mine
(Little Canyon Mine)

The first indication of an interest in the phosphate rock in the Paris-Bloomington area occurred in 1903. On October 5, 1903, Charles C. Jones (of Waterloo Mine fame), his wife Elizabeth and six other individuals located a 150-acre association placer mining claim called the Jones Placer. This claim, in a shallow, dry canyon (Little Canyon) branching north from Bloomington Canyon (Figures 67 and 68), included the E½SW¼, SE¼NW¼, E½E½W½SW¼, and E½E½SW¼NW¼ of Section 21, T. 14 S., R. 43 E., BM. The location certificate lists the minerals being located as "lime carbonate and all other lime rocks, slates and shales in sedimentary deposit or strati-form with lime as the base or chief component." Bear Lake County records show that C. C. Jones and Elizabeth Jones executed a quit claim deed for the claim dated January 26, 1904, but there was no indication to whom. This mining claim soon became invalid and was voided as no affidavits of assessment work were filed on the claim since the discovery in 1903.

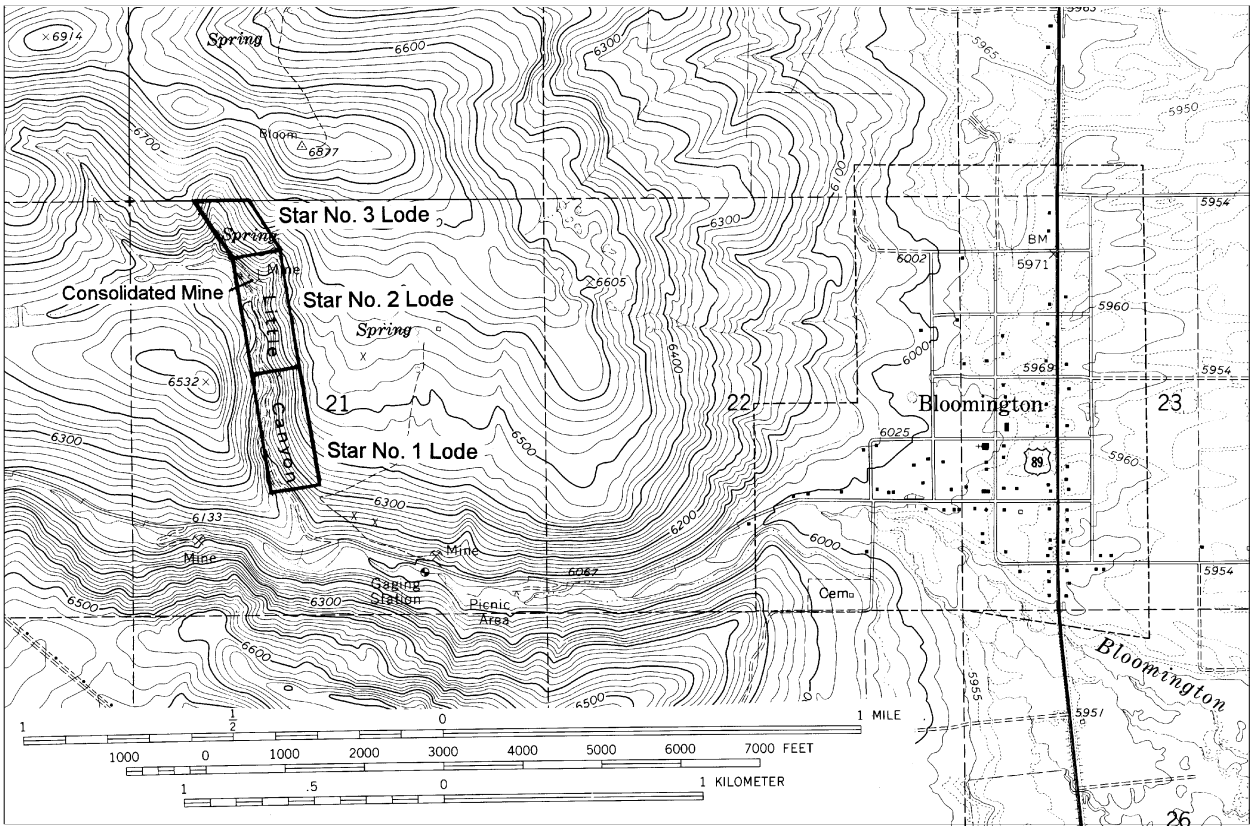

Figure 67. Map showing the location of the Consolidated Mine, Bear Lake County, Idaho.

On April 25, 1908, three prospectors named Joseph Oakey, G. W. Nebeker, and G. Spongberg located three lode mining claims. These three claims, Star Nos. 1, 2, and 3 (Table 6) were located for phosphate rock. The three prospectors conducted extensive exploration and development work on the claims between April, 1908 and June, 1915. Richards and Mansfield (1911) mention that the only prospects in the entire township at that time were the developments on these claims and that high grade phosphate rock was found near Spongberg's tunnel. This work included the following development:

Star No. 1 lode mining claim
- open cut and tunnel 59 feet long with a 16-foot drift (discovery point)
- open cut and tunnel 152 feet long

Star No. 2 lode mining claim
- open cut and tunnel 115 feet long (Spongberg's tunnel) (discovery point)
- open cut and tunnel 30 feet long
- open cut and tunnel 54 feet long
- open cut and tunnel 12 feet long
- open cut and tunnel 9 feet long

Star No. 3 lode mining claim
- shaft, 5x5x10 feet deep (discovery point)
- open cut 22 feet long
- open cut and tunnel 59 feet long

Table 6. Patented mining claims of the Consolidated Mine.

Claim Name	Date of Location	Mineral Survey Number	General Land Office Serial Number (Blackfoot)	Patent Number	Date of Patent
Star No. 1 Lode	April 25, 1908	MS 2765	BL-024025	592989	July 20, 1917
Star No. 2 Lode	April 25, 1908	MS 2765	BL-024025	592989	July 20, 1917
Star No. 3 Lode	April 25, 1908	MS 2765	BL-024025	592989	July 20, 1917

All three of the lode claims were located by Joseph Oakey, G. W. Nebeker, and G. Spongberg. The claimants sold the claims to the United States Phosphate Company of Michigan, L. A. Jeffs, agent. The claims were patented by that company.

The locators sold the three lode mining claims to the United States Phosphate Company of Michigan about 1914 or early 1915. That company filed papers with the State of Idaho to enable it to do business in Idaho on December 18, 1915. Lewis A. Jeffs, acting as an agent for the United States

Figure 68. Little Canyon spur off of Bloomington Canyon. Consolidated Mine at end of Little Canyon (arrows), August 12, 1975. Photo by Peter Oberlindacher, BLM.

Phosphate Company applied for a patent to the three claims on May 1, 1916, and the company received that patent on July 20, 1917.

There was an attempt to mine phosphate on the property from the west limb of an overturned syncline in 1920 (Butner, 1949). The United States Phosphate Company was unsuccessful in this venture but did recognize a relatively high vanadium content of the phosphate ore. Campbell (1921, 1922) reported that the property was idle in 1921 and 1922 and in fact, the United States Phosphate Company of Michigan transferred by quit claim deed the three patented claims on July 31, 1922 to Francis A. Jeffs, executor of the estate of Lewis A. Jeffs, a former agent of the company. The Company then voluntarily withdrew their rights to do business in Idaho on November 20, 1922. This brought to a close the first phase in the development of the Star lode mining claims. The three patented lode claims eventually became known as the "Jeff Phosphate Property" (Paris Post, 1930a).

In the later part of 1930, Solar Development Company, Ltd., acquired the property by lease and option from Francis A. Jeffs (Campbell, 1930) and began an extensive exploration program in Little Canyon (Service, 1966, 1967). Solar Development Company was a subsidiary of the Consolidated Mining and Smelting Co., Ltd. of Trail, British Columbia, Canada, and filed to do business in Idaho on

September 14, 1928. Campbell (1930) reported that the company constructed buildings, installed mining equipment and started sinking an inclined shaft in 1930 (Figure 69). The Paris Post (1930b) reported that the Solar Development Company was mining day and night with ore being rail shipped to the Consolidated plant at Trail, British Columbia. There was also a loading platform being built at the Oregon Short Line rail yard in Paris to speed shipments. Between 1930 and 1932, the Solar Development Company developed the Consolidated Mine. Several thousands of feet of drifts, crosscuts and raises were driven and ore mined from several stopes (Service, 1966, 1967). The mined ore was sent to the Consolidated Mining and Smelting Company's mill in Canada for beneficiation, and the finished triple superphosphate fertilizer product was marketed under the trade name of "Elephant Brand" (Campbell, 1931).

Figure 69. The Solar Development Company's Consolidated Mine, circa 1931. Photo from Campbell, 1931, p. 69.

In 1932, the inclined shaft was reported to be 200 feet deep with two intermediate lateral drifts, totaling about 3,500 feet of underground development (Campbell, 1932) (Figure 70). It has been reported that during January and February, 1932, Solar Development Company shipped about 3,500 tons of phosphate ore to the Consolidated mill in Trail, B. C. That apparently was the last shipment of ore because the mine was closed and all the equipment was removed in the early part of February, 1932. The lease and option held by Solar Development was returned to Francis A. Jeffs, the property owner. The Solar Development Company, Ltd., voluntarily withdrew their rights to do business in Idaho on

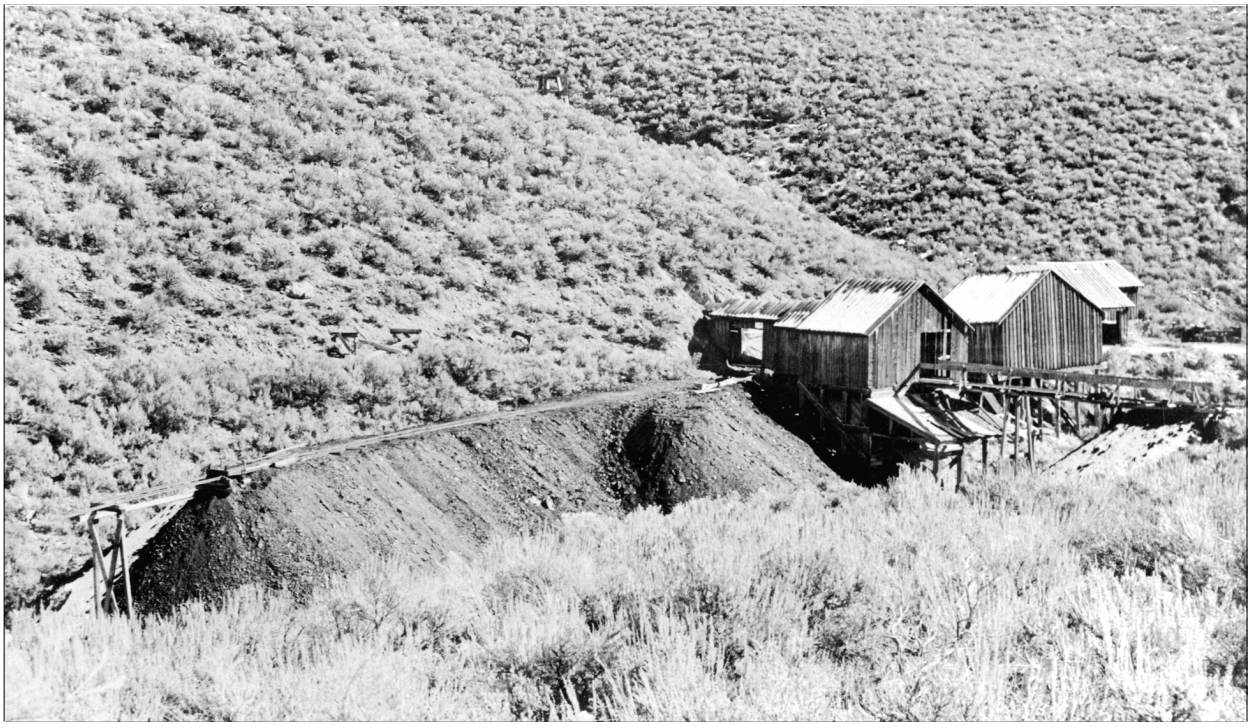

Figure 70. Portal of the Consolidated Mine showing the dump from the north and south drifts, circa 1943. Photo from Wyodak, 1943.

July 14, 1938. Thus, the second phase of phosphate mining on the patented Star lode mining claims came to a close. Figures 71, 72, and 73 show the Consolidated Mine as of the writing of this report.

The final phase of mining on the patented Star mining claims occurred in 1942-1943 and will be discussed later in this report under Wyodak's Paris-Bloomington vanadium exploration program.

Figure 71. The Consolidated Mine, June 25, 1996. Photo by the author.

Figure 72. Consolidated Mine showing the upper adit, June 25, 1966. Photo by the author.

Figure 73. Upper adit, Consolidated Mine, June 25, 1966. Photo by Peter Oberlindacher, BLM.

Bennington Canyon Mine

The Bennington Canyon Mine is located in the SE¼NE¼ Section 14, T. 12 S., R. 44 E., BM (Figure 74). The first published report of the occurrence of phosphate at this location was made in 1907 when C. C. Jones (1907) reported:

> *At Bennington, Idaho, 3 miles north of Montpelier, a disconnected and faulted portion of the phosphate formation is shown. The material runs from 25 to 50 percent bone phosphate, and further work will be necessary to determine its position and relation to the other deposits.*

The San Francisco Chemical Company (SFCC), an operating division of the Mountain Copper Company, Ltd., a British company, apparently paid attention to the 1907 report. The company located mining claims between 1907 and 1912 on the deposit and opened prospects on the phosphate ore zone (BLM unpublished data). The mining claimant (J. J. Taylor, local superintendent of the SFCC) excavated three short adits, the two northernmost openings consisted of a tunnel about 75 feet long and a tunnel about 50 feet long. Little is known about the third opening which was situated somewhere in the Joes Gap drainage just south of the mine. Mansfield (1927) reported making measurements in the tunnel openings in 1909 but stated that no work had been conducted at the tunnel sites from 1909 to 1920, when the bed was opened again. In this same period of time, the mining claims were apparently relinquished as the land was offered for homesteading. The land on which the mine was to be later developed left Federal ownership December 15, 1914 under the Homestead Laws and was patented to John C. Nelson. Mr. Nelson is probably the one who reopened the deposit in 1920. Mansfield (1927) also reports that prospects were opened by F. R. Richards of Montpelier on the hillside south of Joes Gap in section 23.

None of this early activity resulted in economic development of this deposit. It wasn't until 1939 that there was serious interest in mining this deposit. On November 25, 1939, a new company was formed to mine the Bennington Canyon phosphate deposits, the Teton Phosphate Company of Boise, Idaho. On that date, the new company filed to do business in Idaho with the Secretary of State's office. The Paris Post (1939) reported that there were eight incorporators. They were: Houston T. Hitt, C. Van Clark, F. P. Van Horn, J. C. McKinley, Sr., Milton Robison, Conover Wright, Frank D. Maxwell, and Edward G. Rosenheim. The new company obtained mining rights on 160 acres (Service, 1966). Exploration was started in 1940 with the excavation of several shallow trenches, all of which are now caved and indistinguishable. In October, 1941, the Teton Phosphate Company started a small open pit operation. Overburden was stripped from about 1300 square yards of the flat-lying Phosphoria Formation. A prospect tunnel about 150 feet long was driven in the open pit. This tunnel was to explore the phosphate at depth. A 40-ton hammer mill with crusher, rotary barrel dryer, trommel screens, and storage bins were placed in the open below the stripped phosphate (Service, 1966; Anaconda Collection, 1942). The ore was crushed, dried, ground, sacked, and sold for direct application on farm lands throughout southern Idaho. One carload of 43 tons was mined and shipped

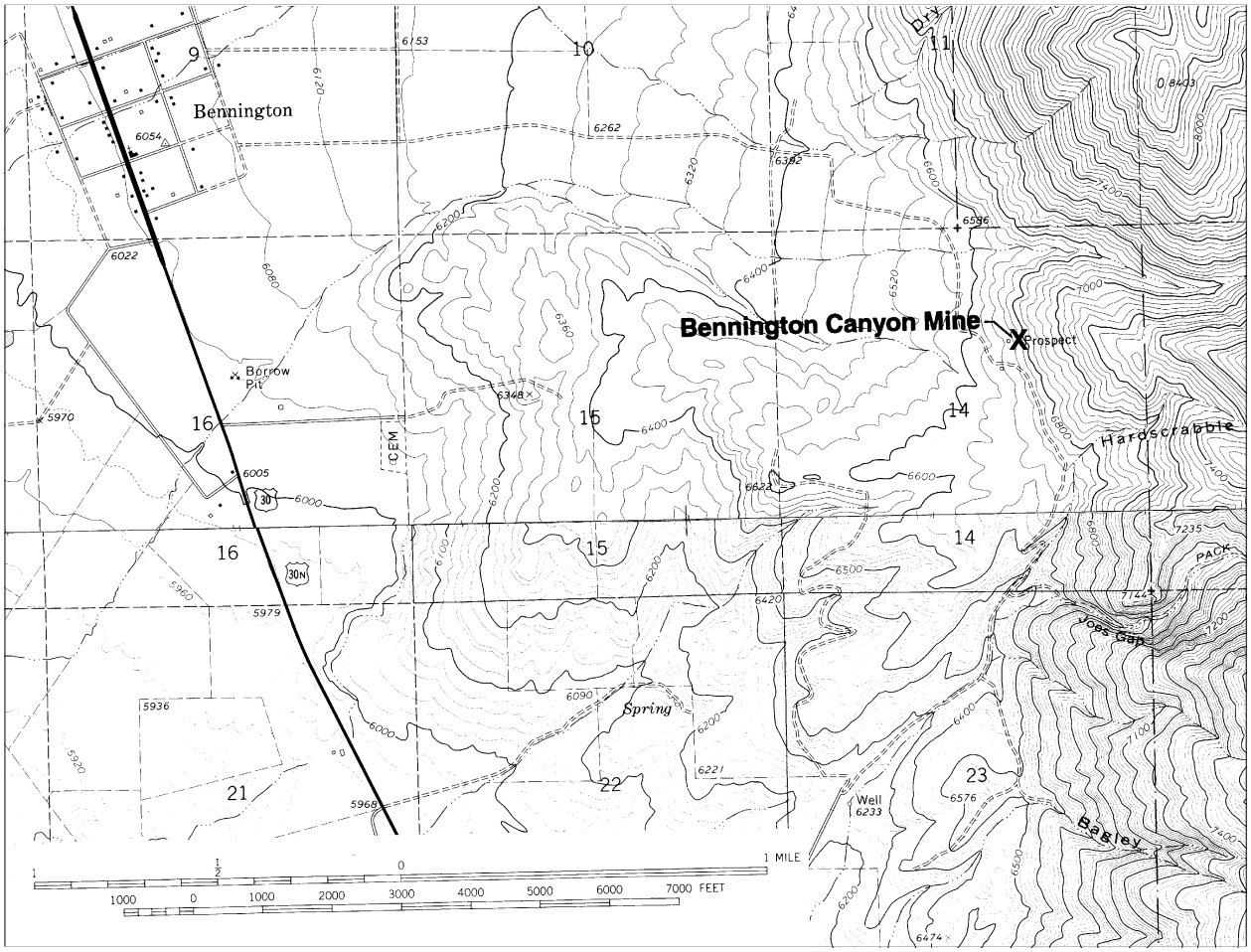

Figure 74. Map showing the location of the Bennington Canyon Mine, Bear Lake County, Idaho.

to the Vasser Produce Company in Caldwell, Idaho (Anaconda Collection, 1942). Campbell (1943, 1944) reported that production amounted to about 1000 cubic yards and that five men were employed. Many mines, including this one, have been opened in the phosphate field with the object to market the phosphate rock for direct application to the soil as fertilizer. Unfortunately, natural phosphate, even when finely ground, is not sufficiently soluble to benefit plant growth. The unanimous fate of small mines opened with soil amendments as a product was a short mine life (Butner, 1949).

Labor trouble and poor economic conditions closed the mine in 1942. Due to a demand from former users of the phosphate product, the mine reopened for a short period of time in 1943. Lack of volume capacity and stiff competition from larger phosphate mines in the area spelled doom for this mine and it closed again, never to reopen. The Teton Phosphate Company started to negotiate with several processors for a lease on parts of the property on a royalty basis. In 1946, the property was leased to J. L. Ogilvy of Spokane, Washington (Service, 1966) but there is no record that Mr. Ogilvy mined any ore.

McDowell (1951) reported that the property was being operated by Soilife, Inc. Officers of this new company included Houston T. Hitt, President, D. Charles Regan, Secretary, and J. P. Gilmore, Manager, all of Boise, Idaho. However, records of the Secretary of State's office do not show that Soilife, Inc. was licenced to do business in Idaho. This may have been a brief and unsuccessful name change by Teton Phosphate Company. Successive reports by the Idaho Inspector of Mines show the property as idle and in fact, the Teton Phosphate Company forfeited its right to do business in Idaho November 11, 1967. The mine only exists today as a scar on the hillside east of the small town of Bennington, Idaho (Figures 75, 76, and 77).

Figure 75. Bennington Canyon Mine, June 24, 1996. Photo by the author.

Figure 76. Open pit, Bennington Canyon Mine, June 24, 1996. Photo by the author.

Figure 77. Ruins of the processing facility, Bennington Canyon Mine, June 24, 1996. Photo by the author.

Wyodak Coal and Manufacturing Company
(Paris-Bloomington Phosphate/Vanadium Area)

One of the final chapters in phosphate mining in the vicinity of Paris and Bloomington, Idaho was the exploration and development carried on in 1942-1943 by the Wyodak Coal and Manufacturing Company, a subsidiary of the Homestake Mining Company of Lead, South Dakota (Figures 78 and 79). While phosphate rock was being explored and developed, the main material of interest was the vanadium content of the rock. Vanadium is alloyed with iron to make a very tough, hard steel used in munitions, weapons, and armor. Prior to World War II, the U. S. had to depend on shipments of vanadium from unreliable foreign sources and a small domestic supply from mines in southeast Utah and southwest Colorado. With the advent of World War II, it appeared that these domestic mines could not supply enough vanadium ore to fulfil the immediate needs of the country. A search for new domestic sources of vanadium was initiated throughout the nation (Ravitz, et al, 1947).

Vanadium was recognized by USGS chemists as early as 1911 in a phosphate rock sample from the vicinity of Driggs, Idaho, in the Teton Basin District (Mansfield, 1927). Because of the early phosphate mining in the 1920's in the Bear Lake and Paris Canyon mines, the presence of vanadium in the phosphate rock of this area was well established and influenced the decisions to focus attention on the Paris-Bloomington deposits (Butner, 1949). Possibilities of the commercial recovery of vanadium as a byproduct in the manufacture of fertilizer from Idaho phosphate ore had been discussed as early as 1923 (Hess, 1923). During the 1930's, the Anaconda Copper Mining Company, at their facilities at the Conda Mine, conducted research on the recovery of vanadium from Conda ore, and in January, 1941, began commercial recovery of vanadium as a byproduct material (Rubey, 1943).

Because of Anaconda's success in recovering vanadium, field investigations began in earnest in 1942 for more and better vanadium-bearing phosphate ore (Rubey, 1943). To prevent speculative claim location for vanadium, Secretary of the Interior Harold Ickes withdrew extensive areas of public lands in the western phosphate deposits in order to allow a large scale program of testing and proper public control of the resource (USGS, 1943). The USGS initiated exploration in the Paris-Bloomington area in 1942 and dug three trenches during the summer (Wyodak, 1944).

The task of developing the vanadium in the phosphate ore was given to the Reconstruction Finance Corporation (RFC), a Federal agency. The RFC was created on January 22, 1932 to extend aid during the Depression to agriculture, commerce, and industry in the form of loans, expertise and other forms of assistance. The RFC consisted of many sub-agencies, one of which was the Metals Reserve Company (MRC). The MRC was organized on June 28, 1940 to provide, stockpile and dispose of metals and minerals defined as strategic and critical and to pay subsidies to producers of such materials. The MRC was active in the mining industry throughout the years of World War II. It was dissolved and merged back into the RFC on July 1, 1945 and the RFC itself was abolished on June 30, 1957 (NARA, 1987).

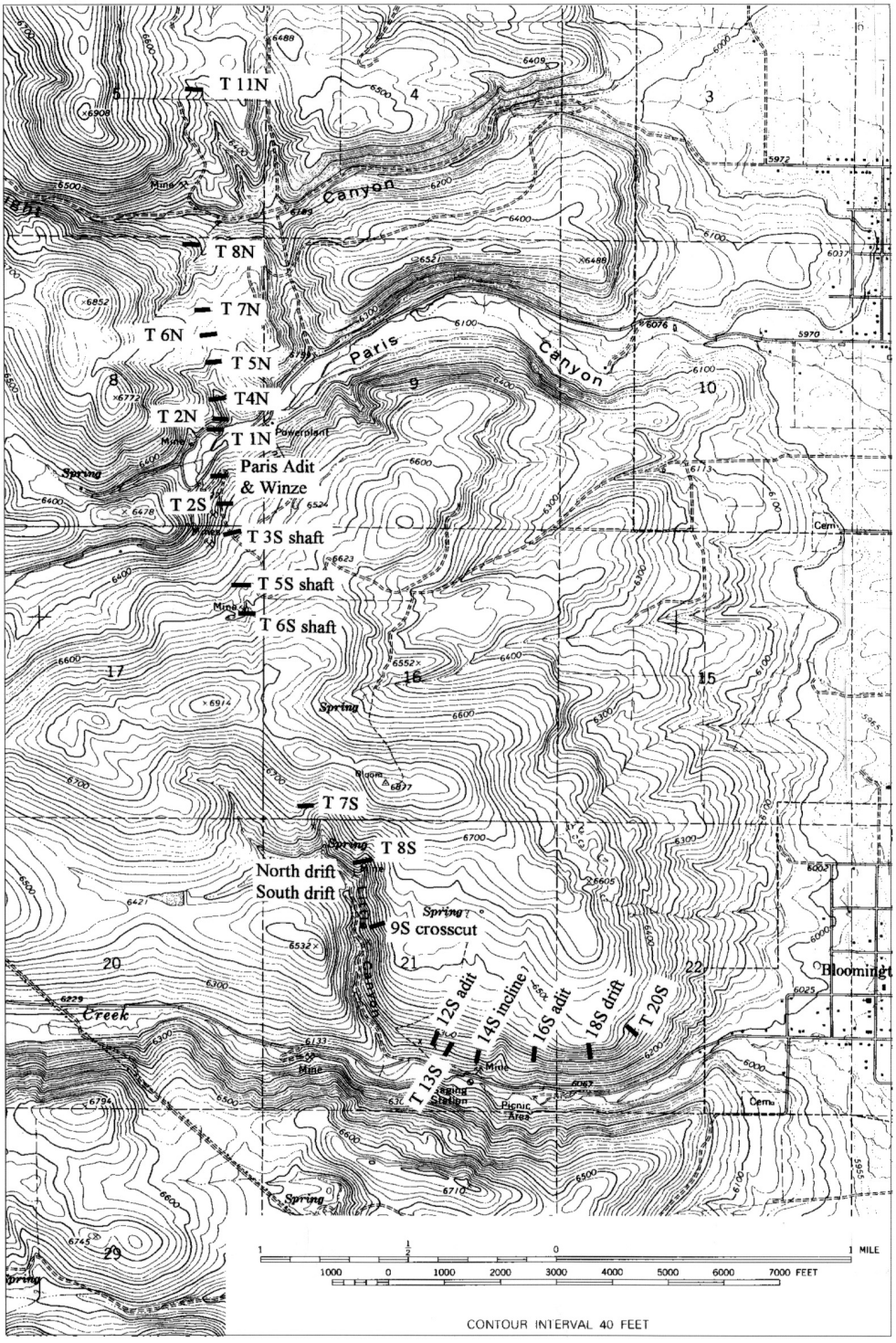

Figure 78. Map showing the location of Wyodak trenches and underground development, Bear Lake County, Idaho.

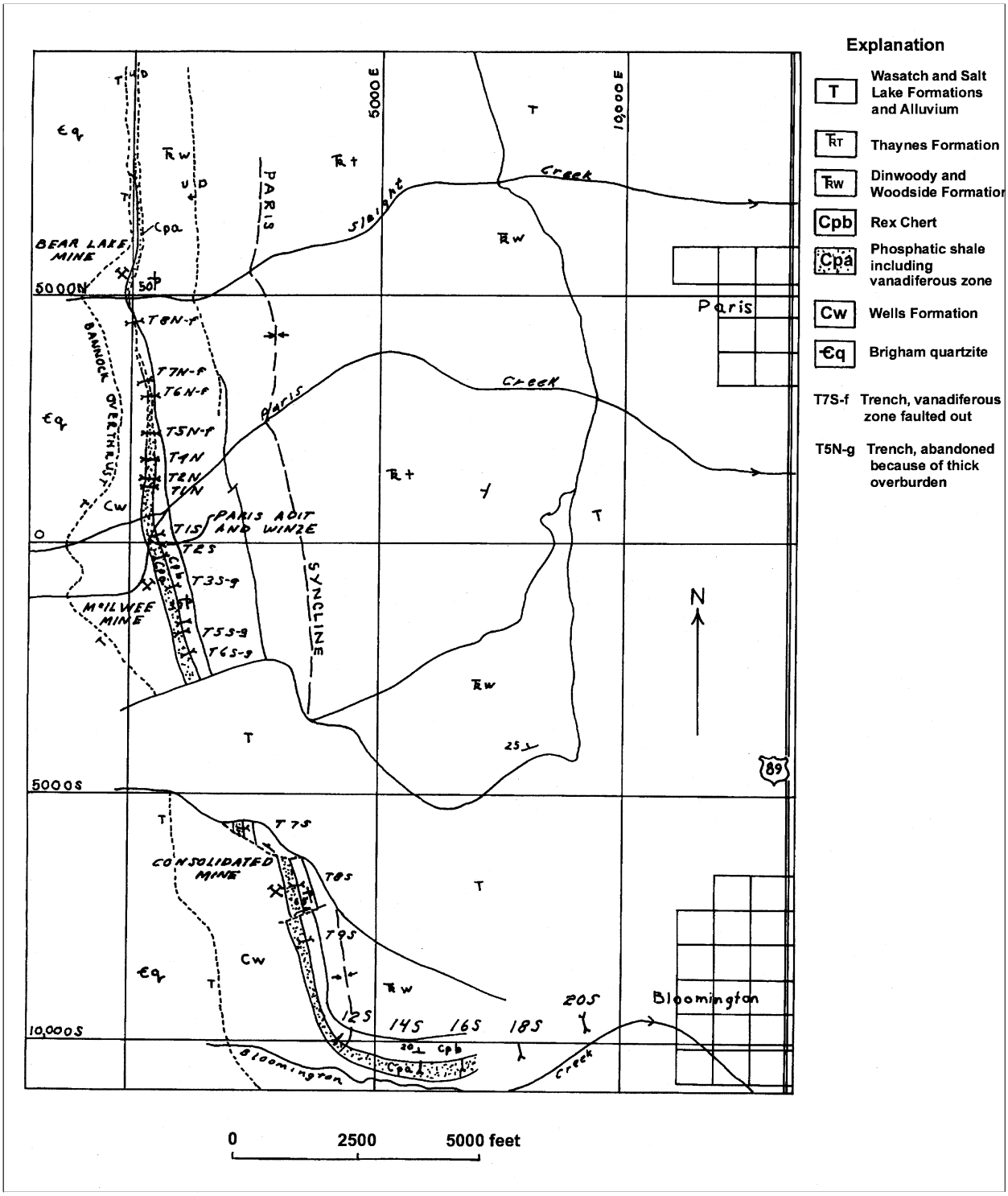

Figure 79. Geologic sketch map of the Paris-Bloomington vanadium area, adapted from Wyodak, 1944. Map by V. E. McKelvey and J. D. Strobell, December 5, 1943.

Once the MRC focused in on the Paris-Bloomington area, they started to acquire properties by either purchase or lease from the current owners. The Paris Post (1942b) reported that two individuals, C. E. Beymer and C. I. Wild (probably working for MRC) were in the area talking to landowners about purchasing their properties. The Paris Post (1942c) also reported that R. C. McIlwee had leased the McIlwee Mine property to the MRC. The MRC finally purchased 503.76 acres and leased 1,423.30 acres in the Paris-Bloomington area (Wyodak, 1944).

The MRC contracted with the Wyodak Coal and Manufacturing Company in September, 1942 as the agent to conduct mineral exploration, development, and operation. In February, 1943, Wyodak began an extensive exploration and development of the vanadium resource on the purchased and leased property in the vicinity of Paris and Bloomington. This exploration program included extensive trenching and underground development (Tables 7 and 8). The first event was plowing snow, surveying, reopening the old Consolidated Mine for sampling, and digging two trenches in Paris Canyon (McKelvey and Strobell, 1943a; Wyodak, 1944). The old McIlwee Mine was also to be reopened but it was found to be in such poor condition that idea was abandoned (Wyodak, 1944). A new adit was driven near the McIlwee Mine to sample the same beds as the mine in March, 1943.

By July, 1943, the new Paris adit was advanced 360 feet with a winze to a depth of 175 feet down dip. A drift was advanced 15 feet from the winze at the 125-foot level. A drift had been advanced 50 feet to the north in the Consolidated Mine. Two trenches had been completed, and two others were in progress. Phosphate rock at depth in the Paris winze and in the drift at the Consolidated Mine were found to contain oil and burned readily (McKelvey and Strobell, 1943b). Exploration in Bloomington Canyon also started in July (Figure 80) (Wyodak, 1944).

Table 7. Tabulation of Wyodak trenching, Paris-Bloomington phosphate/vanadium area, Idaho (from Wyodak, 1944).

Trench Number	Width of Trench	Length of Trench	Maximum depth	Trench Number	Width of Trench	Length of Trench	Maximum depth
T 1 N *	3 Ft.	135 Ft.	10.0 Ft.	T 5 S	3 Ft.	95 Ft.	62.5 Ft.
T 2 N *	3 Ft.	200 Ft.	12.0 Ft.	T 6 S	3 Ft.	31 Ft.	40 Ft.
T 4 N *	3 Ft.	89 Ft.	12.0 Ft.	T 7 S	3 Ft.	75 Ft.	10.0 Ft.
T 5 N	3 Ft.	80 Ft.	10.0 Ft.	T 8 S *	3 Ft.	61 Ft.	12.0 Ft.
T 6 N	3 Ft.	105 Ft.	5.0 Ft.	T 12 S	18 Ft.	60 Ft.	18.0 Ft.
T 7 N	3 Ft.	80 Ft.	7.0 Ft.	T 12 S (a)	18 Ft.	60 Ft.	16.0 Ft.
T 8 N	3 Ft.	50 Ft.	5.0 Ft.	T 12 S (b)	18 Ft.	120 Ft.	8.0 Ft.
T 11 N (a)	3 Ft.	6 Ft.	10.0 Ft.	T 12 S ©	18 Ft.	45 Ft.	11.0 Ft.
T 11 N (b)	3 Ft.	31 Ft.	18.0 Ft.	T 13 S	12 Ft.	60 Ft.	22.0 Ft.
T 1 S *	3 Ft.	164 Ft.	12.0 Ft.	T 13 S (a)	12 Ft.	80 Ft.	12.0 Ft.

Trench Number	Width of Trench	Length of Trench	Maximum depth	Trench Number	Width of Trench	Length of Trench	Maximum depth
T 2 S (a) *	4 Ft.	135 Ft.	14.0 Ft.	T 14 S (a) *	4 Ft.	78 Ft.	27.0 Ft.
T 2 S (b)	4 Ft.	35 Ft.	8.0 Ft.	T 14 S (b) *	16 Ft.	30 Ft.	6.5 Ft.
T 3 S (a)	4 Ft.	30 Ft.	6.0 Ft.	T 16 S *	4 Ft.	70 Ft.	20.0 Ft.
T 3 S (b)	3 Ft.	12 Ft.	18.5 Ft.	T 18 S	4 Ft.	225 Ft.	10.0 Ft.
T 4 S	3 Ft.	100 Ft.	7.5 Ft.	T 20 S	18 Ft.	50 Ft.	15.5 Ft.

* - Indicates trenches which located the vanadiferous phosphate beds

Table 8. Tabulation of Wyodak's underground development, Paris-Bloomington phosphate/vanadium area, Idaho (from Wyodak, 1944).

Drifts

Paris Creek	Number of Feet
Adit	
	400.0
No. 2 crosscut	30.0
No. 3 crosscut	15.5
2nd level station crosscut	32.0
South drift	12.0
Crosscut 20 feet below station	12.0
Bloomington Creek	
North drift, Consolidated Mine	417.0
No. 1 North crosscut	8.0
South drift, Consolidated Mine	148.0
No. 1 South crosscut	8.5
No. 9 South crosscut	188.0
No. 12 South adit	215.5
No. 14 South adit	384.5
Car drifts	12.0
No. 1 West drift	143.5
No. 16 South adit	223.5
No. 1 East drift	135.0
No. 18 South adit	195.5
Total drifts	2,614.0

Raises and Winzes

Paris Creek	Number of Feet
Winze	
	322.0
Bloomington Creek	
No. 12 South adit	
Exploratory raises	25.5
No. 14 South adit	
No. 1 West raise	61.0
No. 2 West raise	98.0
Exploratory raises	42.0
No. 16 South adit	
Exploratory raises	11.0
Winze	25.0
Total raises and winzes	584.5
Total underground development	3,198.5

By August, 1943, the Paris adit had advanced to 395 feet and the winze was at 250 feet. The north drift in the Consolidated Mine had advanced to 190 feet and a new drift to the south was at 60 feet. Trenching and sampling continued and inclines and drifts were driven off of those trenches that intersected the vanadium zones. There were two inclines driven off of trenches; a 120-foot incline out of 14S (Figure 81), and a 30-foot incline out of 16S. Three trenches were completed (McKelvey and Strobell, 1943c).

By October, 1943, both north and south drifts in the Consolidated Mine were advanced, along with the 14S and 16S inclines. Water was encountered at the 200-foot level in the Paris winze (30 gpm). The Paris adit was eventually advanced to a length of 400 feet and the winze was sunk to a depth of 322

Figure 80. Phosphate prospects on north side of Bloomington Canyon, Idaho. The outcrop of the bedrock formation is completely concealed by a wash of boulders derived from Eocene or Pliocene conglomerates. Trench numbers correspond to Figures 78 and 79. Photo by R. W. Richards, #118, USGS Photographic Library.

feet where it was discontinued because pumps could no longer keep up with the water flow. Several new trenches and inclines were started (McKelvey and Strobell, 1943d). There was some question about how much longer the exploration would continue in the area. In an unpublished letter, McKelvey reported that the ore stockpile at the 14S incline was on fire, apparently started by spontaneous combustion. Perhaps the early prospectors who mistook the phosphate shale for coal were not so far off!

By November, 1943, the drifts in the Consolidated Mine were discontinued, trial stopes in the 14S west incline were developed (Figure 82), and trenching for the most part was completed. Stoping proved to be quite risky as the hanging wall continued to break between timbers and after about three days, the stopes would completely cave. No new instructions for continuing exploration had been received from the MRC, so the future was uncertain for the project (McKelvey, 1943).

McKelvey, in a letter to R. P. Fischer, dated November 24, 1943, reported that the order to cease work in the Paris-Bloomington area had been received by Wyodak. Underground work stopped on November 27 with the completion of the 14S incline (380 feet) and the 16S incline (260 feet), and all ground work (track pulling, removal and shipping of equipment, etc. was completed in December, 1943.

With the completion of the vanadium exploration in December, 1943, the total development between Sleight and Bloomington Canyons consisted of 30 trenches, nearly 2,500 feet of underground

Figure 81. Bloomington Canyon, view north, showing Bloomington Creek, compressor equipment in an old road-metal quarry, and the dump at No. 14 South incline, 1944. Photo from Wyodak, 1944.

Figure 82. Number 1 west stope, 14S incline, Bloomington Canyon, 1944, view north toward the chute from the upper end of the stope. Photo from Wyodak, 1944.

development consisting of drifts, crosscuts, raises, winzes and several experimental stopes (Service, 1967; McKelvey and others, 1986). Broken down by area, Paris Canyon was explored and sampled by 725 feet of underground workings, six trenches and one short crosscut. The Consolidated Mine had 500 feet of new workings along with three trenches. Bloomington Canyon was explored and sampled by 1,200 feet of underground workings, several experimental stopes, and five trenches. The results of the geologic mapping program and vanadium zone identification were published by McKelvey and Strobell (1955).

Gay Mine

The J. R. Simplot Company's Gay Mine is located on the Fort Hall Indian Reservation, about 16 miles east of Fort Hall, Idaho (Figure 83). It was the only phosphate mine in the southeastern Idaho phosphate field to be located on the Shoshone-Bannock Indian land, and was the first open pit mine in southeast Idaho to extract Federally-owned phosphate. The mine eventually consisted of about 7,000 acres of leased Tribal and allottee lands within the reservation.

Early surveys of the land and geology of the area of the Fort Hall Reservation (Mansfield, 1920) include the following:

> The Astorians, a collection of pioneer fur trappers and traders in the employ of John Jacob Astor, were probably the first organized expedition to pass through the general area of the Gay Mine on their way to Oregon in 1811-12.
>
> Captain Benjamin Louis Eulalie de Bonneville surveyed the general area for fur resources during the years 1833 and 1834. Nathaniel J. Wyeth established the Fort Hall fur trading post in 1834 near the confluence of the Portneuf and Snake Rivers, naming the post after the oldest member of the party.
>
> John C. Fremont surveyed the area in 1843 and 1844 for agricultural possibilities and general exploration.
>
> Captain Stanisbury followed Fremont into the area in 1849 in order to survey proposed wagon roads. This was also the time of the first emigrants on the Oregon Trail which, in its many variants, ran very near the site of the Gay Mine.
>
> The United States Geological and Geographical Survey of the Territories, under the charge of Ferdinand V. Hayden, systematically surveyed the eastern part of the reservation area in the late 1860s and the 1870s. Members of the Hayden Survey, F. H. Bradley in 1872, A. C. Peale in 1877, and Orestes St. John in 1877, mapped the geology and minerals of the eastern reservation area (they failed to recognize the existence of the phosphate deposits, however).

The Fort Hall Indian Reservation was created by an Act of Congress July 3, 1868, ratified on February 16, 1869, and formally proclaimed on February 24, 1869. The Shoshone and Bannock tribes were moved onto the Reservation from several areas throughout southern Idaho.

G. R. Mansfield (1920) examined the area of the Reservation in 1913 and was the first to do detailed geologic mapping and reporting of the phosphate deposits of the Fort Hall Indian Reservation. Mansfield's work included excavating trenches and test pits on the phosphate (Figure 84).

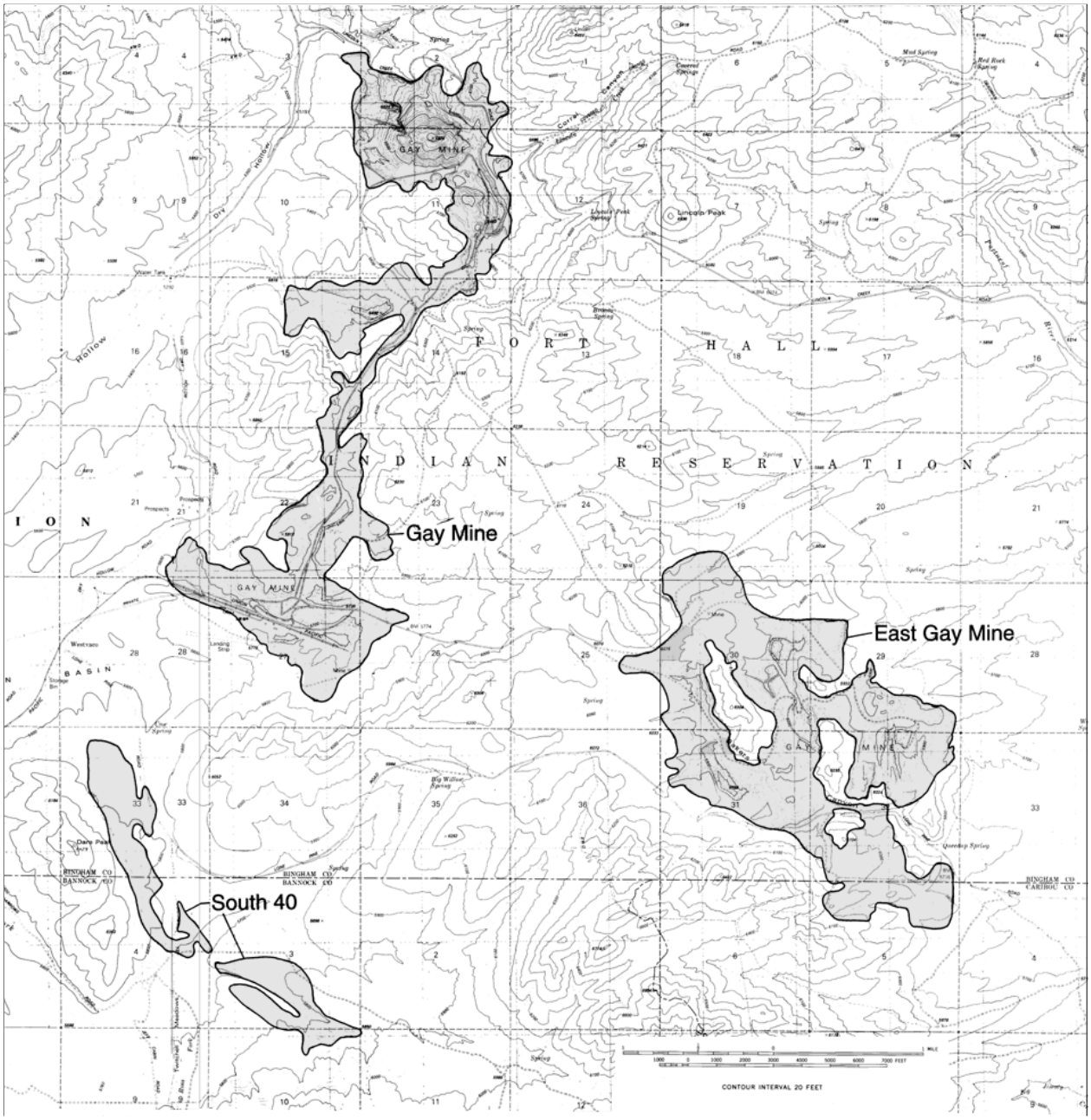

Figure 83. Map showing the location of the Gay Mine, Bingham and Bannock Counties, Idaho.

Based on Mansfield's work and subsequent geologic exploration, the Simplot Fertilizer Company started exploring for phosphate on the Indian Reservation in 1945 (Service, 1966). The Simplot Fertilizer Company (now J. R. Simplot Company) was established in 1945 to serve regional agricultural markets for phosphate fertilizers. The company's exploration program consisted of drilling, trenching, sampling and mapping (Figure 85). The exploration proved successful and in 1946, the company negotiated and obtained Tribal and allottee leases on about 7,000 acres (Carter, 1978). The Simplot

Figure 84. Prospect trench, date unknown. Photo by R. W. Richards, #189, USGS Photographic Library.

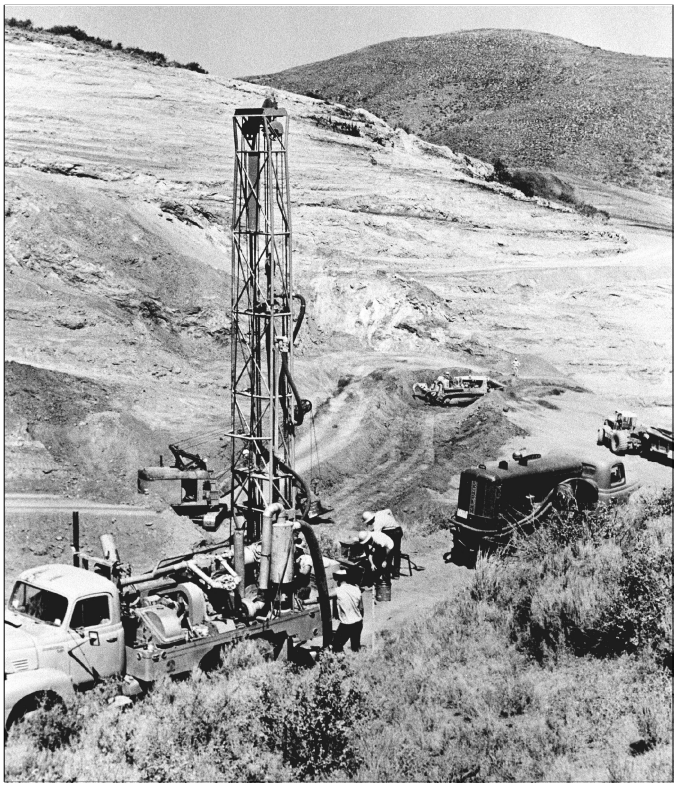

Figure 85. Drilling rig, Gay Mine. Photo courtesy of the FMC Corporation.

Fertilizer Company also obtained a Tribal business lease authorizing the company to commence phosphate extraction on February 4, 1946. The Simplot Company opened the Gay Mine that same year (Figure 86), and ultimately became the longest operating open pit phosphate mine in Idaho. The Gay Mine was named after J. R. Simplot's only daughter. The initial production from the Gay Mine marked the beginning of Idaho's present day phosphate mining/fertilizer industry (Carter, 1978).

Figure 86. Start of Mining, Gay Mine. Photo courtesy of the Idaho State Historical Society, #63-160.221.

In 1944, prior to the opening of the Gay Mine, the Simplot Fertilizer Company began construction of a fertilizer plant at Pocatello, Idaho. The plant did not go into production until the Gay Mine started producing phosphate ore in late 1946. In late 1946, the U. S. Quartermaster's Office contracted for a million tons of phosphate rock to be shipped to Japan to build up that country's soil as part of the post-war reconstruction effort (Hansen, 1964; Day, 1973). The Gay Mine provided about one-quarter of the contracted amount in 1947 and 1948, blending lower-grade phosphatic shales with the fertilizer-grade phosphate rock.

Associated with the high-grade phosphate rock suitable for fertilizer manufacturing, there are extensive deposits of lower-grade phosphatic shales that were not suitable for fertilizer. The main bed fertilizer-grade phosphorite averages 31% P_2O_5 while the overlying phosphatic shales, or furnace-grade ore, averages 24% P_2O_5 (Schmitt, 1967). The Simplot Company stockpiled those shales at the mine until a market could be developed (Service, 1966, 1967). The Simplot Fertilizer Company laboratory conducted extensive tests to discover the commercial possibilities of the phosphatic shales (Power, 1947). In 1948, the Union Pacific Railroad constructed 21 miles of standard gauge railroad line between the Fort Hall Agency and the mine tipple (Figure 87). The Simplot company promptly shipped 150 tons of phosphatic shales to the Westvaco Chlorine Products Company in Tennessee to determine if the phosphatic shales were amenable to electrolytic reduction to elemental phosphorous. The tests proved successful and negotiations were commenced with the view of Westvaco building a reduction plant at Pocatello for utilization of the lower grade shales of the Gay Mine. In 1949, the Westvaco company built the first elemental phosphorous plant in Idaho at Pocatello (Bennett, 1989). The Food Machinery and Chemical Corporation (FMC) bought the plant the same year and made it into the largest elemental phosphorous plant in the world. The first production of elemental phosphorous from the plant in Idaho was August, 1949 (Hansen, 1964).

Figure 87. Gay Mine loading area, view east, August 15, 1973. Photo courtesy of the FMC Corporation.

Between the years 1946 to 1952, in addition to opening the Gay Mine, going online with a brand new fertilizer manufacturing facility and creating a feed stock supply to an elemental phosphorous facility, the Simplot Company was undergoing a series of internal changes. The original Simplot Fertilizer Company, incorporated February 28, 1946, merged into the Simplot Investment Company, which in turn, on March 7, 1952 merged into the present J. R. Simplot Company (McDowell, 1952).

The phosphate ore in the vicinity of the Gay Mine lies in a horizontal to near horizontal attitude but it is broken by extensive northeast- and northwest-trending normal faulting which transects earlier regional thrust faulting. The large number of normal faults created a mosaic of rotated, discontinuous blocks containing phosphate ore (Lehman, 1966). Mining of the phosphate ore resulted in a series of small- to medium-sized open pits (Figure 88). Mining depths averaged 250 feet, however, several pits exceeded 300 feet in depth. Pits were generally small, averaging 15 to 20 acres, although several reached as much as 50 acres. It is estimated that 45 pits were eventually mined. The operations of the mine were located in three primary areas: the Gay Mine proper, the East Gay mine, and the "South 40". At the beginning of the mine, stripping of the overburden (Figure 89) was done on a year-round basis while mining of the ore beds was carried out only during the spring and summer months. Eventually, it was not feasible to only mine in the summer. Consequently, mining was carried out year round and the ore mined during the winter was stockpiled at a site near the tipple for loading and shipping during the summer shipping season. Initially, phosphate ore was mined by 1½- and 2½-yard shovels (Figure 90) and loaded onto 20- and 30-ton trucks and shipped to the railroad at Fort Hall (Power, 1947). A rail spur was laid from the main line at Fort Hall to the mine site, and loading facilities were developed at the terminus at the mine. Those facilities included screening, crushing, sampling and weighing equipment.

By the early 1960's, the Gay Mine was producing over 1 million short tons of phosphate rock per year. The original shovel and truck fleet was too small to produce this volume and conversion of the stripping fleet to scrapers and dozers and the mining fleet to larger (7-yard) electric shovels and 35-ton trucks began. By the mid-1970's production approached 2 million tons per year, pit development had extended to the north end of the original lease block. The East Gay Mine leases were placed in production and 120-ton tractor-trailer trucks were added to haul ore from surge stockpiles at the pits to the loading facility. In 1974, the first hydraulic shovel (7 cu. yd. capacity) was tested successfully for mining ore and the mining fleet was gradually converted to the faster and less costly hydraulic machines.

From 1983-1985, in anticipation of peak production of about 2.2 million tons per year and development of the South 40 leases, the stripping fleet was also converted from scrapers to large (12-yard) hydraulic shovels and 85-ton trucks. This conversion produced a significant increase in mine productivity and reduction in mine operating costs.

The J. R. Simplot Company held the majority of the Tribal and allottee leases. The FMC Corporation held several other leases and the two companies jointly held leases, particularly in the mining area called

Figure 88. Gay Mine, August 12, 1975. Photo by Peter Oberlindacher, BLM.

Figure 89. Stripping overburden at the Gay Mine. Photo from Service, 1967, p. 167.

Figure 90. Gay Mine, October 18, 1948. Photo courtesy of the Idaho State Historical Society, #72-201.101.

the “South 40". As stated before, there was a total of about 7,000 acres held under lease by the two companies, however, only about 2,496 acres were actually mined.

Prior to 1956, the J. R. Simplot Company owned the mine and the FMC Corporation purchased their ore requirements from the Simplot company. In 1956, FMC acquired certain leases at the Gay Mine and entered into joint ownership and operating agreements with Simplot. The Simplot company remained the mine operator but FMC received all of the lower grade (24-25 percent P_2O_5) “furnace

grade" shale, which constituted about 80 percent of total production. The Simplot company received the higher-grade (30-32 percent P_2O_5) "main bed" ore, about 20 percent of total production.

In 1990, shortly after the Simplot company opened its Smoky Canyon Mine and began delivering beneficiated ore in slurry form through a pipeline to its plant in Pocatello, FMC purchased the remaining high grade ore reserves at the Gay Mine and from that point forward until mine closure total mine production was delivered to FMC.

Along with being the first open pit phosphate mine in southeastern Idaho to mine Federally owned phosphate, and being considered as the beginning of the modern phosphate mining era in that part of Idaho, the Gay Mine is also known for another "first". In August, 1980, a D-9 Caterpiller bulldozer, operating in Pit CC-3, reduced the limestone footwall that remained above the pit backfill. This was the first highwall removal ever to be done in the southeastern Idaho phosphate field.

After 47 years of more or less continuous production, mining at the Gay Mine finally stopped for good in September, 1993 and all remaining mined ore was shipped. Reclamation of all of the mine pits open at that time was started in October of that year.

Ballard Mine

The Ballard Mine is located in T. 7 S., R. 42-43 E. (Figure 91). The first recorded phosphate-related activity in the area of the mine occurred in 1912 when a U. S. Geological Survey field party under the direction of R. W. Richards explored the phosphate in the area of the future Ballard Mine with two hand-dug trenches. One trench was located in the NW¼SE¼ Section 7, T. 7 S., R. 43 E. That trench found an unsuspected fault and had to be abandoned. A second trench in the NE¼SW¼ of Section 7 found a complete section of the phosphate deposit. The trench was 270 feet long, seven feet wide, and two to six feet deep. A measured section in this trench is given in Mansfield (1927, p.242).

There was no further interest in the phosphate deposits of this area until the J. R. Simplot Processing Company (later the J. R. Simplot Company) filed an application to lease the phosphate from the Federal government on August 28, 1947. A lease sale was held on July 21, 1948. There were two bidders in the sale, the J. R. Simplot Company and the Washington Cooperative Farmers Association. The Simplot Company was the successful high bidder and was issued lease BL-055875 on December 1, 1948. The Simplot Company's intentions were to mine the lower grade phosphatic shales to feed an electric furnace to make elemental phosphorous. The Simplot lease was the first lease ever issued by the Federal government in which development of lower grade ores specifically was the intent (Salt Lake City Tribune, Thursday, December 9, 1948). Simplot never developed the lease for either low-grade or high-grade ore and on May 23, 1951, the Simplot Company assigned the lease to the Monsanto Chemical Company. Monsanto began exploration activities on July 16, 1951 with 115 drill holes and numerous trenches (Figure 92).

Concurrent with the development of the Ballard Mine, Monsanto was building an elemental phosphorous plant at Soda Springs, with construction starting in early July, 1951. The elemental phosphorous plant was completed and put into operation in December, 1952. Ore from the first production of the mine was stockpiled at the plant site until the furnace could be put on line. The capacity of the one electric furnace was quickly met and a second furnace was completed in September, 1954. Initially, mined ore was sorted into three grades, 31%, 27%, and 19-20% P_2O_5 (unpublished BLM information, 1954). The two lowest grades were to be used as furnace feed for elemental phosphorous production while the high grade was to be shipped to the Victor Chemical Company in Montana. In actuality, all grades of ore were shipped to the elemental plant at Soda Springs (Service, 1966).

The Monsanto Company contracted with the Morrison Knudsen Company of Boise, Idaho to build the plant and to mine and haul the ore. Initially, the ore was trucked over county roads and State highways (McDivitt, 1956; Service, 1966). Because of State highway load restrictions, it soon became apparent that a private haul road would have to be built between the mine and the plant. In 1958, construction began on a heavy-duty private haul road that would accommodate the heavy ore-filled trucks. The road was completed July 20, 1959, and was 11½ miles long with an maximum grade of 2.7% (Service, 1966).

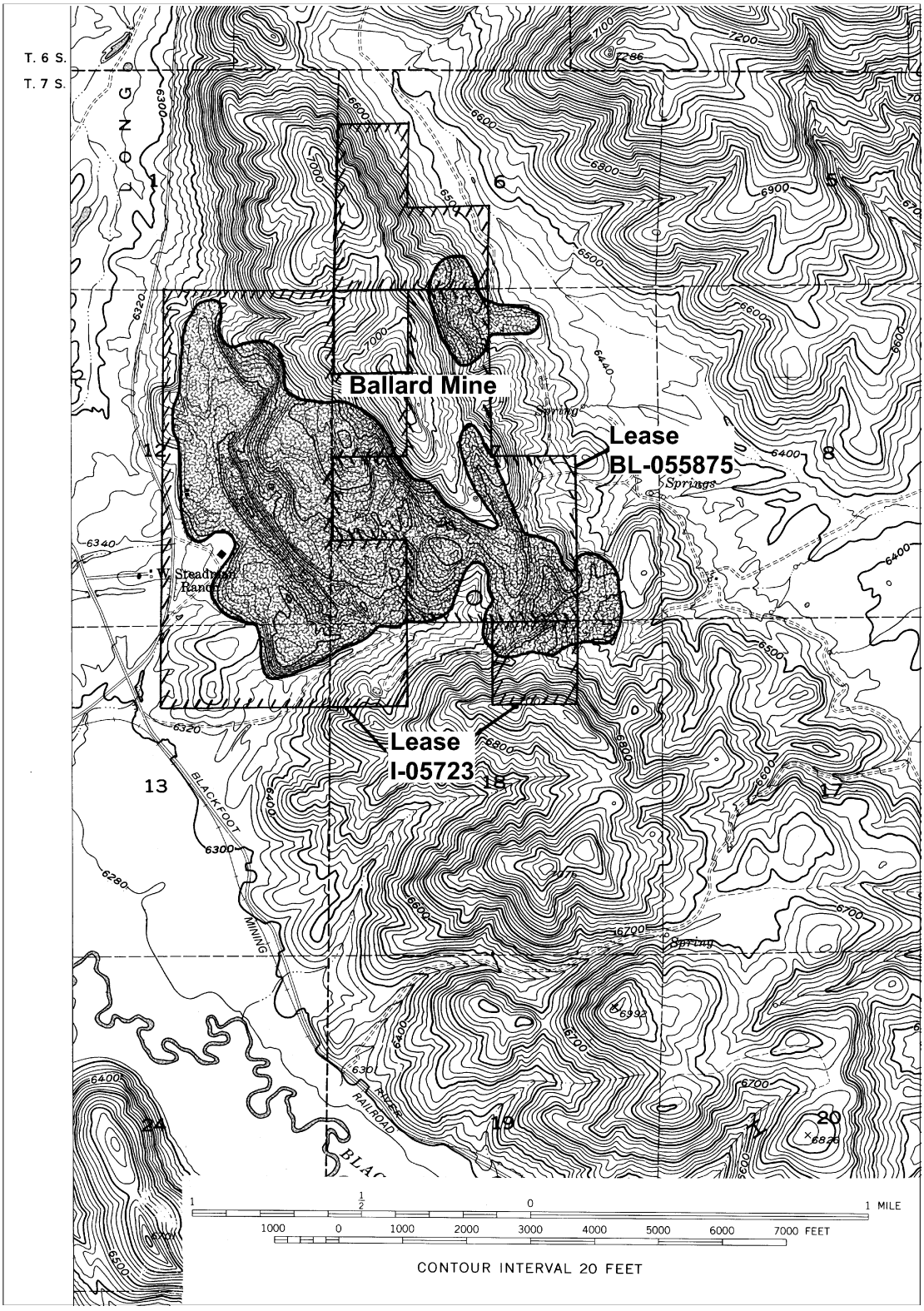

Figure 91. Map showing the location of the Ballard Mine, Caribou County, Idaho.

Figure 92. Ballard Mine, July 16, 1951. BLM file photo.

The phosphate rock occurs at two horizons and is separated by 100 feet of waste rock. Stripping operations started in June, 1951 on Lease BL-055875 in what was known as the Ballard Pit (Service (1966) refers to the site as the South Ballard Pit). Actual mining in the Ballard Pit started when the weather permitted early in 1952. Mining was done with power shovels and scrapers. Since all of the ore grades were earmarked for the elemental phosphorous plant at Soda Springs, careful ore control was not as critical as at some other mines, however a lower limit of ore grade was carefully determined. Mining operations continued out of the Ballard Pit into the area known as the North Ballard area.

Exploration in 1954 in the area of the mine and development of the ore body within the existing lease showed that there was a large volume of ore that existed outside of lease BL-055875. On February 7, 1955, Monsanto made an application to lease that ore with the BLM. Lease I-05723 was issued to the Monsanto Company on July 1, 1955. Once that ore had been secured, the West Ballard Pit was developed on the new lease. The West Ballard Pit contained the largest ore reserves and was operated longer than any of the other pits in the mine. The Ballard Mine eventually consisted of several side-hill, open-pit excavations (Figures 93 and 94).

In May, 1961, a 470-foot long conveyor belt was installed from the footwall to the tipple level in the West Ballard Pit, some 90 feet in vertical elevation difference. This improved the haulage situation greatly, as the ore only needed to be trucked on the level to the tipple loading facility.

Figure 93. Ballard Mine, 1975. BLM file photo.

Figure 94. Ballard Mine, August 12, 1975. Photo by Peter Oberlindacher, BLM.

According to Service (1966), the loading facilities included tipples, screens, conveyors, weigh bins, and automatic samplers (Figure 95). In 1962, Monsanto contracted with Wells Cargo to be the mine operator while Morrison Knudsen Company retained the contract to haul the ore to the processing plant. Also in 1962, the conveyor belt was removed from the West Ballard Pit because of the advance of mining made it unusable.

Figure 95. West Ballard Mine tipple, July 10, 1962. BLM file photo.

During the mining season of 1964, Monsanto purchased and put into use a 45-inch horizontal auger to recover ore that remained under the highwall in stripped-out pit areas. The auger was first used in the West Ballard Pit and extended the recovery of ore to an average hole depth of 89 feet (Figure 96). The auger was apparently only used for two mining seasons because by October, 1965, the auger was idle.

Mining continued in various places on the two leases until late 1969 when the Ballard Mine was finally worked out entirely. Even before the mine was worked out, reclamation had started on the earlier pits. As early as 1958, the Ballard Mine dumps were used for experimental plantings for reclamation. Additional experimental plantings were done in the 1960's, and in the early 1970's, the U. S. Forest Service Experimental Station at Logan, Utah planted a total of 78 different types of trees, shrubs, grasses, and forb seeds, and seedlings and cuttings on the dumps (USGS, 1977). These experimental reclamation plantings had varying degrees of success.

Figure 96. Ballard Mine, north pit of West Ballard, view east, showing 45-inch auger holes, spring, 1966. Photo courtesy of the FMC Corporation.

In 1970, the Monsanto Company completed active mining at the Ballard Mine. During the 18 years of production, about 11 million tons of phosphate rock was mined and removed from about 191 acres at the Ballard Mine on the two Federal leases. Over 20 million cubic yards of waste rock were stripped; of this amount 2 millions cubic yards were used to backfill the pits with the remaining 18 million cubic yards hauled to the dumps. About 317 acres of land were covered by the dumps and an additional 96 acres were used as service areas for the mine (USGS, 1977).

The Monsanto Company filed relinquishments for the two Federal leases on April 30, 1984. The BLM accepted the relinquishments and the leases were closed on July 3, 1984.

Maybe Canyon Mine
(North Maybe Canyon, South Maybe Canyon)

The Maybe Canyon Mines (North and South) are located in T. 7 and 8 S., R. 44 E., on the east side of Dry Valley, about 17 miles northeast of Soda Springs, in Caribou County, Idaho (Figure 97). The mines together are over 3½ miles in length and are located on Federal Lease I-04.

Although phosphate ore has been known in this area since the latter part of the nineteenth century, it wasn't until 1910 that the ore deposits were investigated in any detail. In that year, the USGS conducted field investigations of the phosphate, and in 1911, the USGS field party made an opening consisting of three pits in the SW¼SE¼ of Section 14, T. 8 S., R. 44 E., near the southern end of the future South Maybe Canyon Mine (Mansfield, 1927, p. 258). The three pits were offset from one another in order to cover as much of the phosphate section as possible.

The next reported investigation of the phosphate ore in the vicinity of Maybe Canyon occurred in August and September, 1948 when the USGS excavated a bulldozer trench (Lot #1210) in the NW¼NE¼ of Section 10, T. 8 S., R. 44 E., in Maybe Canyon proper. The rocks exposed in this trench were extensively sampled and analyzed for phosphate content (McKelvey, Davidson, O'Malley, and Smith, 1953, page 14). The USGS field party also opened a bulldozer trench (Lot #1258) in Section 28, T. 7 S., R. 44 E., about a quarter of a mile north of the northernmost extension of the future mine. The rocks of this trench were also extensively sampled and analyzed (O'Malley and others, 1953, p. 20).

The trenching activities of the USGS during 1948 apparently attracted commercial interest. On September 7, 1948, the J. R. Simplot Company applied to the Federal government for a lease of the phosphate ore in the Maybe Canyon area. Later, on March 14, 1949, the Simplot Company withdrew their application from consideration. The BLM continued to look at this area for leasing and on May 25, 1949, the BLM held a competitive lease sale for the phosphate resources of the Maybe Canyon area. There were three bidders at the sale with the Western Fertilizer Association (WFA) of Salt Lake City, Utah being the successful high bidder for this Federal lease, I-04. The two other bidders were the J. R. Simplot Company of Pocatello, Idaho, and the Washington Cooperative Farmers Association of Seattle, Washington. The WFA was issued Lease I-04 on October 1, 1950.

The WFA was incorporated under the laws of the State of Utah and was an association consisting of the following organizations:

Washington Cooperative Farmers Assoc.	Pacific Supply Cooperative
Northwest Wholesale, Inc.	Grange Cooperative Wholesale
Idaho Egg Producers	Idaho Potato Growers, Inc.
Idaho Farm Bureau Federation, Inc.	Utah Poultry and Farmers Cooperative
Utah State Farm Bureau Federation	Utah Cooperative Association.

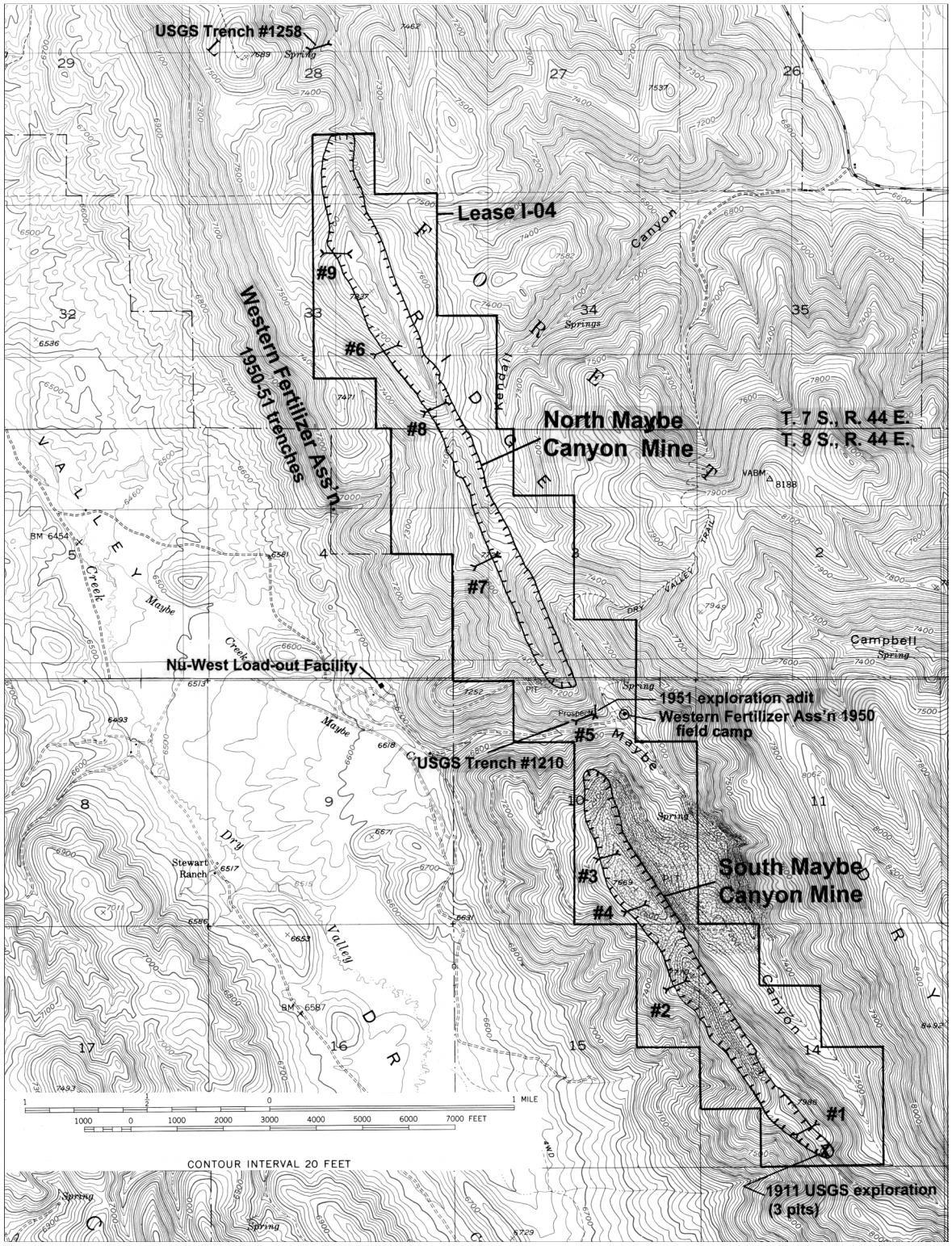

Figure 97. Map showing the location of the North and South Maybe Canyon Mines, Caribou County, Idaho.

Immediately after the issuance of the Lease I-04, WFA established a field camp (Figures 97 and 98) and started construction of roads to the Maybe Canyon area and throughout the lease in preparation for mining. Underground mining was initially contemplated for Lease I-04. The WFA initiated mining on Lease I-04 in July, 1951 at a site in Maybe Canyon near the creek-level by excavating an area about 250 feet long by 50 feet wide and siting the portal area on an exposed 8-foot thick phosphate ore bed (Figures 99 and 100). Equipment used to excavate the tunnel was a 500-horsepower Gardner-Denver compressor and a one-quarter yard EIMCO mucking machine (Figures 101 and 102). The tunnel was driven 191 feet north and by the cession of excavation reported production was approximately 1,048 tons of 28% phosphate rock, all mined for bulk sample analyses, phosphate content, and processing characteristics (Krall, and others, 1985). Nothing further was done at the tunnel site and in August, 1961, the adit was sealed with 4-inch planks and all buildings and equipment were removed from the site. The final costs of the underground exploration was $23,196.33 for equipment and $15,320.03 for payroll, benefits, supplies and insurance for a grand total of $38,516.36. As of the writing of this report, the adit is completely caved to the portal with only a few timbers visible (Figure 103).

Figure 98. Area of the Western Fertilizer Association camp of 1950 in Maybe Canyon, June 8, 1998. Photo by the author.

Also during this period of time, WFA excavated two exploration trenches near the south end of the lease, each about 300 feet long and 8 to 10 feet deep (Figure 104). The exploration trenching program

Figure 99. Portal area, Western Fertlizer Association prospect tunnel, July, 1951.
Stewart Williams, geologist, WFA. BLM file photo.

continued into 1951 and eventually the WFA excavated nine trenches on the lease, including reopening the 1948 USGS trench #1210. The trenching program cost WFA approximately $12,500. Other exploration on the lease during 1950-1951 consisted of topographic and geologic mapping, sampling, and sample analyses (Service, 1966).

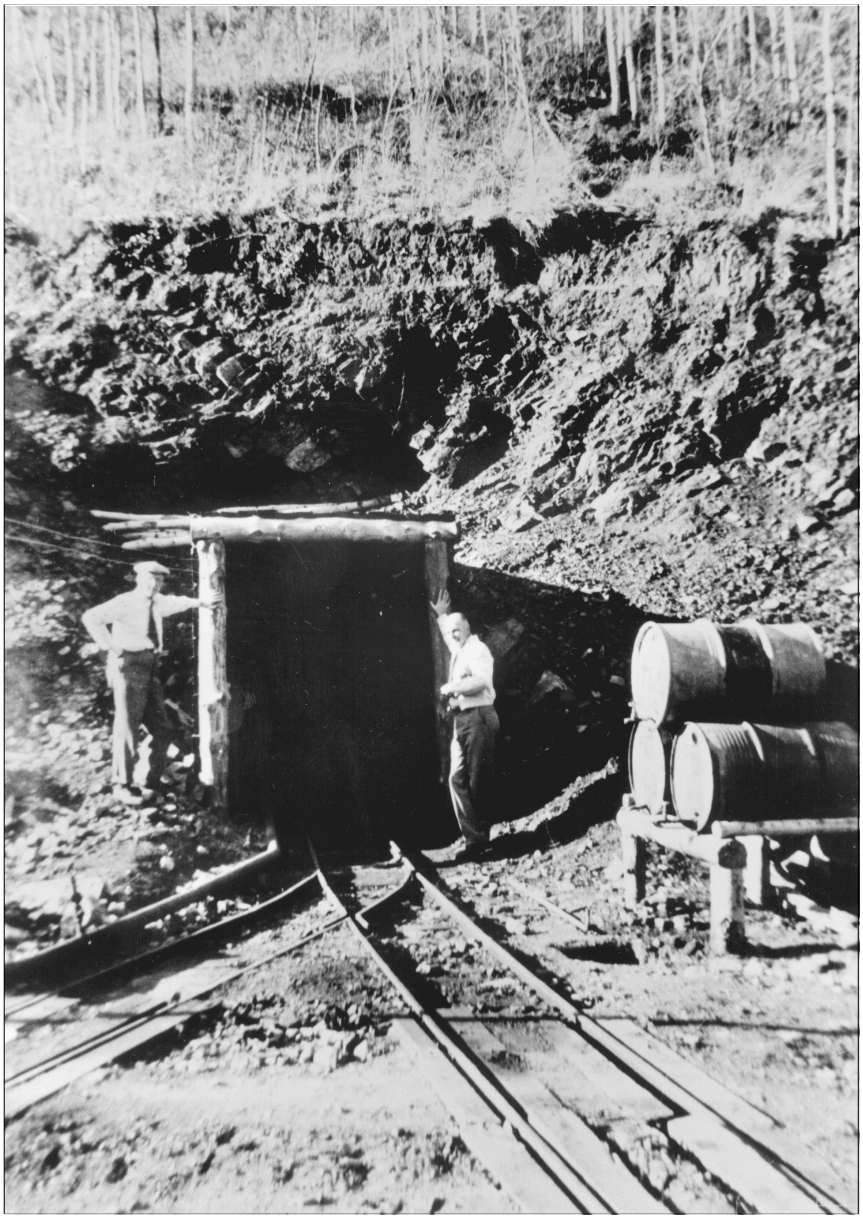

Figure 100. Western Fertilizer Association prospect tunnel in Maybe Canyon, October 10, 1951. Right - C. Donald Emigh, Production Superintendent, Monsanto Chemical Company; left - H. I. Smith, Mining Branch, USGS. BLM file photo.

The BLM held a lease sale for lands adjacent to Lease I-04 on August 29, 1953. There were two bidders with the WFA being the successful high bidder. The J. R. Simplot Company was the second bidder. Because the WFA was the successful high bidder, the lands covered by this lease sale were then incorporated into the Lease I-04.

Figure 101. 500-hp Gardner-Denver compressor, Maybe Canyon underground mine. BLM file photo.

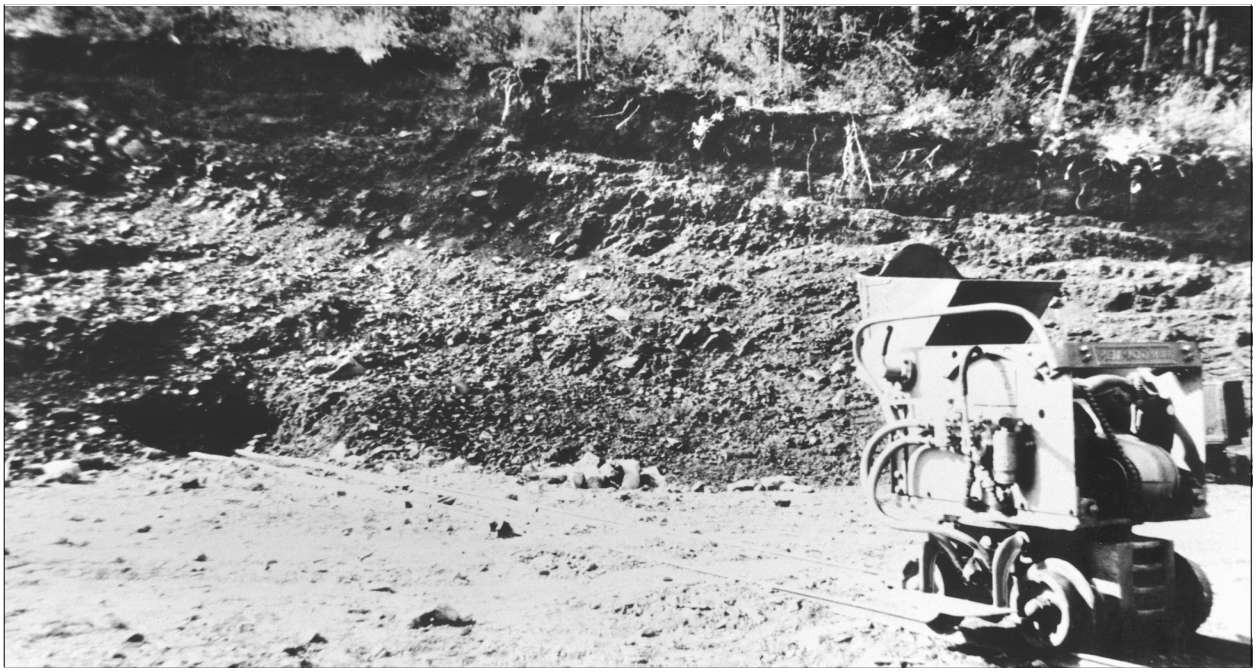

Figure 102. Western Fertilizer Association EIMCO mucking machine and face at Maybe Canyon underground mine, view northeast. BLM file photo.

Figure 103. Caved adit of the Maybe Canyon underground mine, June 8, 1998. Photo by the author.

Based on the exploration conducted on the lease during 1950-1951, WFA applied for a lease modification to add 200 acres to Lease I-04 and on September 30, 1953, the lease was so modified. In the period from late 1951 to early 1959, WFA conducted low level mining activities that consisted of the removal of overburden along the ridge immediately south of Maybe Canyon in preparation for mining (Cressman and Gulbrandsen, 1955), and scattered exploration activities throughout the leasehold.

Apparently, the Western Fertilizer Association was unable to develop a viable phosphate mine on the lease, because, on June 1, 1959, the Lease I-04 was assigned to the Central Farmers Fertilizer Company (CFFC). This company was a large association of farm cooperatives organized in the State of Illinois. The CFFC filed to do business in Idaho on June 11, 1948. The company consisted of the following organizations:

Central Cooperatives, Inc.
Farm Bureau Cooperative Assoc.
Farm Bureau Services, Inc.
Farmers Union Central Exchange
Illinois Farm Supply Company
Iowa Farm Supply Company
Minnesota Farm Bureau Service Co.
Consumers Cooperative Association
Farm Bureau Service Co. of Missouri
Farmers Chemical Company
Farmers Union State Exchange
Indiana Farm Bureau Cooperative Assoc.
Midland Cooperatives, Inc.
Missouri Farmers Association

Nebraska Non-Stock Cooperative Assoc.
Pacific Supply Cooperative
Utah Poultry and Farmers Cooperative
Wisconsin Farmco Service Cooperative
Ohio Farmers Grain and Supply Assoc.
Utah Cooperative Association
Washington Cooperative Farmers Assoc.

The CFFC was a large phosphate operator in the Georgetown Canyon area south of the Maybe Canyon property. There the company had developed a phosphate mine on private land and had erected a processing facility for the phosphate ore. Apparently the company wanted the Maybe Canyon property as an ore reserve for when their other property was exhausted.

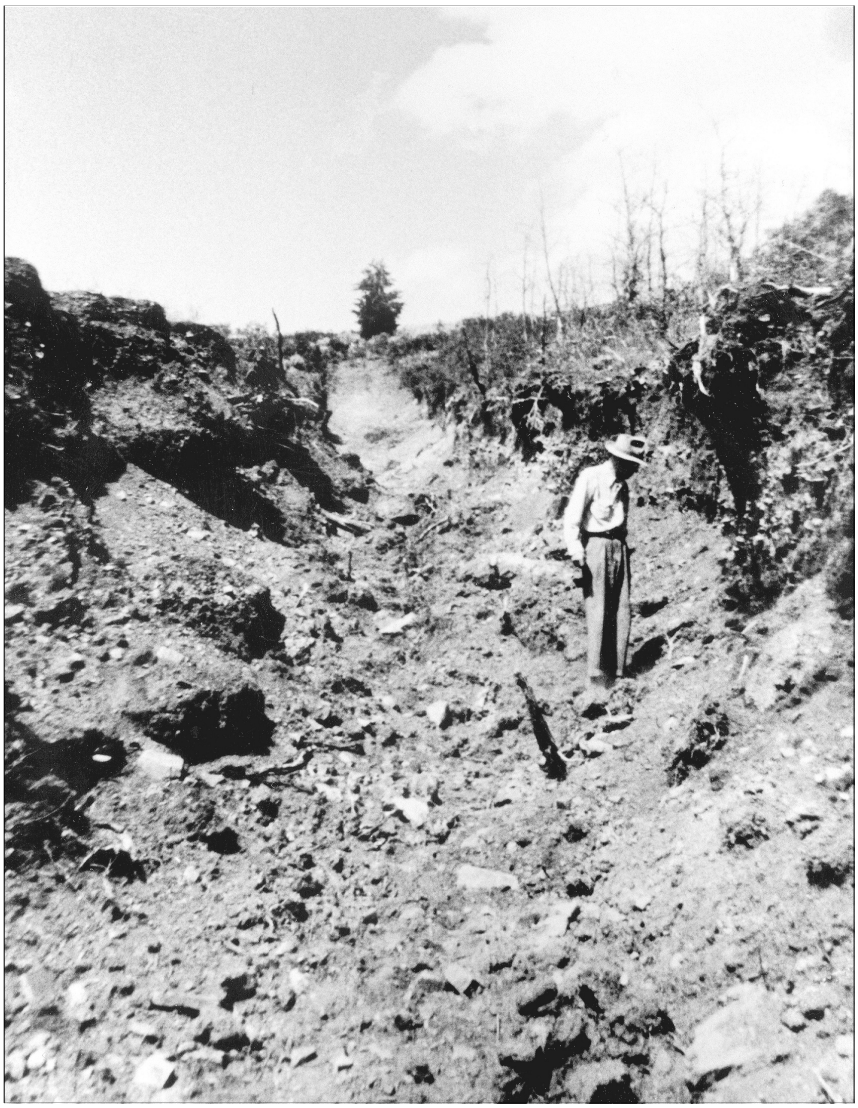

Figure 104. Western Fertilizer Association trench, South Maybe Canyon area, July, 1951. George G. Bywater, Regional Mining Supervisor, USGS. BLM file photo.

Central Farmers Fertilizer Company did nothing on the Lease I-04 for the next five years. In 1964, CFFC initiated efforts to sell the lease and encouraged other companies to look at the property. In July, 1964 the El Paso Natural Gas Products Company purchased all of CFFC's interests in the Georgetown Canyon area. The CFFC then went out of business and withdrew their authorization to do business in Idaho on July 22, 1969. El Paso moved most of the Georgetown Canyon phosphate processing facility to a new plant being built at Conda, Idaho (Service, 1967). This facility consisted of a sulphuric acid plant, fluosolids reactor, crushing and grinding equipment and facilities for manufacturing phosphoric acid and phosphate fertilizer (Service, 1967). This new phosphate processing facility at Conda was called the Charles F. White phosphate plant.

On November 1, 1964, Lease I-04 was assigned to the El Paso Natural Gas Products Company. Shortly after acquiring the lease, the El Paso company began to develop the North Maybe Canyon Mine and construction began on an 18-mile railroad spur between the new plant and the mine area. By the first of June, 1965, the site for the initial open pit had been cleared of brush and trees and stripping of overburden had started. At the same time, construction of a haul road from the top of Dry Ridge to a terminal on the valley floor was initiated (Figure 105). On August 2, 1965, the initial shipment of phosphate ore from the new mine was made to the Conda processing facility on the new railroad spur. Overburden stripping, mining and hauling of ore at the mine was contracted to Wells Cargo, Inc., of Las Vegas, Nevada. The new pit was located between Maybe Canyon and Kendall Canyon. The shipped ore was used for the manufacturing of triple superphosphate and ammonium phosphate fertilizers at the new plant (Day, 1973).

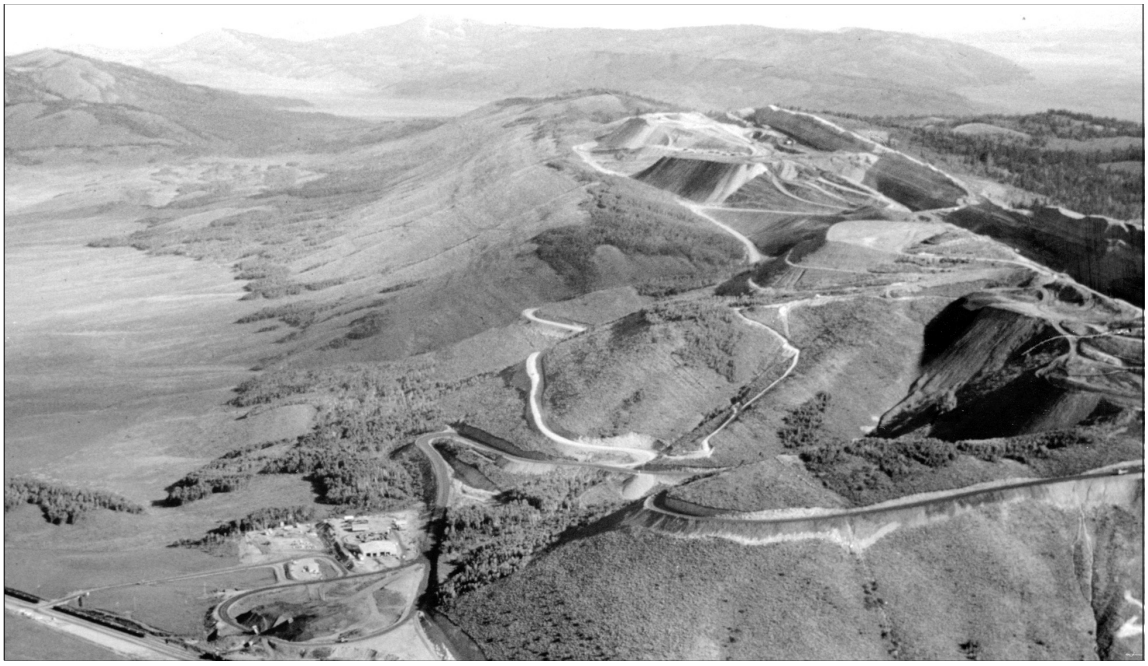

Figure 105. Maybe Canyon Mine, view north, August 12, 1975. Photo by Peter Oberlindacher, BLM.

On January 1, 1966, El Paso Natural Gas Products Company changed their name to El Paso Products Company. Mining continued in the North Maybe Canyon Mine under the newly renamed company until 1967 (Figures 106 and 107). On July 19, 1967, the decision was made by the El Paso Products Company to close the phosphate mine and the associated mill facility at Conda due to the high cost of sulphur and the low price received from fertilizer sales. Operations finally terminated on October 31, 1967.

Figure 106. North Maybe Canyon Mine, August 5, 1966. BLM file photo.

The mine remained closed throughout 1968 and 1969. On April 1, 1970, the lease was assigned to the El Paso Products Service Company. That company did not operate the mine until 1972 when a decision was made to sell the property. Agricultural Products Company (APC) became interested in the closed mine and did some exploratory work and test mining. On November 1, 1972, the lease was assigned to the APC and the mine was reopened. The APC was a wholly owned subsidiary of Beker Industries, Inc. At this same time, Beker Industries, Inc. acquired title to the Charles F. White phosphate plant at Conda (Carter, 1978).

The North Maybe Canyon Mine was re-opened by APC immediately after acquisition. Actual mining operations and ore hauling were done by the Conda Mining Division of the Washington Construction Company, a mining contractor headquartered in Missoula, Montana. Mining was extended north from

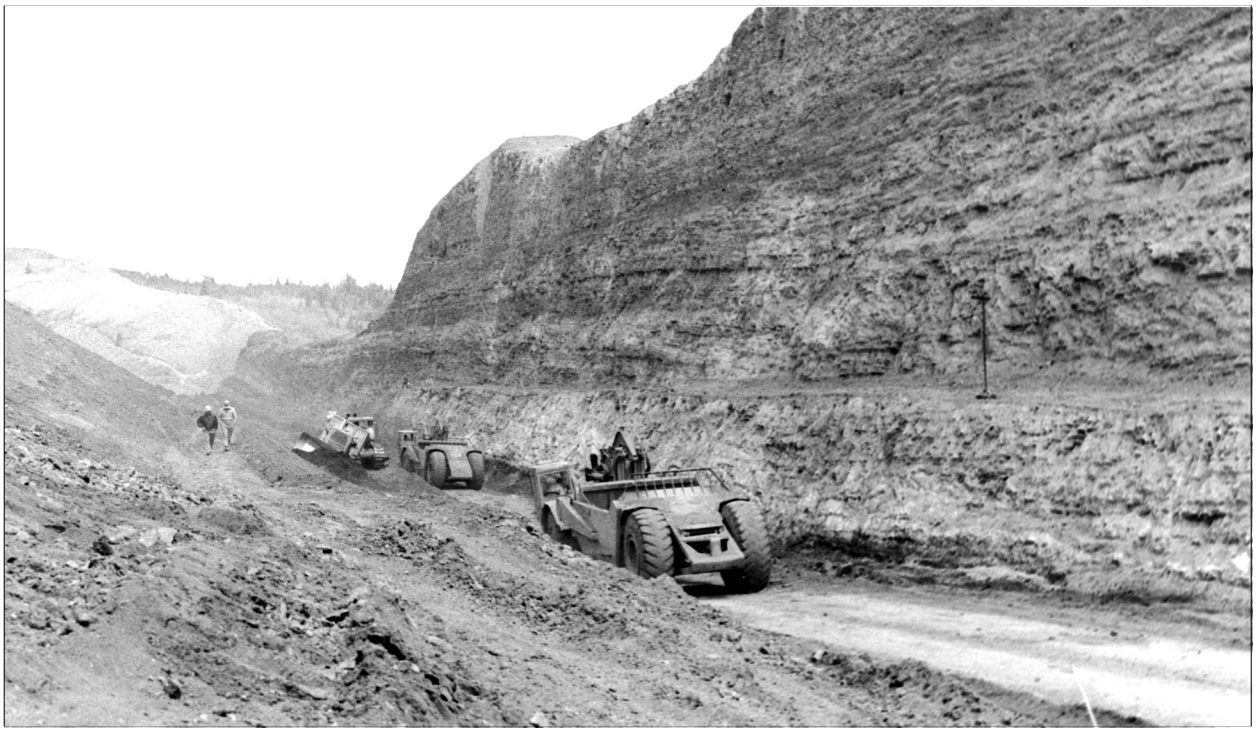

Figure 107. North Maybe Canyon Mine, August 5, 1966. BLM file photo.

the old El Paso pit. Equipment used in mining included 15-inch bore hole drills, 85- and 120-ton haulage trucks, bulldozers, scrapers, and 16- and 24-yard electric shovels (Figure 108).

The mine underwent a major expansion during the 1974 phosphate boom (Carter, 1978). The company roughed out the alignment for the South Maybe Canyon Mine haul road with the plan to open a pit on the southern portion of the lease. On January 1, 1975, the Agricultural Products Corporation was merged into its parent company, Beker Industries, Inc. and ceased to exist as a separate corporation. This merger wasn't officially recognized until April 21, 1975, however this business activity had no effect on the mining status of the Maybe Canyon Mines. Production was slowed down to about half during the latter part of 1975 and into 1976 due to a major phosphate price drop-off (Carter, 1978).

By December, 1976, Beker had started mining in the northernmost section of the South Maybe Canyon Mine in Section 10, T. 8 S., R. 44 E. Reclamation of the southern end of the North Maybe Canyon Mine pit also had started by late 1976. Mining activities ceased in the North Maybe Canyon Mine and by 1977, all mining occurred in the South Maybe Canyon Mine. This portion of the mine was plagued with slope stability problems in the waste dump areas. Because of these stability problems, french drains were constructed under the new dumps to drain surface water.

Figure 108. Maybe Canyon Mine, fall, 1978. Photo by Peter Oberlindacher, BLM.

On January 1, 1979, Beker Industries, Inc. assigned 50% of the Lease I-04 to Western Co-operative Fertilizer (US), Inc. (WCF) and on the same day, Beker and WCF combined to create the Conda Partnership. All of the phosphate properties, including the processing facility at Conda were transferred to the new partnership. Western Co-operative Fertilizer (US), Inc. was a US subsidiary of an Alberta, Canada fertilizer company. Beker Industries, Inc. ran the Maybe Canyon Mine for the partnership as a truck/shovel and scraper/dozer operation (Krall and others, 1985), with the Conda Mining Division of Washington Construction Company continuing to perform the stripping, mining, hauling, loading, and unloading activities. In November, 1979, Conda Partnership reactivated the North Maybe Canyon Mine and began to mine both north and south mines simultaneously until 1984.

Beker Industries, Inc. filed for reorganization relief under Chapter 11 of the Bankruptcy Code on October 21, 1985. This action caused mining to decrease and in May, 1986, the two Maybe Canyon mines and the Conda mill were closed. In July, 1987, Nu-West Industries, Inc. purchased the Conda mill and Beker Industries' 50% interest in Conda Partnership. The new partnership restarted operations in August, 1987 and resumed full-scale production in April, 1988.

Production from the two mines continued at a moderate rate and in 1993, the North Maybe Canyon Mine was mined out and closed with only reclamation activities conducted. The South Maybe Canyon Mine went to an inactive status in 1995, but was not formally closed.

Georgetown Canyon Mine

For a period from April, 1906 to October, 1907, 16 association placer mining claims were located on the phosphate deposits of Georgetown Canyon (Table 9, Figure 109). There were three separate groups or associations of locators for those claims. Unpublished records in the BLM show that all but four of the claims were sold by the initial locators to the Utah Fertilizer and Chemical Manufacturing Company (UF&CMC). Four of the claims (Superior Placer, Superior No. 1 Placer, Superior Placer No. 2, and Superior Placer No. 3) were sold by the initial locators to the Southern California Orange Grove Fertilizer Company who in turn sold the claims to UF&CMC just prior to patenting. The Southern California company was the same company that located and patented the phosphate placer claims at the Conda Mine, discussed earlier.

The UF&CMC was incorporated January 29, 1908 specifically to purchase the mining claims at Georgetown Canyon and at other places and develop mines on the phosphate property (Campbell, 1923). The UF&CMC applied for and received patent for all 16 placer mining claims in 1912, 1915, and in 1916. Robert J. Shields of the Salt Lake City law firm of Henderson, Pierce, Critchlow and Barrette was the agent and attorney-in-fact for the UF&CMC. Shields later became the mine manager of the Georgetown Canyon Mine (Campbell, 1921).

The first known report of mining related activity in Georgetown Canyon was in 1909 (Gale and Richards, 1910). On the Superior Extension placer mining claim, the UF&CMC put down two tunnels, each having a southeasterly trend, one being about 125 feet long and the other less than 30 feet long (Richards and Mansfield, 1914) (Figure 110). There was a third tunnel of about 50 feet in length located on the Highland No. Two placer mining claim. Richards and Mansfield (1914) also reported on several other tunnels including two on the Great Producer placer mining claim, one of about 110 feet and one of about 60 feet in length. There were two short tunnels located on the Great Deposit placer mining claim. There was also a short tunnel located in the southeast corner of the Hillside placer mining claim. All of these tunnels along with many shallow pits and trenches located along the outcrop of the phosphate rock were made by the UF&CMC in 1911 to 1912 as part of their placer claim development and assessment work. The heavy snowfall and avalanches of the winter of 1911 delayed opening some of these underground workings until 1912 (Richards and Mansfield, 1914).

Also, in 1909, a tramway was being constructed on the Highland placer claim and a tunnel about 82 feet in length, a shaft 14 feet deep, and several shallow cuts were found. The tramway was located in the southern part of the claim and ran northwest down a shallow gulch toward the Canyon proper. Richards and Mansfield (1914, p. 56) report that the tramway was about 3,000 feet in length and had a vertical drop of about 1,000 feet, but had not been completed as of 1914. No trace of this tramway remains. The mineral survey of 1915 for the Superior, and the Superior Nos. 1, 2, and 3 placers noted several open cuts and tunnels on those claims that were made for development and assessment requirements. All in all, a total of approximately 800 feet of underground development in nine tunnels and two shafts was completed on the 16 placer mining claims held by the UF&CMC. No

Table 9. Patented mining claims of the Georgetown Canyon Mine.

Claim Name	Date of Location	Mineral Survey Number	General Land Office Serial Number (Blackfoot)	Patent Number	Date of Patent
Great Producer Placer [1/]	August 16, 1906	2558	BL-09168	245166	January 29, 1912
Great Deposit Placer [1/]	August 17, 1906	2558	BL-09168	245166	January 29, 1912
Highland Placer [1/]	June 13, 1906	2497	BL-07447	483955	July 26, 1915
Highland No. One Placer [1/]	June 18, 1906	2505	BL-07448	483956	July 26, 1915
Hillside No. 1 Placer [2/]	August 15, 1907	2505	BL-07448	483956	July 26, 1915
Hillside No. 2 Placer [2/]	October 15, 1907	2505	BL-07448	483956	July 26, 1915
Superior Extension Placer [3/]	May 29, 1907	2505	BL-07448	483956	July 26, 1915
Highland No. Two Placer [1/]	June 25, 1906	2564	BL-09167	488040	August 25, 1915
Hillside Placer [2/]	August 15, 1907	2564	BL-09167	488040	August 25, 1915
Highland No. 4 Placer [1/]	April 1, 1906	2778	BL-022726	548595	October 3, 1916
Highland No. 3 Placer [1/]	June 28, 1906	2778	BL-022726	548595	October 3, 1916
Highland No. 5 Placer [1/]	July 2, 1906	2778	BL-022726	548595	October 3, 1916
Superior Placer [3/]	May 9, 1907	2783	BL-022747	548596	October 18, 1916
Superior No. 1 Placer [3/]	May 29, 1907	2783	BL-022747	548596	October 18, 1916
Superior No. 2 Placer [3/]	May 29, 1907	2783	BL-022747	548596	October 18, 1916
Superior No. 3 Placer [3/]	June 29, 1907	2783	BL-022747	548596	October 18, 1916

[1/] Claims located by Louis Fugal, Annie Boren, Oscar Olsen, John Boren, Lizzie Thorne, Stena Van Horne, James Thorne, and Hervy Van Horne.

[2/] Claims located by John A. Widtsoe, Lewis A. Merrill, John A. Macfarlane, Susa Y. Gates, Jacob F. Gates, Leah D. Widtsoe, Osborne Widtsoe, and Nora A. Macfarlane.

[3/] Claims located by Jacob F. Gates, Lewis A. Merrill, John A. Macfarlane, Osborne Widtsoe, Louis Fugal, John A. Widtsoe, Leah D. Widtsoe, and James Thorne.

Note:

The Superior, Superior No. 1, Superior No. 2, and Superior No. 3 placer mining claims were at one time owned by the Southern California Orange Grove Fertilizer Company but were patented by the Utah Fertilizer and Chemical Manufacturing Company. All of the other placer mining claims were located for or were acquired from the original locators and patented by the Utah Fertilizer and Chemical Manufacturing Company.

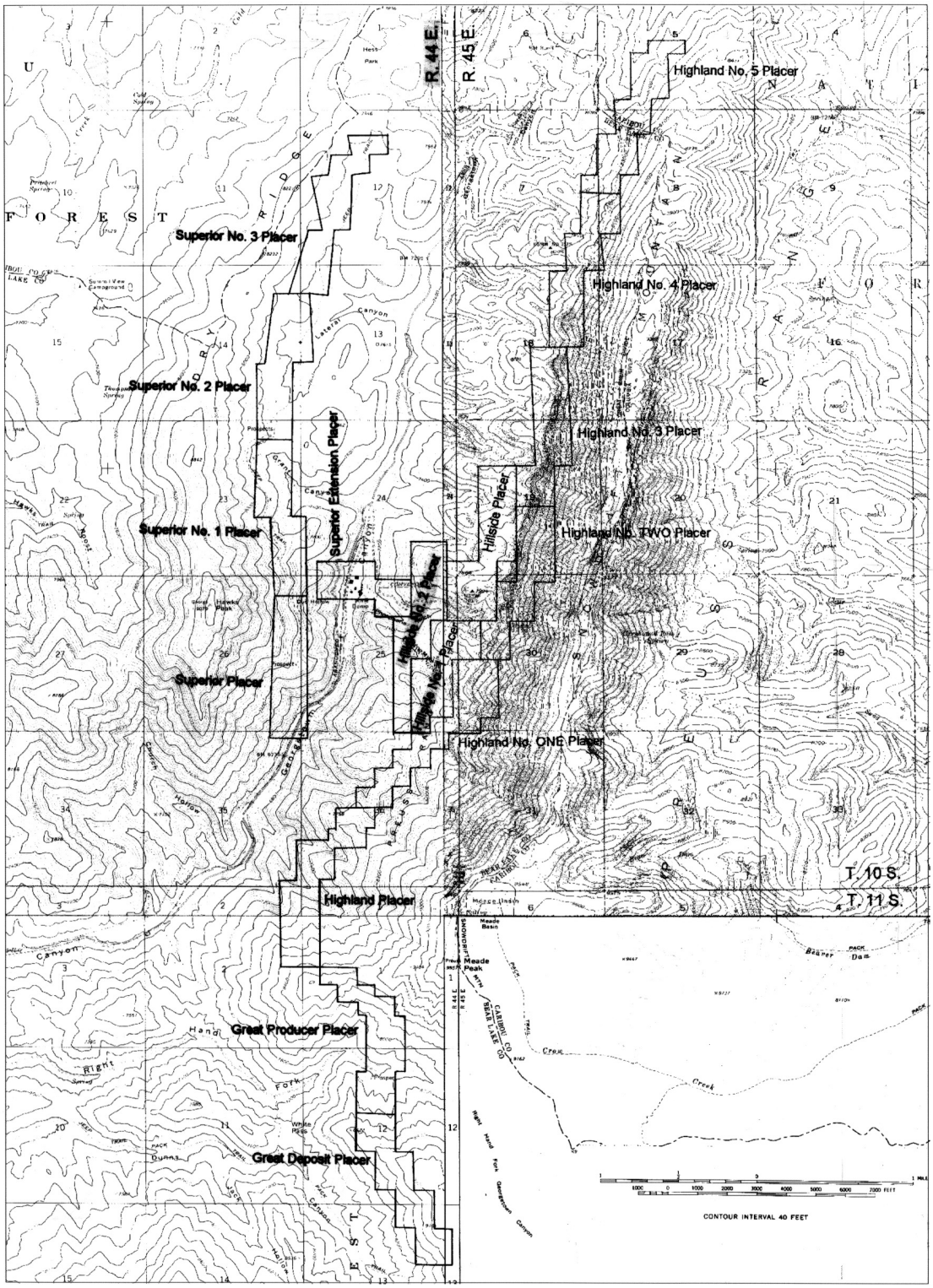

Figure 109. Map showing the location of the patented mining claims of the Georgetown Canyon Mine, Bear Lake and Caribou Counties, Idaho.

Figure 110. View of Tunnel Improvement No. 2, Superior Extension Claim, Georgetown Canyon Mine, October 3, 1916. Photo from the General Land Office Patent Case File No. 548596, National Archives and Records Service, Washington, D. C.

production oriented underground mining was ever accomplished by the UF&CMC on these patented placer claims.

In 1916, the UF&CMC under the management of Robert J. Shields started negotiations to bring a railroad spur line up Georgetown Canyon for a distance of about six or seven miles (Bell, 1916). However, the railroad spur was not built until the processing facility was constructed in the Canyon in

1957-1958. In 1919, Bell (1919) reported that the phosphate properties held by the UF&CMC were under negotiations for sale to an unnamed buyer.

In 1928, the UF&CMC sold all of its interests in the 16 patented placer mining claims of Georgetown Canyon to the Stockholders Syndicate of Los Angeles, California (Campbell, 1928). It is of interest to note that the last president of record of the Utah company was a man by the name of F. W. Braun of Los Angeles. At the time of sale and transfer of title of the 16 patented claims, F. W. Braun of Los Angeles was listed as the president of the Stockholders Syndicate.

From its purchase of the 16 patented placer claims in 1928 until 1953, Stockholders Syndicate did only upkeep work on the property with no mining of phosphate ore. In 1953, it was reported that Stockholders did 2,400 feet of tunneling during the year and that the work was done under contract to Centennial Development Company of Eureka, Utah (McDowell, 1953). It was reported that, in 1954, there was 1,350 feet of tunneling, 550 feet of drifting and 300 feet of raises done during the year, with 2 tunnels, the principal one being 3,019 feet long, and a total of 4,600 feet of underground workings (McDowell, 1954). However, throughout all of this spate of underground activity and development, there was no reported production from the mine, and by 1955, the property was again idle.

The 16 patented placer mining claims of Stockholders Syndicate were sold to Central Farmers Fertilizer Company in 1955 (Hansen, 1964). The Central Farmers Fertilizer Company was a large farm co-operative made up of smaller farm co-ops throughout the south, midwest, and northwest United States and southern Canada (Emigh, 1959). The Central Farmers company very soon after acquisition of the property announced that plans were being made to begin a $7.5 million project to construct a processing plant and open a mine in Georgetown Canyon. In fact, construction started on a processing plant with an electric furnace and kiln in the Canyon in 1957 (Figures 111 and 112) (Cressman, 1964) and open pit mining was first reported in June, 1958. The railroad spur that was first conceived in 1916 was finally constructed up the Canyon to the site of the new processing facility in 1957. The facility consisted of a beneficiation plant (Figure 113), 35,000 kw electric furnace, phosphoric acid plant, and fertilizer processing plant, and was completed in May, 1959 (Figures 114 and 115) (Service, 1966). By late 1959, all underground mining had been abandoned and by 1960, the new open pit was approximately 3,000 feet long, 100 feet wide, and 100 feet deep (Fletcher, 1960).

Open pit mining progressed until 1963 (Figure 116) when the pit was reported to be approximately 10,000 feet long, 250 feet wide, and 100 feet deep (Hansen, 1964). A conveyor belt was used to move ore from the open pit to the processing plant (Figure 117 and 118). This conveyor system, unique to western phosphate mining, was located about two miles north of the defunct 1909 tramway mentioned above. The belt, more than 5,000 feet long, was constructed in two stages, and had a cutting bridge at the plant end. The first stage was 3,200 feet long, the second stage was 1,300 feet long, and the cutting bridge was 650 feet long (Figure 119). The vertical fall from the mine grizzly to

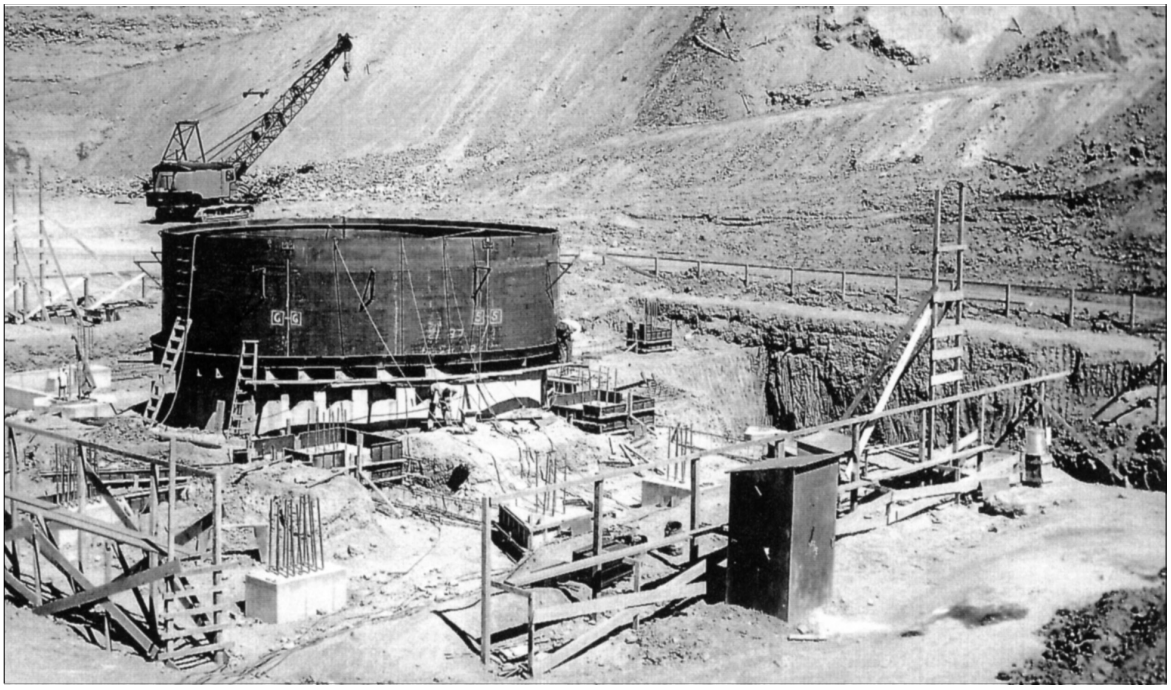

Figure 111. Furnace construction, Georgetown Canyon, 1957. Photo courtesy of the Idaho Geological Survey.

Figure 112. Kiln construction, Georgetown Canyon, 1957. Photo courtesy of the Idaho Geological Survey.

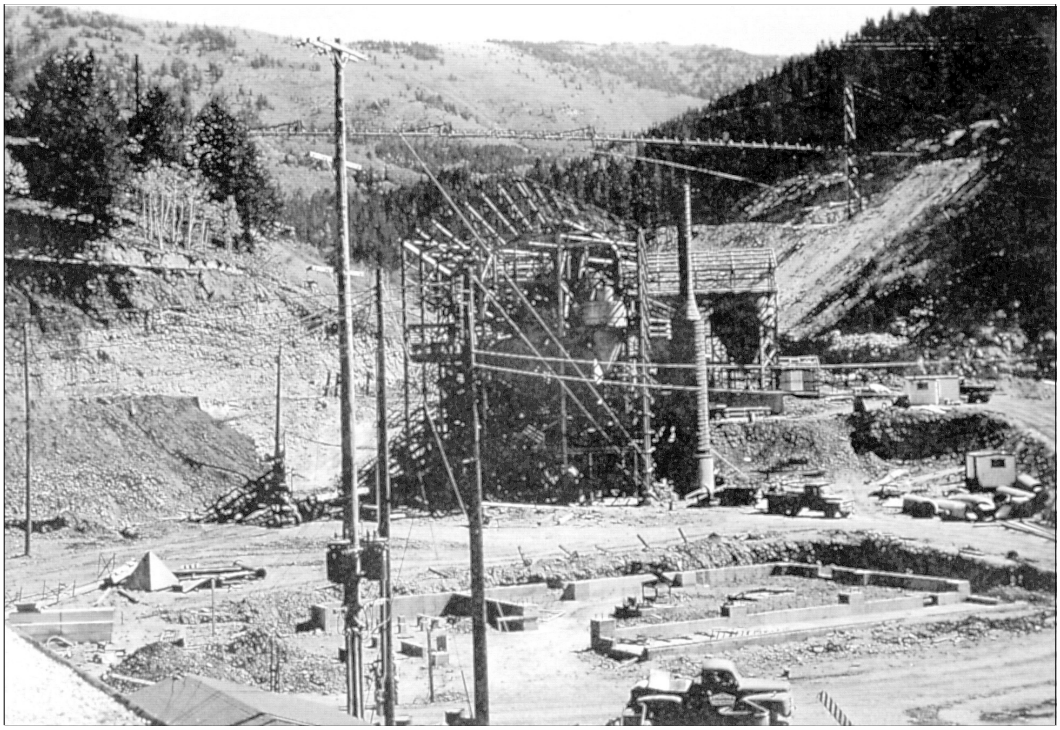

Figure 113. Phosphate rock beneficiation building, Georgetown Canyon, 1958. Photo courtesy of the Idaho Geological Survey.

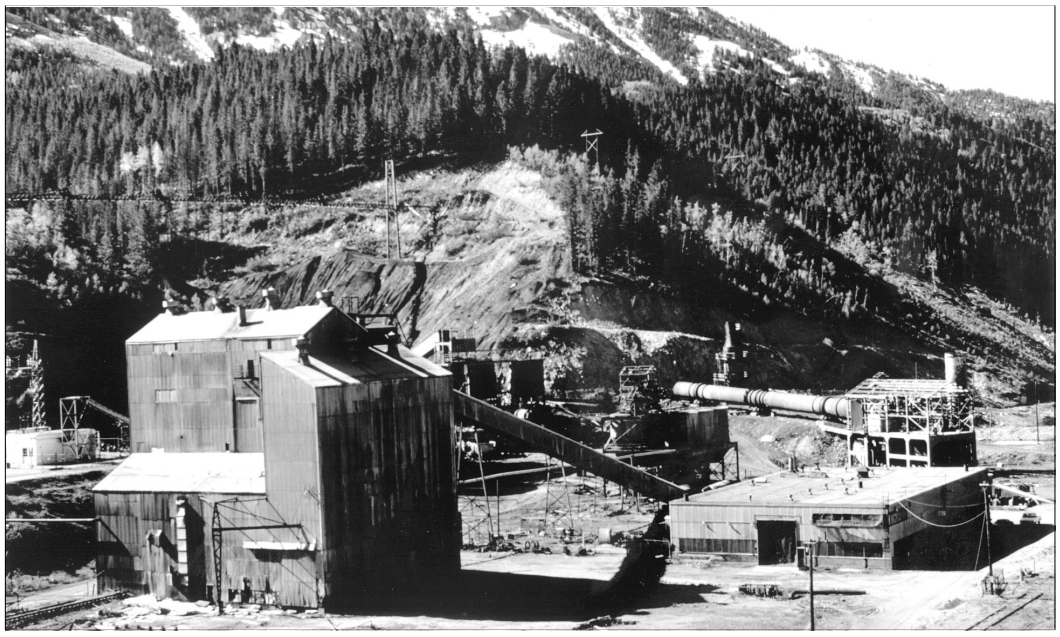

Figure 114. Georgetown Canyon phosphate plant of the Central Farmers Fertilizer Company, June, 1978. Photo by Peter Oberlindacher, BLM.

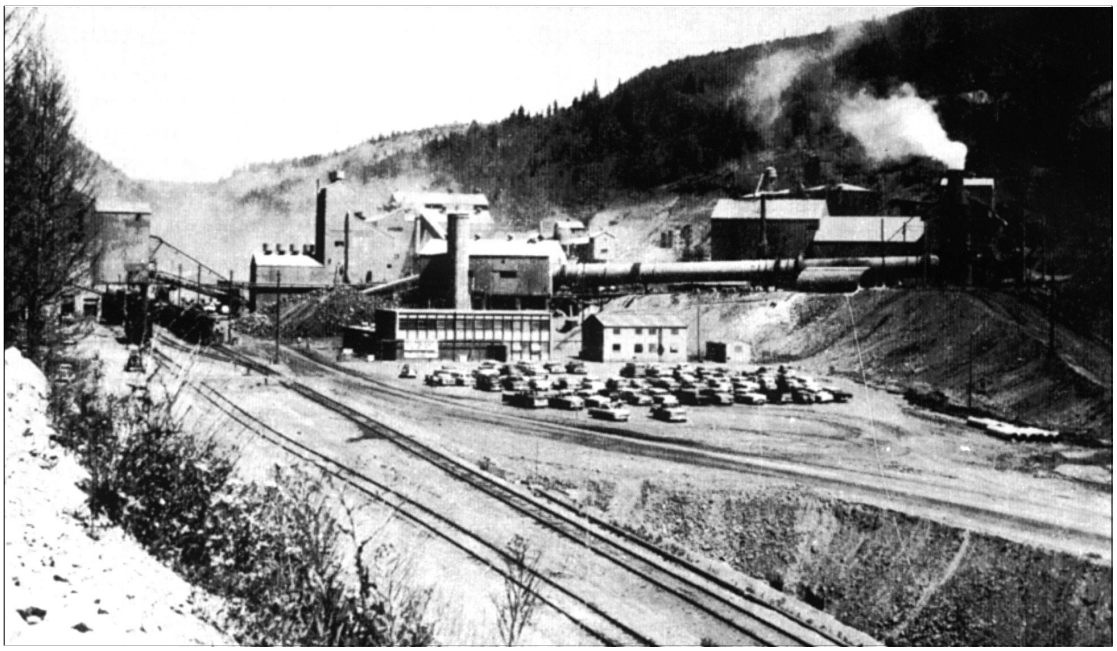

Figure 115. Central Farmers Fertilizer Company plant in Georgetown Canyon, date unknown. Photo from Service, 1967, p. 59.

Figure 116. Georgetown Canyon Mine, date unknown. Photo from Service, 1967, p. 61.

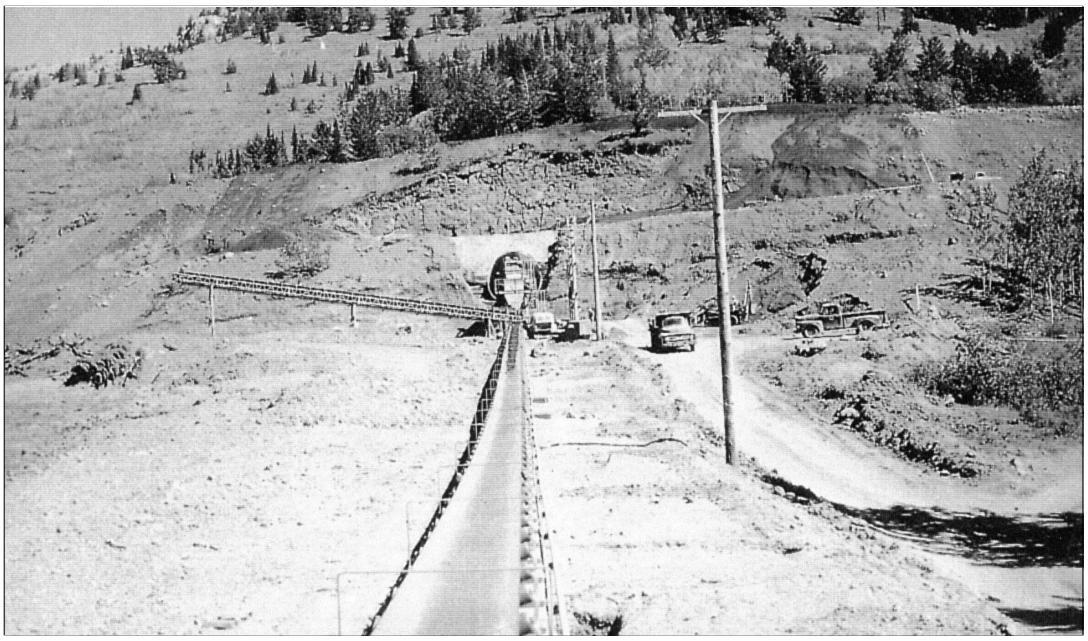

Figure 117. First ore starts down the conveyor belt at Central Farmers Fertilizer Company's Georgetown Canyon Mine, date unknown. Photo courtesy of the Idaho Geological Survey.

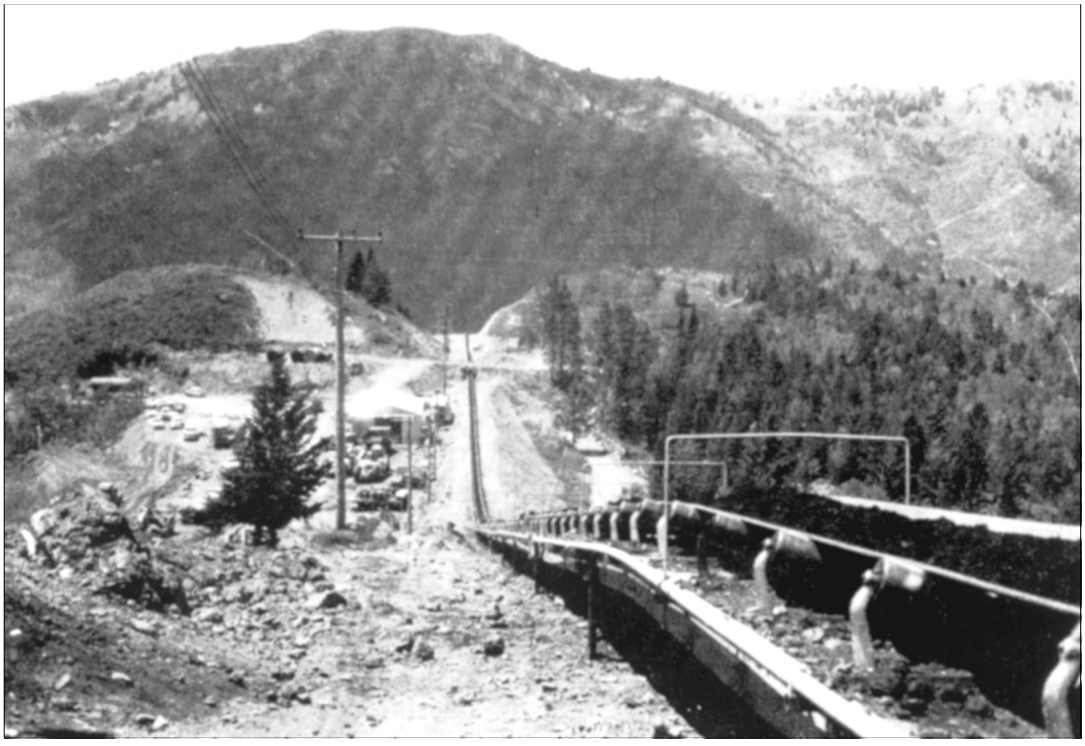

Figure 118. Conveyor belt at Georgetown Canyon Mine, date unknown. Photo from Service, 1967, p. 62.

the cutting bridge (a devise, anchored at one end by the conveyor mechanism, and used to evenly stockpile the mined ore) was about 850 feet (Service, 1966).

Figure 119. Cutting bridge at Central Farmers Fertilizer Company complex, date unknown. Photo from Service, 1967, p. 64.

In 1964, production stopped from the mine. In July, 1964, the El Paso Natural Gas Products Company bought the Georgetown Canyon phosphate properties from the Central Farmers Fertilizer Company (Hansen, 1965) and in October, closed the plant facility and moved parts of it to Conda where the company was building a new phosphate processing plant (Service, 1967).

The Georgetown Canyon Mine has not produced phosphate ore since 1964, however, the mine ownership has changed hands several times since then. In May of 1972, Agricultural Products Corporation (APC) purchased the mine properties from El Paso. Agricultural Products Corporation was a wholly owned subsidiary of Beker Industries Corporation. In 1972, APC was dissolved and all of their property holdings, including the Georgetown Canyon mine were assigned to the parent company, Beker Industries. In January of 1979, Beker Industries Corporation sold 50% of their holdings, including the Georgetown Canyon mine, to Western Co-operative Fertilizer, Ltd., USA and formed the Conda Partnership. In 1987, the Beker Corporation filed for a Chapter 11 bankruptcy and a financial group called Nu-West Industries, Inc. replaced the Beker Corporation in the Conda Partnership. In 1992, Nu-West Industries, Inc. bought out the Western Co-operative Fertilizer, Ltd., and formed a wholly owned subsidiary named Nu-West Mining, Inc. to replace the co-op in Conda Partnership. In 1995, the Conda Partnership was dissolved and all of the mine properties were

assigned to Nu-West Mining, Inc. In October of 1995, Nu-West Industries was acquired by Agrium, Inc., a Canadian firm based in Calgary, Alberta. As of this writing, no name changes have occurred and the mine properties, including Georgetown Canyon mine remain under the ownership of Agrium, U.S.

Blackfoot Narrows Mine
(Terteling Pit, Wooley Valley Unit #1)

On November 30, 1953, the BLM received an application to lease certain lands in T. 7 S., R. 43 E., from the J. A. Terteling and Sons Company (Figure 120). A lease sale was held March 11, 1955. There were four bidders at the sale; the Utah Construction Company, Grant J. Murdock, J. A. Terteling and Sons Company, and the Monsanto Chemical Company. The Terteling Company was the successful high bidder and was issued Federal Lease I-04775 on June 1, 1955.

The Terteling company immediately started stripping operations on the lease July 27, 1955 with actual mining and production starting in September, 1955. Initially, the ore was stockpiled at the mine in three separate piles according to grade; 31.5% P_2O_5, 24-27% P_2O_5, and 17% P_2O_5. The ore was stockpiled at the mine pending development of load-out facilities in Soda Springs. The mine was basically an experimental operation (Service, 1966).

According to an unpublished Bureau of Mines safety report (August 14, 1956), the mine consisted of three side-hill excavations with overburden varying from 1 to 50 feet. Ore was mined and trucked from the mine to the stockpiles which were located about one half mile from the pit. A selective bench system of mining was used and benches varied from six to eight feet in height. Overburden was removed with a bulldozer and power-operated shovel and all overburden that could not be wasted at the site of the mining operation was trucked and dumped a short distance from the mine. Exposed ore was mined by a power shovel and loaded directly onto trucks. Service (1966) reported that, in 1956, the mine was 2,000 feet in length, the depth of the cut was 80 feet.

After the mining season of 1956, except for some ore that was sold and shipped in 1960, the mine was shut down. The J. A. Terteling and Sons Company assigned the Federal lease to the Terteling Land Company on April 1, 1959. The Stauffer Chemical Company entered into negotiations with the Terteling Land Company in early 1967 in order to obtain phosphate reserves. Lease I-04775 was further assigned to the Stauffer Chemical Company on June 1, 1967.

The Stauffer Company reopened the Blackfoot Narrows Mine July 27, 1967 and shipped some ore to their Victor Chemical Works plant in Silver Bow, Montana. Stauffer contracted with the Terteling Company to act as operator of the reopened mine. The Terteling Company subcontracted the mine operations to the MacGregor Triangle Company. Plans were developed in 1967 for a 2-mile spur railroad line to connect with the existing El Paso Products railroad and run northward to a new load-out facility. At the end of the 1967 mining season, the pit was 4,800 feet in length.

In 1968, the 2-mile rail spur was built to the new Wooley Valley tipple site, north of the Blackfoot Narrows pit. Ore was hauled northward from the Blackfoot Narrows Mine. During the 1967-68 mining seasons under the ownership of the Stauffer Chemical Company, the production amounted to more that half of the entire production from the mine.

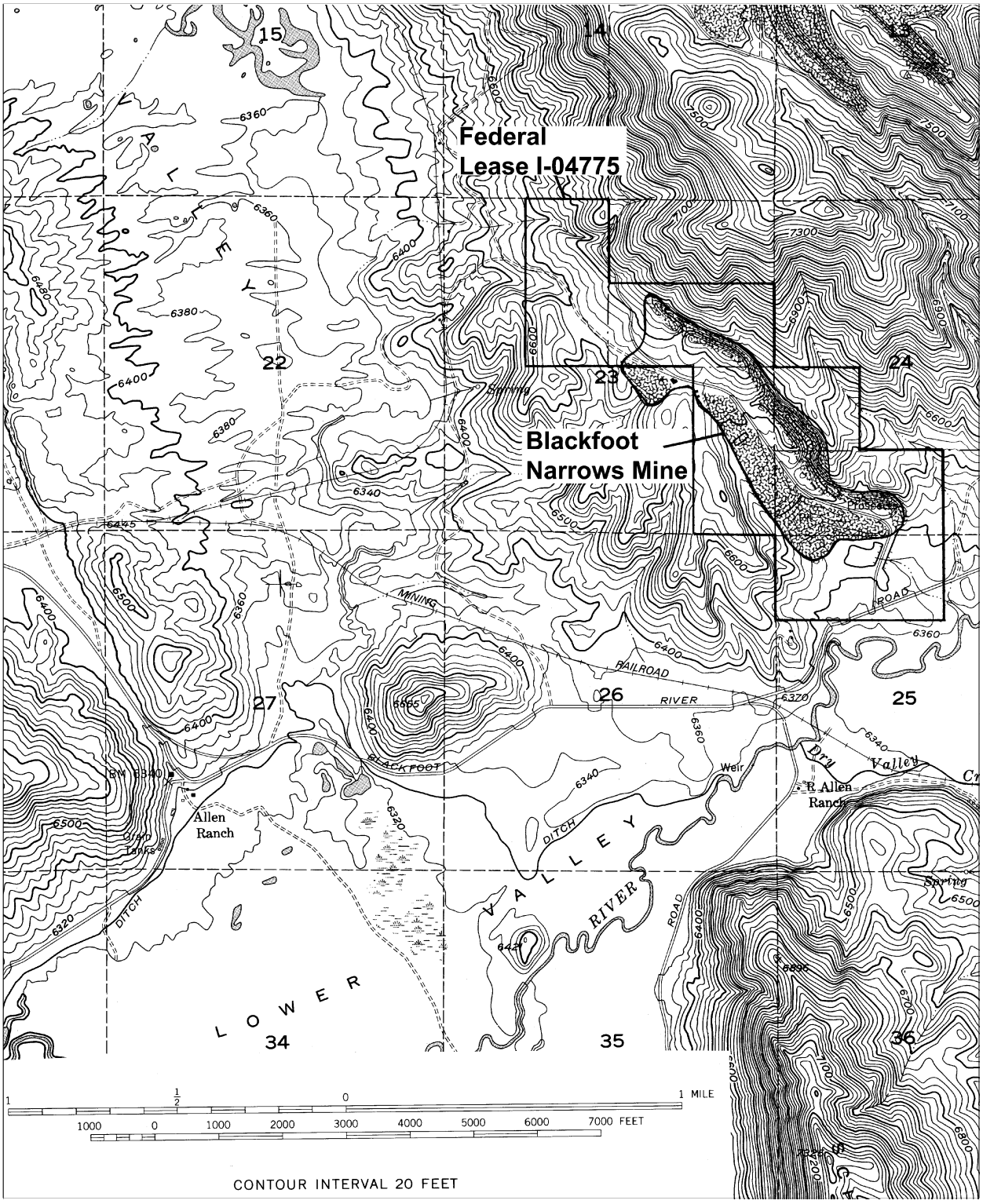

Figure 120. Map showing the location of the Blackfoot Narrows Mine, Caribou County, Idaho.

According to an unpublished Bureau of Mines report dated September 12, 1967, surface structures at the mine included railroad-loading facilities with weigh scales for scrapers, two buildings and two trailers. The phosphate rock was loaded directly into scrapers which were pushed by bulldozers. Each scraper carried about 50 tons of ore to the stockpiles at the rail loading facilities. Front end loaders moved ore from the stockpiles to rail cars.

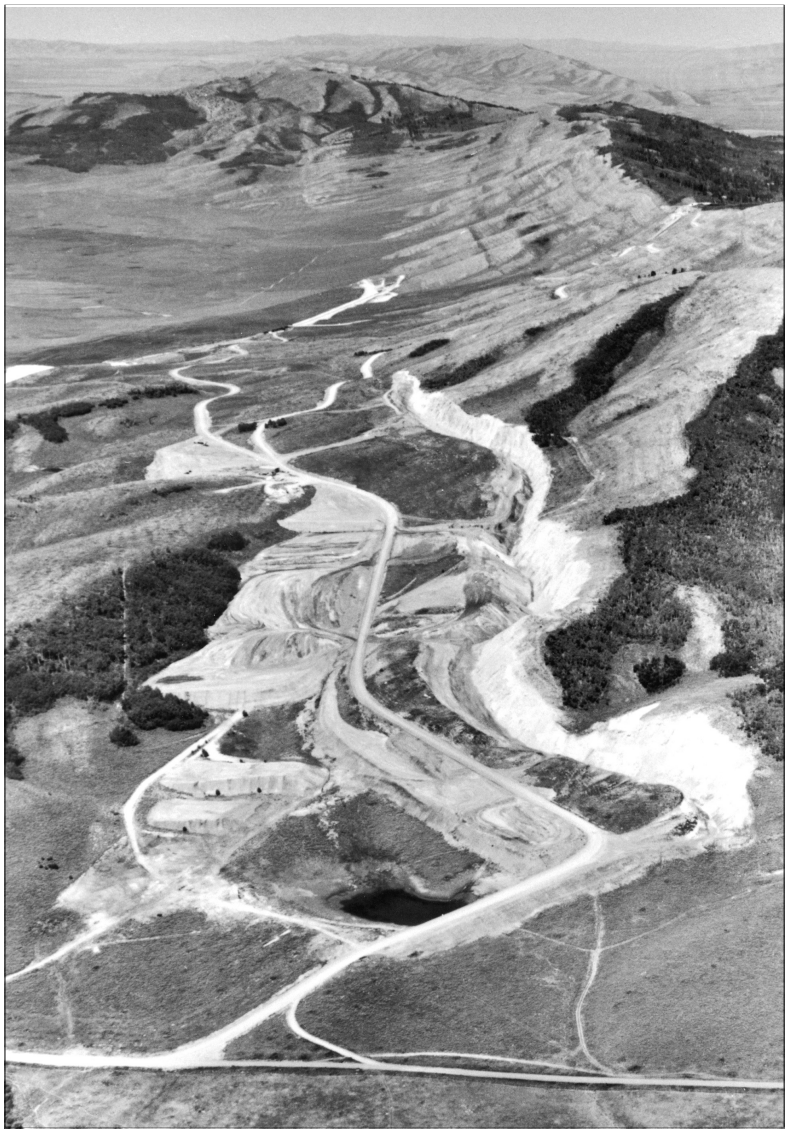

Figure 121. Blackfoot Narrows Mine, view north, 1975. BLM file photo.

Mining was suspended and the mine was closed in August, 1969. Under today's economic mining limits, the mine is considered depleted and mined-out (Figures 121, 122, and 123). In 1985, Stauffer's

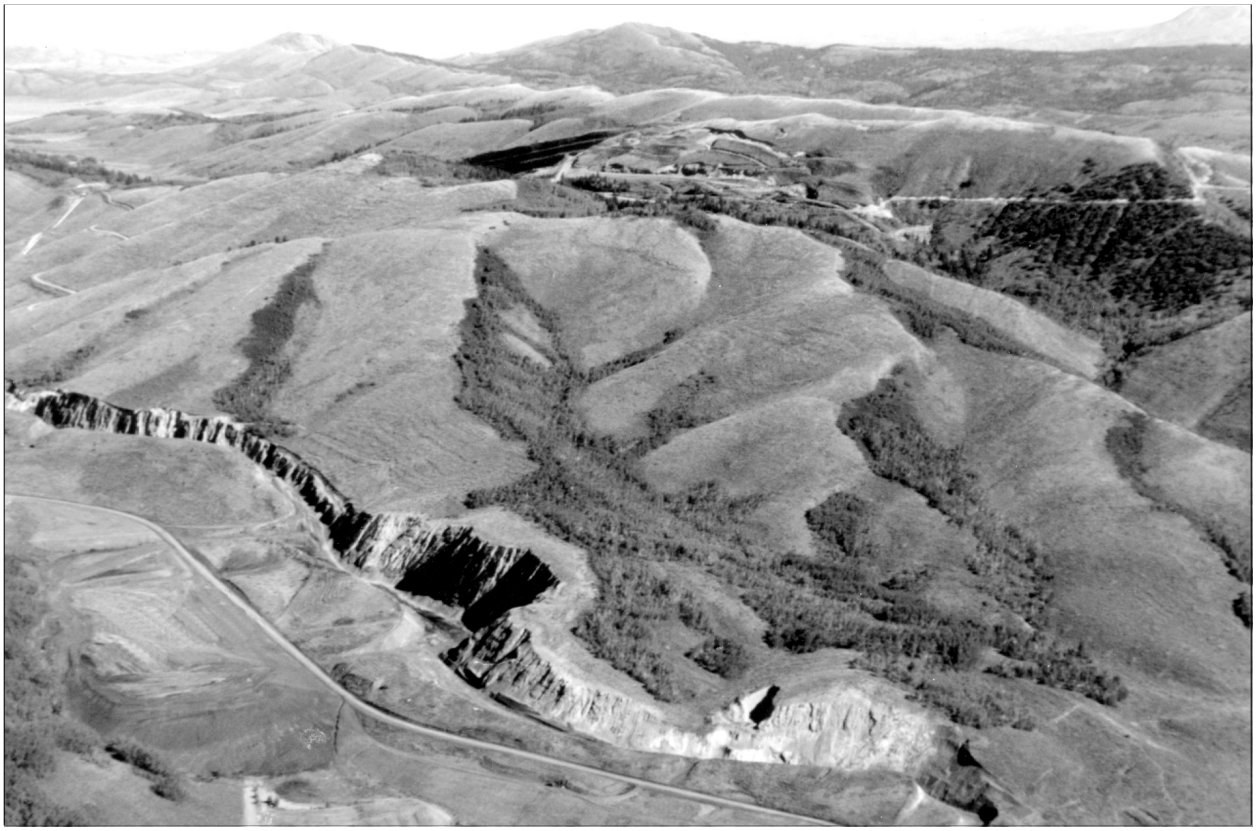

Figure 122. Blackfoot Narrows Mine, August 19, 1978. BLM file photo.

Figure 123. Blackfoot Narrows Mine, view north, June 27, 1996. Photo by the author.

Idaho phosphorous operations was purchased by the Cheeseborough-Ponds Company, which in turn was acquired in 1986 by Unilever N. V. Unilever sold all of the Idaho/Montana phosphate operations to the Imperial Chemicals Industries Company of Great Britain (Bennett, 1994). This company promptly sold some of Stauffer's basic and specialty chemical businesses. By September, 1987, all of Stauffer's Idaho operations were owned by Rhône-Poulenc, Inc., the US subsidiary of the French company, Rhône-Poulenc SA (Anonymous, 1989). On February 1, 1998, Rhone-Poulenc assigned I-04775 to Rhodia, Inc., and as of this writing, the Federal Lease I-04775 remains current and open.

There is currently a limestone quarry located on the east side of the old Blackfoot Narrows mine pit. This operation is on a BLM-issued free use permit to Caribou County, Idaho. The limestone is used on Caribou County road projects.

Centennial Mine

The presence of phosphate in the Centennial Range of Montana and Idaho has been known for many years (Condit and others, 1928). However, it wasn't until the summer of 1950 that mining interest was expressed after three geologists from the USGS mapped the phosphate deposits in detail and made the information available to the public (Honkala, 1953). The newly generated information concerning the phosphate deposits of this area created a small bit of competition between the J. R. Simplot Company and the San Francisco Chemical Company for the phosphate in the area, but the Simplot Company prevailed. The J. R. Simplot Company made an application for a federal non-competitive lease for lands on the southwest slope of Taylor Mountain, a prominent peak in the Centennial Range. That lease (I-02400) was issued to the Company on August 1, 1953. Based on the success of obtaining that lease, the Simplot Company applied for a federal non-competitive lease on additional lands adjacent to their phosphate lease. This application was rejected because, by now, the existence of the phosphate was well known and was only available by competitive leasing. A lease sale for those lands was held on May 12 1954, and the Simplot Company was the successful bidder. A lease (I-05379) was issued October 1, 1954. All in all, the J. R. Simplot Company came to hold three federal phosphate leases in this area, including one on the Montana side of the Range (MT-012510) (Figure 124).

Exploration on the leases was conducted during 1953 and 1954 and was essentially completed in October of 1955. The exploration consisted of detailed geologic studies, trenching, core drilling, and core analyses. Approximately 15 trenches were put in to uncover the phosphate ore. Discovered ore was classified as either underground ore or open pit ore. An access road to the leases were built during the fall of 1955 to Odell Creek, a distance of about 7 miles.

The mining season for the Centennial Range deposits was very short, generally from July 1 to October 1, due to the high altitude (from 8,000 to over 9,000 feet). The areal extent of the phosphate ore was divided into five mining areas. Only Areas 2, 4, and 5 were mined. The first mining activity started with the stripping of the overburden in Area 2, Block 1 on June 16, 1956, with actual mining and trucking of ore starting July 24, 1956. McDowell (1955) reported that operations at the mine had begun. At that time, the mine equipment consisted of two D-9 Caterpillar bulldozers, two carryalls, and one 1-yard shovel (Figure 125). The produced ore was shipped to fertilizer plants in Alberta, Canada. Area 2, Block 2, on "Goose Pimple Ridge" was mined between October, 1956 and August, 1957. Area 5 (MT-012510) was also mined at about this same time. The last area to be mined was the easternmost Area 4, with overburden removal and mining starting August 27, 1957. McDowell (1957) reported that all of the operations in 1957 were open pit with surface mining and development only.

An improved haul road to the railhead at Monida, Montana was built from June 1 to June 19, 1957. Ore was shipped by truck 37 miles to the railroad at Monida. Construction of an ore crushing and loading facility at Monida was started on March 8, 1957 and was completed June 1, 1957 (Figure 126).

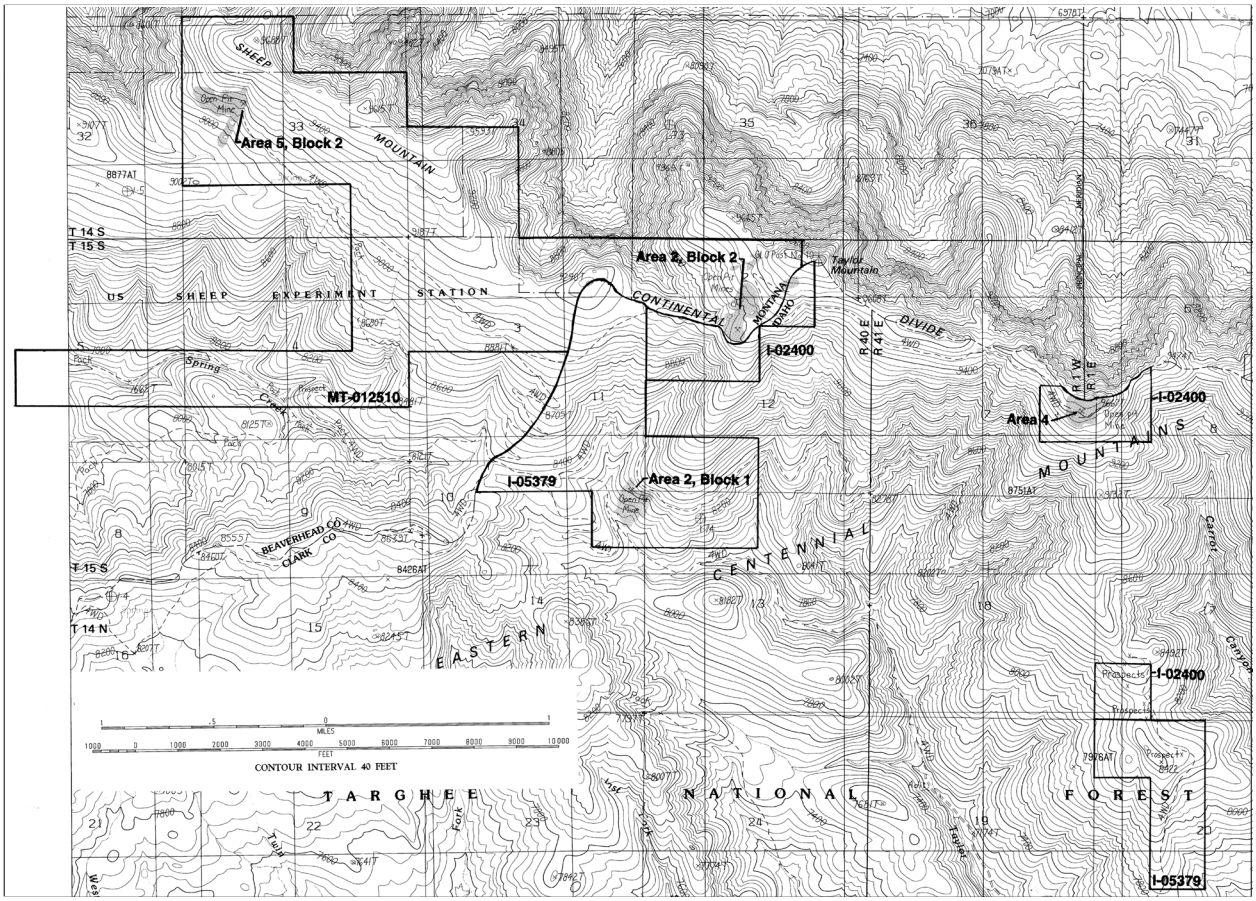

Figure 124. Map showing the location of the Centennial Mine, Clark County, Idaho and Beaverhead County, Montana.

While the bulldozers and shovels were busy moving ore, the leases themselves were undergoing change. Business decisions within the J. R. Simplot Company were being made. The two Idaho leases (I-02400 and I-05379) were assigned from the J. R. Simplot Company to The Ruby Company on July 1, 1956. The Ruby Company was a wholly owned subsidiary of the J. R. Simplot Company. These leases were later assigned to the Bannock Chemical Company (June 1, 1966), another wholly owned subsidiary of the J. R. Simplot Company. The leases were finally assigned back to the Simplot Company for good on February 1, 1983.

The last reported production from the Centennial Mine was in 1958. Early in 1959, a decision was made to close the mine. At the time of closure, the mining equipment on site consisted of one 1-yd Northwest diesel shovel, one 3/4-yd Northwest diesel shovel, three D-9 Cats, two D-8 Cats, 2 Cat patrols, one portadrill (Figure 127), one payloader, one Euclid water truck, and six pickup trucks. There were 28 men employed in the mine and the loading facility. Open pit reserves had been essentially mined out, leaving only the underground reserves. Underground operations were not

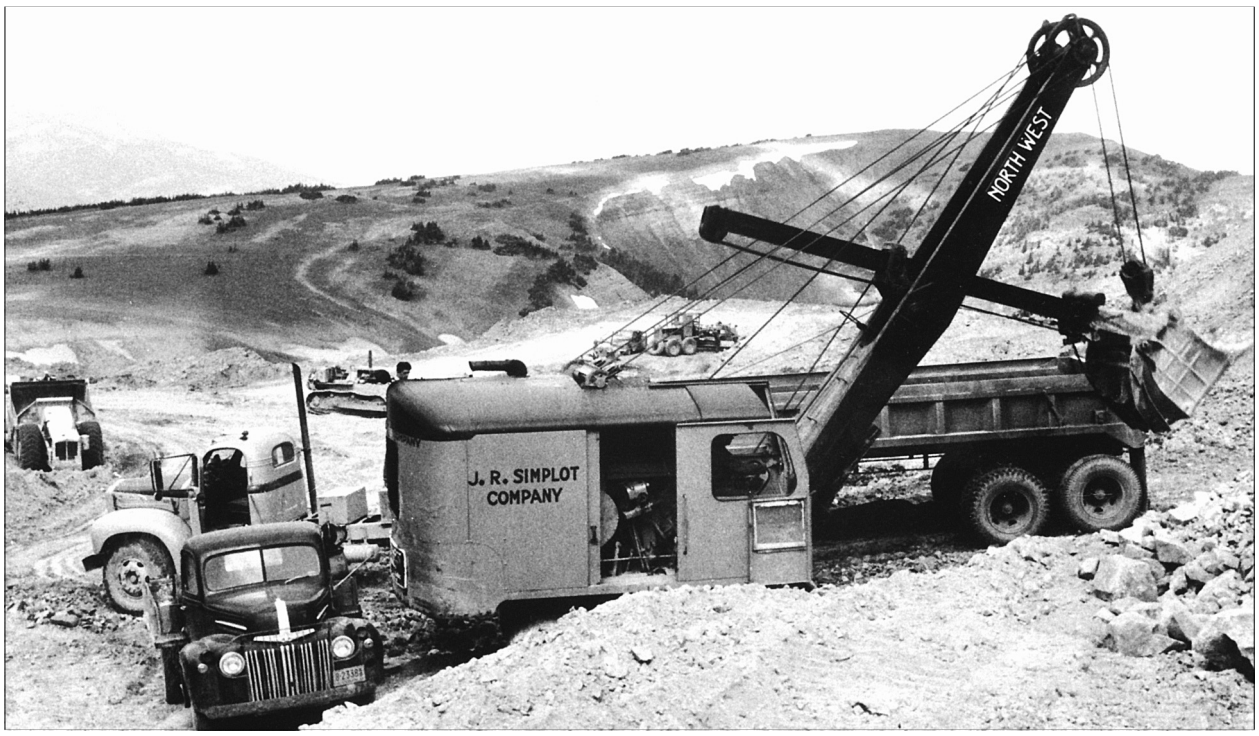

Figure 125. Centennial Mine, September 23, 1957. BLM file photo.

Figure 126. Loading Centennial Mine phosphate ore at Monida, Montana, September 23, 1957. BLM file photo.

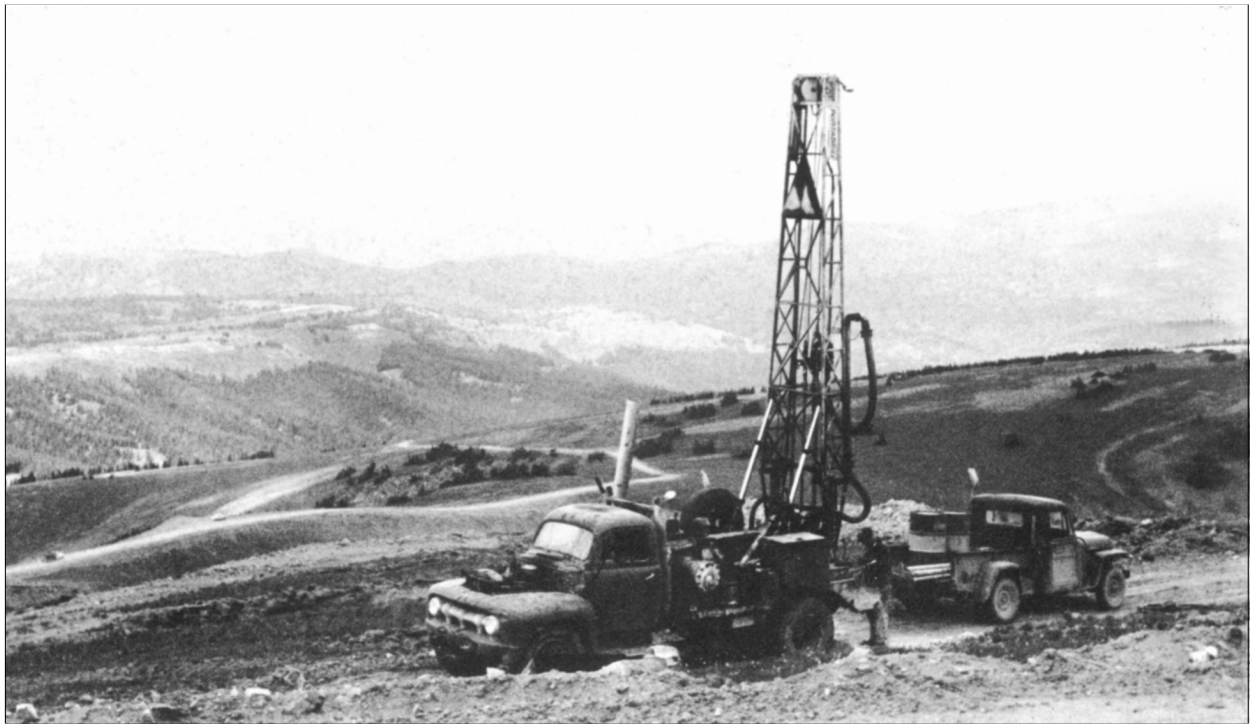

Figure 127. Drilling rig, Centennial Mine, September 23, 1957. BLM file photo.

economically justified at that time and current market constraints worked against continuing the mine. Fletcher (1959) made the first report that the property was idle.

Reclamation was started shortly after the mine closure and was completed during the mid-1960's. There was a brief episode of underground reserve exploration in 1960. Some 40 drill holes were put down on both Idaho leases for a total of 1,417 feet. There was also extensive erosion control work conducted. The leases remain idle as of this writing, waiting until underground mining of phosphate becomes a viable business venture. The J. R. Simplot Company remains the Federal lessee of record.

Diamond Gulch Mine

On November 14, 1905, eight individuals in the employ of the San Francisco Chemical Company (SFCC) located the Diamond Placer mining claim in Section 32 and 33 of T. 9 S., 43 E., BM (Figure 128). Those individuals were William S. Goodfellow, Hugh Goodfellow, Joseph J. Taylor, R. W. Hart, John Shepard Eells, H. L. Atkinson, Richard M. Lyman, and Richard A. Sullivan, all familiar names in phosphate mining claim location. Nearly two years later, on October 1, 1907, seven employees of San Francisco Chemical Company located the Dodo Placer mining claim, adjacent to the Diamond Placer. Those individuals were Joseph J. Taylor, Richard A. Sullivan, E. M. Sullivan, Arthur F. Rice, M. H. Rice, T. T. Huntington, and F. J. Brandt. It should be noted that Joseph J. Taylor was agent and attorney in fact for San Francisco Chemical Company.

During the summer of 1910, the SFCC conducted extensive exploration on the two placer mining claims (Mansfield, unpublished field notes). Apparently, it was the intent of the company to patent both of these placer claims because a formal mineral survey was conducted on September 23, 1912. The Diamond Placer was explored by 11 open cuts (trenches) and four short tunnels, for a total excavation volume of 11,032 cubic yards. The Dodo Placer was explored by 13 open cuts, three short tunnels and one vertical shaft for a total excavation volume of 14,048 cubic yards (Mansfield, 1927, p. 245-247, describes some of these workings).

Although phosphate ore was discovered in most of the excavations on the two placer claims, the company eventually chose not to patent the property under the Mining Law. The property remained inactive until 1956. During the middle 1950's, SFCC began to see the mining effort at their Waterloo Mine come to a close. In order to maintain their position, the company sought other areas of phosphate to mine and mill. On December 19, 1956, SFCC applied to the BLM for a competitive lease for 320 acres covering essentially the same ground that was covered by the two placer claims. At the request of the USGS, the BLM added an additional 40 acres to the desired parcel. BLM held a competitive lease sale on March 21, 1957. There were two bidders for the lease tract and SFCC was the successful high bidder. A Federal phosphate lease (I-07881) for 360 acres was issued to the company on May 1, 1957.

Initial stripping of the overburden began on May 3, 1960 (Figure 129) and actual mining of ore began on May 16, 1960 (Figure 130). This was the first phosphate mine to be opened and operated on Caribou National Forest lands (USGS, 1977). Operations were conducted by two subcontractors, Cherf Bros., Inc., and the Sankey Contractors, Inc. The mine consisted of two connected open pits (Figure 131). Ore was removed with a front end loader and loaded into trucks (Figure 132). The ore was then transported by trucks to a pulverizing plant at Montpelier, Idaho (Service, 1966.).

The mine operated only during the mining season of 1960. About 84,000 tons of phosphate ore were shipped from the mine. Mining proved difficult because of extensive faulting and pinching of the ore

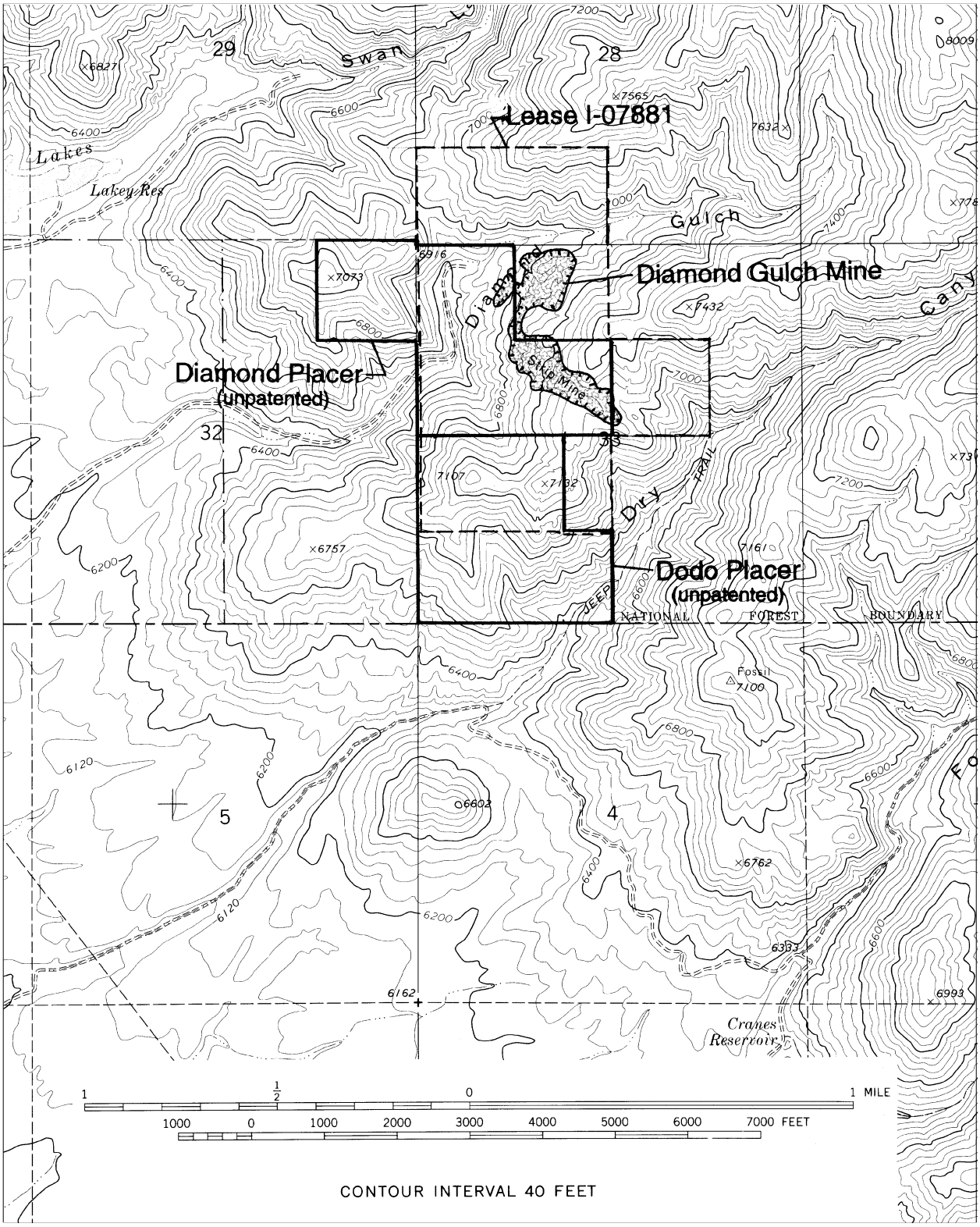

Figure 128. Map showing the location of the Diamond Gulch Mine, Caribou County, Idaho.

Figure 129. Stripping overburden, Diamond Gulch Mine, May, 1960. BLM file photo.

Figure 130. Mining ore, Diamond Gulch Mine, May, 1960. BLM file photo.

Figure 131. Diamond Gulch Mine, 1975, view east, showing open pit boundaries. BLM file photo.

bodies. Only the high-grade phosphate ore was sold and the lower-grade phosphatic shales were stockpiled on the lease and at the company's processing facility. Since the SFCC had no facilities to upgrade the phosphatic shales, an effort was made to sell the shales to either the Monsanto Company or the Central Farmers Fertilizer Company as feedstock for electro-processing into elemental phosphorous. Monsanto even engaged in a small drilling and analysis program on the lease but decided that they did not need the ore for their processing. Because of the failure to sell the lower grade shales and other economic and geologic considerations, the mine was closed prior to the 1961 mining season. Reclamation was conducted on the mine site during 1961 and 1962 (Figure 133).

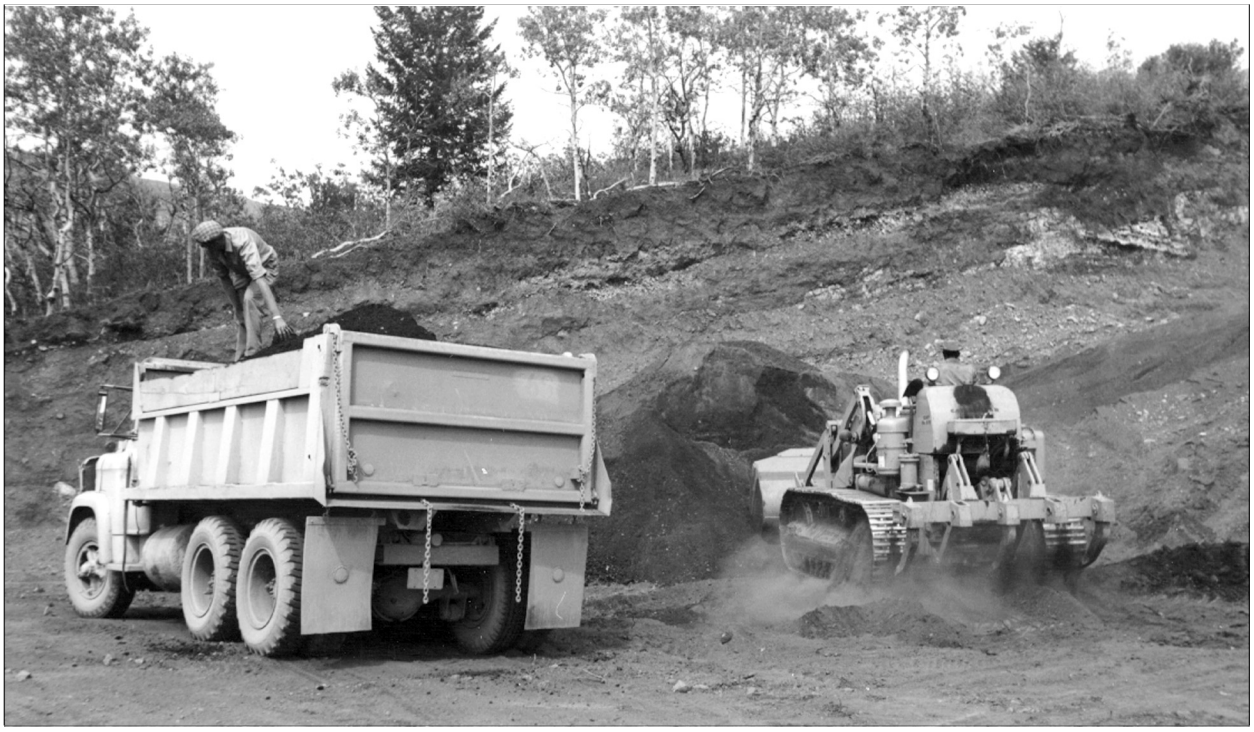

Figure 132. Loading ore, Diamond Gulch Mine, May, 1960. BLM file photo.

Figure 133. Diamond Gulch Mine, June 26, 1996. Photo by the author.

On December 31, 1968, the SFCC was dissolved with all of their assets and liabilities being assumed by the Stauffer Chemical Company, the company's sole shareholder. Stauffer Chemical Company did no further work at the Diamond Gulch Mine other than maintain the reclamation. During June, 1987, the Stauffer Chemical Company and its operations were acquired by Imperial Chemical Industries, Ltd., a United Kingdom chemical giant. Imperial Chemical Industries immediately sold what had been the Stauffer company and its holdings. By September, 1987, Stauffer's former Idaho operations were firmly in the hands of Rhône-Poulenc Basic Chemicals, Inc., the US subsidiary of the major French minerals processor, Rhône-Poulenc, SA (Anonymous, 1989). The Diamond Gulch Mine remained closed throughout all of these transactions and on May 12, 1993, Rhône-Poulenc relinquished the Federal lease I-07881.

Fall Creek Mine

The Fall Creek mine is located in the NW¼NW¼ Section 17, T. 1 N., R. 43 E., in Bonneville County, Idaho. Geographically, the mine is about three miles southwest of the Snake River, up the Fall Creek Canyon, and about 1,200 feet up a small unnamed side canyon to the northwest (Figure 134).

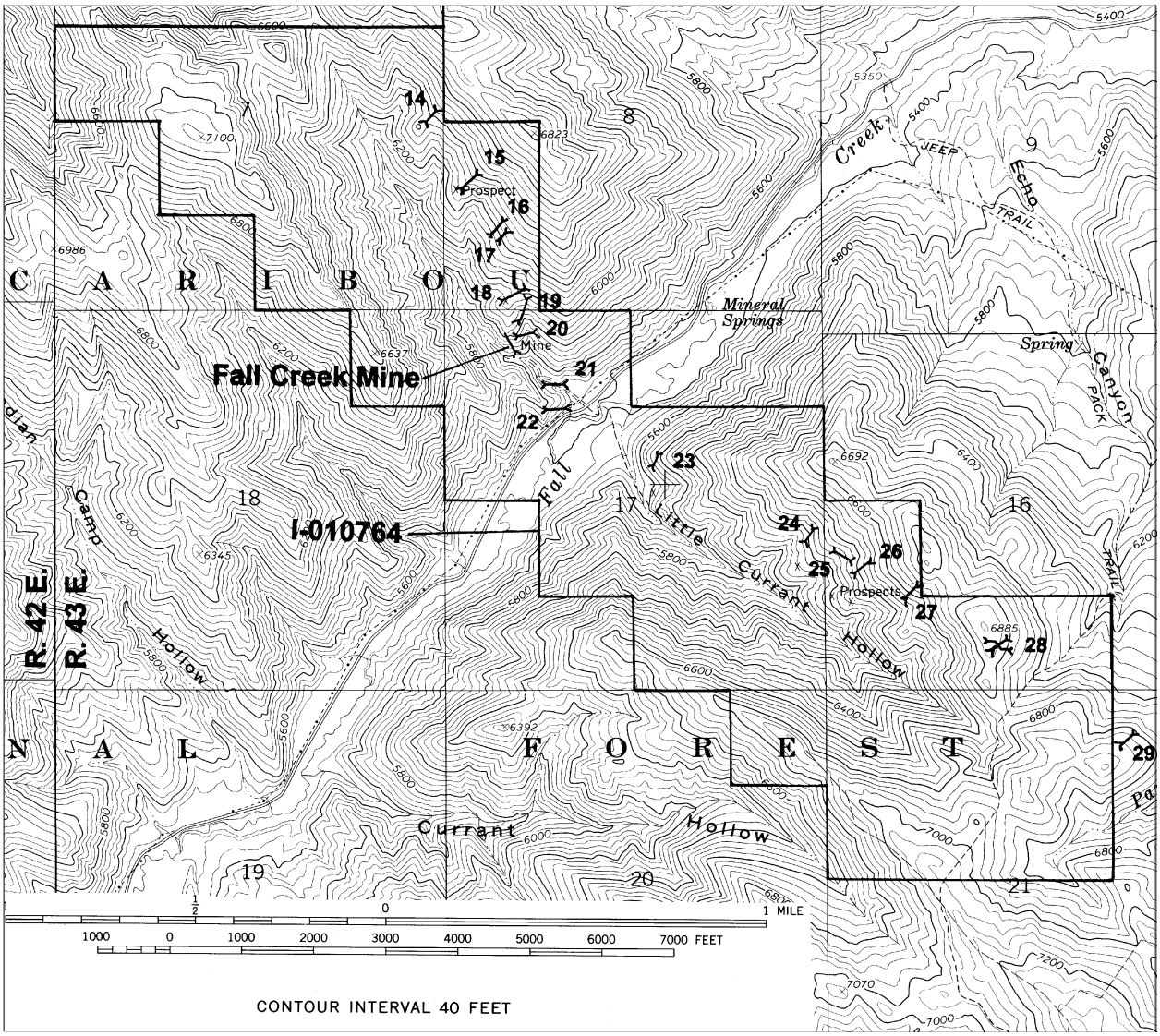

Figure 134. Map showing the location of the Fall Creek Mine, Bonneville County, Idaho.

The occurrence of phosphate in this part of the Caribou Range has been known for many years (Schultz and Richards, 1912; Schultz, 1918; Kirkham, 1924). There was no exploration interest in these deposits until September, 1950 when the USGS hand dug some trenches in the area and sampled

the phosphate ore (Smart and others, 1954, p. 5). The mineral resources of the Fall Creek area were discussed by Vine and Moore (1952) and Savage (1961), and the geology of the area was mapped starting in 1961 (Jobin and Schroeder, 1964).

Based on the published findings of the USGS and others, Phillips Petroleum Company did preliminary sampling and mapping of the phosphate in the Fall Creek area in 1955 (Sears, 1955). E. A. Rasmussen of Rexburg, Idaho and Clifford Purser of Rigby, Idaho applied to the BLM for a Federal noncompetitive phosphate lease (I-06433) on June 16, 1955 for lands in the immediate vicinity of Fall Creek. On November 7, 1955, Rasmussen bought out Purser's interest in the phosphate lease application. The lands applied for exceeded the Mineral Leasing Act's limits on acreage for a single lease so the lands were divided into two separate leaseholds (I-06433 and I-010764) (see Pritchard Creek Mine for description of I-06433). The two phosphate leases were finally issued on August 1, 1959 to E. A. Rasmussen. Rasmussen and others had formed a mining company entitled E. A. Rex Mining Corporation earlier and on September 1, 1960, the leases were assigned to this company. As an interesting aside, the phosphate ore contains an anomalous amount of uranium and for a while, the E. A. Rex Mining Corporation held mining claims for uranium over the same area as the lease.

From 1955 to 1959, the E. A. Rex Mining Corp. started limited development of an underground mine, initially for uranium and, later, for phosphate rock (Service, 1966, p. 175) (Figure 135). About 150 feet of drift was driven in the phosphate bed. The adit was 8 feet by 10 feet in size and ran along the N. 25° W. strike of the "A" zone of the phosphate bed. The elevation of the portal was 5,800 feet above sea level and the adit had a slight curvature to follow the strike. The adit was timbered and lagged for the first 60 feet.

During the late spring and early summer of 1960, the E. A. Rex Mining Corporation, through an operating company, Wells Cargo, Inc., explored the leases with an extensive trenching program (Figure 136). Bulldozer cuts were made approximately every ½ mile along the outcrop of the phosphate ore in the two leases (Jobin, unpublished report, May 14, 1962). Wells Cargo, Inc. bought the controlling interest of the E. A. Rex Mining Corporation in late 1961. Wells Cargo, Inc. continued to use the E. A. Rex name for their operations. In 1962, Wells Cargo, Inc. conducted a limited trenching program, and in 1963, the USGS trenched and sampled sections of the phosphate ore. Based on the results of these exploration events, Wells Cargo, Inc. sold an option to the Mineral Development Department of the FMC Corporation to reopen the Fall Creek Mine adit in the fall of 1964. All field work was under the supervision of O. A. Power and H. B. Fowler (Larsen, unknown date). The underground workings were extended about 150 feet for a total length of about 300 feet and a 60-foot crosscut was driven to the northeast from the end (Figure 137). This crosscut intersected the "B" zone of the phosphate ore bed. That was the last underground development conducted in the Fall Creek Mine. FMC Corporation did not continue their option on the property, and the underground workings were abandoned (Figure 138).

Figure 135. Fall Creek Mine, date unknown. Photo courtesy of the FMC Corporation.

Figure 136. FMC prospecting at the Fall Creek Mine. Photo courtesy of the FMC Corporation.

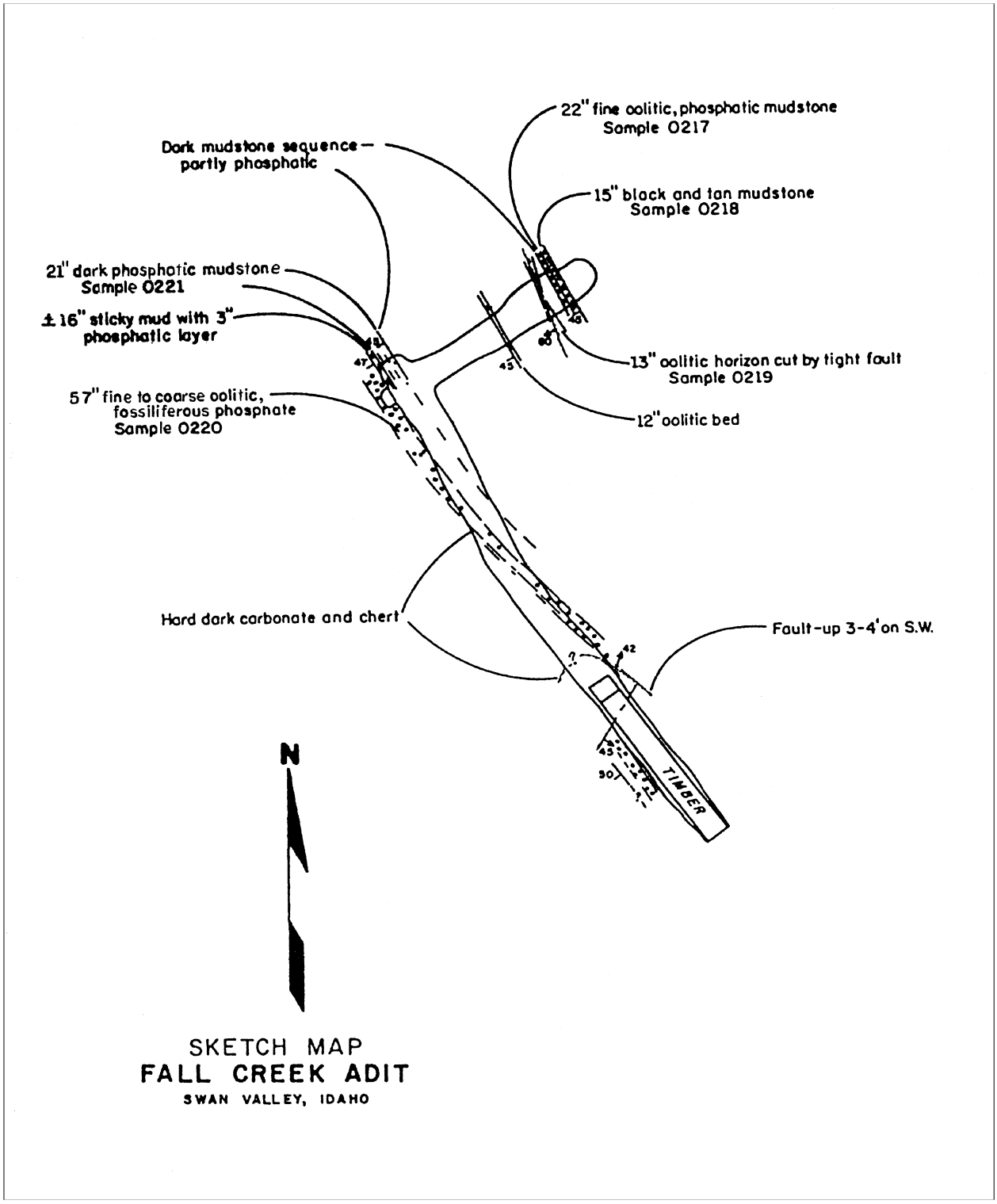

Figure 137. Map of FMC's underground workings at Fall Creek Mine. Map from Larsen, date unknown, Anaconda Collection, File 80210.01, American Heritage Center, Laramie, Wyoming.

Figure 138. Caved Fall Creek Mine adit, June 2, 1997. Photo by Charles Horsburgh, BLM.

In December, 1977, the Wells Cargo, Inc. company and the Western Cooperative Fertilizers Ltd. (WCFL) of Calgary, Alberta, Canada entered into an agreement whereby WCFL would purchase shares in Wells Cargo, Inc. over a period of time. On October 3, 1979, WCFL was designated operator of the two leases. By January, 1985, WCFL had acquired 705,230 of the 706,730 shares (99.8%) of Wells Cargo, Inc./E. A. Rex Mining Corporation. The Western Cooperative Fertilizers Ltd. continued to use the E. A. Rex name for the leaseholder.

On June 9, 1997, WCFL/E. A. Rex Mining Corporation applied for lease relinquishment for Federal leases I-06433 and I-010764, and on August 27, 1997, the relinquishments were accepted by the BLM.

Mountain Fuel Mine
(Upper Dry Valley Mine)

The Mountain Fuel Mine (sometimes referred to as the Upper Dry Valley Mine) is located in T. 9 S., R. 44 E., Sections 14, 15, 23, 24, 25, and 26 (Figure 139). The mine extends for over three miles in length and is located on Federal Lease I-012989.

The presence of phosphate ore in the immediate vicinity of the Mountain Fuel Mine has been known since the early twentieth century. In July, 1911, the USGS excavated an exploration trench in the NW¼NE¼ of Section 16, T. 9 S., R. 44 E., about 1½ miles west of the mine site. This hand-dug trench was 450 feet long and 10 feet deep and explored the phosphate ore zone (Mansfield, 1927, p. 260). There was no further known phosphate exploration in this area until September and October, 1947, when the USGS initiated a new round of exploration. The USGS excavated two bulldozer trenches in the NW¼SE¼ of Section 14, T. 9 S., R. 44 E., on the west limb of the Schmid syncline (McKelvey, Armstrong, Gulbrandsen, and Campbell, 1953, p. 38). This location placed the trenches directly in the area of the future open pit (see Figure 139). By December, 1961, this trench caved and the exposed beds were indescribable.

Interest in developing and mining the phosphate ore in this area started in 1961. An application for a Federal lease was filed by Wells Cargo Inc. on November 20, 1961, but was rejected one week later on the 28th because of insufficient information. The Wells Cargo company resubmitted the competitive lease application on December 26, 1961, modified the application on January 26, 1962 and again on March 14, 1962. Due to business reasons, the Wells Cargo company withdrew their application for the competitive lease on July 31, 1962.

The BLM held a competitive lease sale for this area on August 23, 1962, even though the requester had withdrawn their application. There were two bidders at the lease sale, the Monsanto Company and a partnership of John D. Archer and William J. Colman. Sealed bids were opened for the Federal phosphate lease I-012989. J. D. Archer and W. J. Colman were recognized as the high bidders; thus securing the rights of the lease. The lease was issued jointly to them on November 1, 1962, covering 560 acres.

Considerable work was expended on the lease from the winter of 1962 through 1963. Four trenches and several drill holes were put in by the Mountain Fuel Supply Company on the northern portion of the lease. On April 1, 1963, W. J. Colman assigned his portion of the lease to J. D. Archer, and on the same date, Archer assigned the entire lease to the Mountain Fuel Supply Company, retaining a 15 cents/ton overriding royalty.

Exploration by drilling and trenching continued during the period from Spring, 1963 through Spring, 1967. There were 50 drill holes put down totaling 8,750 feet in the northern portion of the lease during

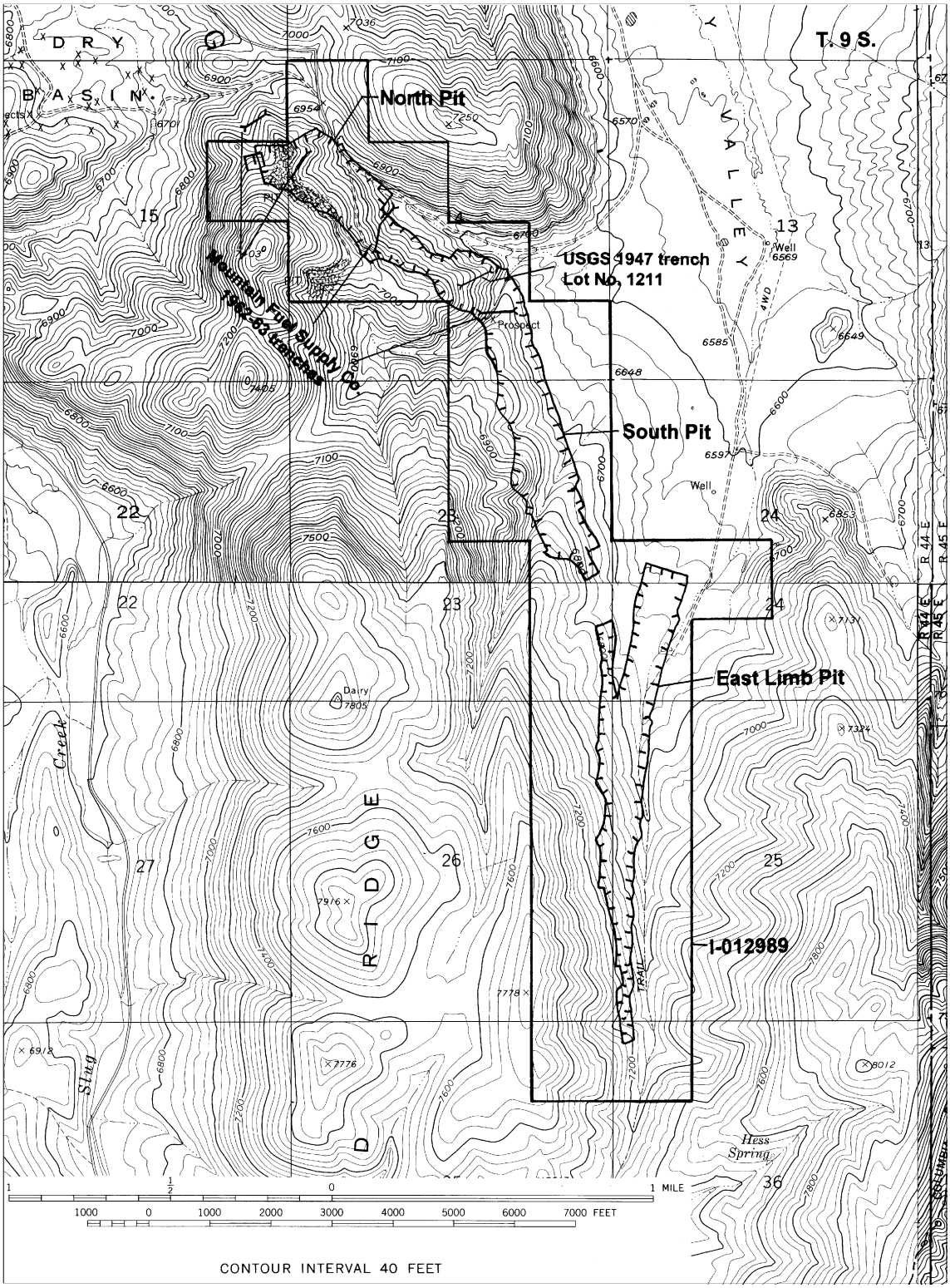

Figure 139. Map showing the location of the Mountain Fuel Mine, Caribou County, Idaho.

1963, with another 48 drill holes in the same area totaling 7,200 feet in 1966. There were 90 drill holes emplaced in the southern part of the lease in 1966 that totaled 18,400 feet.

During late 1966 and early 1967, Mountain Fuel Supply Company, and their operator, Wells Cargo, Inc., commenced the opening of a mine. This initial work consisted of stripping approximately 1,000,000 tons of overburden from the ore zone, roughing in access roads, and clearing vegetation. By April, 1967, bulldozers and scrapers had removed a considerable amount of overburden, and the construction of the haul road (utilizing the stripped overburden) from the area of the pit to the lease boundary was well underway (Figure 140). The initial plan called for mining ore starting in the summer of 1967, with an open pit about 2,400 feet long, 1,100 feet wide and 150 feet deep.

Figure 140. Area of the Mountain Fuel Mine, view north, 1974. BLM file photo.

Concurrent with the exploration on this lease during 1965-66, Mountain Fuel Supply Company was constructing a beneficiation plant, called the C. F. White Plant, near Conda, Idaho, adjacent to a similar plant owned by the El Paso Products Company. This plant was to beneficiate the ore from their mine and the processed material was to be sold to fertilizer manufacturers in the western States and Canada (Hansen, 1968; Hansen, 1970; Service, 1967). Prior to ore being delivered from the mine, the plant utilized purchased phosphate rock.

Due to business reasons internal to the company, Mountain Fuel Supply Company suspended operations at the minesite on July 7, 1967. At the same time, the beneficiation plant was shut down. No phosphate ore had been mined, removed or beneficiated.

Mining activities on Federal lease I-012989 languished from the summer, 1967 until about 1981. During that period of time, the major event was the assigning of the lease from Mountain Fuel Supply Company to Beker Industries, Inc. on June 1, 1977. Beker Industries then assigned 50% of the lease to Western Co-operative Fertilizers (US) Inc. on January 1, 1979. Also on January 1, 1979, Beker Industries, Inc. and Western Co-operative Fertilizers (US) Inc. formed a partnership entitled Conda Partnership and the Federal lease was assigned to the Partnership.

Conda Partnership initiated exploration activities on the lease in late 1981. By the end of 1982, the Partnership had drilled 111 holes utilizing a 5-inch rotary drill and reverse circulation. Exploration continued throughout 1983 and 1984 and by the end of 1984, there were 42 additional drill holes totaling 6,765 feet, and 14 trenches had been excavated. Also during this time, Conda Partnership extended the railroad line from their now closed Champ Mine, and relocated the Champ loadout tipple to the Mountain Fuel Mine site (Figure 141).

The Mountain Fuel Mine began ore production in late 1985. All of the phosphate ore produced at the mine was sent to supply the Partnership's C. F. White Plant at Conda, Idaho. The Conda Mining Division of Washington Construction Company was designated as the operator of the mine. Mining was an open pit operation using 16-yard electric shovels and 120-ton Lectra Haul trucks. Development and mining moved from the northern part of the lease to the south. Mining continued into 1986 until in May of that year, Beker Industries, Inc., one of the Conda Partners, declared bankruptcy. At that time, the Mountain Fuel Mine and the C. F. White Plant were shut down.

The C. F. White Plant was bought by a newly formed fertilizer company called Nu-West Industries and was opened in the summer of 1987. The Conda Partnership also reopened the Mountain Fuel Mine to supply the plant under contract. Exploration in the southern part of the lease indicated that there was additional ore to be leased and the Partnership was granted lease modifications on October 1, 1989, May 1, 1990, June 1, 1991, and October 1, 1991, bringing the total acreage of the lease to 1,120 acres. As the open pit progressed southward, reclamation was initiated to backfill the northern portions of the pit (Figure 142).

Figure 141. Mountain Fuel Mine tipple, May 3, 1995. Photo by the author.

Figure 142. Mountain Fuel Mine, view south, October 10, 1991. Photo by Peter Oberlindacher, BLM.

The Mountain Fuel Mine continued operations into 1993 at an annual production rate of approximately 1.6 to 1.7 million tons of phosphate rock. During the latter part of 1993, all of the economically valuable ore in the mine was extracted and in November, 1993, Conda Partnership closed production at the mine and initiated final reclamation (Figure 143). On June 1, 1995, the lease was assigned to Nu-West Mining, Inc., the parent company of Nu-West Industries, Inc.

Figure 143. Reclaimed Mountain Fuel Mine, June 27, 1996. Photo by the author.

Mill Canyon Mine
(Wooley Valley Unit #4)

The Mill Canyon Mine, part of the Wooley Valley Mine complex, is located on Federal Lease I-04374 in Sections 11, 13, and 14 of T. 7 S., R. 43 E. (Figure 144). The earliest known phosphate related activity occurred in 1912 when geologists of the USGS mapped and trenched the phosphate rock in the township. No trenches were excavated in the area of the Mill Canyon Mine, however, extensive geologic mapping disclosed a northwest-plunging anticline (Mansfield, 1927). This plunging anticline forms a "nose" and would become the centerpiece of mining in the future mine.

An expression of interest in leasing these deposits of phosphate was made in the early 1950's, and on May 6, 1953, the BLM conducted a lease sale for these lands. The J. A. Terteling and Sons Company was the successful high bidder and was issued Federal Lease I-04374 on September 1, 1953. The J. A. Terteling and Sons Company conducted exploration trenching and drilling on the lease but did not develop the deposit for mining. On April 1, 1959, the lease was assigned to the Terteling Land Company, an adjunct to the original Terteling lessee.

With all intents to develop the mine, the Terteling Land Company contracted with and designated the Stauffer Chemical Company as the mine operator on July 1, 1966. No timely mining development occurred, and on July 1, 1967, the lease was assigned to the Stauffer Chemical Company after the Terteling Company divested themselves of all of their phosphate holdings in southeast Idaho.

The Stauffer Chemical Company began stripping overburden in the mine area in late 1968, with actual mining of phosphate ore starting in the summer of 1969. The Stauffer Company designated the Terteling Land Company as the operator of the mine and that company immediately subcontracted all stripping, mining, hauling, and loading to the MacGregor Triangle Company. Mining started on the west limb of the plunging anticline. Mining on that limb soon proved to be a disappointment because the phosphate ore was badly broken and contaminated with limestone blocks. This required a rapid switch in mining to the east limb which had not been prepared in 1969.

Along with the advent of mining in 1969, the year also saw the construction of a conveyor belt from the mine area to the railhead (Figure 145). The belt was 30 inches wide and aligned in two segments down the hillside for a total distance of about 4,200 feet, an elevation drop of about 700 feet. Ore was fed from the stockpile area at the mine by a short 36-inch wide belt into a hopper over the tail piece of the long belt (see Figure 145). A surge bin was located at the lower end of the long belt from which the railroad cars were loaded from another 48-inch wide elevated belt. The whole conveyor system was rated at about 600 tons per hour. Scrapers brought the ore to the stockpile and bulldozers were used to load material onto the conveyor belt feeder assembly.

Stripping of the overburden in the "nose" area of the plunging anticline started early in July, 1971 with mining starting July 12, 1971. In November, 1971, the mine operator placed about 80,000 cubic yards

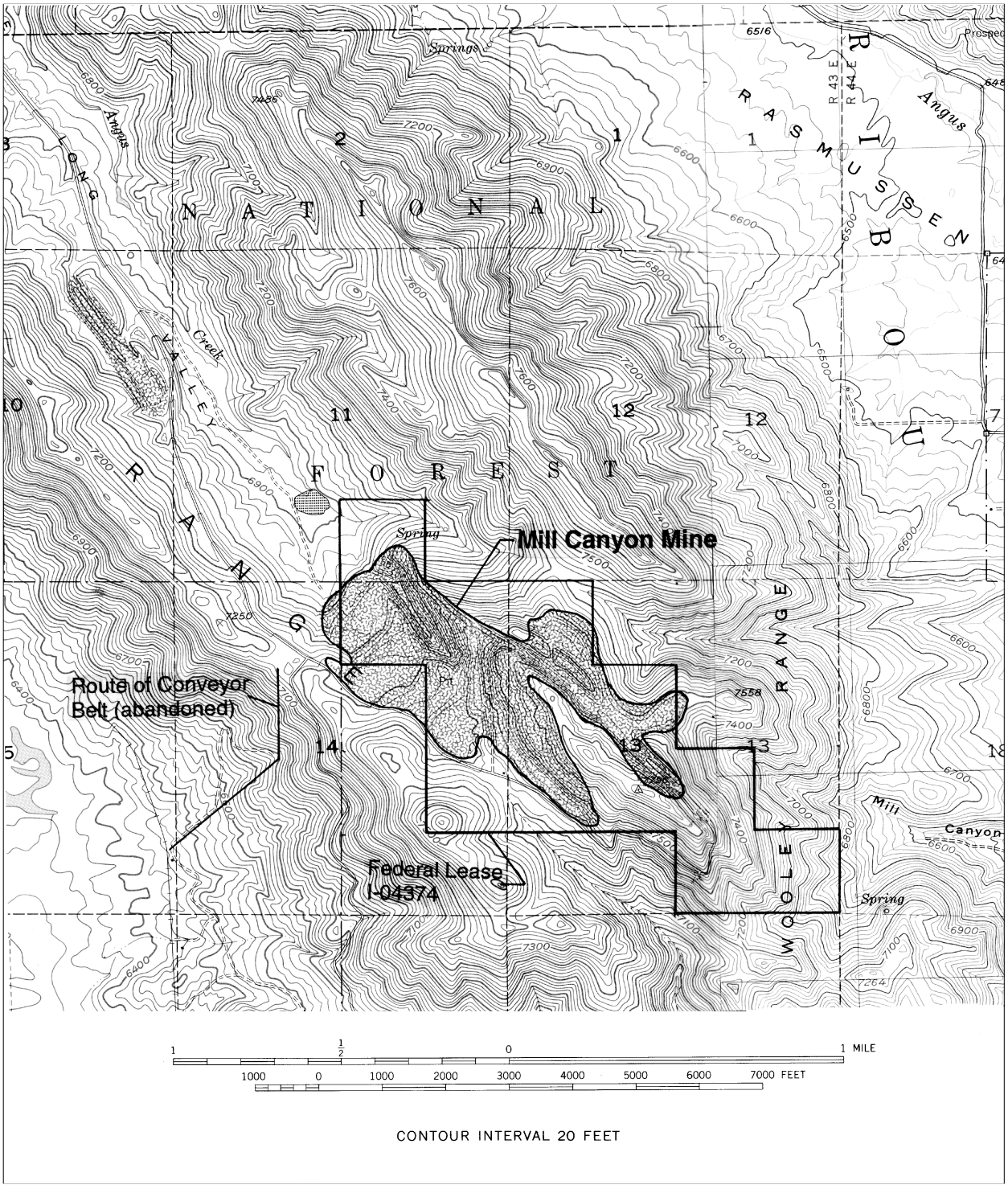

Figure 144. Map showing the location of the Mill Canyon (Wooley Valley #4) Mine, Caribou County, Idaho.

Figure 145. Ore conveyor belt, Mill Canyon Mine, July 30, 1975. BLM file photo.

of waste, ice, snow, frozen ore and frozen mud on the crest of Dump #4, raising the elevation of the dump by about 15 feet. This material was later pushed over the side of the dump. Toward the last part of June, 1972, the material thawed and ran down the face of the dump and into the wooded area below. Silt overfilled the retention ponds and spilled over and went into Angus Creek. There were mudflows coming from the dump that were approximately 600 feet long by 70 feet wide and three feet

deep. This dump failure caused a great amount of anxiety on the part of the mine operator, the mine owner and government officials. A large effort was made to restabilize the dump by removing about 20 feet from the top of the dump and all of the loose material on the face of the dump. Benches were cut into the face and total reshaping and reseeding of the dump was done, and by 1973, the work resulted in stabilizing Dump #4 from any further failures (Figure 146).

Figure 146. Dump No. 4, Mill Canyon Mine, September 7, 1973. BLM file photo.

Eventually, the Mill Canyon Mine consisted of two large pits, six waste dumps and one sub-ore pile, and approximately 2½ miles of haul and service roads (Figures 147 and 148). Surface structures

Figure 147. "The Nose" area, Mill Canyon Mine, 1975. BLM file photo.

Figure 148. Mill Canyon Mine, view east, showing haul road and conveyor belt, July 18, 1984. BLM file photo.

included two metal buildings, an office frame building, office trailer, lunchroom trailer and a repair facility. All of the production of this mine was shipped to the Stauffer Chemical Company plant in Silver Bow, Montana, for use in manufacturing elemental phosphorous (Hansen, 1968).

By September, 1974, all of the minable ore had been removed from the mine. Reclamation of the pit areas and the dumps was in full swing (Figure 149). Some ore remained on the east end of the lease near the Mill Canyon drainage, but it may not be economically recoverable.

As outlined previously in this report, the Stauffer Chemical Company's Idaho operations were sold in 1985, and through a chain of buyers, eventually would up in the hands of the Rhône-Poulenc Basic Chemicals Company. Rhône-Poulenc assigned the mine to a subsidiary, Rhodia, Inc.,

Figure 149. Mill Canyon Mine reclamation, view north, July 30, 1975. BLM file photo.

and that company is the current lessee of record of I-04374.

Taylor Creek Adit

The Taylor Creek Adit is located in the NW¼ Section 19, T. 14 N., R. 41 E., in the drainage of Taylor Creek in the Centennial Mountains approximately two miles due south of the Continental Divide/Montana-Idaho state line (Figure 150).

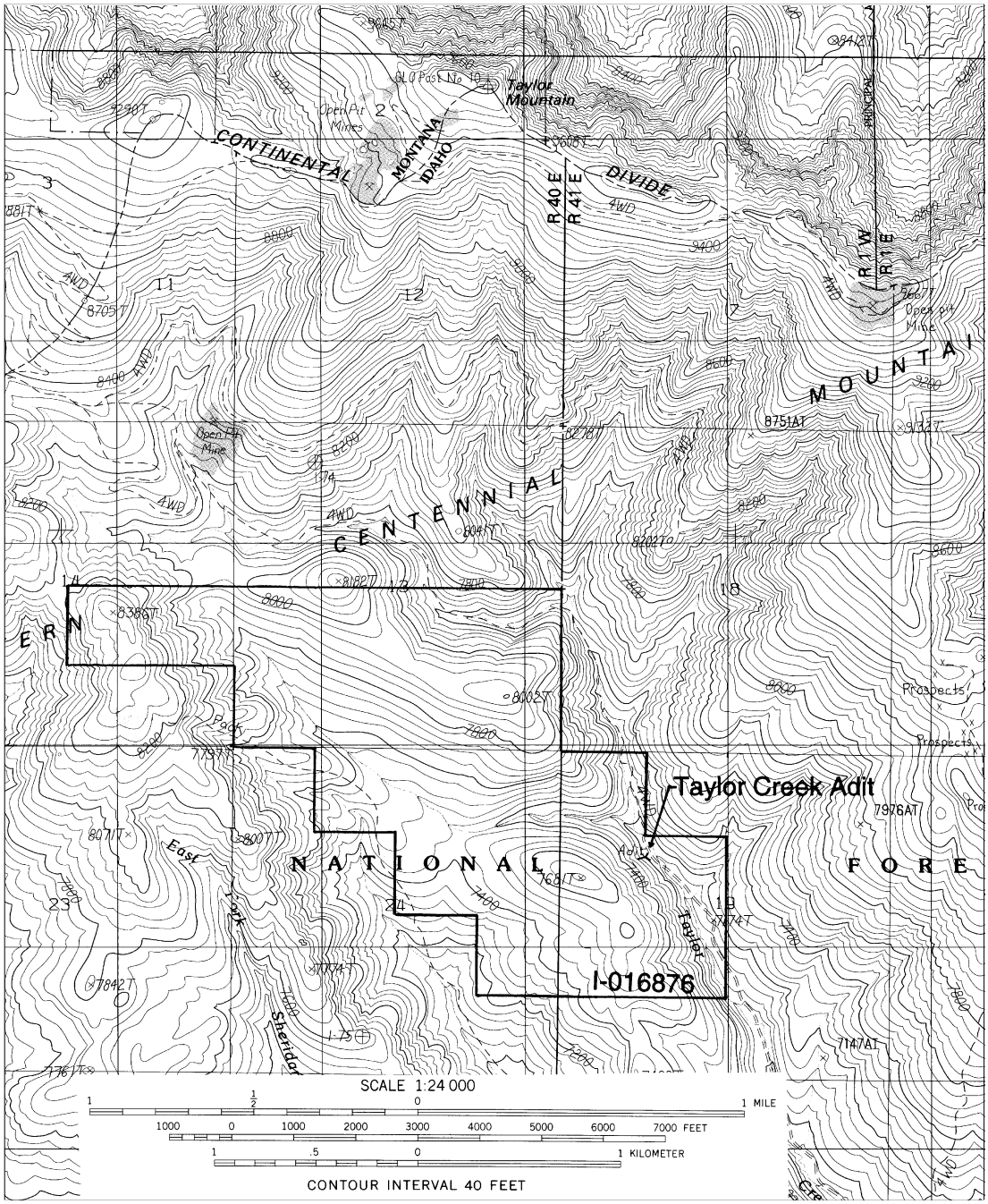

Figure 150. Map showing the location of the Taylor Creek Adit, Clark County, Idaho.

The occurrence of phosphate resources in the Centennial Mountains has been known for many years (Bowen, 1918; Condit, 1919; Condit and others, 1928). The phosphate resources in the Taylor Creek drainage were mapped by F. S. Honkala August 24 to September 11, 1950 (BLM unpublished data). The final results of Honkala's mapping were published in 1953 (Honkala, 1953).

Development of the phosphate resources in this area started in 1954 with the exploration and development of the open-pit Centennial Mine two miles north of the area of the Taylor Creek Adit. It was not until 1965 that the phosphate on Taylor Creek attracted attention. Table 10 shows the prospecting permitting activity of one company, Northern Investment Company (a corporation). In particular, Northern Investment Company filed a prospecting permit application (I-016876) with the

Table 10. Northern Investment Company's historic permitting/leasing activities in the area of Taylor Creek.

Serial Number	Location (Township, Range, Section)	Date of Application	Date of Issue of Permit	Date Permit Expired/Term.
I-016876*	T. 14 N., R. 40 E., Secs. 13, 14, 24 T. 14 N., R. 41 E., Sec. 19	11/23/65	02/02/67	02/02/69
I-016877	T. 15 N., R. 44 E., Secs. 8, 17, 18, 20 T. 16 N., R. 44 E., Secs. 19, 29-30	11/23/65	08/30/66	10/11/67
I-016878	T. 14 N., R. 41 E., Secs. 10, 15 T. 14 N., R. 42 E., Secs. 19-21	11/23/65	08/30/66	08/30/70
I-68**	T. 14 N., R. 42 E., Secs. 15-22	08/05/66	02/14/67	02/14/69
I-326	T. 14 N., R. 42 E., Secs. 17-22, 27-31	10/03/66	03/30/67	07/08/69
I-327	T. 14 N., R. 40 E., Secs. 14-16, 24	10/31/66	10/18/67	10/17/69
I-328	T. 14 N., R. 41 E., Secs. 24-25, 36	10/31/66	03/30/67	03/30/69
I-925	T. 14 N., R. 41 E., Secs. 10-11, 14-15	02/15/67	08/14/67	08/11/71
I-926	T. 15 N., R. 44 E., Secs. 17, 29	02/15/67	08/11/67	08/11/71
I-2061	T. 14 N., R. 40 E., Secs. 23-25 T. 14 N., R. 41 E., Secs. 19-20, 29-32	01/05/68	04/30/68	04/30/71
I-2936	T. 14 N., R. 42 E., Secs. 15-17, 19-22	05/01/69	10/17/69	10/17/71

* Prospecting Permit I-016876 resulted in a Preference Right Lease Application (PRLA) that was issued as non-competitive phosphate Lease I-016876 on July 1, 1969.
** Prospecting Permit I-68 resulted in a PRLA that never was issued as a non-competitive phosphate lease.

BLM on November 23, 1965. The permit was approved on February 2, 1967, and exploration work started as soon as the weather conditions permitted. Northern Investment Company contracted with Sun Oil Company to act as the operator and Sun drilled six exploration holes in the permit area. Based on the drill hole data and information on previous USGS trenches (Honkala, 1953), a site for an underground exploration adit was selected. Sun Oil Company contracted with the Ralph M. Parsons

Company of Los Angeles, California (who further subcontracted the work to the Centennial Development Company of Salt Lake City, Utah) to excavate the exploratory adit. Prior to the start of the underground activities, the prospecting permit was assigned to a new company, Northern Investment Company (a co-partnership) on May 1, 1968. This partnership consisted of Leonard J. Garrand, Josephine Garrand, David A. Aro, Joan A. Aro, Leonard J. Lewis, and Lois Ann C. Lewis.

The adit was started July 24, 1968. Elevation at the portal was 7,420 feet. The adit was 8' x 10' in cross section, with timbered square sets of 6-foot centers and with solid board lagging on the back and ribs. Ventilation was provided by a centrifugal blower fan on the surface with vent tubing into the adit. A mucking machine was used to load waste and phosphate ore into a small diesel tram car mounted on rubber tires. The adit was extended 323 feet in a southwesterly direction with a crosscut to the northwest at 220 feet from the portal. This crosscut extended approximately 153 feet. A side drift at 58 feet from the main drift extended to the northeast and contained an experimental stope. The phosphate ore zone was encountered at 224 feet from the portal. The average overburden over the exploration adit is 220 feet. All in all, there was approximately 464 feet of underground development (Figures 151, 152, and 153).

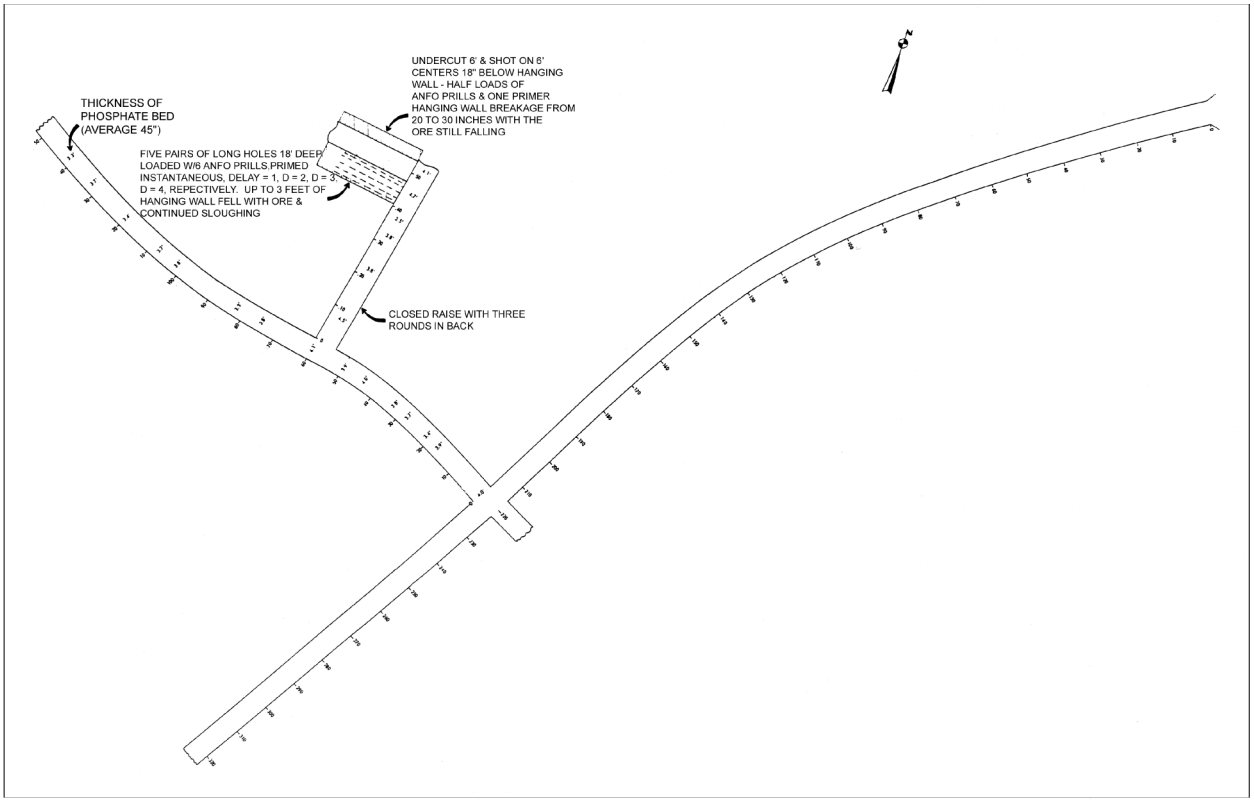

Figure 151. Underground mine map of the Taylor Creek Adit. Map from BLM files.

Figure 152. Taylor Creek Adit, September 24, 1980. BLM file photo.

Figure 153. Taylor Creek Adit, September 24, 1980. BLM file photo.

Based on information developed in the underground operation, an application for a Federal Preference Right Lease was made on February 27, 1969. The lease (I-016876) was issued on July 1, 1969. There has been no further phosphate development on the lease since 1968, and the adit has been abandoned (Figure 154). However, the lease itself has a history of being assigned and reassigned. Northern Investment Company (a co-partnership) assigned the lease to Leonard J. Garrand on November 1, 1974. Garrand assigned the lease to Monida Resources, Inc. on January 1, 1994. As of this writing, Monida Resources, Inc. is the Federal leaseholder of record.

Figure 154. Abandoned Taylor Creek Adit, date and individuals unknown. BLM file photo.

Henry Mine

The Henry Mine, operated by the Monsanto Company, is located in T. 6 S., R. 42-43 E., just to the southeast of the small village of Henry, Idaho (Figure 155). The phosphate resources in the area of the North Pit of the Henry Mine were first explored in 1912 by a field party of the USGS. A trench in the NE¼SE¼ of Section 10, T. 6 S., R. 42 E. was excavated to sample the phosphatic shales. The trench was 350 feet long, 6 to 7 feet wide, and 4½ feet deep, and cut nearly the entire phosphatic shale section (Mansfield, 1927).

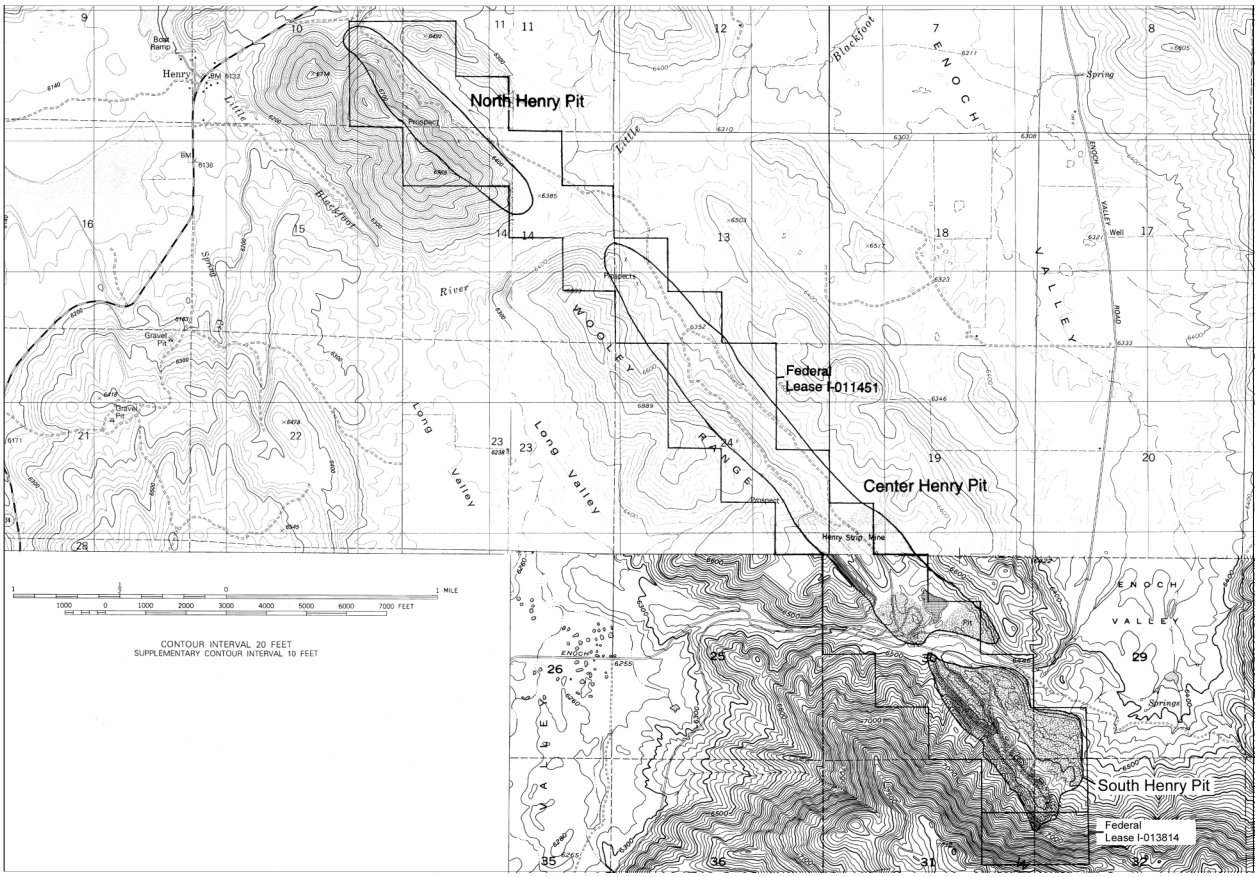

Figure 155. Map showing the location of the Henry Mine, Caribou County, Idaho.

There was no further known interest in the phosphate of this particular area until the Monsanto Chemical Company applied to the BLM for a Federal phosphate lease on March 15, 1960. A phosphate lease sale was held on July 7, 1960. There were two bidders at the sale, the J. A. Terteling and Sons Company and the Monsanto Chemical Company. Monsanto was the high bidder and was issued Federal Lease I-011451 on September 1, 1960. Monsanto's intent was to use the ore on this lease as replacement for the dwindling resources at their Ballard Mine (Carter, 1978).

Exploration on their newly acquired Federal lease (Figures 156 and 157) soon led the Monsanto Company to seek additional adjacent acreage. On December 10, 1962, Monsanto applied to the BLM for a prospecting permit covering land immediately south of Federal Lease I-011451. The BLM issued a prospecting permit on April 5, 1963. Apparently, Monsanto found phosphate ore in the area of the permit because they filed an application with the BLM for a Federal Preference Right Lease on January 11, 1965. The lease, I-013814, was issued on December 1, 1965.

Figure 156. Core drill and drill site, Henry Mine, view north, date unknown. Photo courtesy of the FMC Corporation.

Mining at the Henry Mine began in 1969. Approximately five miles of phosphate outcrop was eventually developed and mined with the entire output of the mine going to Monsanto's elemental plant at Soda Springs (USGS, 1977). The mining plan called for five mine panels or pits; Pits I and II were the site of the initial mining, Pit III was the South Henry Continuation, Pit IV was the Center Henry Continuation, and Pit V was the North Henry Continuation. The Monsanto Company contracted with the Dravo-Soda Springs for mining and ore hauling. Dravo-Soda Springs was a joint venture between the Dravo Corporation and N. A. Degerstrom, Inc. Initial mining was a scraper operation using a scraper spread for both mining the ore and stripping waste. The ore in the steeply dipping side-hill

Figure 157. Exploration trench, Henry Mine, view east, date and individual unknown. Photo courtesy of the FMC Corporation.

deposit was moved by self-discharging scrapers from the mine face to the tipple ore stockpile or directly into the tipple when shipping was occurring. Mining was later converted to a truck/shovel operation during the mining season of 1986.

Shipping the ore from the mine to the elemental phosphorous plant at Soda Springs was by trucks with two or three belly-dump trailers. These truck-trailer combinations were called “trains” and ran on the private heavy-duty haul road that was initially built for the Ballard Mine and later extended to the Henry Mine. The haul road distance from the mine to the plant at Soda Springs is about 18 miles.

Figure 158. South Henry Mine, view west, July, 1978. Photo by Peter Oberlindacher, BLM.

Mining in the South Henry Pit (Pit III) started in the fall of 1976 (Figure 158). Mining operations in that pit were completed in 1980, and mining then started in Center Henry Pit (Pit IV) in the summer of 1981 (Figures 159, 160, and 161). Mining in the Center Henry Pit was completed in the fall of 1985. The North Henry Pit (Pit V) was opened and mining operations started at the beginning of the summer mining season in 1986. Mining operations were completed at North Henry in mid-October, 1989, bringing to a close the active phase of the Henry Mine.

Reclamation of the Henry Mine progressed throughout the active mining phase with excavated waste rock being used to backfill the pits as mining advanced. Once the mine closed in late 1989, other forms of reclamation took place such as reseeding and hydromulching of the highwalls. Reclamation continued for a number of years after mining and monitoring of the reclamation effort continued even longer.

Monsanto applied to the BLM for relinquishment of the two Federal leases on December 3, 1993. The BLM accepted the relinquishments on December 7, 1993, the leases were closed thus bringing an end to the Henry Mine.

Figure 159. Center Henry Mine, August 12, 1975. Photo by Peter Oberlindacher, BLM.

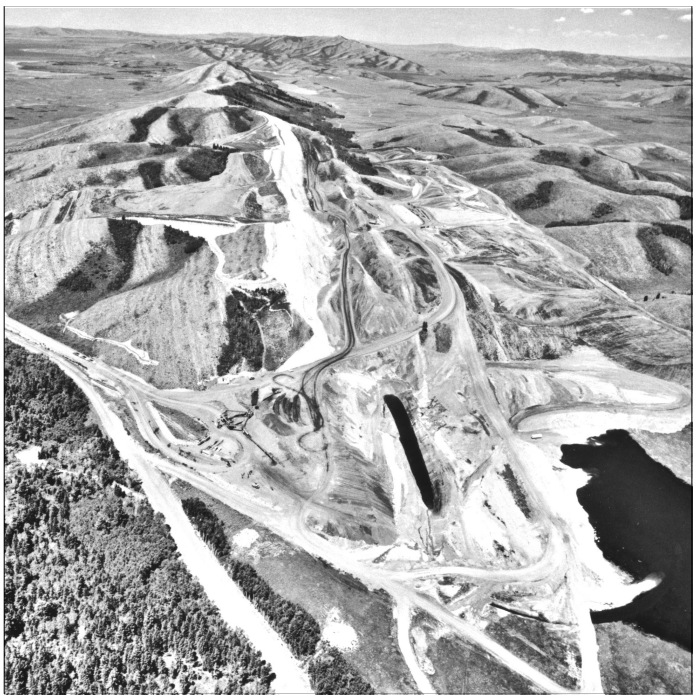

Figure 160. Center Henry Mine, view northwest, 1975. BLM file photo.

Figure 161. Henry Mine, view southeast, 1975. BLM file photo.

Bloomington Canyon Mine

Bloomington Canyon, one mile west of the town of Bloomington (Figure 162), has been the site of several different episodes of phosphate exploration and mining. The first development of the phosphate ore in the Canyon was reported in Richards and Mansfield (1911). They described several prospects that were opened in the phosphate shales (Figure 163). Mansfield (1927) elaborated on these prospects when he reported that the discovery of phosphate float material on the south side of the Canyon led to the opening of two pits by H. H. Broomhead of Bloomington. Even the development of the Consolidated Mine in 1930 in Little Canyon, a branch of Bloomington Canyon to the north, did not encourage further exploration and development of the phosphate in the Canyon proper. In 1942-1943, the vanadium explorations of Wyodak, discussed earlier in this report, opened several inclines and underground developments on the north side of Bloomington Canyon. The principal development was Wyodak's T14S incline. This incline consisted of about 741 feet of total underground workings (see Table 8).

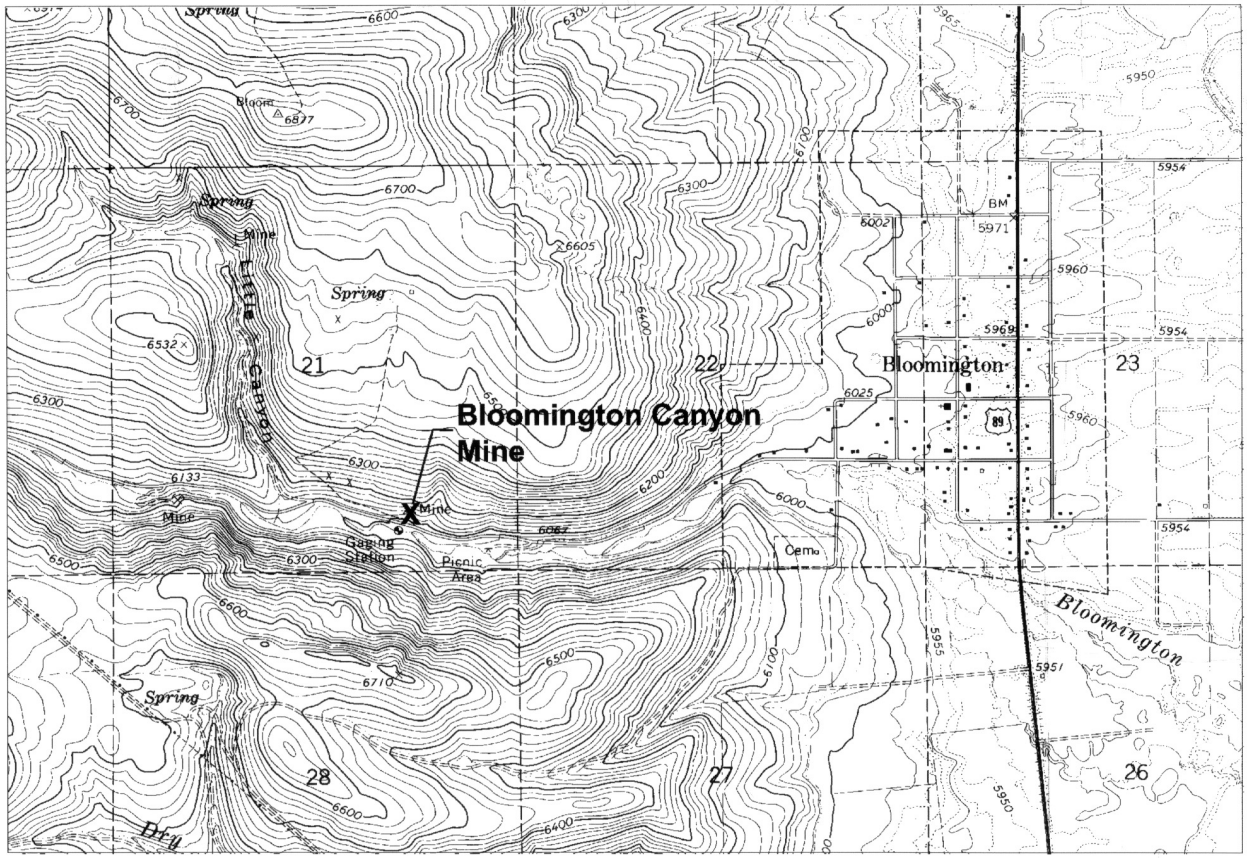

Figure 162. Map showing the location of the Bloomington Canyon Mine, Bear Lake County, Idaho.

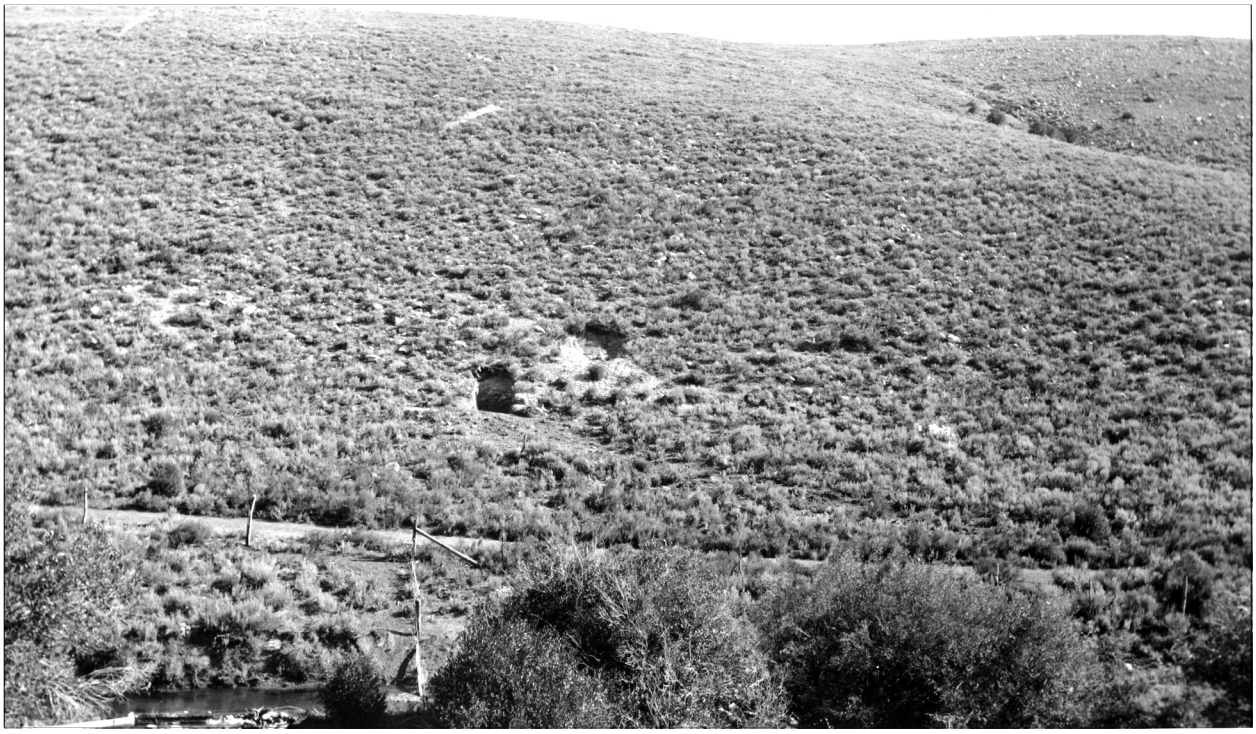

Figure 163. Phosphate prospects on north side of Bloomington Canyon, date unknown. Photo by R. W. Richards, #118, USGS Photographic Library.

After the Wyodak exploration and development, the property remained idle until November 7, 1961 when the Ruby Company (J. R. Simplot Co.) applied for a competitive phosphate lease from the Bureau of Land Management. A phosphate lease sale was held on June 7, 1962 with the Ruby Company as the high bidder. A phosphate lease, I-012982,was issued to the Ruby Company on July 1, 1962 for Lot 4 and the SW¼SE¼ of Section 21, T. 14 S., R. 43 E. The Ruby Co. did not develop the lease and in 1973, assigned the lease to Earth Sciences, Inc. (ESI).

ESI had performed some preliminary exploration work on the lease in 1972 while the sale was being negotiated with Simplot. This preliminary exploration consisted of driving an 8x8½-foot tunnel about 150 feet deep from an outcrop in Bloomington Canyon just west of the Wyodak T14S incline in order to collect bulk samples of the phosphate (ESI unpublished information). Starting in August, 1973, this tunnel was extended to the west and north until a major fault was encountered at about 690-700 feet from the portal. An offset drift was driven 190 feet eastward to intercept the vanadiferous zone of the phosphate rock. This underground venture was concluded in 1974 and is referred to as the 1974 tunnel.

In 1975, ESI located a new portal a few hundred feet east of the T14S incline (Figure 164). This development work consisted of about 2,700 feet of underground workings and is called the 1975

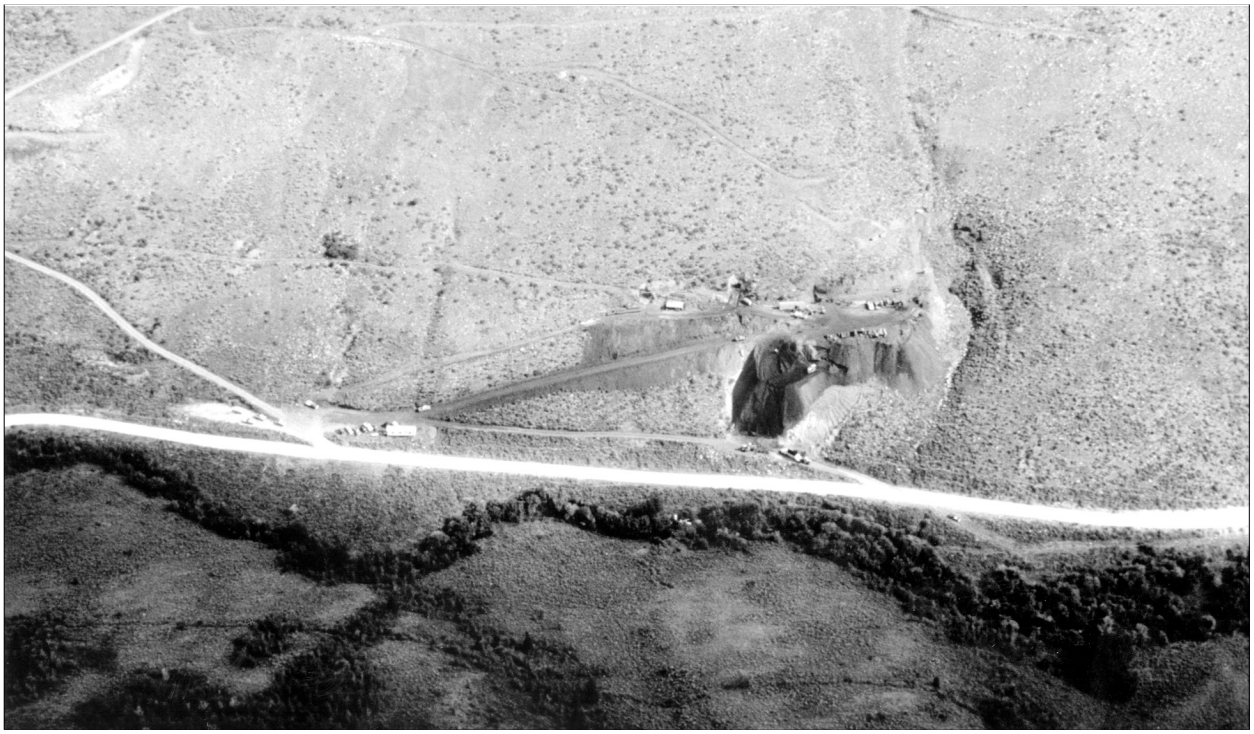

Figure 164. Bloomington Canyon Mine, view north, August 12, 1975. Photo by Peter Oberlindacher, BLM.

tunnel (Figure 165). Figure 166 shows a plot of the T14S incline, the 1974 tunnel, and the 1975 tunnel. The purpose of the 1975 tunnel was to prove the success of a continuous mining machine in excavating phosphate ore, to provide bulk samples and to determine existing mining conditions in the phosphate rock. The vanadiferous phosphate ore mined in 1973-1974 and in 1975, was shipped to a processing plant in Wyoming. Gulbrandsen and Krier (1980) reported that ESI's underground work in Bloomington Canyon had created new interest in large-scale underground operations in the phosphate field.

On November 1, 1984, ESI's Federal phosphate lease was assigned to the Conda Partnership, an established phosphate mining company. The Conda Partnership did no development on the Federal lease in Bloomington Canyon and on April 1, 1993 assigned the lease back to ESI. ESI has reclaimed the portal areas of their two tunnels and no further activity has occurred.

Figure 165. Bloomington Canyon Mine, view north, November, 1978. Photo by Peter Oberlindacher, BLM.

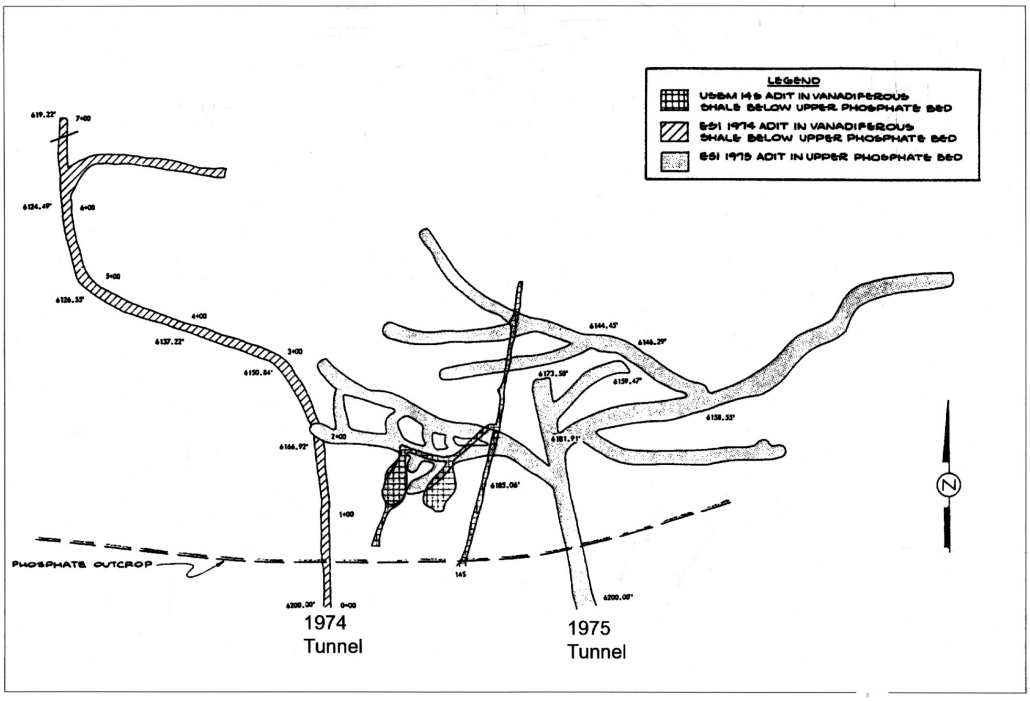

Figure 166. Underground mine map, Bloomington Canyon Mine, October, 1975. Map courtesy of Earth Science Incorporated.

Pritchard Creek Mine
(Swan Valley Phosphate Mine)

The Pritchard Creek Mine is located in Lot 6, Section 6, T. 1 N., R. 43 E., at the confluence of an unnamed tributary and Pritchard Creek, about two miles southwest of the Snake River (Figures 167, 168, and 169). The mine is located on Federal phosphate lease I-06433. The history of this Federal lease, as well as its companion lease, I-010764, has been discussed in the Fall Creek Mine section.

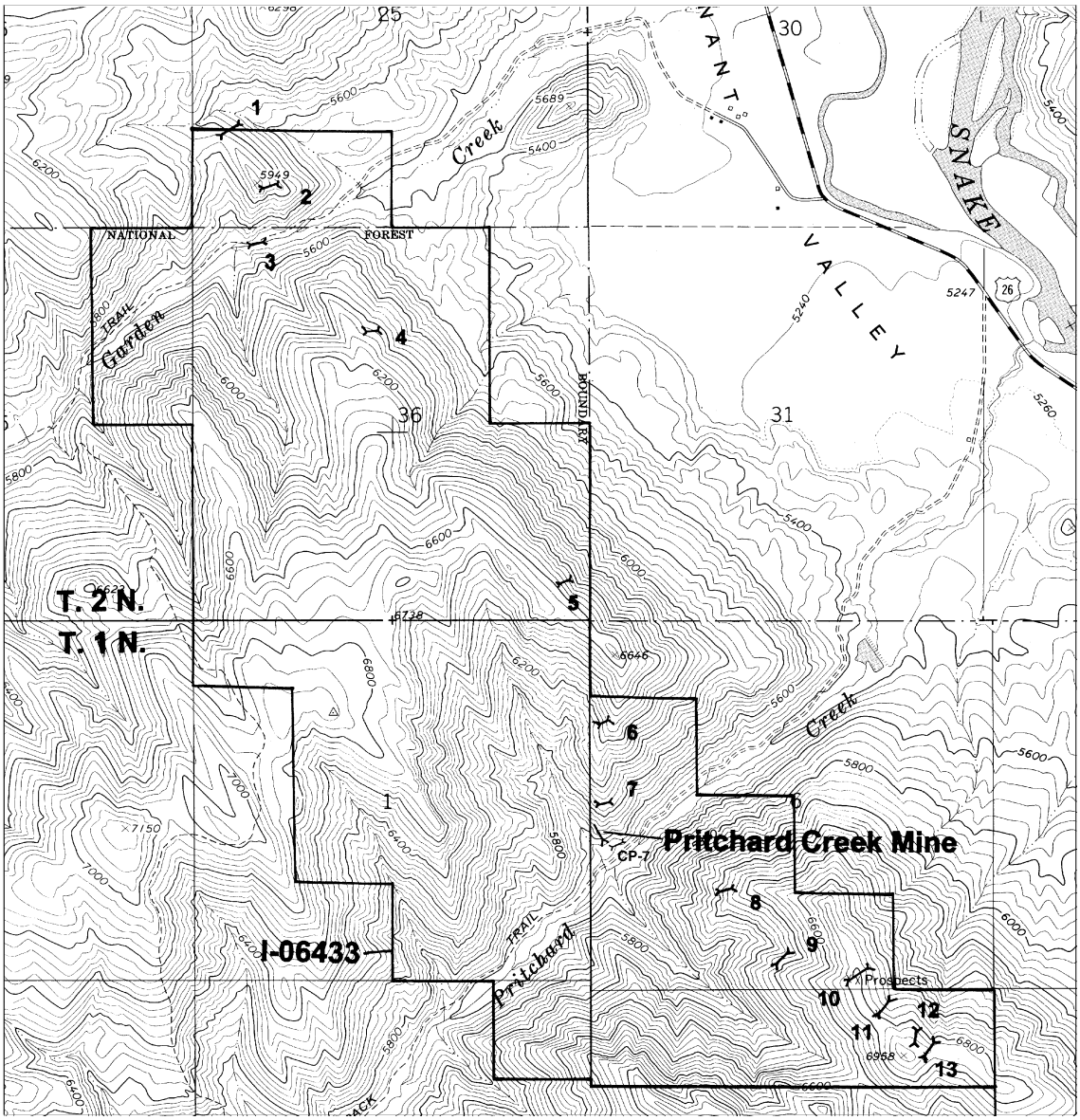

Figure 167. Map showing the location of the Pritchard Creek Mine, Bonneville County, Idaho.

Figure 168. Overview of the Pritchard Creek Mine, view northwest, 1975. BLM file photo.

Exploration directly related to the Pritchard Creek Mine started in 1961 when Wells Cargo, Inc. bulldozed a trench in the immediate vicinity of the future portal of the mine. The trench, designated as Trench CP-7, was sampled and reported by the USGS (Jobin and Schroeder, 1964). Based on

Figure 169. Panorama of the Pritchard Creek Mine area, April 16, 1976. BLM file photo.

geologic information derived from this trench and some drilling that had been conducted, Wells Cargo, Inc. submitted an underground exploration plan for the Federal lease. The exploration plan was approved on July 21, 1975, and underground operations started soon after.

The underground development consisted of about 1,000 feet of a 9' x 9' drift driven northwest on strike of the upper phosphate ore zone (Figures 170 and 171). The elevation at the portal was approximately 5,550 feet. At about 850 feet from the portal, a 100-foot crosscut was driven to the

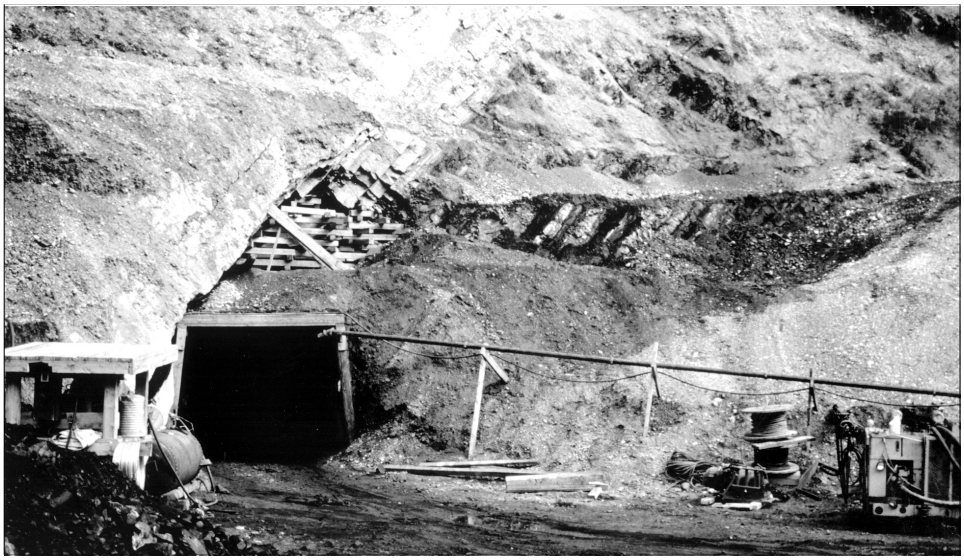

Figure 170. Pritchard Creek Mine portal, August 14, 1975. Photo by Peter Oberlindacher, BLM.

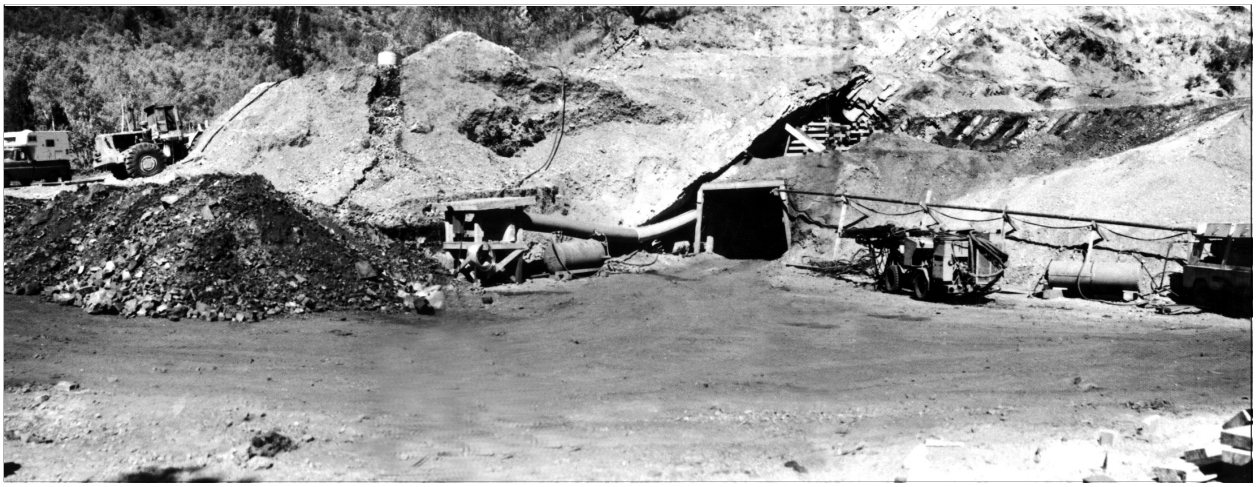

Figure 171. Panorama of the portal area, Pritchard Creek Mine, September 3, 1975. BLM file photo.

northeast to sample the lower ore zone. The crosscut had been planned to open a stope on the ore zones, but that was never completed. Mining was conducted with trackless diesel-powered excavation equipment. Mining stopped at 1,000 feet because the use of this equipment become infeasible due to distance. Underground operations terminated on March 31, 1976, and were abandoned (Figure 172).

There was an ambitious plan to drive a drift to the southeast from the portal site to link up with the Fall Creek Mine and develop the phosphate ore over a linear distance of about two miles. Also planned was the development of the existing underground work to the northwest into a room and pillar mine, using the exploratory drift as the main haulage way. However, both of these plans were abandoned when the economics of phosphate turned unfavorable for underground development.

Figure 172. Abandoned Pritchard Creek Mine portal area, June 2, 1997. Photo by Charles Horsburgh, BLM.

Little Long Valley Mine
(Wooley Valley Unit #3)

The Little Long Valley Mine is located on the east slope of the Wooley Valley Range about 15 miles northeast of Soda Springs, Idaho, and northwest of the Mill Canyon Mine (Figure 173). The area of the mine was examined by the USGS as part of the phosphate withdrawal examination as early as 1912 (Mansfield, 1927). There were no early trenches or other excavations on the land that was to become the mine although there were several trenches in the immediate vicinity.

The first leasing activity in the mine area occurred in 1947. The Farm Bureau Cooperative Association, Inc. of Columbus, Ohio filed an application to lease on March 17, but that application was rejected on procedural grounds on April 14, 1947. On August 11, 1947, the Pacific Supply Cooperative of Walla Walla, Washington filed an application to lease, but that effort also was rejected on procedural grounds.

On May 6, 1953, the BLM held a competitive phosphate lease sale. The J. A. Terteling and Sons Company was the successful high bidder and Federal Lease I-04373 was issued to them on September 1, 1953. The J. A. Terteling and Sons Company assigned the lease to the Terteling Land Company on April 1, 1959. The only work conducted on the lease was exploratory in nature. On July 1, 1966, the Stauffer Chemical Company was designated as the operator of the future mine and eventually, on June 1, 1967, the Terteling Land Company assigned the lease to the Stauffer Chemical Company. Still no mining occurred on the lease. The Stauffer Chemical Company immediately designated the Terteling and Sons Company as the operator, and they in turn subcontracted operations to the Triangle Mining Company (a wholly owned subsidiary of the Terteling and Sons Company). To complete the business maneuvering, the Triangle Mining Company was designated operator on February 16, 1973.

It was well recognized that the phosphate ore wasn't confined to the limits of Lease I-04373 and that to complete the land acquisition, more ground had to be leased from the Federal Government. A prospecting permit for additional land was applied for by the J. A. Terteling and Sons Company on August 23, 1966 and the permit was issued on February 1, 1967. This prospecting permit was assigned, along with Lease I-04373, to the Stauffer Chemical Company on June 1, 1967. Apparently, a deposit of phosphate ore was found in the area of the prospecting permit because on January 14, 1969, the Stauffer Company applied for a preference right lease for the area of the permit. Federal Lease I-97 was issued to Stauffer Chemical Company on August 1, 1969.

Mining actually started on Lease I-04373 during the summer of 1976, about the time that an all-weather haul road to the mine was completed. In support of starting the mine, 104 exploratory drill holes were drilled during the summer and early fall. The mine was divided into four sections, or mine panels. Mining started on panels 1 and 4, with the waste from panel 4 being used in the final construction of the haul road, and the waste from panel 1 being hauled to the #1 Waste Pile. Also

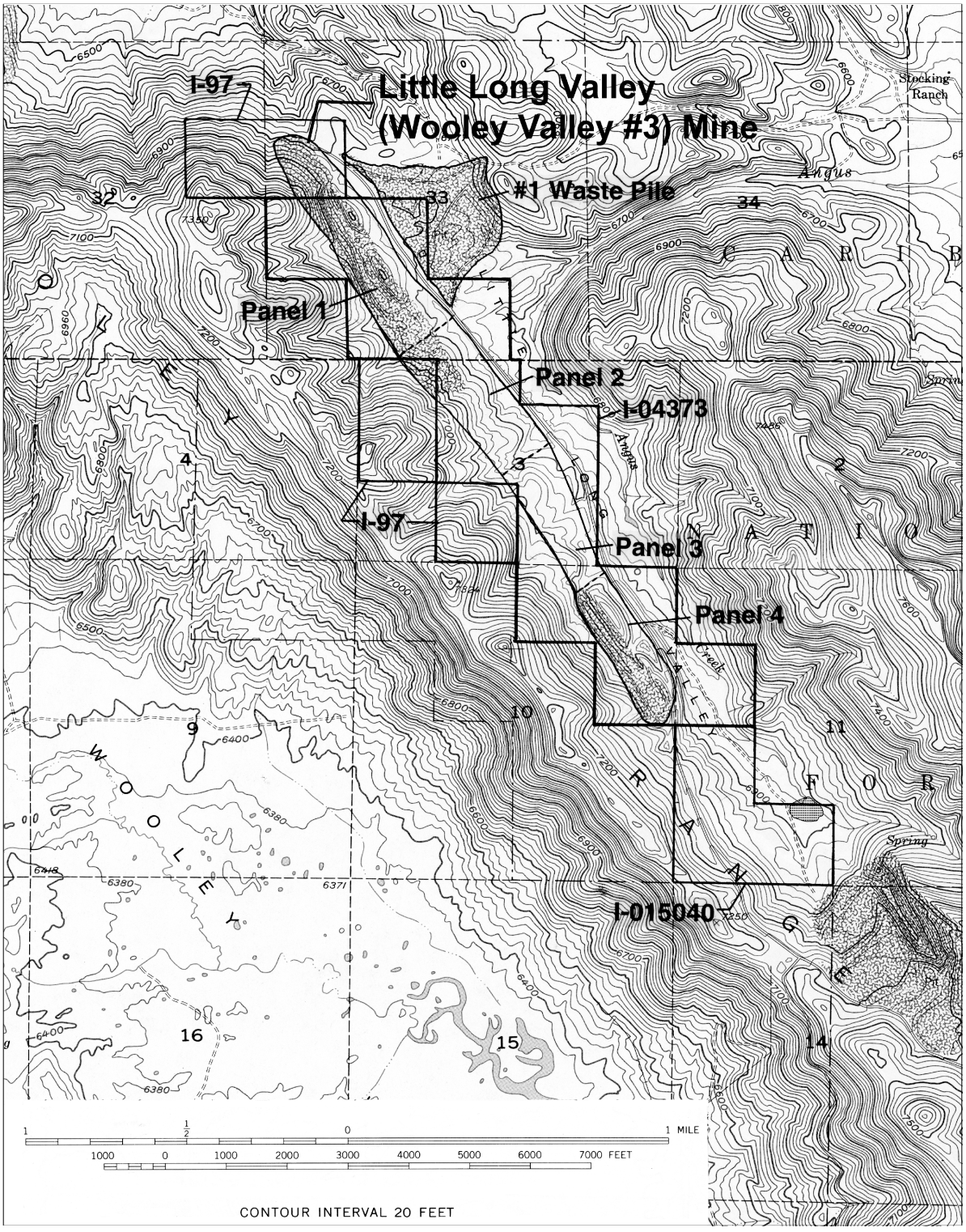

Figure 173. Map showing the location of the Little Long Valley (Wooley Valley #3) Mine, Caribou County, Idaho.

constructed during the summer of 1976 were a series of sediment control basins to prevent sediment run-off from the mining activity from entering Angus Creek. During 1977, exploration was carried on in advance of mining and a total of 137 drill holes were drilled to delineate the ore zone. Mining was completed in Panel 1 in May, 1977, with operations moving on to Panel 2 (Figures 174 and 175).

On April 15, 1978, the Stauffer Chemical Company terminated their operating contract with Triangle Mining Company, thereby assuming all control in the Little Long Valley Mine.

Mining on Lease I-97 occurred on 2 of the 3 parcels. Parcel 1, or the northernmost parcel, produced ore, Parcel 2, or the central parcel, was acquired to cover segments of Lease I-04373 pit footwall which extended off-lease, and Parcel 3, the southernmost, was found to be barren of phosphate.

Figure 174. Site of the Little Long Valley Mine (pre-mining), view northeast, 1973. BLM file photo.

Mining on the northernmost Parcel 1 started in February of 1980 and was completed in 1981 with surface disturbance resulting from mining and mine related activities totaling about 20 acres. The mined-out pit was to serve as a run-off catchment basin and only a small area in the south end of the pit was backfilled.

Stripping operations and ore extraction was carried out by rubber-tired scrapers assisted by crawler dozers. Ore was hauled to the belt conveyor built at the Mill Canyon Mine just to the southeast of the

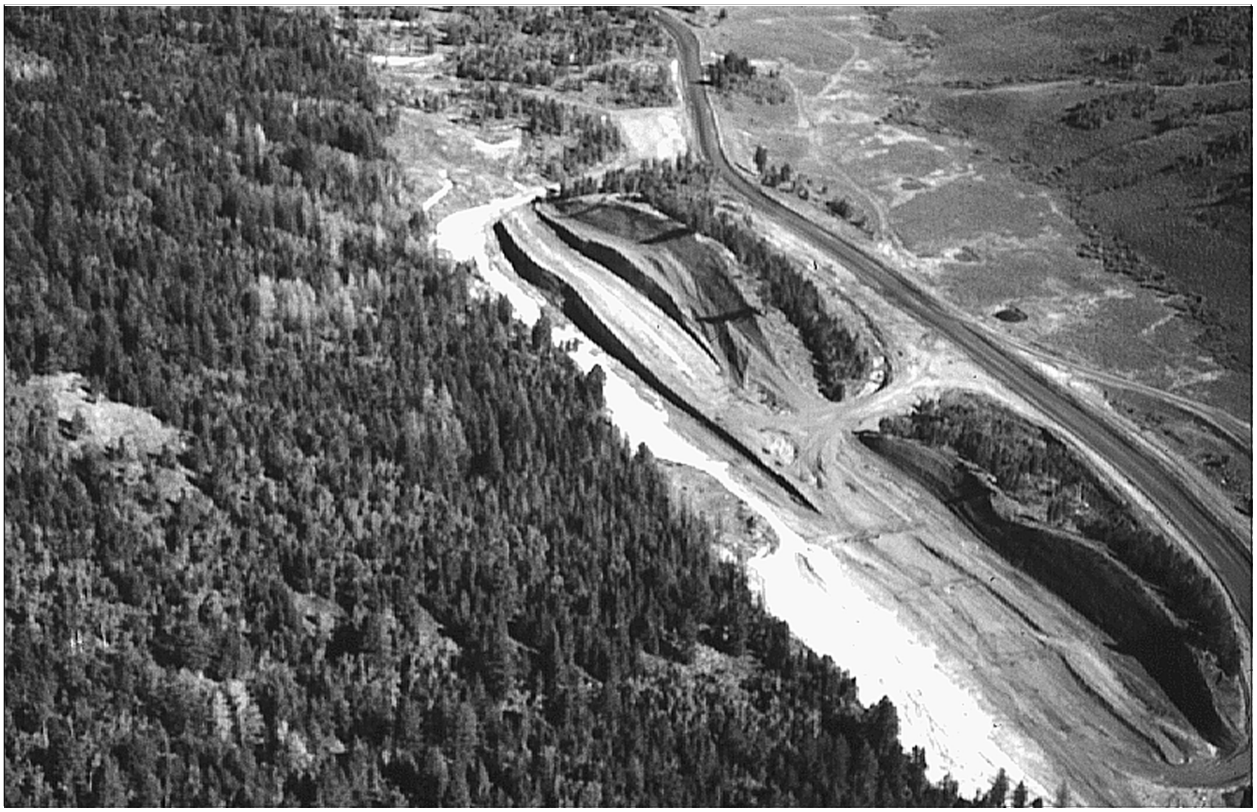

Figure 175. Aerial view of Little Long Valley Mine, August, 1978. Photo by Peter Oberlindacher.

new mine. There, the ore was carried downhill to the rail loading facility and then hauled to the Stauffer mill at Silver Bow, Montana.

To link the Little Long Valley Mine with the Mill Canyon Mine, the Stauffer Chemical Company acquired the 120-acre Federal Lease I-015040 from the FMC Corporation on October 1, 1974. This lease lay between the two Stauffer mines. Mining was conducted on this lease as Panel 5 and less than one million tons of ore was produced. On June 1, 1990, Stauffer assigned 78.7% of the lease back to the FMC Corporation.

By December, 1989, all economically recoverable phosphate reserves located within the area of Leases I-04373, I-97, and I-015040 had been recovered. Reclamation was completed and the mine was closed. For a company history after 1990, see the section of this report for the Blackfoot Narrows Mine.

Lanes Creek Mine

The Lanes Creek Mine is located near the southern end of Rasmussen Ridge in Section 4, T. 7 S., R. 44 E. (Figure 176). The mine is located on private land/private minerals owned by the Bear Lake Grazing Association, a cooperative of about 54 area ranchers. Initially, the land was patented under the Desert Land laws to George M. Pugmire of Bear Lake County on May 4, 1888.

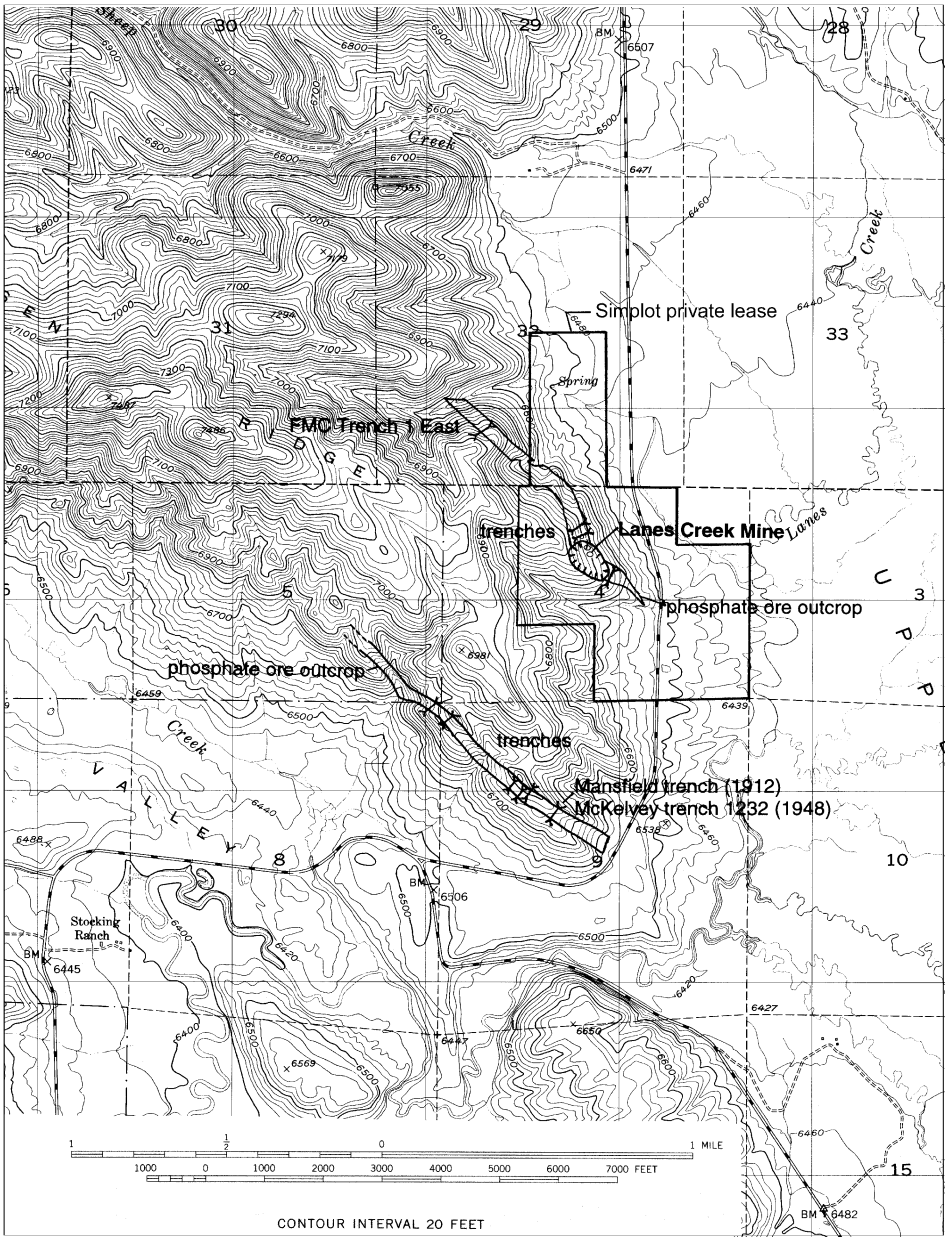

Figure 176. Map showing the location of the Lanes Creek Mine, Caribou County, Idaho.

The phosphate resource was first explored by the USGS in August, 1912 (Mansfield, 1927). The USGS survey party opened two exploratory trenches, or pits, across the phosphate ore bed in the SE¼NW¼ Section 9, T. 7 S., R. 44 E., about one mile south of the future site of the Lanes Creek Mine. These trenches opened both the top and the bottom of the phosphate ore zone. Phosphate analyses from the trenches are given in Mansfield (1927).

Mansfield's 1912 trenches were reopened and resampled (trench #1232) as a part of the overall study of the Western Phosphate Field in 1948 (McKelvey, Armstrong, Gulbrandsen, and Campbell, 1953). In 1975, Rioux and others mapped several additional trenches in the vicinity of the future Lanes Creek Mine including 3 sites within the boundaries of the future mine. These trenches were probably excavated by mining companies seeking the phosphate ore zone.

The lands in the current private leasehold were originally leased from the Bear Lake Grazing Company by John Archer in the early 1970's. Archer sold the lease to the Alumet Company while retaining an overriding royalty. Alumet Company is a partnership between Earth Science, Incorporated (20%), National Steel Corporation (40%), and the Southwire Company (40%). Alumet drilled the ore body on the lease in 1974, during the winter of 1977, and again in the summer of 1978, preparatory to opening the open-pit mine.

The mine was opened in August, 1978. The initial mining contractor was the HK Contractor's Company. The operation was conducted with rubber-tired excavation equipment with bulldozer assistance (Figure 177). The first shipment of fertilizer-grade ore was by truck over the existing road through the Blackfoot Narrows to the Wooley Valley loadout facility and sent by rail to the Valley Nitrogen Company of Helm, California. During the summer of 1983, Alumet shipped approximately 50,000 tons of ore to the J. R. Simplot Company plant at Conda, Idaho. In 1987, and 1988, shipments of ore were made by truck (Figure 178) to the Maybe Canyon railroad facilities and shipped to the Conda plant of Agrium Corp. The most recent operator of the mine was Washington Construction (Conda Mining Co.). The biggest production year for the mine was 1988. Production from the mine was suspended in late 1988 or early 1989, however, the mine was never officially closed and remains available for limited production.

Alumet's Lanes Creek Mine was acquired by the J. R. Simplot Company in September, 1997, along with all of Alumet's other phosphate interests. Reshaping and reclamation of the waste dump at the mine was initiated in June, 1998 (Figure 179). As of the writing of this report, the mine is closed but not abandoned or reclaimed (Figures 180 and 181).

Figure 177. Beginning of mining at Lanes Creek Mine, August, 1978. Photo courtesy of Frank Hamill, Alumet.

Figure 178. Ore trucks at Lanes Creek Mine, date unknown. Photo courtesy of Frank Hamill, Alumet.

Figure 179. Reshaping Lanes Creek Mine dump by the J. R. Simplot Company, June 8, 1998. Photo by the author.

Figure 180. Lanes Creek Mine, view north, June 8, 1998. Photo by the author.

Figure 181. Lanes Creek Mine, view south, June 8, 1998. Photo by the author.

Champ Mine
Champ Mine Extension

The Champ Mine and its extension are located in Section 35, T. 8 S., R. 44 E., and Section 2, T. 9 S., R. 44 E., in the upper Dry Valley, Caribou County, Idaho (Figure 182). The mine was an open-pit operation located on two low hills on the valley floor.

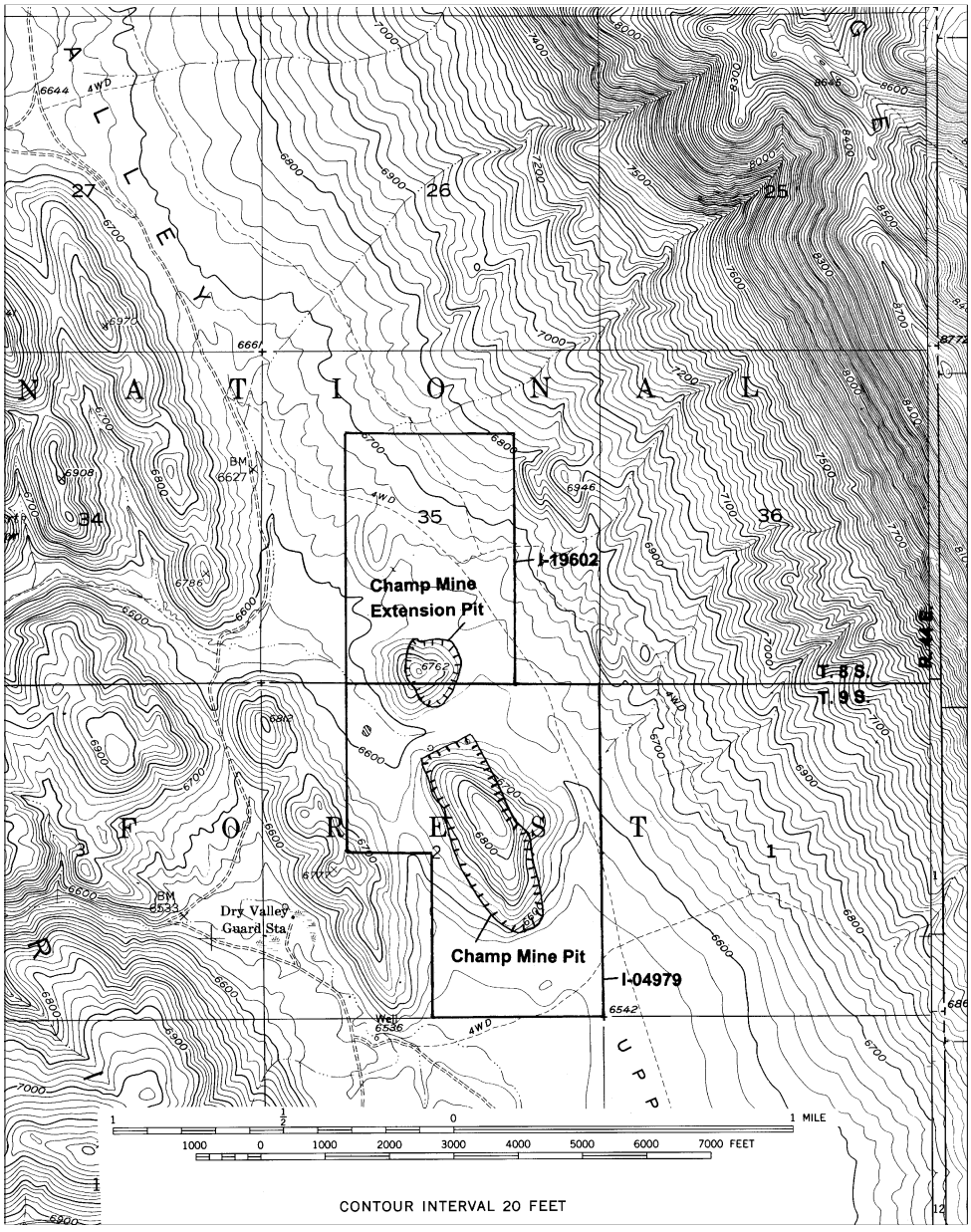

Figure 182. Map showing the location of the Champ Mine and the Champ Mine Extension, Caribou County, Idaho.

Phosphate ore was known to exist in the area of the Champ Mine as early as 1911 (Mansfield, 1927, p. 260). The nearest early exploration was conducted by members of the USGS in July of that year, and consisted of a hand-dug trench 450 feet long and averaging 10 feet deep. This trench was located about 2½ miles southeast of the future site of the Champ Mine. Another early exploration in the area was conducted by the USGS later in 1911 with the excavation of three pits about 3½ miles north of the Champ Mine site in Section 7, T. 8 S., R. 44 E., very near the future site of the Maybe Canyon Mine.

A second round of phosphate exploration was conducted by the USGS in 1947. In September and October of that year, the USGS excavated two bulldozer trenches in the NW¼SE¼ Section 14, T. 9 S., R. 44 E., about two miles south of the Champ Mine site. This trenching site (Lot 1211) was extensively sampled (McKelvey, Armstrong, Gulbrandsen, and Campbell, 1953, p. 38).

Commercial interests in the phosphate resources in this area developed and the BLM was requested to hold a competitive lease sale. The BLM held the lease sale on September 26, 1951. There were three bidders for the property with Frederick P. Champ, of Logan, Utah, being the successful high bidder. The Federal phosphate lease (I-04979) was issued to Mr. Champ on April 1, 1954.

Some exploratory trenching by bulldozer was undertaken in 1952 but the work did little more than expose the main high grade phosphate bed next to the outcrop of the Wells Limestone. In 1954, the Boyles Brothers Drilling Company of Salt Lake City was contracted by the lessee, Mr. Champ, to drill on the lease. At first, a wagon drill was used, which proved to be unsuccessful, and later a rotary rig was used which proved highly successful. A total of 17 holes were drilled that year for a total of 597 feet. In 1955, lease exploration consisted of ten bulldozer trenches (Figure 183) and stripping operations. In 1956, exploration was conducted by drilling 17 more holes totaling 874 feet.

All of this early exploration led to a modification of the lease to add additional acreage on August 14, 1957. Additional exploration was conducted on the lease by Mr. Champ in July 1962, and this led to another modification to the lease to add more acreage on February 13, 1963. There was still no mine development or production on this enlarged lease.

On November 1, 1973, Frederick Champ assigned the lease to the Williams Family Partnership (50%) and the Champ Family Partnership (50%). One month later, December 1, 1973, the lease was further assigned to the Agricultural Products Corporation of Greenwich, Connecticut and Conda, Idaho, a wholly-owned subsidiary of Beker Industries.

Tangled legal maneuvering concerning the Federal lease continued when Agricultural Products Corporation was absorbed into the parent company, Beker Industries, Inc., in 1975. Beker Industries, Inc and the Western Cooperative Fertilizers (US), Inc, joined together by mutual agreement on December 20, 1978, to form the Conda Partnership. On January 1, 1979, Beker Industries, Inc. partially assigned (50%) the lease to the Western Cooperative Fertilizer (US), Inc., and, on the same day, Western Cooperative Fertilizer (US), Inc reassigned the lease to the Conda Partnership.

Figure 183. Exploration Trench “E”, Champ Mine, date unknown. BLM file photo.

The Conda Partnership initiated mining operations on Federal lease I-04979 in late September, 1982, with a small, limited production through the remainder of that year and into 1983. The initial mine plan called for two open pits on the lease. Equipment used in the opening of the mine were diesel-powered scrapers to remove the overburden and front end loaders to remove the ore. Ore was loaded onto trucks and transported six miles via a private haul road to the rail head loading tipple at the Maybe Canyon Mine where the ore was loaded into rail cars and shipped to the Conda Partnership plant at Conda, Idaho.

As mining continued through 1983, two things became apparent. First, all of the available ore on Federal lease I-04979 would be mined out by 1984, and secondly, there were additional reserves of phosphate ore located just off-lease to the north on land leased by the FMC Corporation. The character of this additional ore was such that it was logical to mine it with the current operations of the Champ Mine and not as a separate mining operation. Negotiations were entered into between the Conda Partnership and the FMC Corporation for this adjacent ore deposit.

On June 1, 1983, the FMC Corporation assigned part of their adjacent Federal phosphate lease to the Conda Partnership. FMC Corporation retained a 1% override on the gross value of output from this land. This additional land was given a new lease number, I-19602. Mining on this new acquisition, the Champ Mine Extension, commenced later in 1983.

In 1984, mining operations were escalated. Railroad service was extended to the Champ mine and an onsite loading tipple was completed for use in 1984. Overburden was blasted and loaded into 100-ton trucks by 14-yard shovels. Ore was moved from the mine to either ore stockpiles or the tipple by 120-ton unit rig trucks. All economically recoverable phosphate ore reserves on the original lease, I-04979, were mined during 1984 with mining operations moving onto the Federal lease I-19602. There was a lease modification to add more acreage on January 1, 1985.

By later in 1985, all recoverable phosphate reserves on the Champ Mine Extension, I-19602, had been mined. Backfilling of the pits with overburden and waste had been taking place continuously during the mining phase, and with the completion of mining operations, final reclamation was initiated. The final reclamation consisted of completion of pit back filling, overburden replacement, contouring and reseeding, and was competed in 1986 (Figure 184).

Figure 184. Champ Mine, view north, June 11, 1986. Photo by Peter Oberlindacher, BLM.

The completion of mining and reclamation did not see the end of all of the business maneuvering that was associated with these Federal leases. Beker Industries, Inc., one of the Conda Partnership, declared bankruptcy on December 10, 1986, and sold their interests in the Conda Partnership to Nu-West Industries, Inc. on July 24, 1987. The other Conda Partner, Western Cooperative Fertilizers (US) Inc., became Nu-West Mining Inc. on July 14, 1992. Nu-West Mining Inc. is wholly owned by

Nu-West Industries Inc., so in essence, the old Conda Partnership was consolidated and ceased to exist. On August 10, 1995, Nu-West Industries was acquired by Agrium, Inc., a Calgary, Alberta, Canada agriculture and chemical company. All through these various business dealings, the Federal leases, I-04979 and I-19602 continue in effect, albeit worked out.

Smoky Canyon Mine

The Smoky Canyon Mine is located in T. 8, 9 S., R. 45, 46 E., in Caribou County, Idaho, about 24 air miles east of Soda Springs, Idaho and 6 air miles west of Afton, Wyoming. The J. R. Simplot Company operates the mine on five Federal phosphate leases, I-012890, I-015259, I-26843, I-27801, and I-30369 (Figure 185).

The first reported phosphate exploration activity occurred in October, 1914, when the USGS excavated a trench in the SE¼NW¼ of Section 29, T. 8 S., R. 46 E. The trench was dug at a right angle to the strike of the phosphate ore zone, but had to be offset after excavation had started due to unexpected structure problems. The trench was completed in two sections, 20.5 feet and 117.5 feet in length, and averaging 3.5 to 5.5 feet in depth (Mansfield, 1927).

The next episode of phosphate exploration also was performed by the USGS. In August, 1949, a trench (#1303) was excavated on the west limb of the Boulder Creek anticline in Pole Canyon, in the SW¼SW¼, Section 31, T. 8 S., R. 46 E. (Sheldon and others, 1953; Montgomery and Cheney, 1967; Derkey and others, 1984). This trench uncovered 145.5 feet of the Phosphoria Formation.

On September 29, 1961, Wells Cargo, Inc. filed an application for a Federal phosphate lease with the BLM. The land applied for was determined to be available only for competitive lease and a lease sale was held on April 12, 1962. There were four bidders at the sale, the San Francisco Chemical Company, J. A. Terteling and Sons, Wells Cargo, Inc., and the Ruby Company. The Ruby Company was the successful high bidder and was issued Federal Phosphate Lease I-012890 on October 1, 1962. Upon issuance of the lease, the Ruby Company immediately initiated an exploration program that consisted of drilling 28 exploration holes utilizing a rotary air return drill.

On April 17, 1964, John D. Archer, a prominent and reoccurring name in modern Idaho phosphate, applied for a prospecting permit for phosphate on lands immediately adjacent to the Ruby Company lease. The permit was issued for two years to Archer on February 18, 1965. The permit was extended for an additional two years and was finally explored by three trenches in 1968. Phosphate was discovered on the lands of the permit and Archer applied to the BLM for a Preference Right non-competitive lease on January 3, 1969. The Federal phosphate lease, I-015259, was issued to Mr. Archer on August 1, 1969.

Meanwhile, the Ruby Company continued to explore their lease. In early 1966, the Ruby Company changed their name to Simplot Industries, Inc. Simplot Industries assigned lease I-012890 to the Bannock Chemical Company on June 1, 1966.

On June 1, 1975, John Archer assigned lease I-015259 to a partnership that included Earth Science, Inc. (50%), National Steel Corp. (25%), and Southwire Company (25%). The lease was further

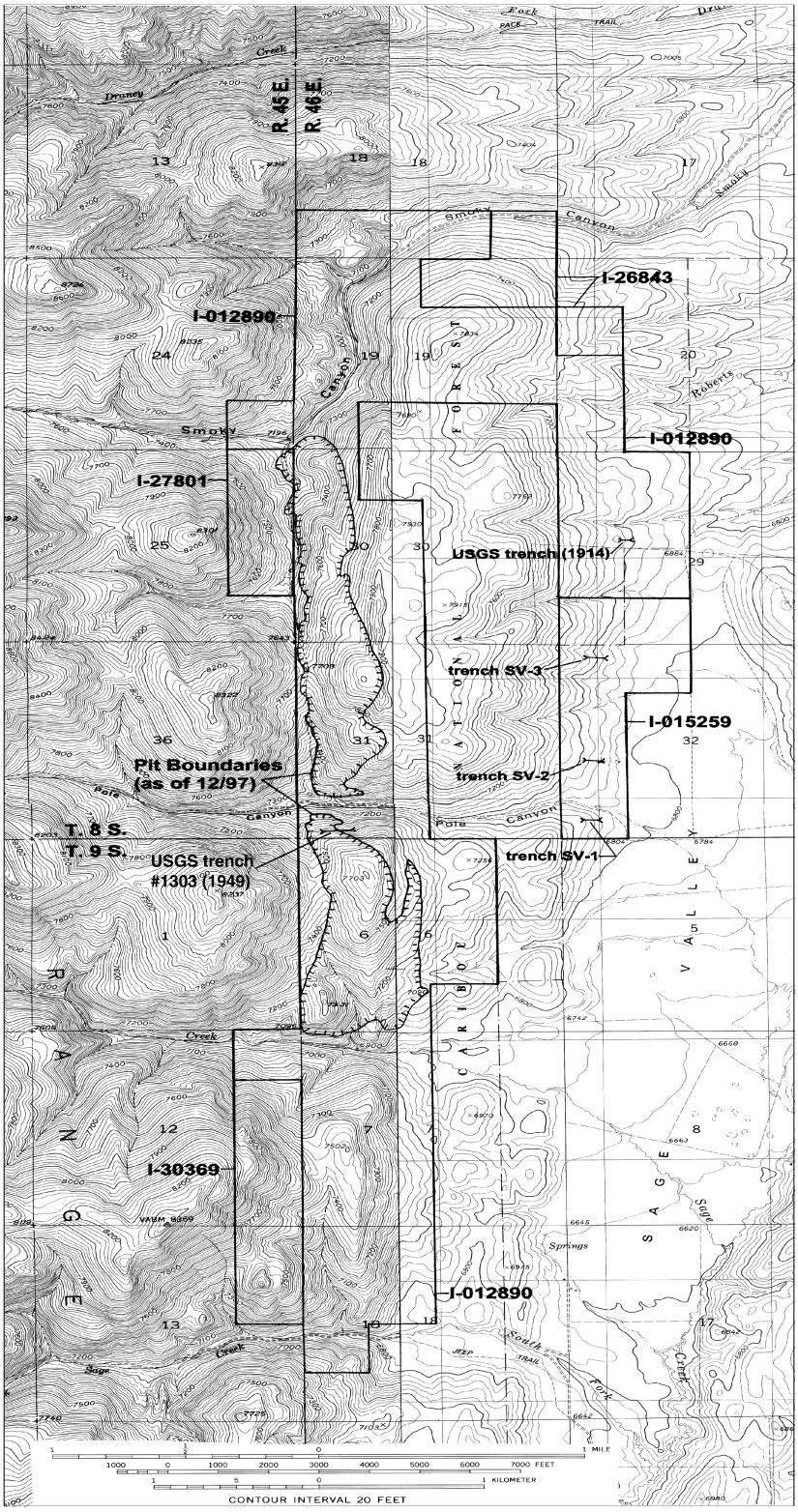

Figure 185. Map showing the location of the Smoky Canyon Mine, Caribou County, Idaho.

assigned to Alumet Company on December 1, 1975. Alumet was a formalization of the 3-way partnership.

The two leases were actively explored by the respective lease holders throughout the late 1970s and early 1980s. The Bannock Chemical Company drilled 12 exploration holes in 1977 and excavated four trenches in 1981, utilizing a D7 Caterpillar bulldozer. Exploration on lease I-012890 indicated that phosphate ore could be found outside the bounds of the existing lease. On February 1, 1983, the lease was assigned to the J. R. Simplot Company. Also on February 1, 1983, the Simplot Company made a application for a fringe acreage lease to add additional ore to their proposed mine. That lease, I-26843, was issued to the Company on September 1, 1989.

Construction of the Smoky Canyon Mine began in the summer of 1982. Construction of an on-site mill was started in 1983. The Smoky Canyon Mine was initially designed to be unique among the modern southeast Idaho phosphate mines inasmuch as the mined ore was to be milled and beneficiated at the mine site. The Smoky Canyon Mine complex consists of an open-pit mine (Figure 186), an ore beneficiation plant, including a flotation circuit, a phosphate concentrate slurry line, a tailings thickener and tailing pipeline system, and a tailings impoundment. At the mine design stage, various transportation issues were examined and a slurry pipeline was decided upon. No other Idaho phosphate mine had

Figure 186. Smoky Canyon Mine, June 27, 1996. Photo by the author.

used this form of ore shipment before. Construction of the first section of the 8-inch inside diameter slurry pipeline was completed to the Simplot plant facility at Conda, Idaho, a distance of about 27 miles, in about 3 months, from late spring to early fall, 1983.

The Smoky Canyon Mine was brought online early in 1984 (Anonymous, 1989) as a truck/shovel operation utilizing a P & H 2300 electric shovel (Figure 187), 170-ton Lectra Haul trucks, and 130-ton Caterpillar trucks for hauling both ore and waste. The pipeline went into operation in May of that year. After the ore was processed and slurried, it was sent on its way to the Simplot Conda facility. At Conda, the ore was dewatered and part of the ore was calcined. The calcined ore was then shipped by rail to a Simplot plant in California for further processing. The uncalcined ore was shipped by rail to the Simplot plant at Pocatello for manufacturing into fertilizer products (Dillard, 1992). The Conda calciner was eventually shut down in 1985 and all ore was rail shipped to the Pocatello facility.

Figure 187. Truck-shovel operation, Smoky Canyon Mine, June 27, 1996. Photo by the author.

Exploration continued on the Simplot leases throughout the 1980s. Six holes were drilled on the leases in 1985, six more in 1986, and 16 more in 1987. The Simplot Company, ever watchful for opportunities for additional ore reserves, entered into an agreement with the Alumet Company in 1987 to conduct an exploration program on the Alumet lease I-015259. The Simplot Company reopened the three 1968 Archer trenches, renamed them SV-1, -2, and -3, and resampled the phosphate ore. Exploration drilling continued on the Simplot leases with 14 holes in 1988, and 23 holes in 1990. All of

this exploration drilling led the Simplot Company to apply for another fringe acreage lease on July 16, 1990. Federal phosphate lease I-27801 was issued to the Simplot Company on August 1, 1991. Also in August, 1991, construction of the final phase of the slurry pipeline was completed, taking 3½ months and extending it 59 miles from Conda to the Simplot plant at Pocatello. Total distance for the pipeline is 86 miles. A booster pump facility was installed at Conda.

The Simplot Company applied for a third fringe acreage lease on November 18, 1993. Phosphate lease I-30369 was issued to the company on October 1, 1995. The final piece of the Smoky Canyon Mine leasehold occurred on June 1, 1996 when the Simplot Company acquired the Alumet Lease I-015259. Simplot now controlled all of the leases in the immediate area of the mine. As of the writing of this report, mining continues on the west limb of the Boulder Creek anticline.

Enoch Valley Mine

The Enoch Valley Mine is located in T. 6 S., R. 43 E., Sections 16, 17, 21, 22, and 27 (Figure 188), in Caribou County, Idaho. The mine lies about 19 air miles northeast of Soda Springs, Idaho. Mining is conducted on three Federal phosphate leases and two State of Idaho phosphate leases.

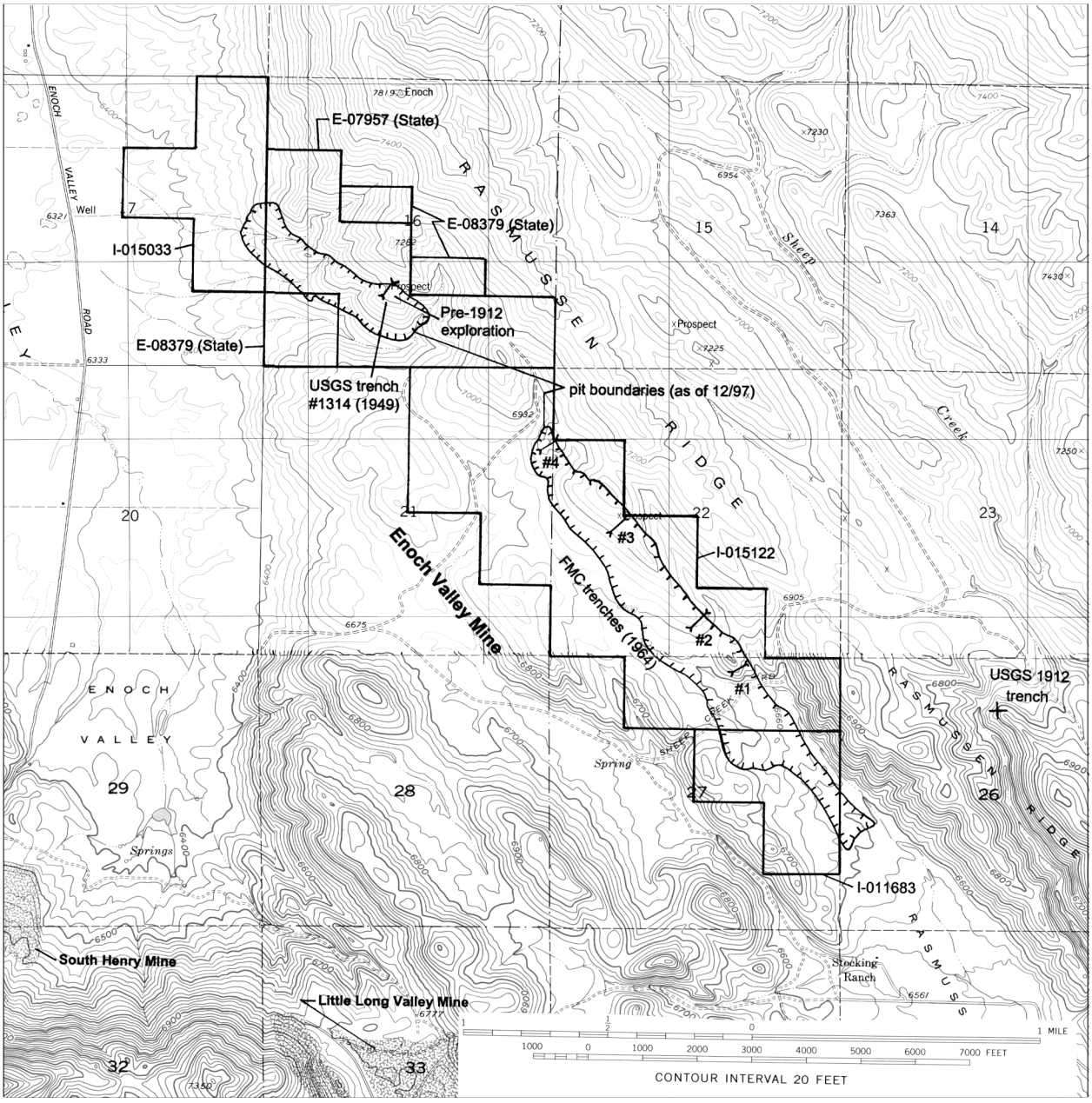

Figure 188. Map showing the location of the Enoch Valley Mine, Caribou County, Idaho.

The presence of phosphate ore in this area has been known since the early 1900's. There was some very early exploration for phosphate ore in the immediate vicinity of the future Enoch Valley Mine. The USGS explored this area in 1912 and reported earlier prospect pits by unknown prospectors in the NW¼SW¼ of Section 16, T. 6 S., R. 43 E. This early exploration consisted of two pits about 100 feet apart, with the west pit being 12 feet long and four feet deep, and the east pit being 25 feet long and 10 feet deep parallel to bedding and 15 feet deep across bedding (Mansfield, 1927, p. 240). The USGS excavated a trench in 1912 in the NE¼NW¼ of Section 26, T. 6 S., R. 43 E. (Mansfield, 1927, p. 241). This trench was 300 feet long, six feet in average depth and 10½ feet in maximum depth, and up to eight feet wide. Samples were gathered and analyses were made and reported in Mansfield (1927).

There was a flurry of phosphate lease applications filed with the BLM in 1947 for the phosphate resources in the area of the future mine. None of the lease applications were issued for a variety of administrative reasons, mostly lack of controlling regulations, and failure to submit filing fee, but that activity indicated there was interest in the resource in this area. Some of the companies interested in leasing at that time were:

California Farm Supply Company
Farm Bureau Cooperative Assoc., Inc.
Utah Cooperative Association
Pacific Supply Cooperative
Idaho Potato Growers, Inc.
The Consumers' Cooperative Assoc.
Farmer Educational and Coop. Union of America
Frank G. Shelley

There was no further reported phosphate interest or exploration in the vicinity of the future Enoch Valley Mine until the USGS revisited the area in 1949. In August of that year, the USGS excavated a trench (Lot #1314) in the SW¼ of Section 16, T. 6 S., R. 43 E. (Davidson and others, 1953). This was a reopening of the pre-1912 prospects mentioned above.

The next event in the history of the phosphate resource in this area occurred in 1960 when, on June 8, the Ruby Company filed an application for a prospecting permit for phosphate with the BLM. The application was initially suspended pending issuance of implementing regulations. The permit was finally issued December 12, 1961, and the Ruby Company commenced exploration activities. The Ruby Company drilled a total of 11 holes on the permit using an air blast rotary drill. Significant ore reserves were discovered and on December 11, 1962, the Ruby Company filed an application for a preference right lease. A Federal lease, I-011683, was issued to the Ruby Company May 1, 1963.

The issuance of this lease caused other companies to become interested in the commercial development of the phosphate resource of this area. On December 30, 1963, the FMC Corporation filed an application for a prospecting permit for lands adjacent to the Ruby Company lease. The BLM issued the permit on May 20, 1964, and the FMC Corporation started exploration. The company drilled five holes totaling 825 feet on the permit with a portable rotary table drill rig. They encountered some

circulation problems, and sample contamination problems occurred due to ground water. The permit was extended for 2 additional years and on May 2, 1968, an application for a preference right lease was made. The Federal phosphate lease, I-015033, was issued to the FMC Corporation on September 1, 1968.

Meanwhile, on February 10, 1964, the Monsanto Chemical Company applied to the BLM for a phosphate lease for the lands lying between the leases described above. The BLM held a lease sale on June 4, 1964 for that tract of land. There were four bidders at the sale; FMC Corporation, Monsanto Chemical Company, Phyliss E. Colman, and J. A. Terteling and Sons. The FMC Corporation was the high bidder and was awarded the lease, I-015122, on September 1, 1964.

The FMC Corporation began exploration immediately after the lease award. By September 21, 1964, the company had excavated four trenches across the outcrop. Additional exploration was conducted by drilling throughout the leasehold. In July and August, 1972, the FMC Corporation drilled 18 holes averaging 275 feet deep with a Model 504 rotary portadrill. The Monsanto Company, although losing the bid for this lease to FMC, maintained an interest in this parcel of land. Under an agreement with FMC, Monsanto did some exploration drilling of their own on lease I-015122 between 1972 and 1980. Monsanto Company also applied for a State lease E-07957 on February 16, 1978. The State of Idaho awarded the company that lease on May 1, 1978.

The interest in the phosphate resource paid off for the Monsanto Chemical Company. The FMC Corporation decided not to develop their two Federal leases, and on April 1, 1981, they assigned both Federal leases I-015033 and I-015122 to the Monsanto Company as part of a lease exchange. Monsanto immediately initiated an intensive exploration and development drilling program on their new leases, drilling 20 holes totaling 4,648 feet by the end of 1981. It became apparent to the Monsanto Company that the phosphate resource on their new leases could not be fully developed without some additional adjacent State-owned land, so they acquired State lease E-08379 on April 2, 1981.

Meanwhile, the Ruby Company Federal lease, I-011683, was undergoing evolution itself. The Ruby Company underwent a name change to Simplot Industries, Inc. in 1965. On June 1, 1966, the lease was assigned to the Bannock Chemical Company, and was further assigned on February 1, 1983 to the J. R. Simplot Company. Only low level exploration was ever conducted on this lease and that was limited to geologic mapping and 11 shallow drill holes put down with an air blast rotary drill in 1962. Through agreement, the Monsanto Company drilled two holes totaling 619 feet on the Simplot lease in 1988.

The Monsanto Company began to develop their leaseholds in preparation for mining in late 1987. The company's operation at the Henry Mine was winding down and a source of future ore needed to be developed. Construction of in-pit haulroads, tipple pads, siltation ponds, and topsoil salvage piles was started. The company began construction of a haul road into the mine area in late 1988, and the road was completed in September, 1989. Construction of a load-out tipple was also started. Stripping of

the overburden near the south end of lease I-015122 began in mid-September, 1989. The plan for mining the Enoch Valley phosphate reserves called for mining to progress from both ends towards the center of the deposit. The initial pit mining began on October 10, 1989 and was done by truck/shovel methods, operated by Dravo-Soda Springs, a mining contractor (Figures 189 and 190). The primary moving equipment included 85-ton Caterpillar Model 777 haultrucks, Hitachi Model 801 shovel, Caterpillar Model 651 and 656 scrapers and Caterpillar D-9L and D-10N dozers and miscellaneous other equipment such as smaller dozers and motor patrols. By the end of 1989, some ore was stockpiled and the budgeted levels of waste removal were reached.

Figure 189. Enoch Valley Mine, May 4, 1995. Photo by the author.

Actual shipment of ore from the new Enoch Valley Mine began in the spring of 1990, with the first production shipment from Federal lease I-015122 and State of Idaho lease E-07957 in May. The ore from the mine was to feed Monsanto's elemental phosphorous plant near Soda Springs. All of the ore shipped from the Enoch Valley Mine passed through the Enoch Valley Mine tipple. At the tipple the ore was loaded into a fleet of 140-ton or 210-ton capacity diesel powered tractor/trailer belly dump haul units, commonly referred to as rubber tired "trains", and hauled 21 miles to the Monsanto elemental phosphorous furnace at Soda Springs.

Monsanto finally completed their planned reserve leasing at the Enoch Valley Mine when, on June 1, 1990, the J. R. Simplot Company assigned their Federal lease I-011683 to the Monsanto Chemical

Figure 190. Truck-shovel operations, Enoch Valley Mine, August, 1997. Photo by Peter Oberlindacher, BLM.

Company. Monsanto's first production from Federal lease I-011683 occurred in August 1990 (Figure 191). By July, 1992, the phosphate ore reserves on this lease were mined out. In May, 1992, Monsanto started mining on Federal lease I-015033, and by October, 1993, the phosphate reserves were mined out. As of this writing, mining continues on Federal lease I-015122 and State of Idaho lease E-07957 (Figure 192).

On September 1, 1997, Monsanto spun off its traditional chemical business to form Solutia. Monsanto retained its pharmaceutical, foods, biotech, agricultural chemicals and seeds business. On that same day, Solutia and Monsanto formed a joint venture called P4 Production L.L.C., organized under the laws of the State of Delaware. The phosphate leases were assigned to P4 Production. P4 Production also owns, to the current time, the Soda Springs elemental phosphorous plant and all other mineral rights formerly held by Monsanto. Operation of the joint venture was originally with Solutia and in June, 2000, transferred to Monsanto.

Figure 191. South end of the Enoch Valley Mine, June 26, 1996. Photo by the author.

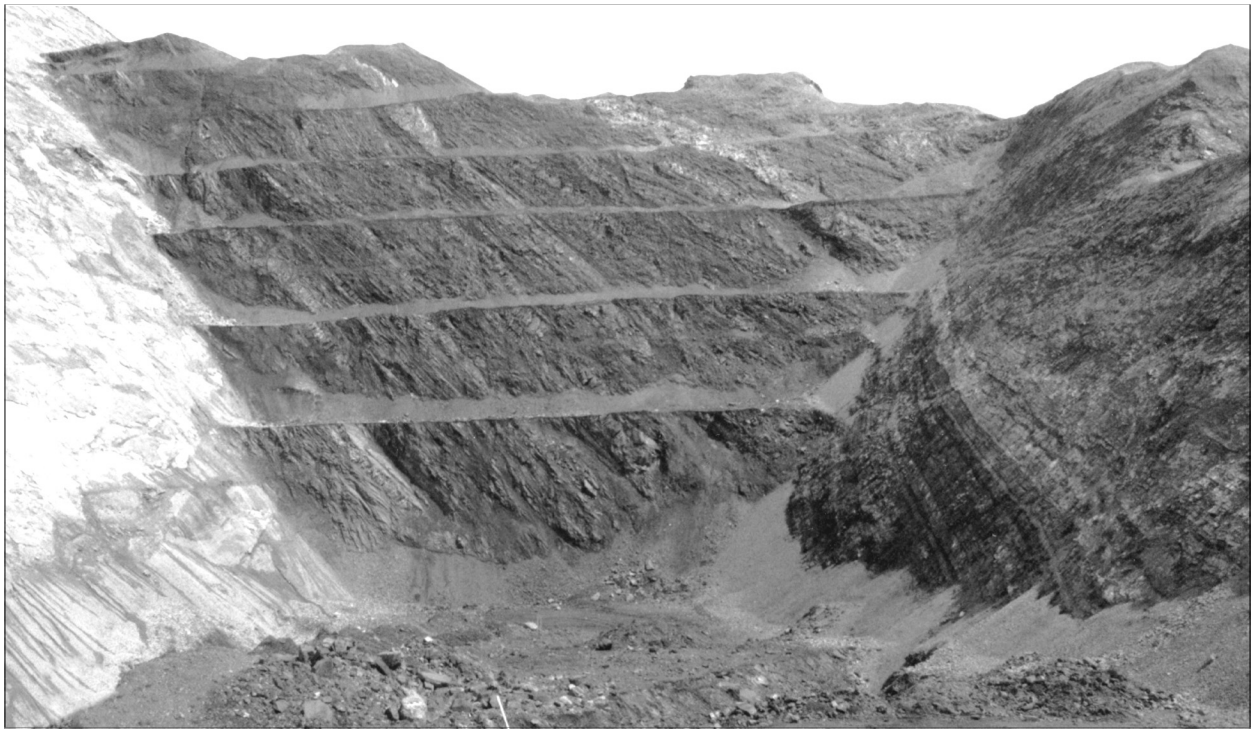

Figure 192. Monsanto's State lease, Enoch Valley Mine, May 4, 1995. Photo by the author.

Rasmussen Ridge Mine

The Rasmussen Ridge Mine is located in T. 6 S., R. 43 E., Sections 9, 15, 16, 22, 23, 25, and 26, in Caribou County, Idaho (Figure 193). The mine is located about 20 air miles northeast of Soda Springs, Idaho.

The first phosphate exploration activity in the immediate area of the future mine took place in 1912. In that year, the USGS opened a large cut on a northwest-facing slope in the NE¼NW¼ of Section 26, T. 6. S., R. 43 E. (Mansfield, 1927, p. 241). The cut was about 300 feet in length, six feet in average depth and about 10½ feet in maximum width, all hand dug. This trench showed about nine feet of phosphate ore in two separate beds.

On March 17, 1947, the Farmers Educational and Cooperative Union of America filed for a phosphate lease in Sections 22, 23, and 25, T. 6 S., R. 43 E. This application, which was rejected for failure to file appropriate fees along with the application, was appealed in May of that year, and was permanently rejected in September, 1952. This attempt at leasing phosphate in the area of the future mine represented the first commercial interest in the phosphate ore in this immediate area.

Partly because of the expressions of commercial interest in the phosphate in this area, the USGS, in August, 1948, excavated a bulldozer trench (#1233) in the northern part of Section 6, T. 7 S., R. 44 E., about one mile southeast of the future mine (McKelvey, Armstrong, Gulbrandsen, and Campbell, 1953, p. 10-15). This trench uncovered about 135 feet of rock of the Phosphoria Formation.

Also due to the commercial interest in the phosphate ore in this area, the BLM held a lease sale on May 6, 1953. There were several tracts offered in this sale, two of which would cover the area of the future Rasmussen Ridge Mine. The first of these two tracts, Wooley Valley Unit #5, was issued as lease I-04375 to the high bidder, the J. A. Terteling and Sons Company on September 1, 1953. The second tract, Wooley Valley Unit #2, was issued as lease I-07619 to the J. A. Terteling and Sons Company but not until March 1, 1957. This delay in issuing the lease was caused by some procedural items not timely addressed.

The J. A. Terteling and Sons Company assigned both leases to the Terteling Land Company on April 1, 1959. The company initiated trenching and drilling exploration on the two leases. During 1961-63, the company excavated three exploration trenches on the two leases, in addition to recovering and resampling the 1912 trench of Mansfield.

The Terteling Land Company assigned the two leases to the Stauffer Chemical Company on June 1, 1967. The Stauffer Chemical Company immediately initiated an extensive exploration program, and during the remainder of 1967 and 1968, 26 trenches were excavated throughout the two leases and across the trend of the phosphate ore zone. Low-level exploration and mapping was conducted

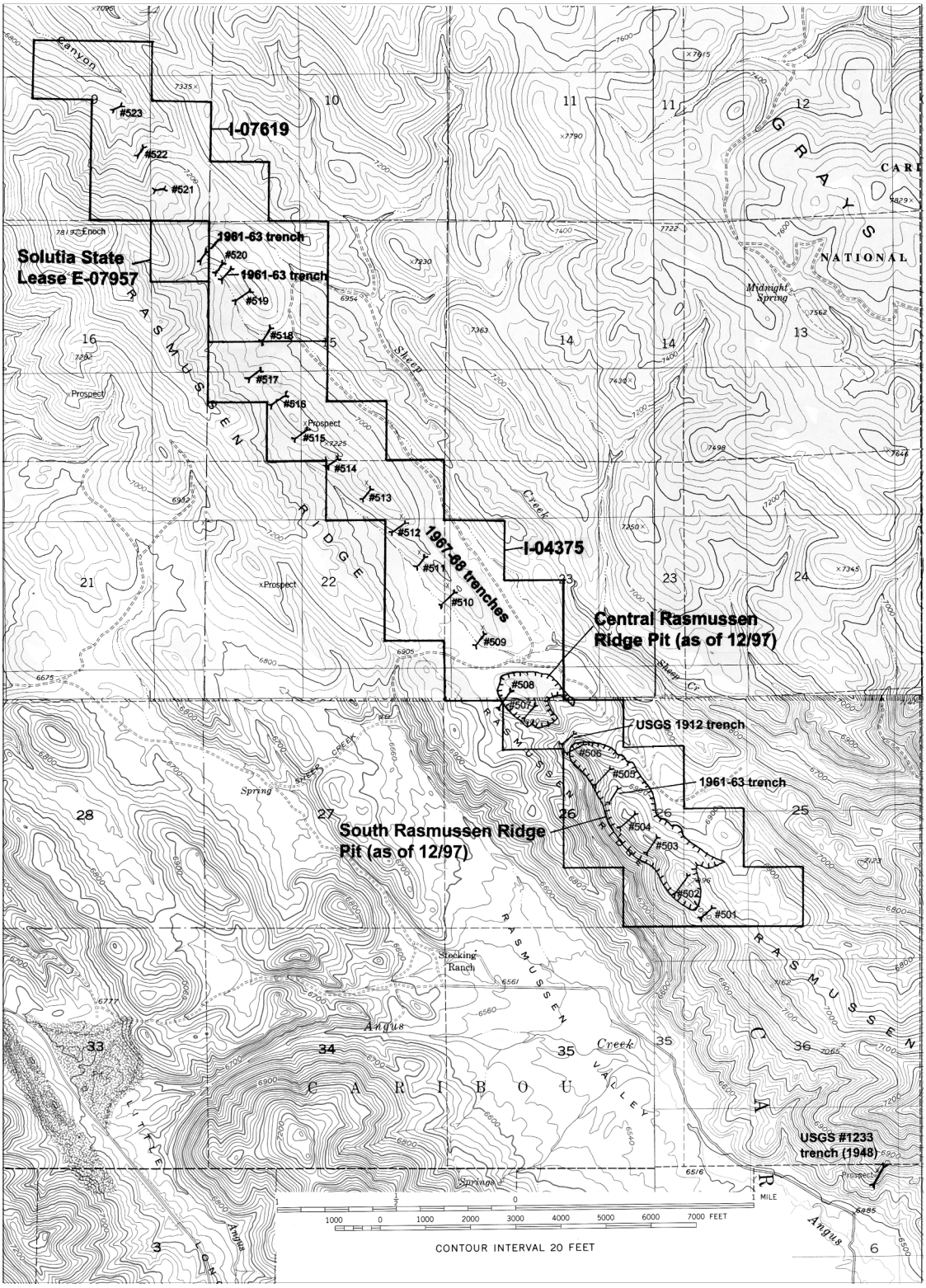

Figure 193. Map showing the location of the Rasmussen Ridge Mine, Caribou County, Idaho.

throughout the 1970's and into the 1980's. Stauffer was holding this mine development in reserve while the company was mining their Mill Canyon and Little Long Valley Mines.

In 1985, Stauffer Chemical Company's phosphorous operations were acquired by the Chesebrough-Ponds Company, which was soon acquired by Unilever N. V. Unilever N. V. sold the operations to the Imperial Chemical Company in 1986, who then immediately sold the whole operation to Rhône-Poulenc (Bennett, 1994). During 1988, the Monsanto Chemical Company contracted to drill 5 holes on the leases. Monsanto holds a State lease immediately to the southeast of the Rasmussen Ridge Mine.

With the closing of mining activities and the exhaustion of phosphate ore in the Little Long Valley Mine, Rhône-Poulenc initiated activities to open the Rasmussen Ridge Mine. Construction of an 8-mile haul road between the Little Long Valley facilities and the new mine began on August 15, 1990, and continued until January, 1991. During the fall of 1990, Rhône -Poulenc put into operation a wash plant adjacent to the loading tipple at Little Long Valley Mine that was designed to upgrade the phosphate ore. The company also drilled 8 development holes totaling 1,890 feet on the leases during 1990.

Mining at the Rasmussen Ridge Mine (the southern end of lease I-04375) was initiated in January, 1991. Mining began as a scraper-dozer operation (Figure 194). The first reported production was in

Figure 194. Initial scraper-dozer operations, Rasmussen Ridge Mine, date unknown. Photo by Peter Oberlindacher, BLM.

June, 1991. The ore was transported by end-dump trucks along the haul road to a stockpile at the old Little Long Valley Mine. A contractor, Circle A Construction Company, was used to haul the ore. There the ore was then moved via conveyor to the wash plant and tipple. The ore was initially shipped to Rhône-Poulenc's elemental furnace plant at Silver Bow, Montana. In December, 1992, the use of front-end loaders and 85-ton haul trucks was started and the scrapers were phased out of the mine by January, 1993 (Figure 195).

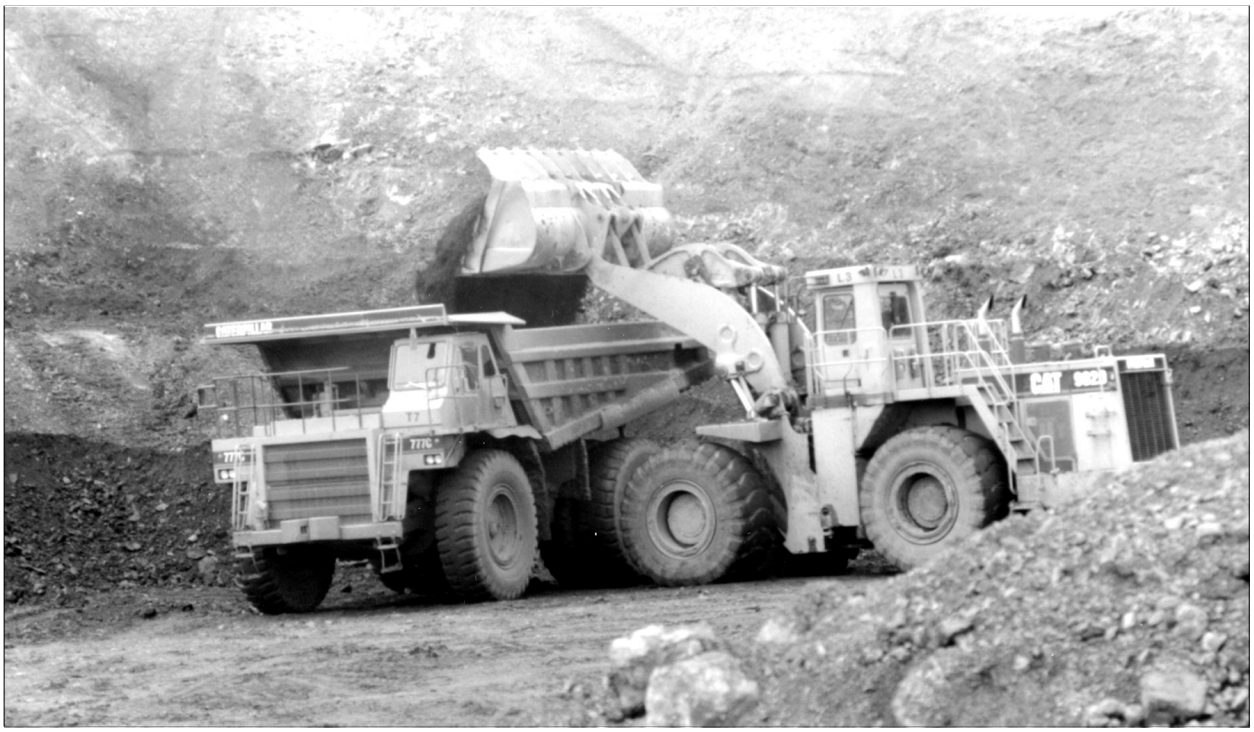

Figure 195. Current operations, Rasmussen Ridge Mine, June 10, 1998. Photo by the author.

In 1993, Rhône Poulenc and Nu-West Mining reached a 7-year agreement whereby Rhône-Poulenc would provide approximately 1.3 million tons of phosphate ore for the Conda plant of Nu-West on an annual basis. Almost the entire production of the mine went to the Conda plant. As the mine pit advanced northwestward, development drilling was conducted ahead of mining. There were 14 holes totaling 2,619 feet drilled in 1994. At the load-out facility, the use of the conveyor was phased out in 1994 and ore was directly hauled to the wash plant and the tipple by truck.

The Rhône Poulenc Basic Chemicals Company assigned the leases to Rhodia, Inc. on February 1, 1998. Rhodia is a subsidiary of Rhône-Poulenc and consisted of the agricultural and chemical business of the parent company. Nu-West Mining was designated as the operator of the mine on February 27, 1998. Rhodia assigned the two leases to Agrium, Inc. on May 1, 1998. As of this writing, Agrium,

Inc. continues to mine at the Rasmussen Ridge Mine through their subsidiary, Nu-West Mining, Inc. Morrison Knudsen's Conda Mining Company has been designated as the mine operator. Morrison Knudsen is now known as Washington International Group.

Dry Valley Mine

The Dry Valley Mine of the FMC Corporation is located in Section 31, T. 7 S., R. 44 E., and Sections 5, 6, 8, 9, 16, 21, and 22, T. 8 S., R. 44 E., about 14 air miles northeast of Soda Springs, in Caribou County, Idaho (Figure 196). The leasehold for the mine extends over six miles in length in a northwest-southeast direction, while actual mining as of the writing of this report extends about two miles.

Known exploration for phosphate ore in the vicinity of the Dry Valley Mine started in 1910 when the USGS opened a shallow pit on the west limb of the Schmid Syncline in the SW¼SW¼ of Section 7, T. 8 S., R. 44 E., in Caldwell Canyon about 1½ miles southwest of the future mine (Mansfield, 1927, p. 258) (Figure 197).

There was very little, if any, phosphate exploration conducted in the area of the future mine until March, 1947. In that month, there was a flurry of phosphate lease applications filed with the BLM. The following companies and cooperatives made application for Federal leases in the area of the future mine:

Farm Bureau Services, Inc.	Farmers' Union Central Exchange, Inc.
Iowa Plant Food Company	Farm Bureau Service Co. of Missouri, Inc.
Illinois Farm Supply Co.	Midland Cooperative Wholesale
Western Idaho Potato Growers, Inc.	

For administrative reasons such as failure to file administrative fees and the lack of proper regulations, all of those lease applications were rejected. It is unknown what caused this activity but a focus was placed on the phosphate deposits in the area of the future Dry Valley Mine.

The USGS, probably encouraged by the number of lease applications, excavated an exploratory trench, Lot # 1259, in the NW¼ of Section 31, T. 7 S., R. 44 E., in August, 1948 (O'Malley and others, 1953). This trench was located on phosphate ore of the east limb of the Schmid Syncline in the area of what would become the "A" pit of the Dry Valley Mine. The USGS also conducted geologic field mapping in the area of the future mine starting in 1950.

The next adventure in phosphate in this area was the advent of prospecting and leasing that would eventually lead to the leasehold as it currently exists. The J. R. Simplot Company, of Pocatello, Idaho, made an application for a Federal lease on September 23, 1949. This application covered lands in Sections 15, 21, and 22, of T. 8 S., R. 44 E. This application was withdrawn on March 15, 1950 and later reinstated in part on May 22, 1950. A competitive lease sale was scheduled to be held September 26, 1951. There were two bidders at the sale; the J. R. Simplot Company and the FMC Corporation. The Simplot Company was the high bidder and was awarded the Federal lease I-0678 on December 1, 1951. The lease was assigned to the Monsanto Chemical Company on March 1, 1956. The lease was further assigned to the FMC Corporation April 1, 1981.

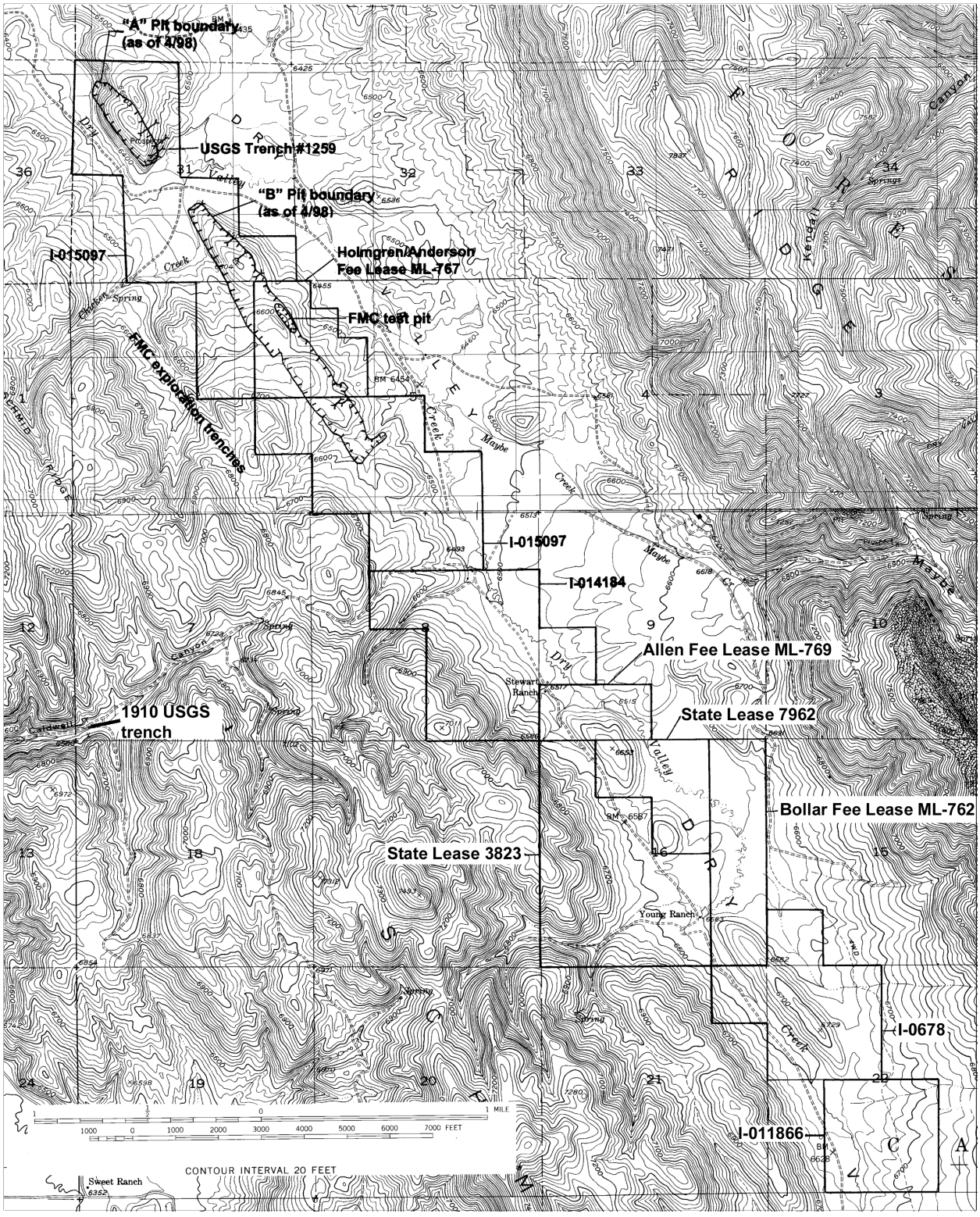

Figure 196. Map showing the location of the Dry Valley Mine, Caribou County, Idaho.

Figure 197. Site of the 1910 USGS trench in Caldwell Canyon, later modified by bulldozer, view east, June 8, 1998. Photo by the author.

The next leasing or permitting action to occur was when Veryl Ershel Larsen applied for a Federal prospecting permit for lands in Section 22, T. 8 S., R. 44 E. The application was rejected for failure to file appropriate documentation. Mr. Larsen reapplied July 25, 1961. It is interesting to note that before the prospecting permit was issued, Mr. Larsen tried to assign the application to the FMC Corporation, however the attempt at assignment was rejected because there were no issued rights to assign. The prospecting permit was eventually issued to Mr. Larsen on February 13, 1962. Mr. Larsen lost no time assigning the now issued permit to the FMC Corporation on March 30, 1962. The FMC Corporation explored the permit area by drilling during the field seasons of 1962, 1963, and 1965. A total of 28 holes were drilled with an aggregate footage of 5,165 feet with 91 samples analyzed. The information generated by this exploration program was sufficient for the company to make an application for a preference right lease on January 19, 1966. The Federal phosphate lease, I-011866, was issued to FMC February 1, 1967.

The next round of phosphate interest in this area occurred when Kerr-McGee Oil Industries, Inc. applied for a Federal prospecting permit for lands in Section 8 and 9, T. 8 S. R. 44 E. on May 24, 1963. The permit was issued to Kerr-McGee on October 14, 1963. During the remainder of 1963, 1964, and into 1965, the company initiated a drilling program to investigate the phosphate resources covered by the permit. Kerr-McGee assigned the prospecting permit to the FMC Corporation on

December 1, 1965. The FMC Corporation conducted additional exploration throughout 1966. All told, exploration on the prospecting permit consisted of fourteen drill holes aggregating 2,414 feet with 224 samples analyzed. The FMC Corporation applied for a preference right lease and on April 1, 1968, Federal lease I-014184 was issued to FMC.

The last round of Federal leasing activity was on January 28, 1964, when Kerr-McGee Oil Industries, Inc. made an application for a competitive lease for lands located in Section 31, T. 7 S., R. 44 E., and in Sections 5, 6, and 8, T. 8 S., R. 44 E.. A lease sale was held on June 4, 1964. There were four bidders at the sale; J. W. Colman, Kerr-McGee Oil Industries, Inc., J. A. Terteling and Sons, and the FMC Corporation. The FMC Corporation was the high bidder and the Federal phosphate lease, I-015097, was issued September 1, 1964.

Throughout this entire period when FMC was gaining control over Federal phosphate leases, there was action to lease the State of Idaho lands in the vicinity of the future mine as well. The Monsanto Chemical Company was issued the State of Idaho lease 3059 in January, 1948. This lease was renewed in 1953, 1958, and 1968. For unknown reasons, Monsanto allowed the lease to expire in January, 1978. However, the company must have realized their error, for on February 16, 1978, Monsanto applied for a new State lease on the same land. State of Idaho lease 7962 was issued to the company on May 1, 1978. The lease was assigned to the FMC Corporation on May 29, 1981. The lease was renewed in 1988 and is up for renewal as of the writing of this report.

Kerr-McGee Oil Industries, Inc. applied for selected State lands in Section 16, T. 8 S., R. 44 E., on May 20, 1963. The State of Idaho lease 3823 was issued to Kerr-McGee on October 30, 1963. The lease was assigned to the FMC Corporation on May 11, 1967. The lease was renewed in 1973, 1983, and 1993.

As one can see from the above discussion, the FMC Corporation consolidated the Federal and State leaseholds by 1981. Along the way, the FMC Corporation obtained three private fee leases to obtain continuity in the total leasehold. These three private leases are the Holmgren/Anderson lease, ML-767, the Allen lease, ML-769, and the Bollar lease, ML-762. These leases were acquired prior to 1974. The FMC Corporation controlled over six miles of phosphate reserves with their mix of Federal, State, and private leases. In addition, FMC purchased or leased the surface rights to all private lands overlying or adjacent to the Federal, State, and private mineral leases (Richard Conroy, personal communications, 1998)

The FMC Corporation did not waste much time getting a lease exploration and development program started. In fact, just after the issuance of Federal lease I-015097 in the northern part of the leasehold on September 1, 1964, FMC initiated a program of trenching that started on September 14, 1964. In addition to several new trenches, FMC also cleaned out and relogged and sampled the 1948 USGS trench #1259 in the NW¼, Section 31, T. 7 S., R. 44 E. There was a period of relative inactivity until FMC excavated a small pit on their Holmgren/Anderson private lease, ML-767, in July, 1971 (James

Figure 198. Test pit, Dry Valley Mine, August 15, 1973. Photo courtesy of the FMC Corporation.

Spaulding, personal communications, 1998) (Figure 198). This pit was developed to provide 51,000 short tons of phosphate ore for testing purposes at FMC's elemental phosphorous plant in Pocatello, Idaho (Rioux and others, 1975; Richard Conroy, personal communications, 1998). It wasn't until August, 1975, that FMC initiated a comprehensive drilling program located principally in the northern portion of the leasehold (Figures 199, 200, and 201). Sixteen holes were drilled that month with a portable rotary table Winter-Weiss rig, Model 524, with water/air circulation. Additional drilling for exploration and hydrological studies was conducted periodically through 1989. Mine development drilling was initiated in 1991 and is ongoing. A total of more than 600 drill holes had been completed on the property prior to 1992 (Richard Conroy, personal communications, 1998).

In anticipation of actual mining, FMC built a railroad spur into the mine area and constructed a tipple during the summer of 1991. A mine-office complex was completed and occupied in 1992. On June 8, 1992, excavation started on the northern-most "A" pit portion of the Dry Valley Mine (FMC, 1998, personal communication). The area of "A" pit is a small hill located near the mouth of Dry Valley. Initially, the equipment used at the start of "A" pit was a P&H 2250 23-yard shovel and 150-ton haul trucks (Bennett and Gillerman, 1994). The first phosphate ore mined at "A" pit was in the Fall of 1992 and was stockpiled on-lease (I-014184) during the winter of 1992-93. The first phosphate ore shipped from the "A" pit of the Dry Valley Mine was on August 23, 1993, and went by rail to the FMC elemental phosphorous plant in Pocatello (Bennett, 1994).

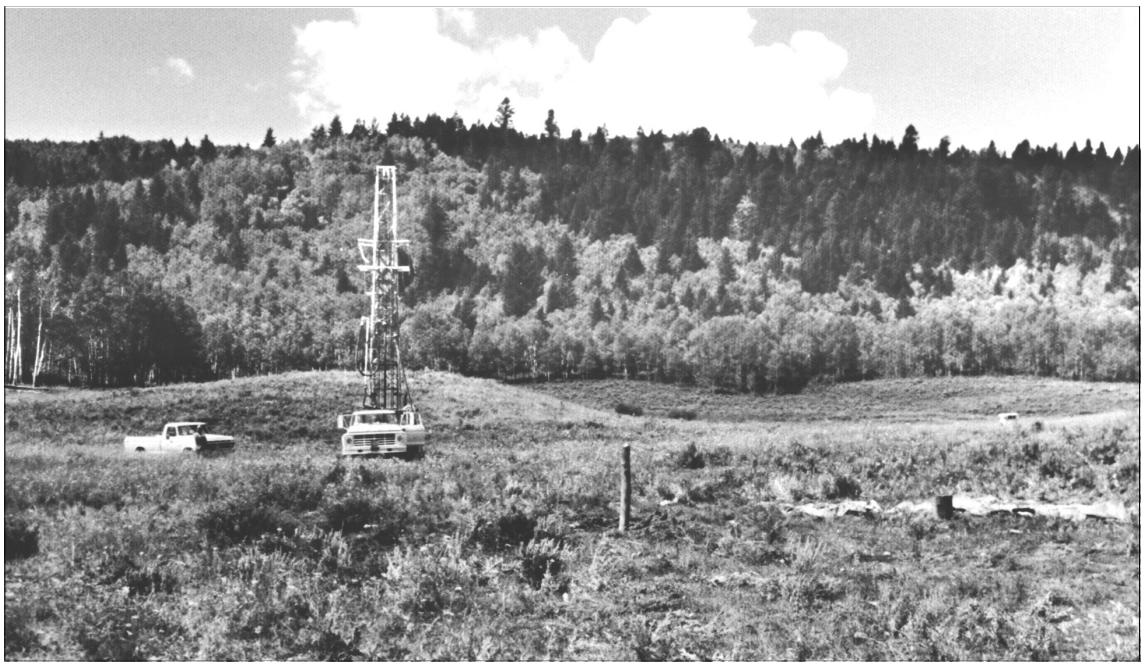

Figure 199. Exploration drilling, Dry Valley Mine site, September 22, 1975. Photo courtesy of the FMC Corporation.

Figure 200. FMC's Winter-Weiss Model 524 drilling rig, Dry Valley Mine, September 22, 1975. BLM file photo.

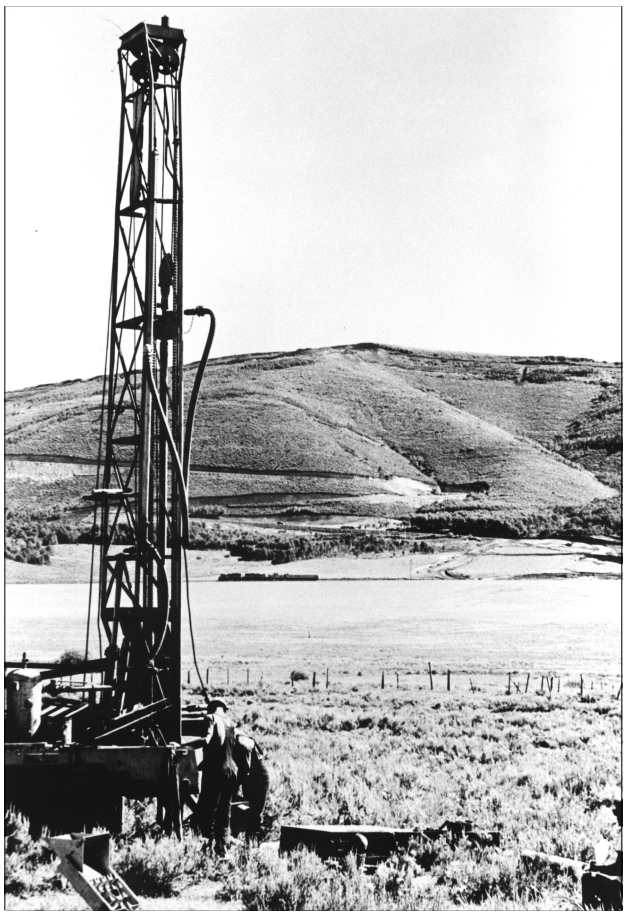

Figure 201. Early exploration, Dry Valley Mine. Photo courtesy of the FMC Corporation.

The area of “B” pit is located along a northwest-southeast trending ridge (Figure 202). This ridge is a prominent feature in Dry Valley along the west side. Stripping of overburden started in the “B” pit area during the summer of 1994. All of the economic phosphate ore was removed from “A” pit by the summer of 1995. Waste materials from “B” pit were then placed in the worked-out “A” pit when reclamation started (Figures 203, 204, and 205).

During late 1996 and throughout 1997, the FMC Corporation conducted an extensive drilling program in their southern leasehold in preparation for the design of the future “C” and “D” pits. Thirty-nine drill holes were put down in the future pit areas in 1997 totaling 10,050 feet. These holes bring the total number of drill holes in the “C” and “D” pit areas to approximately 240.

Figure 202. “B” Pit, Dry Valley Mine, October 13, 1994. Photo by Peter Oberlindacher, BLM.

Figure 203. “B” Pit, Dry Valley Mine, view south, June 27, 1996. Photo by the author.

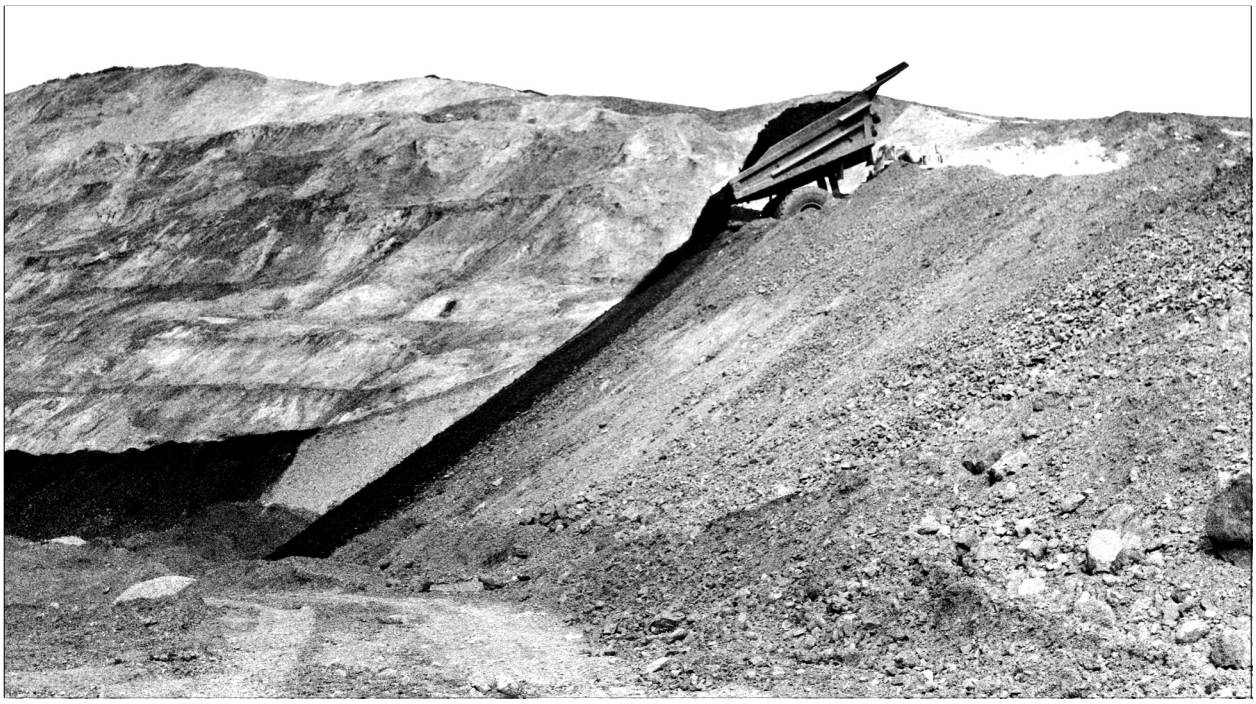

Figure 204. "A" Pit backfilling, Dry Valley Mine, October 13, 1994. Photo by Peter Oberlindacher, BLM.

Figure 205. Reclaimed "A" Pit, Dry Valley Mine, view north, June 27, 1996. Photo by the author.

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References Cited:

Anaconda Collection, 1942, File 020118.18, American Heritage Center, Laramie, Wyoming.

Anonymous, 1926, A large western phosphate operation: Rock Products Magazine, vol. 29, no. 13, June 26, 1926.

_____, 1989, U.S. Pacific Northwest, an outpost of industrial mineral wealth: Industrial Minerals, no. 259, April.

Aro, D.E., 1960, The Conda phosphate operation: Report of the Anaconda Copper Mining Company, File 080114, Anaconda Collection, American Heritage Center, Laramie, Wyoming.

Bell, R.N., 1911, Thirteenth Annual Report of the Mining Industry of Idaho for the year 1911, p. 23, 32.

_____, 1913, Fifteenth Annual Report of the Mining Industry of Idaho for the year 1913, p. 192-204.

_____, 1916, Eighteenth Annual Report of the Mining Industry of Idaho for the year 1916, p. 10-13, 42.

_____, 1918, Twentieth Annual Report of the Mining Industry of Idaho for the year 1918, p. 117.

_____, 1919, Twenty-first Annual Report of the Mining Industry of Idaho for the year 1919, p. 162-165.

_____, 1920, Twenty-second Annual Report of the Mining Industry of Idaho for the year 1920, p. 10-15.

Bennett, E.H., 1994, Idaho's phosphate industry, 1994 update: Idaho Geological Survey, GeoNote #30, 2 p.

Bennett, E.H., McNary, S.W., Lowe, N.T., Neumann, T.R., Rains, R.L., Zilka, N.T., Mayerle, R. T., Leszcykowski, A.M., Olson, J.E., and Gabby, P.N. 1990, Principal deposits of industrial minerals in Idaho: *in* Industrial rocks and minerals of the Pacific Northwest: Oregon Department of Geology and Mineral Industries Special Paper 23, p. 31-32.

Bennett, E.H., and Gillerman, V.S., 1994, Mining, minerals, and the environment in Idaho, 1993: Idaho Geological Survey Staff Report 94-1, February, p. 24-27.

Bowen, C.F., 1918, Phosphatic oil shale near Dell and Dillon, Beaverhead County, Montana: U.S. Geological Survey Bulletin 661-I, pp. 315-328.

Brunelle, A.B., 1978, Federal mineral laws and Idaho phosphate, a historical perspective, *in* Conference proceedings - Open pit mining and environmental law: The Federal/State interface: University of Idaho, April 14-15, Pocatello, Idaho, p. 66-76.

Butner, D.W., 1949, Phosphate rock mining in southeastern Idaho: U. S. Bureau Mines Information Circular 7529, p. 10, 14.

Campbell, Arthur, 1941, Forty-third Annual Report of the Mining Industry of Idaho for the year 1941, 274 p.

_____, 1943, Forty-fifth Annual Report of the Mining Industry of Idaho for the year 1943, 251 p.

_____, 1944, Forty-sixth Annual Report of the Mining Industry of Idaho for the year 1944, 231 p.

Campbell, Stewart, 1921, Twenty-third Annual Report of the Mining Industry of Idaho for the year 1921, 152 p.

_____, 1922, Twenty-fourth Annual Report of the Mining Industry of Idaho for the year 1922, 209 p.

_____, 1923, Twenty-fifth Annual Report of the Mining Industry of Idaho for the Year 1923, p. 10, 25-31.

_____, 1927, Twenty-ninth Annual report of the Mining Industry of Idaho for the year 1927, 280 p.

_____, 1928, Thirtieth Annual Report of the Mining Industry of Idaho for the year 1928, 270 p.

_____, 1929, Thirty-first Annual Report of the Mining Industry of Idaho for the year 1929, 300 p.

_____, 1930, Thirty-second Annual Report of the Mining Industry of Idaho for the year 1930, 308 p.

_____, 1931, Thirty-third Annual Report of the Mining Industry of Idaho for the year 1931, 298 p.

_____, 1932, Thirty-fourth Annual Report of the Mining Industry of Idaho for the year 1932, p. 66.

Carter, R.A., 1978, An integrated industry-phosphate mining and milling in Idaho: Mining Engineering, vol. 30, no. 1, p. 29-36.

Condit, D.D., 1919, Oil shale in western Montana, southeastern Idaho, and adjacent parts of Wyoming and Utah: U.S. Geological Survey Bulletin 711-B, pp. 15-40.

Condit, D.D., Finch, E.H., and Pardee, J.T., 1928, Phosphate rock in the Three Forks-Yellowstone Park region, Montana: U.S. Geological Survey Bulletin 795, p. 147-209.

Cressman, E.R., 1964, Geology of the Georgetown Canyon-Snowdrift Mountain area, southeastern Idaho: U.S. Geological Survey Bulletin 1153, 105 p.

Cressman, E.R., and Gulbrandsen, R.A., 1955, Geology of Dry Valley quadrangle, Idaho: U.S. Geological Survey Bulletin 1015-I, p. 257-270.

Davidson, D.F., Smart, R.A., Peirce, H.W., and Weiser, J.D., 1953, Stratigraphic sections of the Phosphoria Formation in Idaho, 1949, Part 2: U.S. Geological Survey Circular 305, p. 24-27.

Day, R.L., 1973, Trends in the phosphate industry in Idaho and the western phosphate field: Idaho Bureau of Mines and Geology, Pamphlet No. 155, 63 p.

Derkey, P.D., Paul, Ken, Palmer, Pamela, Fakourbayat, Mahasti, Wotruba, N.J., and Hovland, R.D., 1984, Maps showing selected geology and phosphate resources of the Stewart Flat Quadrangle, Caribou County, Idaho: U.S. Geological Survey Minerals Investigations Resource Map MR-72, scale 1:24,000.

Dillard, Gary, 1992, Line moving 1.9 million tons of phosphate a year: Rocky Mountain PAY DIRT, February, p. 4a-8a.

Emigh, G.D., 1959, Review of Idaho's phosphate industry with comments on national market trends, *in* Fletcher, G.D., 1959, Sixtieth Annual Report of the Mining Industry of Idaho for 1959, p. 20-23.

Fletcher, G.D., 1959, Sixtieth Annual Report of the Mining Industry of Idaho for 1959, 116 p.

_____, 1960, Sixty-first Annual Report of the Mining Industry of Idaho for 1960, 113 p.

Gale, H.S., and Richards, R.W., 1910, Preliminary report on the phosphate deposits in southeastern Idaho and adjacent parts of Wyoming and Utah, *in* Hayes, C.W., and Lindgren, Waldemar, 1910, Contributions to Economic Geology, Part I.--Metals and non metals except for fuels: U.S. Geological Survey Bulletin 430, p. 457-535.

Gidel, M.H., 1916a, Report on the property of the Union Phosphate Company near Dingle, Idaho: Report of the Anaconda Copper Mining Company, File 020111, Anaconda Collection, American Heritage Center, Laramie, Wyoming.

_____, 1916b, Grandy phosphate property near Paris, Idaho: Report of the Anaconda Copper Mining Company, Anaconda Collection, File 20310.01, American Heritage Center, Laramie, Wyoming, May.

_____, 1919a, Report of new development on the Grandy phosphate property near Paris, Idaho: Report of the Anaconda Copper Mining Company, Anaconda Collection, File 20310.01, American Heritage Center, Laramie, Wyoming, August.

_____, 1919b, Report on the phosphate property of the San Francisco Chemical Company near Montpelier, Idaho: Report of the Anaconda Copper Mining Company, File 20117.15, Anaconda Collection, American Heritage Center, Laramie, Wyoming, August.

_____, 1947, Correspondence of the Anaconda Copper Mining Company, File 080116, Anaconda Collection, American Heritage Center, Laramie, Wyoming.

Gulbrandsen, R.A., and Krier, D.J., 1980, Large and rich phosphorous resources in the Phosphoria Formation in the Soda Springs area, southeastern Idaho: U.S. Geological Survey Bulletin 1496, p. 20-21.

Hansen, O.T., 1964, A history of the phosphate industry in Idaho: 64th Annual Report of the Mining Industry of Idaho for 1963-1964, 192 p.

_____, 1965, Sixty-fifth Annual Report of the Mining Industry of Idaho for 1965, 94 p.

_____, 1968, Sixty-seventh Annual Report of the Mining Industry of Idaho for 1968, 158 p.

_____, 1970, Sixty-eighth Annual Report of the Mining Industry of Idaho for 1969-1970, 189 p.

Hess, F.L., 1923, Vanadium: U.S. Geological Survey Mineral Resources of the U.S., 1922, pt. 1, p.579-583.

Honkala, F.S., 1953, Preliminary report on geology of the phosphate deposits in the Centennial Range, Montana-Idaho: U.S. Geological Survey Trace Elements Investigations Report 323, 23 p.

Irving, Washington, 1849, The adventures of Captain Bonneville, U.S.A., in the Rocky Mountains and the Far West, digested from his journal and illustrated from various other sources: G. P. Putnam Press, 428 p.

Jobin, D.A., and Schroeder, M.L., 1964, Geology of the Conant Valley Quadrangle, Bonneville County, Idaho: U.S. Geological Survey Mineral Investigations Field Studies Map MF-277, scale 1:24,000.

Jones, C.C., 1907, Phosphate rock in Utah, Idaho and Wyoming: Engineering and Mining Journal, vol. 83, no. 20, May 18, p. 953-955.

_____, 1913, The discovery and opening of a new phosphate field in the United States: American Institute of Mining Engineers Bulletin 82, October, p. 2411-2435.

Kirkham, V.R.D., 1924, Geology and oil possibilities of Bingham, Bonneville, and Caribou Counties, Idaho: Idaho Bureau of Mines and Geology Bulletin No. 8, p. 67.

_____, 1925, Phosphate deposits of Idaho and their relation to the world supply: Transactions of the American Institute of Mining and Metallurgical Engineers, no. 1405-H, January.

Krall, M.A., Frost, J.C., and Geddes, R.L., 1985, Conda Partnership's Dry Valley phosphate mining project: a case study: Mining Engineering, November, 1985, p. 1289.

Larison, E.L., 1934, History of the phosphate business: Report of the Anaconda Copper Mining Company, File 004113, Anaconda Collection, American Heritage Center, Laramie, Wyoming.

Larsen, V.E., unknown date, Report on the Swan Valley phosphate deposits: Report, File 80210.04, Anaconda Collection, American Heritage Center, Laramie, Wyoming.

Lehman, N.E., 1966, Geology and mineralogy of the Fort Hall phosphate deposit: Unpublished Master's thesis, University of Arizona, 184 p.

McDivitt, J.F., 1956, Economic evaluation of phosphate and other minerals in southern Idaho: Idaho Bureau of Mines and Geology Pamphlet No. 111, 48 p.

McDowell, G.A., 1948, Fiftieth Annual Report of the Mining Industry of the State of Idaho for 1948, 258 p.

_____, 1950, Fifty-second Annual Report, Mining Industry of the State of Idaho for 1950, 256 p.

_____, 1951, Fifty-third Annual Report, Mining Industry, State of Idaho for 1951, 174 p.

_____, 1952, Fifty-fourth Annual Report, Mining Industry of Idaho for 1952, 187 p.

_____, 1953, Fifty-fifth Annual Report, Mining Industry of Idaho for 1953, 215 p.

_____, 1954, Fifty-sixth Annual Report, Mining Industry of Idaho for 1954, 192 p.

_____, 1955, Fifty-seventh Annual Report of the Mining Industry of Idaho for 1955, 157 p.

_____, 1957, Fifty-eighth Annual Report of the Mining Industry of Idaho for 1955, 176 p.

McKelvey, V.E., 1943, Paris-Bloomington vanadium area: Monthly report of progress, November 5, 1943, McKelvey Collection, American Heritage Center, Laramie, Wyoming.

McKelvey, V.E., Armstrong, F.C., Gulbrandsen, R.A., and Campbell, R.M., 1953, Stratigraphic sections of the Phosphoria Formation in Idaho, 1947-1948, pt. 2: U.S. Geological Survey Circular 301, 58 p.

McKelvey, V.E., Davidson, D.F., O'Malley, F.W., and Smith, L.E., 1953, Stratigraphic sections of the Phosphoria Formation in Idaho, 1947-48, pt. 1: U.S. Geological Survey Circular 208, 49 p.

McKelvey, V.E., and Strobell, J.D., Jr., 1943a, Paris-Bloomington vanadium area: Monthly report of progress, February 24, 1943, McKelvey Collection, American Heritage Center, Laramie, Wyoming.

_____, 1943b, Paris-Bloomington vanadium area: Monthly report of progress, July 24, 1943, McKelvey Collection, American Heritage Center, Laramie, Wyoming.

_____, 1943c, Paris-Bloomington vanadium area: Monthly report of progress, August 25, 1943, McKelvey Collection, American Heritage Center, Laramie, Wyoming.

_____, 1943d, Paris-Bloomington vanadium area: Monthly report of progress, October 6, 1943, McKelvey Collection, American Heritage Center, Laramie, Wyoming.

_____, 1955, Preliminary geologic maps of the Paris-Bloomington vanadium area, Bear Lake County, Idaho: U.S. Geological Survey Mineral Investigation Field Studies Map MF-41, scales 1:12,000 and 1:4,800.

McKelvey, V.E., Strobell, J.D., Jr., and Slaughter, A.L., 1986, The vanadiferous zone of the Phosphoria Formation in western Wyoming and southeastern Idaho: U.S. Geological Survey Professional Paper 1465, 27 p.

Mansfield, G.R., 1920, Geography, geology and mineral resources of the Fort Hall Indian Reservation, Idaho: U.S. Geological Survey Bulletin 713, 152 p.

_____, 1927, Geography, geology, and mineral resources of part of southeastern Idaho, with descriptions of Carboniferous and Triassic fossils by G.H. Girty: U.S. Geological Survey Professional Paper 152, 453 p.

Maughan, E.K., and Raymond, L.C., 1980, Mining of the Phosphoria Formation in southeastern Idaho, the old and the new: U.S. Geological Survey Administrative Report, May 15, 1980, p. 12-13.

Montgomery, K.M., and Cheney, T.M., 1967, Geology of the Stewart Flat quadrangle, Caribou County, Idaho: U.S. Geological Survey Bulletin 1217, 63 p.

National Archives and Records Administration (NARA), 1987, Guide to the National Archives of the United States; Records of the Reconstruction Finance Corporation (Record Group 234), p. 580-581, 584.

Nichols, Ralph, 1916, Mine production record: Report of the Anaconda Copper Mining Company, Anaconda Collection, File 020310, American Heritage Center, Laramie, Wyoming, March 17.

Nighman, C.E., 1923, Phosphate mine of Anaconda Copper Company at Conda, Idaho; *in* Campbell, Stewart, 1923, Twenty-fifth Annual Report of the Mining Industry of Idaho for the year 1923, p. 26-31.

Norris, E.M., 1944, Underground mining for phosphate rock at Conda, Idaho: Forty-sixth Annual Report of Mining Industry of Idaho for the year 1944, p. 61-66.

O'Malley, F.W., Davidson, D.F., Hoppin, R.A., and Sheldon, R.P., 1953, Stratigraphic sections of the Phosphoria Formation in Idaho, 1947-48, pt. 3: U.S. Geological Survey Circular 262, 43 p.

Paris Post, 1915, Shipping phosphate to Los Angeles, California: August 2, no. 30, col. 2, p. 1.

_____, 1917a, Paris will have new industry: May 25, no. 21, col. 6, p. 1

_____, 1917b, Machinery has been secured for new phosphate mine in Paris Canyon: June 15, no. 24, col. 2, p. 1.

_____, 1918a, Phosphate industry holds big promise, work to commence on property near Paris: April 12, no. 18, col. 1, p. 1.

_____, 1918b, Great future for phosphate mine, rock recognized by the trade as being the best: June 7, no. 24, col 1, p. 1.

_____, 1919, Vast deposits of phosphate in Bear Lake County: November 6, no. 41, col. 4, p. 1.

_____, 1920a, Bear Lake Phosphate Company is organized: January 22, no. 52, col. 4, p. 1.

_____, 1920b, Montpelier part royally entertained at Paris mine: January 29, no. 53, col. 5, p. 1.

_____, 1920c, Western Phosphate Company opens new mill this morning: February 12, no. 2, col. 3-4, p. 1.

_____, 1920d, Idaho phosphate industry active: March 4, no. 5, col. 4, p. 1.

_____, 1920e, Paris is on map forever, Bear Lake Phosphate Company encounters vein of high grade rock in tunnel: March 18, no. 7, col. 1-4, p. 1.

_____, 1920f, First train load of phosphate from west to Orient leaves Paris: March 18, no. 7, col. 4, p. 1.

_____, 1920g, Most extensive deposits of high grade phosphate in world found in Paris: April 15, no. 11, col. 1-2, p. 1.

_____, 1920h, Tunnel collapses at Western Phosphate mine: April 15, no. 11, col. 3, p. 1.

_____, 1920i, no title: July 22, no. 25, col. 2, p. 8.

_____, 1920j, Strike at Western Phosphate settled by favorable compromise: September 9, no. 32, col. 4. p. 1.

_____, 1920k, Leo Bach has narrow escape from mysterious bullet: November 4, no. 40, col. 3, p. 5.

_____, 1920l, Second strike called at phosphate mine Sunday: November 11, no. 41, col. 3, p. 1.

_____, 1920m, Men go back to work after weeks walk out: November 18, no. 42, col. 2, p. 1.

_____, 1920n, Paris - center of phosphate industry, Bear Lake and Western Phosphate Company take important parts: December 9, no. 45, p. 16-17.

_____, 1921a, Phosphate rock being shipped by local company: February 10, no. 2, col. 3, p. 1.

_____, 1921b, Western Phosphate labor case nearing an end: August 4, no. 27, col. 1, p. 1.

_____, 1921c, In the matter of bankruptcy of the Western Phosphate Company, a corporation, bankrupt: October 27, no. 39, col. 4, p. 5.

_____, 1921d, In the matter of bankruptcy of the Western Phosphate Company, a corporation, bankrupt: November 3, no. 40, col. 1-3, p. 5.

_____, 1921e, In the matter of bankruptcy of the Western Phosphate Company, a corporation, bankrupt: November 10, no. 41, col. 1-3, p. 7.

_____, 1921f, Bankrupt sale of Western Phosphate terminates Tuesday: November 24, no. 43, col. 5, p. 1.

_____, 1923, Idaho phosphate mine resumes operation: September 27, no. 34, col. 4, p. 1.

_____, 1924, Two shifts are working at Idaho Phosphate mine: June 12, no. 19, col. 6, p. 1.

_____, 1926a, Keystone Phosphate Company buys Bear Lake phosphate mine: September 9, no. 30, col. 5, p. 1.

_____, 1926b, Keystone Phosphate mine opens with crew of men: October 14, no. 35, col. 2, p. 1.

_____, 1926c, Keystone Phosphate mine will ship ore to coast: October 21, no. 36, col. 5, p. 1.

_____, 1926d, Money due miners will be paid before Christmas: December 16, no. 44, col 6, p. 1.

_____, 1930a, Canada company begins phosphate operations here, phosphate deposits at Bloomington acquired by Canada Mining Co. to be mined, officers now on job, men wanted: October 9, no. 32, col. 5, p. 1.

_____, 1930b, Phosphate on move: November 27, no. 38, col. 3, p. 1.

_____, 1930c, California firm reopens mine: November 27, no. 38, col. 6, p. 1.

_____, 1930d, Paris mining area develops: December 11, no. 41, col. 3, p. 1.

_____, 1931, California phosphate company speeding up operations: January 8, no. 44, col. 4, p. 1.

_____, 1938, Mining industry of Bear Lake listed in report: March 10, no. 12, col. 4, p. 1.

_____, 1939, Phosphate firm files corporate articles: November 30, no. 43, col. 3-4, p. 1.

_____, 1942a, Mine track is being torn up this week: May 7, vol. 62, no. 14, col. 2, p. 1.

_____, 1942b, Prospects good for opening of phosphate mines: September 17, vol. 62, no. 33, col. 4, p. 1.

_____, 1942c, McIlwee phosphate mine leased to Metal Reserve Co.: December 10, vol. 62, no. 45, col. 6, p. 1.

Peale, A.C., 1879, Report on the geology of the Green River District: U.S. Geological and Geographical Survey of the Territories, 11th Annual Report (Hayden), p. 509-646.

Peterson, F.R., 1994, Confronting the desert, *in* Shallat, Todd, editor, Snake, the Plain and its people: Boise State University, Boise, Idaho, p. 130.

Power, O.A., 1947, Idaho phosphate, *in* McDowell, G.A., Forty-ninth Annual Report of the Mining Industry of the State of Idaho for the Year 1947, p. 68-69.

Ravitz, S.F., Nicholson, I.W., Chindgren, C.J., Bauerle, L.C., Williams, F.P., and Martinson, M.T., 1947, Treatment of Idaho-Wyoming vanadiferous shales: American Institute of Mining and Metallurgical Engineers Technical Publication No. 2178, 14 p.

Richards, R.W., and Mansfield, G.R., 1911, Preliminary report on a portion of the Idaho phosphate reserve, *in* Hayes, C.W., and Lindgren, Waldemar, 1911, Contributions of Economic Geology, Part I-Metals and Nonmetals Except Fuels: U.S. Geological Survey Bulletin 470, p. 371-437.

_____, 1912, The Bannock overthrust, a major fault in southeastern Idaho and northeastern Utah: Journal of Geology, vol. 20, no. 8, p. 681-709.

_____, 1914, Geology of the phosphate deposits northeast of Georgetown, Idaho: U.S. Geological Survey Bulletin 577, 76 p.

Richter, Albert, 1911, Western phosphate discovery: Mines and Methods, vol. II, No. 9, May, p. 207.

Rioux, R.L., Hite, R.J., Dyni, J.R., and Gere, W.C., 1975, Geologic map of the Upper Valley Quadrangle, Caribou County, Idaho: U.S. Geological Survey Geologic Quadrangle Map GQ-1194, 1:24,000.

Rubey, W.W., 1943, Vanadiferous shale in the Phosphoria Formation, Wyoming and Idaho [abs.]: Economic Geology, vol. 38, p. 87.

Salt Lake City Tribune, December 9, 1948,

Savage, C.N., 1961, Geology and mineral resources of Bonneville County: Idaho Bureau of Mines and Geology County Report No. 5, p. 62-65.

Schmitt, W.O., 1967, The Gay Mine, Fort Hall, Idaho, *in* Hale, L.A., Anatomy of the western phosphate field, a guide to the geologic occurrence, exploration methods, mining engineering, and recovery technology: Intermountain Association of Geologists, Fifteenth Annual Field Conference Guidebook, p. 195-202.

Schultz, A.R., 1918, A geologic reconnaissance for phosphate and coal in southeastern Idaho and western Wyoming: U.S. Geological Survey Bulletin 680, p. 39-40.

Schultz, A.R., and Richards, R.W., 1913, A geologic reconnaissance in southeastern Idaho: U.S. Geological Survey Bulletin 530, p. 267-284.

Schwarze, D.M., 1967, History of the Conda operation--underground to strip mining; *in* Hale, L.A., 1967, Anatomy of the Western Phosphate Field: Intermountain Association of Geologists, Fifteenth Annual Field Conference Guidebook, p. 187-194.

Sears, R.S., 1955, Phosphate deposits in the Caribou Range, Bonneville County, Idaho [abs.]: Geological Society of America Bulletin, v. 66, no 12.

Service, A.L., 1966, An evaluation of the western phosphate industry and its resources; Part 3. Idaho: U.S. Bureau of Mines Report of Investigations 6801, 201 p.

_____, 1967, History and development of the phosphate industry in southeastern Idaho, *in* Hale, L.A., 1967, Anatomy of the Western Phosphate Field: Intermountain Association of Geologists, Fifteenth Annual Field Conference Guidebook, p. 175, 176.

Sheldon, R.P., Warner, M.A., Thompson, M.E., and Peirce, H.W., 1953, Stratigraphic sections of the Phosphoria Formation in Idaho, 1949, Part 1: U.S. Geological Survey Circular 304, p. 14-19.

Smart, R.A., Waring, R.G., Cheney, T.M., and Sheldon, R.P., 1954, Stratigraphic sections of the Phosphoria Formation in Idaho, 1950-1951: U.S. Geological Survey Circular 327, 22 p.

U.S. Geological Survey, 1943, Office of War Information news release OWI-1226, 3 p.

_____, 1977, Development of phosphate resources in southeastern Idaho: Final Environmental Impact Statement, vol. 1, p. 1-15.

Vine, J.D., and Moore, G.W., 1952, Uranium-bearing coal and carbonaceous rocks in the Fall Creek area, Bonneville County, Idaho: U.S. Geological Survey Circular 212, 10 p.

Weeks, F.B., 1908, Phosphate deposits in the western United States, *in* Hayes, C.W., and Lindgren, Waldemar, Contributions to economic geology, 1907: U.S. Geological Survey Bulletin 340, p. 441-447.

Wyodak, 1944, Report of Paris-Bloomington vanadium investigations: Report No. AA-170, U.S. Geological Survey Field Records Library, January 6, 1944, 100 p.
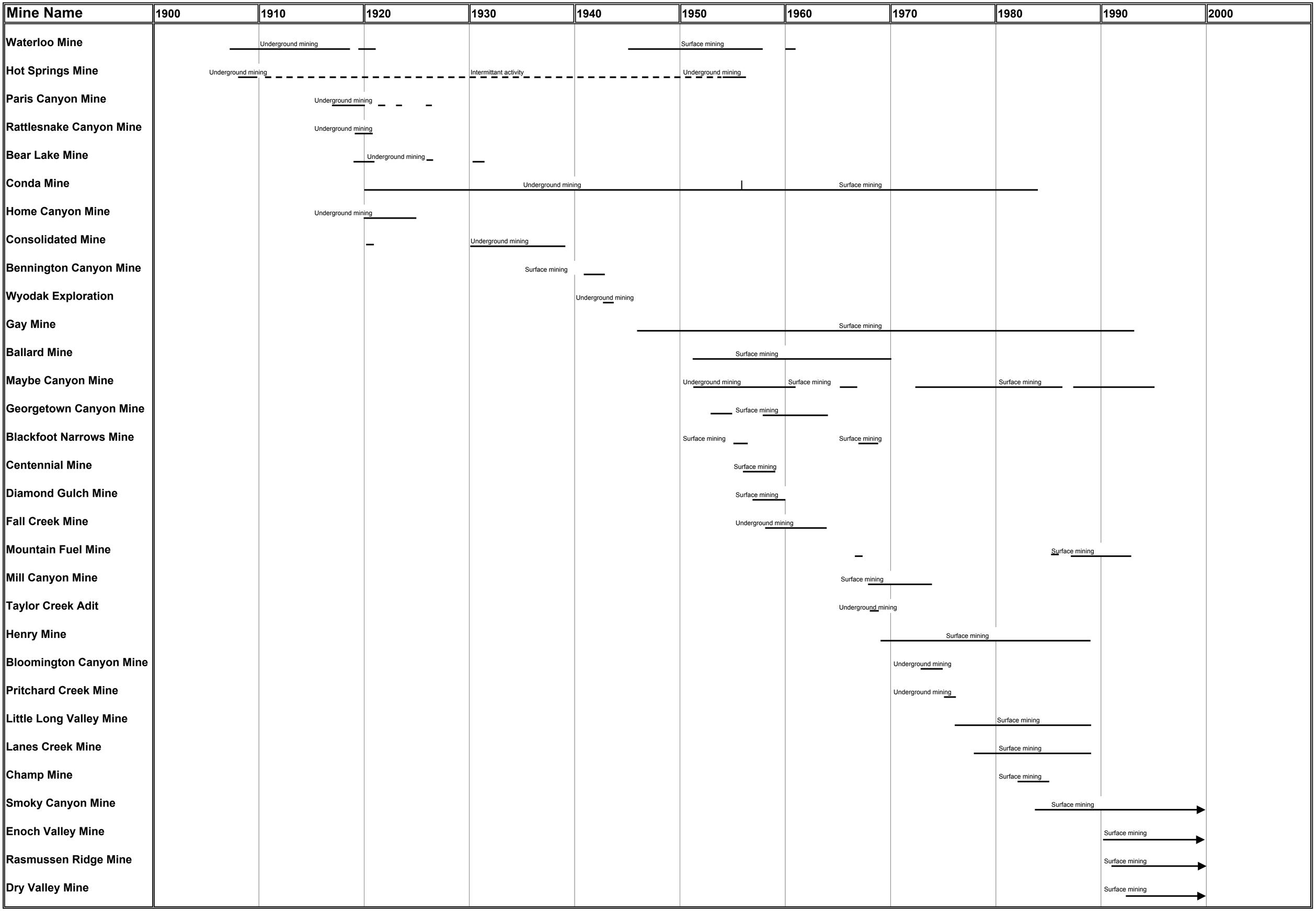
Plate 1. Chronology of Phosphate Mining in Southeast Idaho.