MINE SITE VISIT:

NERCO MINERALS
CRIPPLE CREEK OPERATIONS

U.S. Environmental Protection Agency
Office of Solid Waste
401 M Street SW
Washington, DC 20460

4.0 SITE VISIT REPORT: NERCO MINERALS CRIPPLE CREEK

4.1 INTRODUCTION

4.1.1 Background

The Environmental Protection Agency (EPA) is assisting states to improve their mining programs. As part of this ongoing effort, EPA is gathering data related to waste generation and management practices by conducting site visits to mine sites. As one of several site visits, EPA visited the Ironclad/Globe Hill facility near Cripple Creek, Colorado, on April 14, 1992.

Sites to be visited were selected to represent both an array of mining industry sectors and different regional geographies. All sites visits have been conducted pursuant to RCRA Sections 3001 and 3007 information collection authorities. When sites are on Federal land, EPA has invited representatives of the land management agencies (Forest Service/Bureau of Land Management). State agency representatives and EPA regional personnel have also been invited to participate in each site visit.

For each site, EPA has collected information using a three-step approach: (1) contacting the facility by telephone to get initial information, (2) contacting State regulatory agencies by telephone to get further information, and (3) conducting the actual site visit. Information collected prior to the site visit is then reviewed and confirmed during the site visit.

In preparing this report, EPA collected information from a variety of sources, including Nerco Minerals Company, the Colorado Mined Land Reclamation Division, and the Colorado Department of Health. The following individuals participated in the site visit:

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Participants in the site visit were provided an opportunity to comment on a draft of this report. Nerco Minerals Company submitted comments on the draft, which are presented in Appendix 4-C. EPA's responses to Nerco Minerals Company's comments are summarized in Appendix 4-D.

4.1.2 General Facility Description

The Ironclad/Globe Hill facility and Nerco's other Cripple Creek operations are located in Teller County, Colorado, near the historic mining towns of Cripple Creek and Victor (see Figure 4-1

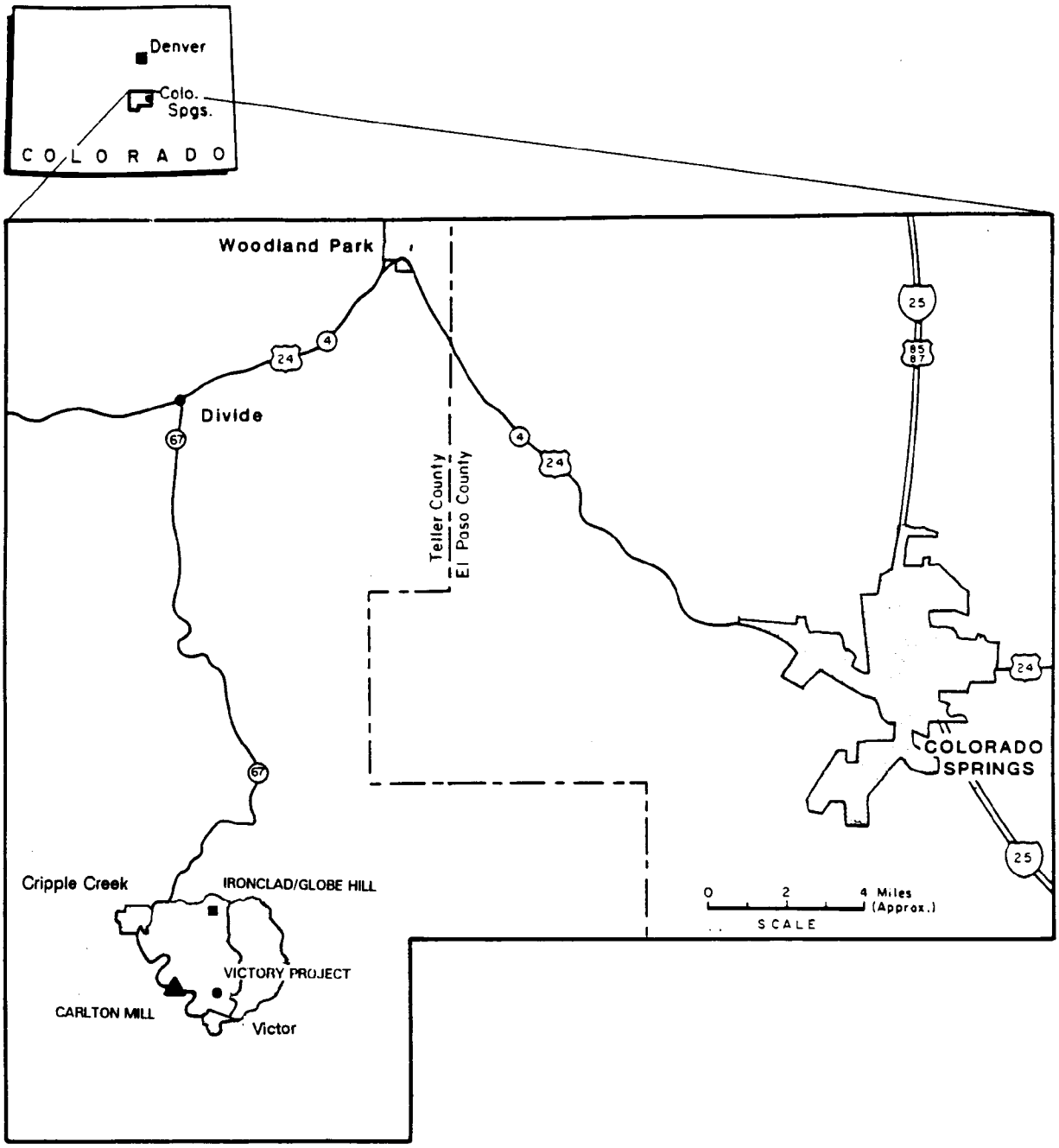


Figure 4-1. Cripple Creek and Victor, Colorado, and Major Nerco Operations

(Source: Map used in numerous permit applications, modified by EPA)

). Mining has occurred in the area since the mining district was organized during the gold rush of the early 1890s. The mining district is characterized by abandoned headframes, waste rock dumps, and hundreds of openings to underground mines. Other than mining, predominant land uses include grazing and ranching. The colorful mining past, reflected in the remnants of historic operations, also makes tourism a mainstay of the local economies. In Cripple Creek, recently authorized gambling has begun to dominate the economy.

Nerco Minerals owns a number of major operations in the Cripple Creek area, all within one to two miles of the towns of Cripple Creek and Victor. Nerco's major current activities occur on two main permits issued by the Mined Land Reclamation Division: the Globe Hill and Ironclad/Victor permits.
The Globe Hill project (MLRD permit number 77-367) was initiated by Gold Resources Joint Venture in 1977 as an open pit mine and the Globe Hill heap leach pad. Newport Minerals became the permittee in 1979 (Newport Minerals, Inc. 3/29/79) and operated two additional heap leach pads: the Forest Queen/2A pad, which was constructed on the surface of waste rock from the pit; and the '76 or Bull Hill project, which was used to leach material taken from old waste rock dumps and is located about one mile southeast of the Ironclad/Globe Hill site. In 1986, Dayspring Mining Corporation succeeded Newport as the permittee for the entire Globe Hill project and other projects covered by Permit 77-367 (MLRD 9/25/86). In 1990, Nerco (actually, Nerco subsidiary Pikes Peak Mining Company) succeeded Dayspring as operator (MLRD 2/6/91). None of the three permitted heap leach pads has been actively leached for several years.

The Ironclad/Victor operation (permit 81-134) is immediately adjacent to the Globe Hill permit area. Permitted by Silver State Mining Company in 1981, this operation originally leached ore from the Ironclad pit in concrete vats inside the Victor Mill building. Nerco purchased Silver State and assumed the permit in 1984 and undertook a major expansion. In late 1985, the facility entered an extended period of inactivity. Nerco then attempted to sell the Victor property, along with three mines in Nevada, in 1988 (Nerco 9/88). This "small mines package" was withdrawn from the market in 1989 (Nerco 9/89) as Nerco consolidated control over much of the Cripple Creek mining district. In 1990, Nerco developed plans to re-activate the facility, again as a vat leaching operation. Shortly thereafter, Nerco (through Pikes Peak Mining Company) assumed the adjacent Globe Hill permit and developed plans for a large 1,500,000 square foot heap leach pad covering portions of both permit areas. This pad, the "Ironclad Pad," is being constructed in three phases during 1991 and 1992, and portions of the developing heap are being actively leached as construction continues on other portions. Ore for this heap is mined from the Ironclad and Globe Hill open pits. Ultimately, the heap will contain a total of about 4,400,000 tons of ore.

Besides the Ironclad/Globe Hill operation, Nerco owns and/or controls a number of other operations and facilities in the Cripple Creek area: the Carlton Mill (Pads 1 and 2), the Victory Project (the Portland pit and Pads 3 and 4), the Gold Star open pit, many mine dumps, and large undeveloped areas. Permitted areas are shown in Figure 4-2 and are listed in Table 4-7. Pads 1, 3, and 4 were no longer being actively leached, although reclamation had not begun at the time of the site visit; similarly, the Gold Star and Portland pits were no longer being mined, and reclamation of the Portland pit had begun. In addition, Nerco is the NPDES permittee for discharges from the Carlton tunnel, a tunnel that drains much of the mining district. Nerco also

has an active exploration program and is preparing to develop a major open pit mine and heap leach operation in the area: the Cresson Mine. This operation will be located northwest of the town of Victor. At the time of the site visit, Nerco planned to submit the permit application for this mine later in 1992. During the site visit, Nerco and MLRD indicated that there was some local opposition to the development.

As in many historic mining districts, land ownership patterns are extremely complex. Nearly all of the district consists of patented lode claims that over the years entered private ownership through the general mining laws. Through leases, purchases, and other agreements, Nerco now controls about 95 percent of the district, a total of about 14,000 acres. The Bureau of Land Management retains something less than one percent of the area in parcels ranging up to 0.25 acres in size.

Nerco Minerals Company is owned by Nerco, Incorporated, which also has extensive coal and oil holdings; the parent company of Nerco, Incorporated, is Pacificorp. Permits issued by the Colorado Mined Land Reclamation Division for the various Cripple Creek operations are issued to one of several companies: Nerco Minerals (Victor Mine permit 81-134), Pikes Peak Mining Company (Globe Hill permit 77-367), and Cripple Creek and Victor Gold Mining Company (Victory permit 86-024, Carlton Mill permit 80-244, and the Carlton Tunnel NPDES permit). Much of Nerco's Cripple Creek property is held by Cripple Creek and Victor Gold Mining Company (CC&V), a joint venture between Nerco subsidiary Pikes Peak Mining Company (67 percent) and the Golden Cycle Gold Corporation (33 percent). Mining operations are managed by Pikes Peak Mining Company, which was known as Texasgulf Minerals and Metals prior to its 1989 purchase from ELF Aquitane. For ease of reference, this report simply refers to "Nerco" when discussing the owner, operator, and/or permittee of any of the Cripple Creek operations.

4.1.3 Environmental Setting

The Cripple Creek area is subalpine, with elevations ranging from 9,000 feet to over 10,000 feet above sea level. Elevations at the Ironclad/Globe Hill site exceed 10,000 feet and range up to about 10,400 feet. The entire mining district has experienced massive disturbance, with hundreds of mine shafts and openings and hundreds of miles of underground workings. Mine headframes dot the landscape, and there are piles of waste rock and tailings scattered throughout the mining district. Teller County has designated the entire area as an Historical Preservation Zone. As such, areas are required to retain their "mining area flavor," and this is reflected in the reclamation plans for Nerco's sites.

Many of the abandoned mine shafts and openings present a safety hazard. According to Nerco, the Colorado inactive mines program closes about 70 mine shafts and openings in the district each year. Nerco indicated during the site visit that tourists or other trespassers sometimes present a problem on their sites.

4.1.3.1 Climate

The climate is semi-arid, averaging only about 16 inches of precipitation a year. Winters are relatively dry, and snow cover is typically light. Showers and thunderstorms are common from May through September,

during which 60 to 70 percent of annual precipitation occurs. Available documentation did not describe wind conditions. The 24-hour storm event with a return interval of 100 years (which mine facilities must contain) would generate about 3.5 inches of precipitation.

Winters are typically very long, and the frost-free period averages only 45 to 90 days. The mean annual temperature in the towns of Cripple Creek and Victor is about 39°F. In January, the mean minimum temperature (i.e., the average daily low temperature) is 8°F and the mean maximum is 36°F. In July, the mean minimum is 36°F, the mean maximum 72°F. Temperatures reach as low as 25 to 30°F below zero.

4.1.3.2 Surface Water

There are no perennial streams on or near the site. Mining operations, with the exception of the bottoms of waste rock dumps and the Cameron and School Section leach pads, occur on ridges and hilltops and the highest reaches of ephemeral drainages. The lower reaches of drainages, in the intervening gulches and valleys, flow only in response to rainfall and snowmelt and reach perennial streams (Cripple Creek, Fourmile Creek, and Beaver Creek) over a mile downstream. There may have been springs in many of the tributary drainages in the past, but the permeable ground surface, extensive underground workings, and deep drainage (the Carlton Tunnel) have "all but eliminated" their expression (MLRD 7/1/85).

Two gulches that are dry except in response to precipitation events drain the Globe Hill permit area (number 77-367): Poverty Gulch, which discharges into Cripple Creek in the town of Cripple Creek; and Squaw Gulch, which discharges into Cripple Creek about 1.25 miles south of the town. There was also a reservoir east of the 1977 waste dump and an emergency catch basin in the bed of Squaw Gulch, the latter intended to intercept any pregnant solution that escaped the Globe Hill pregnant pond. (Gold Resources Joint Venture, 1977) According to Nerco, these two facilities have been removed since present leach pads at Ironclad/Globe Hill drain to the east through collection ditches.

In the Victor Mine permit area (number 81-134), the mine pit, waste rock dumps, and part of the mine facilities and old tailings disposal area are in the upper reaches of Squaw Gulch. Much of the remaining Victor Mine facilities, including the old tailings disposal areas and the new Ironclad heap, are on the drainage divide between Squaw Gulch (to the west and south) and Grassy Creek (to the north and east). (Nerco 6/20/84) At least the lower reaches of Grassy Creek lie outside the Cripple Creek caldera and thus are not affected by the deep drainage of the Carlton Tunnel. Like other drainages in the area, however, Grassy Creek is not a perennial stream: in most years, it is intermittent in nature until just above its confluence with Beaver Creek about 2.3 miles down the valley (MLRD 7/1/85). During the site visit, Grassy Creek was flowing. A spill of cyanide solution in 1985 (see section 4.4.5.4) entered the Grassy Creek drainage area but did not reach the Creek itself.

Other permitted areas drain to various dry gulches and ephemeral drainages in the area. Portions of the Victory project (pads 3 and 4) and the '76 project drain to Wilson Creek. Nerco indicated that it had removed over 500,000 tons of waste rock from this drainage for use as ore on heap leach pads. Portions of this

drainage appeared during the site visit to have well-established vegetation, and the creek was flowing at that time. A small wetlands area occurs in Arequa Gulch, immediately downstream of the Carlton Mill. Development of the Cresson deposit is planned in this area, and a permit under section 404 of the Clean Water Act has been issued by the U.S. Army Corps of Engineers. Water quality data for Arequa Gulch, upstream and downstream of the Carlton Mill heap leach pads, are presented in section 4.3.6.1.

4.1.3.3 Ground Water

There is little or no available ground water in the area. The Carlton Tunnel, at an elevation of about 7,000 feet, or 3,000 feet below the surface, has since 1941 drained the hundreds of underground workings that honeycomb the subsurface. (As described in section 4.4.2, the Carlton Tunnel discharges to Fourmile Creek about six miles south of the Cripple Creek area.) Prior to this, the 1907-1917 Roosevelt drainage tunnel drained much of the mining district to a depth of about 2,000 feet.

In at least some ephemeral drainages below Nerco's hilltop operations, there is shallow alluvial ground water. Below the Carlton Mill, a rancher obtains water from a well that was described by Nerco as 14 feet deep. In addition, there is perched ground water in the Grassy Creek drainage (MLRD 7/1/85). Information was not available on the quality of these alluvial ground waters, or on the presence and quality of any alluvial aquifers that may occur in other drainages.

Because of the lack of surface or ground waters in the area, Nerco obtains water for all its Cripple Creek operations from the town of Victor. This is described in section 4.3.5.3.

4.1.3.4 Vegetation

At the time of the original Globe Hill project application in 1977, vegetation on this portion of the site consisted of grasses, weeds, and forbs. The ground cover was said to be less than 10 percent, with range condition described as "poor." (Gold Resources Joint Venture, 1977) Similarly, bunchgrasses as well as various forbs and shrubs dominated vegetation on the Victor site. Trees in relatively undisturbed areas included Ponderosa and lodgepole pine, Douglas fir, blue spruce, and quaking aspen. (Silver State Mining Corporation 3/25/81, MLRD 7/1/85). Other Nerco sites were similarly disturbed before modern operations occurred, and vegetation was similar on these sites.

4.1.3.5 Soils

Predominant soils on north- and east-facing slopes are mixed Argic Cryoborolls of the "Larand" series, which consist of well drained soils on mountain sideslopes. Fine sandy loam extends to about 16 inches, underlain by about 16 inches of gravelly sandy clay loam subsoil, which is in turn underlain by gravelly sand that extends to 60 inches or more. Permeability of these soils ranges from 0.6 to 20 inches per hour, pH from 5.6 to 6.5 standard units. (Gold Resources Joint Venture, 1977) Soils of the "Quander" series are found on

south- and west-facing slopes. These soils are deep, well-drained gravelly sandy and clay loam soils that formed in colluvium from mixed igneous and volcanic rocks. (Silver State Mining Corporation 3/25/81)

Nearly all of the permitted areas as well as the surrounding district have been affected to some degree by past mining activities. As a result, much of the areas's soil has been lost to erosion or otherwise disturbed. What soils existed on areas affected by current operations have been removed (to depths ranging from 1-2 inches to 12 or more, depending on how much was available) and stored in grass-seeded topsoil stockpiles. This soil will be used to support reclamation and revegetation efforts when mining operations end.

4.1.3.6 Geology

The geology of the Cripple Creek area is dominated by an alkaline volcanic diatreme that formed circa 28 million years ago during the Tertiary Period. A diatreme is a volcanic vent that is formed by gas-charged magma penetrating the surrounding country rock. The country rock is composed of jointed and faulted Precambrian igneous and metamorphic units. The volcanic complex defines the Cripple Creek mining district. The complex is composed of the Cripple Creek Breccia, a highly variable unit containing diatremal breccia and a variety of volcaniclastic derived breccias and tuffs. After the formation of the diatreme, the complex was covered and intruded by fine grain igneous rocks (phonolite flows and hypabyssal dikes). (Thompson 1992, Pontius and Butts 1991)

The larger volcanic complex is composed of three coalesced diatremes. These diatremes have been roughly identified as the North, South, and East Subbasins (Thompson 1992). The South and East Subbasins are characterized as having both vein and disseminated gold. These areas were mined since the early 1900s and include such notable units as the Cresson deposit. Within this deposit, 60,000 ounces of native gold was recovered from an open cavity (vug) 23 feet by 13 feet by 40 feet high. The Globe Hill and Victor Mines are located in the North Subbasin. Within the Globe Hill and Victor Mines, gold occurs in hydrothermal breccia deposits characterized by disseminated gold, with few veins. However, field evidence suggests that deep level vein systems are present.

The mineral-bearing hydrothermal fluid appears to have been strongly oxidizing as indicated by the gangue mineralogy. Iron and manganese oxides, sulfates (celestite $SrSO_4$, barite $BaSO_4$, and anhydrite $CaSO_4$) as well as carbonate ($CaCO_3$) are abundant in the ore body. Fine grain pyrite (Fe_2S) also occurs. It is important to note that the alkaline nature of the diatreme and the presence of carbonate minerals has resulted in relatively low potential for acid generation in the Cripple Creek area.

4.2 FACILITY OPERATIONS

As described in chapter 1 and throughout this report, Nerco's Cripple Creek operations include a number of facilities. The Ironclad/Victor mine is covered by a single Mined Land Reclamation Division (MLRD) permit (number 81-134), and the adjacent and contiguous Globe Hill operation by another (number 77-367). The two permits previously covered two entirely separate facilities operated by different companies. Nerco has consolidated the operations under these permits into the "Ironclad/Globe Hill" operation, but the areas continue to be covered by separate MLRD permits. Currently, Nerco's new "Ironclad" heap leach pad (see below and section 4.3.5) covers parts of both permit areas.

This chapter describes Nerco's current mining (section 4.2.1), heap leaching (section 4.2.2), and gold recovery (section 4.2.3) operations on the Ironclad/Globe Hill site. Previous operations that took place on these permit areas, and more details on the facilities (as opposed to operations), are described in chapter 4.3. Chapter 4.3 also describes both operations and facilities at several of Nerco's other Cripple Creek operations. Except as specifically noted, all information in this chapter was obtained during the site visit. Figure 3-3

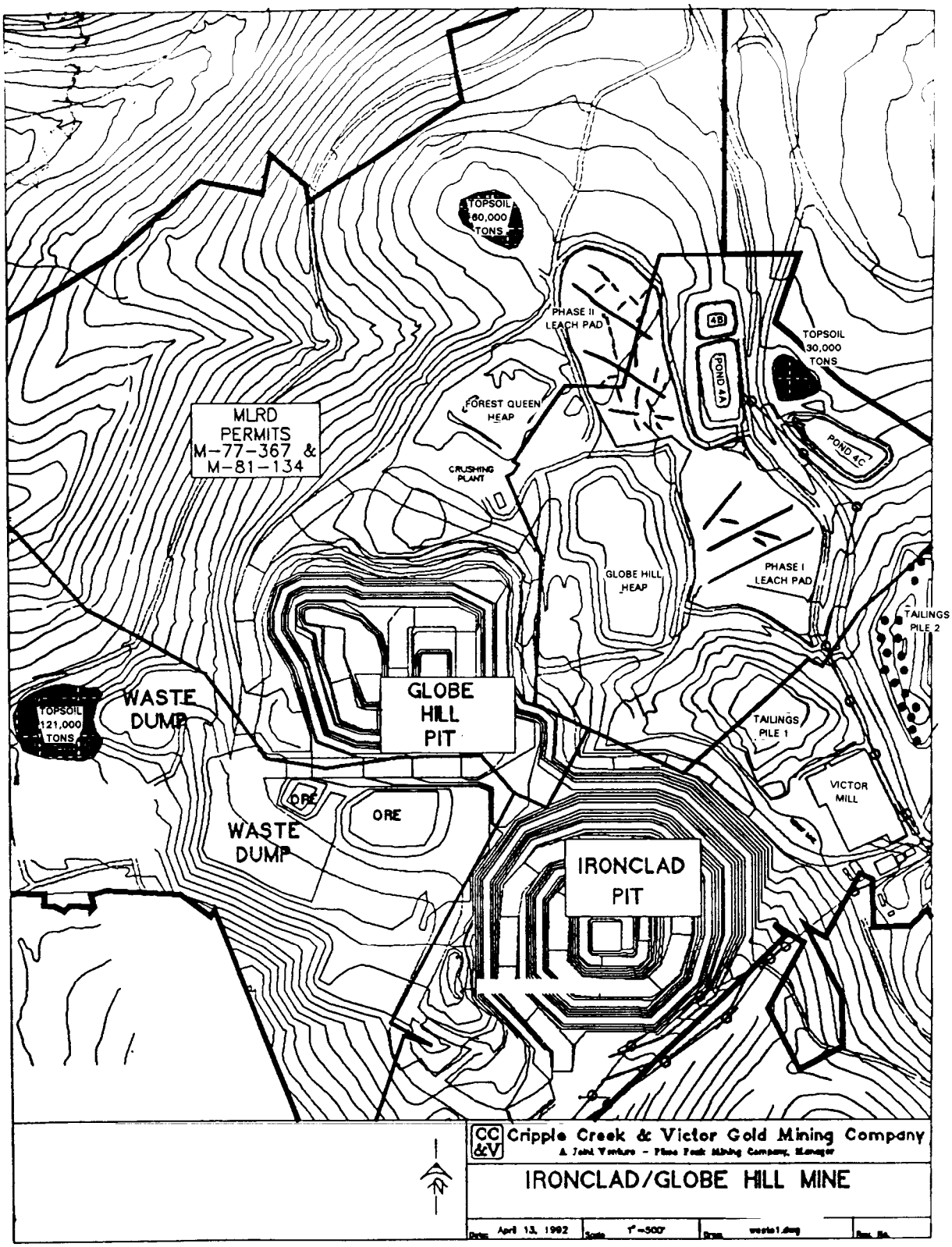


Figure 4-2. Location of Ironclad/Globe Hill Facilities (MLRD Permits 77-367 and 81-134)

(Source: Provided by Nerco during site visit, with additional labels added by EPA)

shows the location of the various facilities on the Ironclad/Globe Hill site.

4.2.1 Mining Operations

The Ironclad/Globe Hill facility mines ore from two open pits, the Ironclad and Globe Hill pits. The Globe Hill pit (MLRD permit 77-367) is on a southwest slope near the top of Globe Hill. The pit has reached a depth of 80 feet, measured from the uphill highwall to the pit floor; the site visit team estimated the depth on the downhill side at about 50 feet. Plans are for the pit to reach a maximum depth of about 200 feet. Ore from the Globe Hill pit has been leached in heaps since the original permit was issued in 1977, first on two heap leach pads (the Forest Queen/2A and Globe Hill pads—see section 4.3.3) and now on the Ironclad pad (see sections 4.2.2 and 4.3.5.1).

The Ironclad pit (permit 81-134) is adjacent to the Globe Hill pit, a distance of less than 0.5 miles. The current pit encompasses part of a previously mined pit that was active around 1904 and the 1930s (Silver State Mining Company 3/25/81). Ironclad also was mined as a glory hole in the 1940s, when manganese and possibly other ores were mined. Since being mined for disseminated gold ore beginning in 1981, the pit has reached a depth of about 200 feet, measured from the uphill highwall to the floor; the site visit team estimated the depth on the downhill side at 50 to 75 feet. Openings to numerous underground workings that have been intersected by the pit were observed during the site visit. The uphill wall of the pit has a slope of about 60 degrees; according to Nerco, this slope is extreme but has remained stable. During the site visit, it appeared that only minor sloughing had occurred. Formerly, ore from the Ironclad pit was leached in vats, as described in section 4.3.4; ore is now leached on the Ironclad pad.Rock in the pits is drilled on 15-foot centers, and each hole is assayed to direct mining operations. Flags of different colors are used to identify material as waste rock or ore prior to removal. The cutoff grade between waste rock and ore is 0.015 Troy ounces of gold per ton of rock (i.e., material with greater than 0.015 Troy ounces of gold per ton of rock is considered ore and material with less is waste rock). Ammonium nitrate/fuel oil (ANFO) is used as the blasting agent, with an unspecified emulsion used when holes are wet. The pits are mined on 20-foot benches. A total of about 45,000 tons of material per day are mined, with approximately half coming from each pit. About 8,000 to 15,000 tons of mined material are ore and 30,000 to 37,000 tons are waste rock. The stripping ratio, according to Nerco, typically ranges from 2.7:1 to 3.0:1 (i.e., 2.7 to 3.0 tons of waste rock per ton of ore).

Caterpillar 992 loaders with capacities of 12.5 cubic yards load blasted waste rock or ore into 85-ton Caterpillar 777 haul trucks. The trucks haul waste rock to the waste rock dump, which extends along the hillsides immediately adjacent to and between the pits. Much of the haulageway from the pits to the edge of the pile traverses the top of the waste rock pile. Rock is dumped over the edge at an angle of repose of about 1.35 horizontal to 1 vertical (about 37 degrees). At the base of the pile, Nerco maintains a berm to contain stray rocks and boulders. Periodically, the addition of waste rock advances the toe of the pile farther downslope into the ephemeral drainage. Before this occurs, Nerco is required to strip and store topsoil before waste rock is allowed to impinge on those areas. At the time of the site visit, the dump contained a total of about 5,000,000 tons of waste rock. In addition, about 121,000 tons of topsoil were in a stockpile near the dump (see Figure 4-3).

Ore is transported in the haul trucks out of the pits to one of two unlined stockpiles. One stockpile, which contains about 300,000 tons of ore, is located between the Globe Hill pit and the edge of the waste rock dump; ore from the two pits is kept separate in this pile. The second stockpile, of undetermined size, is near the jaw crusher. This area is located on the hilltop immediately above the pits, a distance of less than one-half mile. In the crusher stockpile, ore with relatively high clay or fines content is kept separate from other ore (the clay cutoff was not determined). Loaders blend the fine and coarse ore (to maintain a consistent feed to the crusher) and move the ore the short distance (less than 100 feet) from the stockpile to the jaw crusher.

The crusher and conveyor systems are operated by a contractor, Nordic Industries. Ore is crushed (at an unspecified rate) in a primary jaw crusher to a nominal diameter of less than three inches and passed over a one-inch screen. Fine (less than one inch) and coarse materials are placed on separate, parallel conveyors (the proportions greater than and less than one inch were not determined). The fine ore is agglomerated with cement at a rate of seven pounds of cement per ton of ore. This agglomerated ore is then combined with the coarse ore on a third conveyor. On the consolidated conveyor, lime is added to raise pH (five to seven pounds of lime per ton of ore). Cement and lime are added from storage silos that straddle the respective conveyors; the sizes of the silos were not determined. In addition, a sodium cyanide solution (about 0.25 pounds of sodium cyanide per ton of solution) is added to ore on the conveyor to raise the moisture content to about six percent (compared to the mined ore moisture of about four percent) and initiate leaching. The means by which cyanide solution is conveyed from the barren solution tanks in the mill building to the conveyor was not determined, but it appeared that the solution was distributed along the conveyer in otherwise unprotected rubber hoses about 0.5 to one inch in diameter. The conveyor transports the ore from the crushing area to the appropriate cell on the Ironclad leach pad, where ore is stacked on the heap.

During the site visit, it was noted that ore fallen from the conveyors in the crusher area (both before and after cyanide addition) had reached a depth of one to two feet under the conveyors. Workers were observed shoveling some of this stray ore back onto the conveyor. Most of the stray ore appeared to be relatively fine material.

4.2.2 Leaching Operations

As described in more detail in section 4.3.5, the Ironclad heap leach pad system is being constructed in three phases, with the first phase begun in 1991 and the final phase completed in 1992 (see Figure 4-3). When complete, the new pad will cover about 1,500,000 square feet and will contain about 4,400,000 tons of ore (see Figure 4-4

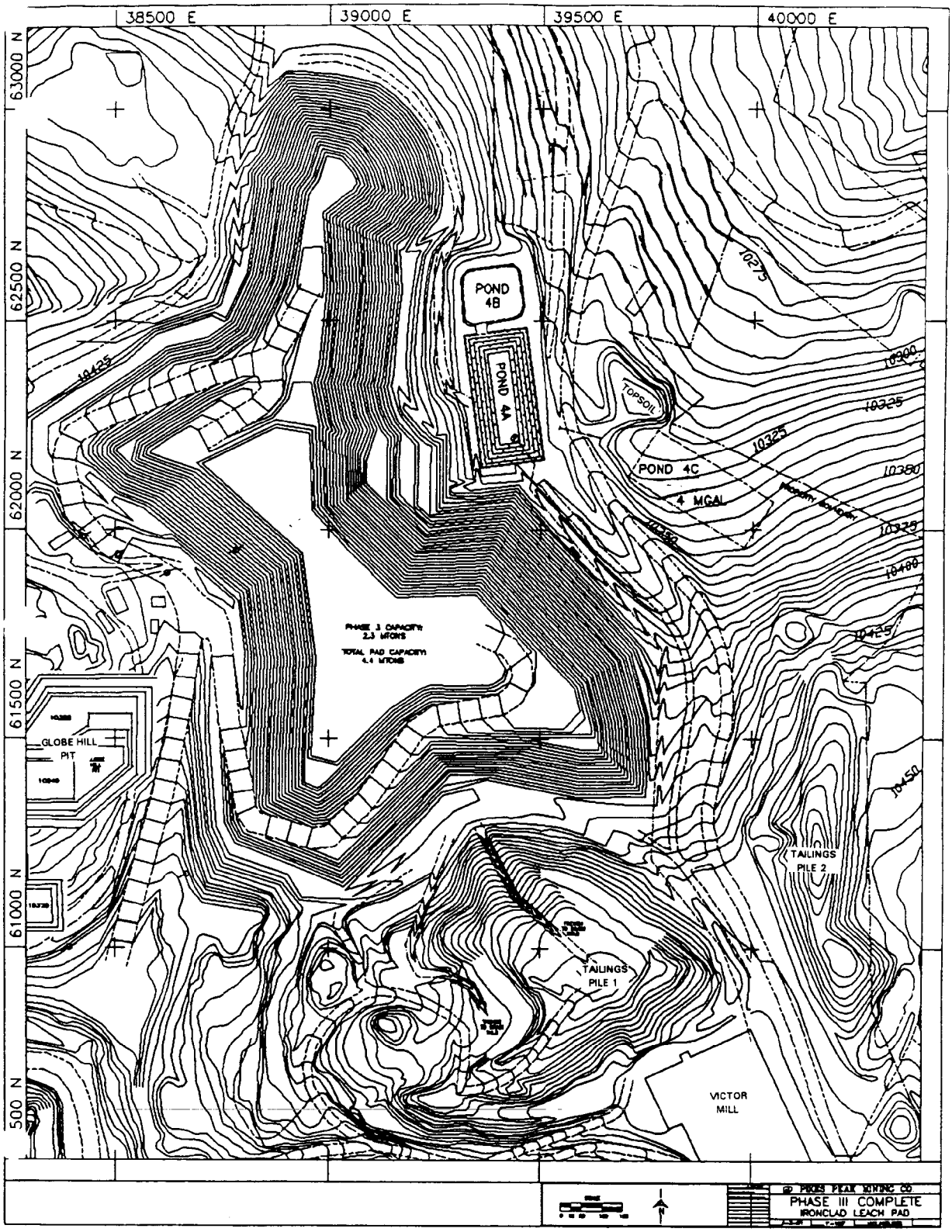


Figure 4-3. Planned Final Configuration of Ironclad Heap

(Source: Nerco 5/10/91, with additional labels added by EPA)

for the planned final configuration of the Ironclad heap). As construction proceeds, sections of the various phases of construction are being placed in operation and actively leached. By early 1992, portions of the Phases I and II pads had been completed and leaching had begun (see section 4.3.5); these will become part of the single large Ironclad heap when Phase III is complete in 1992. The amount of ore that has been placed on these sections to date was not determined.

Ore is stacked in 20- to 30-foot lifts (based on MLRD inspection notes rather than other descriptions) and will reach a final height of over 100 feet (based on contour maps, not on narrative descriptions in available documentation). Maximum side slopes, and whether these are specified by MLRD, were not described.

Barren solution is made up in three 60,000 gallon tanks in the mill building. According to Nerco, barren solution has a cyanide concentration of 80 to 100 parts per million (ppm) and a pH between 11.5 and 12. Milsperse 802 is added to barren solution as an antiscalant (the rate and amount added were not known). Solution is pumped to the pads and applied via drip irrigation pipes to 80,000 square foot active leaching cells at a rate of about 400 gallons per minute (gpm), or 0.005 gallons per square foot per minute. Leaching raises the moisture content of the ore from about six percent to about 15 to 18 percent. The length of time each subcell is leached was not determined. Leaching occurs year-round, unlike many previous heap leach operations in the Cripple Creek area. According to Nerco, there may be occasional freezing in solution lines when temperatures are very low. Nerco indicated that on one occasion, an overnight power outage resulted in about 70
percent of the solution lines freezing. All had thawed and were operational by noon the following day, with no apparent ill effects.The heap leach pads are double-lined (80-mil HDPE primary upper liner over 60-mil HDPE secondary lower liner, with a leak detection system between the liners--see section 3.5 for detailed descriptions of pad and pond construction). Pregnant solution is collected in eight-inch diameter slotted HDPE pipes placed beneath the ore on the upper liner; solution drains from the pipes to collection ditches that extend along the downslope sides of the pads (on the north and east of the Phase I pad, on the west of the Phase II pad). As described in section 4.3.5, ditch liners are simply extensions of pad liners. Solution is conveyed to a stilling basin, which slows the flow before solution is directed to the pregnant solution pond or, if necessary, an emergency overflow pond. All ponds are double-lined, with two 60-mil HDPE liners and a geotextile leak detection system between; pond construction is described in detail in section 4.3.5. The total capacity of the three solution ponds is 10,000,000 gallons, sufficient to hold working solution and run-off from the 100-year/24-hour storm. Pregnant solution, as pumped to the Victor Mill building, has a pH of about 11.

4.2.3 Gold Recovery Operations

Gold recovery operations occur in the Victor Mill building, which also contains the vats formerly used for leaching (see section 4.3.4). Pregnant solution is pumped from the Ironclad solution ponds to the mill building, where gold is recovered from the pregnant solution in two carbon-in-column circuits. Each circuit consists of four portable columns (each "column" is an enclosed tank or vessel) that operate in series. Each column in a four-vessel series contains 1.0 to 1.25 tons of activated carbon. The size of the columns was not

determined, but they appeared to be about 15,000 gallons. Pregnant solution is pumped at a rate of 250 to 400 gallons per minute into the bottom of the first column, up through the carbon, and out through pipes at the top. Similarly, it is pumped to and through the other three columns in series. When solution exits the top of the fourth column, it is directed to one of three 60,000-gallon barren solution makeup tanks, which are also located in the mill building. Nerco periodically assays the tails solution from each column. When the gold concentration rises to some unspecified level, which indicates that the carbon is no longer adequately adsorbing gold, a column with fresh carbon is substituted in the train.

Loaded carbon is removed from the columns for further processing (as described below) and replaced with fresh carbon. According to Nerco, it typically takes three to four days for carbon in a column to become fully loaded, but this can take up to a month. Nerco has a total of 32 portable columns; at the time of the site visit, eight were in use at the Ironclad/Globe Hill site in two parallel circuits and four at the Carlton Mill Pad 2 [see section 4.3.6.1]. The other twenty are held in reserve as replacements for columns with loaded carbon and presumably for Cresson operations when they begin. (When columns at Carlton Mill Pad 2 are loaded with gold, a fresh column is substituted in the train and the column with loaded carbon is transported to the Victor Mill in a specially designed truck. Prior to January 1992, columns were transported to the Carlton Mill for gold recovery and carbon regeneration).

Gold is desorbed (stripped) from the loaded carbon with a caustic wash (one percent sodium hydroxide, one percent sodium cyanide) in one of two enclosed tanks (the size was not determined, but they appeared to be about 50,000 gallons each). The strip circuit is operated at 240°F, at a pressure of 50 pounds per square inch. Stripped carbon is then acid-washed with hydrochloric acid, regenerated in a propane-fired Allis-Chalmers horizontal kiln, and quenched with water before storage and reuse. According to Nerco, spent acid and quench water are returned to "process water ponds" (presumably the pregnant solution pond)—the amounts of fresh acid and reactivated carbon stored on-site were not determined. Carbon fines are shipped off-site for gold recovery: the point in the process at which carbon is screened to remove fines was not determined, but Nerco indicated that they generate about one barrel of fines per year. The facility uses about 50 tons of carbon per year. Spent carbon is shipped off-site with the carbon fines.

The gold-laden caustic solution goes to an electrowinning cell (the number and sizes of cells were not determined). A stainless steel woven wire cathode (steel "wool") acts as the cathode onto which gold is plated (along with small amounts of silver). The steel wool is then removed, washed with high-pressure water, and filtered. The filter cake is then placed in a propane-fired tilt furnace, where gold is melted off the steel wool to produce doré (a conventional flux also is used in the furnace). A wet scrubber is used to control furnace emissions. According to Nerco, significant (but unspecified) amounts of gold are recovered from scrubber sludges, which are sent off-site for gold recovery about once a year; the volume of sludges shipped was not known. (Since the Ironclad leaching operation only began operation in early 1992, it is not clear if the reported volumes and frequency of removal of carbon fines and sludge were estimated for the future or are based on Carlton Mill operations for the previous year.) Overall, Nerco reported that from 70 to 85 percent of soluble gold in mined ore is recovered.

4.3 MATERIALS AND WASTE MANAGEMENT

Chapter 4.2 described operations on the Victor Mine and Globe Hill permit areas, the consolidated "Ironclad/Globe Hill" site. This site was the primary focus of the site visit. Sections 4.3.1 through 4.3.5 of this chapter describe the facilities on these permit areas and the wastes and materials that are managed there by Nerco. Figure 4-3 showed the locations of facilities described in these sections. Active facilities are described in sections 4.3.1, 4.3.2, and 4.3.5. An understanding of previous operations on the site is necessary in order to understand current operations and also to allow the complexity of the site to be conveyed; in addition, wastes generated by previous operations remain on the site. For these reasons, previous operations and facilities on these permit areas are described in this chapter (in sections 4.3.3 and 4.3.4). Finally, section 4.3.6 describes a number of Nerco's other Cripple Creek operations.

4.3.1 Mine Pits

The Ironclad/Globe Hill operation currently mines ore from two open pits, the Globe Hill and Ironclad pits. As described in Chapter 4.2, the Globe Hill pit has reached a depth of 80 feet and plans are to continue to a final depth of about 200 feet. The Ironclad pit has reached 200 feet and plans are to continue to a final depth of about 400 feet (the areal extent of the two pits was not determined). Ore from the two pits is commingled at the crusher plant. As noted in section 4.2.1, the Ironclad pit has intercepted a number of underground workings, which are clearly visible in the highwalls; none were observed in the Globe Hill pit, but they may be encountered as the depth of the pit increases. At the Ironclad pit, tailings from historical mining operations were being encountered by mining operations and were observed during the site visit.

Ground water has not been and is not expected to be encountered in either pit, since the ground-water regime to a depth of about 3,000 feet (to an elevation of about 7,000 feet above sea level) is dominated by drainage to the Carlton Tunnel. There is little or no upslope area from which run-off drains into the pits, and the only water that accumulates in the pit is from direct precipitation. Any such accumulation evaporates and has not required pumping or other removal to date.

Reclamation requirements for the Globe Hill pit include leaving a safety or warning drop bench no more than 15 feet below the top of the pits (Silver State Mining Corporation 3/25/81, MLRD 9/8/81). In the Ironclad pit, a 20-foot-wide drop bench will be left about 20 feet below the pit's rim (Nerco 6/19/84). Final pit walls in the Ironclad pit may be benched at 30-foot intervals, with a final slope of 45 to 55 degrees (this was not described for the Globe Hill pit). There will be a ramp into each pit to increase pit wall stability and to allow exit by trespassers and wildlife. The ramps will be blocked by berms or boulders to discourage access. The pits will be fenced and appropriate warning signs posted. Overall, the pits are to be left rough-graded "without conical peaks or trench-like excavations," but will not be revegetated, except for the benches and pit floors. This will allow the pits to meet Teller County zoning requirements that the area retain its "mining area flavor." (Silver State Mining Corporation 3/25/81, MLRD 9/8/81, Nerco 6/19/84)

Haul roads from the pits to the waste dump (which are constructed on and across the dump) and to the stockpile in the crusher area will be reclaimed by smooth-grading to slopes between three and five horizontal to one vertical (3H:1V to 5H:1V), then mulching and revegetating with grasses and trees (Silver State 3/25/81, MLRD 9/8/81).

4.3.2 Waste Rock Dump

Waste rock from the pits is taken by truck directly to the mine dump, which is on the hillside on the east and north slopes of Poverty Gulch and Squaw Gulch immediately adjacent to the pits. As described in Chapter 4.2, a total of about 45,000 tons of material was being mined per day at the time of the site visit, of which 30,000 to 37,000 tons were waste rock. About 5,000,000 tons of waste rock had been disposed in the dump at the time of the site visit (since 1981, when the Victor Mine permit was issued). The total area covered by the waste rock dump was not determined. At least a portion of the dump on the Ironclad/Victor permit area is located in an area covered by mine dumps that predate the modern operations. The waste rock dump used on the Globe Hill before operations were consolidated is apparently located immediately to the north of the Globe Hill pit; at least one area of this dump was used to dispose of triple-rinsed and crushed barrels in which cyanide was received (MLRD 9/28/84). The amount of waste rock in the Globe Hill dump was not determined.

There is little or no upslope area to contribute run-on, so run-off comes only from direct precipitation on the surface of the dump itself (the top of which is fairly extensive and serves as the haulageway from the pits). References in permit correspondence seemed to refer to one or more sedimentation ponds at the base of the dumps (MLRD 3/21-22/85, Nerco 1/87). According to Nerco, a sedimentation pond remains in place at the base of the dumps. No information was obtained on whether run-off or other storm water discharges have ever been monitored, either at the base of the piles or in the ephemeral drainage of Poverty Gulch. As described in section 4.3.3 and 4.3.5 below, Nerco plans to "detoxify" spent ore on two old heap leach pads (the Globe Hill and Forest Queen/2A pads) and place it on the waste rock dump. It was not determined if the spent ore has a higher proportion of fines than the waste rock and thus could contribute additional loadings to run-off.

To date, only oxide ores have been encountered and acid generation potential of waste rock was described by Nerco as very low; no other information on acid generation or neutralization potential was obtained. As the Ironclad pit increases in depth, Nerco expects an increase in the sulfide content of ores and waste rock. Actions to be taken by Nerco or MLRD when this occurs had not been determined at the time of the site visit.

Waste rock is end-dumped on the pile at the angle of repose, about 1.35H:1V (about 37 degrees). A geotechnical engineering study by Nerco's consultant found this slope was stable under normal conditions, and that only minor sloughing would occur in the event of "unlikely" earthquakes (Dames & Moore 1984). The dump appears to be about 250 feet high. In 1984, gradational analyses of uncrushed run-of-mine material indicative of Ironclad pit waste rock showed over 60 percent less than one inch in diameter, with 35 to 45 percent less than one-quarter inch (Nerco 6/19/84).

At the foot of the dump, Nerco is required by MLRD to maintain a berm to intercept errant boulders that are dumped over the edge. As the dump grows, the base of the dump will continue to be extended outward. Nerco is required to remove topsoil from areas to be affected by the dump. Topsoil is stored, and seeded with grasses, in one or more stockpiles at the base. One stockpile, immediately west of the Globe Hill pit, contains 121,000 tons of topsoil. The topsoil will be used during reclamation.

Original reclamation plans were for the waste rock dumps to be left rough-graded without conical peaks or trench-like excavations in order to retain the "mining area flavor." It was not clear whether the surface would be covered with topsoil and revegetated. (MLRD 5/22/86 and 9/8/81) However, reclamation plans for the Ironclad dump call for the upper surfaces of the dump to be graded and sloped away from the edge in order to prevent erosion; to minimize infiltration, Nerco may use downcomers or other conveyances to remove precipitation. At the Ironclad waste dumps, stockpiled topsoil will be used to aid in revegetation (Nerco 6/19/84), although details on the use of test plots and final planning were not available. Reclamation requirements for the Globe Hill dump include rough-grading as well. The upper surface of this portion of the dump is to have a two to three percent "dome-like" surface to minimize ponding and infiltration. The maximum outer slope is to be 1.5H:1V. Revegetation is apparently not required on the top or slopes. (MLRD 5/22/86)

In 1990, Nerco advised MLRD of its intent to provide two truck loads of waste rock in a pilot test of its use as an aggregate for asphalt or other uses. Evaluation and testing were to occur in Colorado Springs. (Nerco 9/11/90) The results of any such testing, if it occurred, were not determined.

4.3.3 Heap Leach Pads and Ponds, Permit 77-367 (Globe Hill Projects)

As noted elsewhere, the Ironclad/Victor Mine and Globe Hill projects are in reality a single project, although they currently are permitted separately. The separate permits are an artifact of their histories prior to Nerco's consolidation of the operation. The heap leach pads and ponds described in this section are not currently active; they are described in order to indicate the complexity of the site, because they remain on the site, and because they will be affected by current Ironclad/Globe Hill operations. Because the heaps are no longer being leached, the spent ore on the heaps are wastes.

4.3.3.1 Globe Hill Pad and Ponds

One of the first cyanide heap leach projects in Colorado and the west, this pad was originally permitted, in 1977, at about four acres, measuring 350 by 500 feet (Gold Resources Joint Venture 1977). Amendment 1 to the permit added another four acres to the pad (Gold Resources Joint Venture 1978). This brought the total dimensions to roughly 800 by 400 feet (the pad is not rectangular), about eight acres overall. Other than a Nerco report that the liner consisted of 18 inches of old tailings from an area mill, information on pad site preparation and construction was not obtained (Nerco 2/12/86).

The original pregnant pond for this pad was initially 120 by 100 feet, about 0.28 acres (Gold Resources Joint Venture 1977). Another 1.44 acres was added in 1978, making the pregnant pond's dimensions 375 x 200 feet, an area of 1.72 acres (Gold Resources Joint Venture 1978). Information on the pond's capacity was not obtained, nor were descriptions of the liner system (if any) and pond construction. No information was obtained on the barren pond, if there was one.

Ore came from the Globe Hill pit and apparently was not crushed after blasting (Gold Resources Joint Venture 1978). In addition, waste rock from various underground mine dumps in the area may have been used as ore. Information on the means by which barren solution was prepared and stored and by which pregnant solution was conveyed to the pond and processing facilities was not presented in the permit application or other available reports and correspondence. Similarly, information on the processing facilities themselves was not obtained.

When active leaching ended, reclamation requirements were to rinse the heap with fresh water, followed by an oxidant if cyanide was still detectable. The surface of the heap was to be rough-graded without conical peaks or trench-like excavations, but not revegetated. The pregnant pond was to be backfilled and revegetated. (Gold Resources Joint Venture 1978; MLRD 5/22/86) The period of time in which the Globe Hill heap actually received ore and was actively leached, and when active leaching ended, could not be determined from available documentation. Nerco reported in 1986 that the heap's slopes ranged from 1.6 to 1.8 horizontal to 1 vertical (Nerco 2/12/86). The operation's "stripping plant" (not otherwise described) was dismantled in 1984 in preparation for the construction of a vat leaching operation similar to Nerco's adjacent operation (described in section 4.3.4) (MLRD 7/1/85); the vat leaching plan was never implemented. It was not determined if the "stripping plant" and other gold recovery operations were replaced or if other facilities (e.g., Nerco's adjacent plant) were used thereafter.

A number of samples of Globe Hill pond liquids were taken in 1985 and later years. Although available documentation is not explicit, it is believed the liquids in the pond represented run-off and precipitation-induced seepage, not active leaching solutions. Sampling results are presented in Table 4-1.

In 1984, the Globe Hill heap and pond were conveyed from Newport Minerals' permit 77-367 to Nerco's

Table 4-1. Concentrations of Selected Parameters in Globe Hill Heap Pond

(milligrams per liter, unless otherwise indicated)

Parameter	Date				
	4/9/85[a]	7/19/85[b]	6/86[c]	1/20/89[d]	9/15/89[d]
pH (s.u.)	NR	NR	9.53	4.14*	4.85*
TDS	NR	NR	NR	6,840	4,180
Total CN	0.044	NR	0.0025	0.17	0.081
Free CN	NR	NR	NR	0.04	< 0.05
Radium 226 (pCi/L)	NR	NR	NR	NR	2.1 (+/- 1.6)
Nitrate	NR	NR	NR	190	113
Arsenic	0.005	0.005	NR	< 0.001	< 0.002
Copper	0.07	0.44	0.03	1.72	0.57
Lead	NR	NR	NR	0.12	0.22
Silver	0.001	0.020	0.001	0.01	< 0.01
Sulfate	575	2,350	NR	3,440	2,480
Zinc	NR	NR	0.011	5.57	3.02

NOTES:

NR Not reported

* Nerco (3/30/89) speculated that the low pH was attributable to prior effortsto meet reclamation requirements. (Information on these efforts was not available.)

Sources:

a Newport Minerals 6/24/85

b Newport Minerals 9/24/85

c Newport Minerals 7/18/86

d Table G-1 in Nerco 9/89 (1989 Annual Report to MLRD). January samples taken under 14 inches of ice.

Victor Mine permit 81-134. At that time, plans were to cover at least part of the heap with a 20-mil PVC liner and tailings from the Victor vat leaching operation; Nerco requested MLRD to specify decommissioning requirements for the pad before this occurred. (Nerco 6/19/84, 4/25/85) "Environmental responsibility" for the pond (and possibly the pad as well) apparently was to remain with the Globe Hill operator until Nerco actually used the area for tailings disposal (Nerco 3/30/89). Whether MLRD provided decommissioning specifications was not determined, and apparently tailings were never placed on the Globe Hill heap. In

1991, Nerco (actually, Pikes Peak Mining Company) took over this permit as well, and now has full responsibility for all facets of the Globe Hill permit.

In 1991, Nerco developed plans to construct the Ironclad heap leach pad, covering portions of the Victor Mine and Globe Hill permit areas (i.e., both permits 81-134 and 77-367). Phase III of this project, planned to be completed in 1992, is the construction of a double-lined leach pad where the Globe Hill heap is located (see section 4.3.5.1). Nerco indicated in the application that the Globe Hill pad would be "detoxified" before being graded for use as a base for the new pad. (Nerco 5/10/91 and MLRD 10/10/91) During the site visit, Nerco indicated that the heap would be rinsed with water and, if necessary, an oxidant, until cyanide levels were below 0.2 ppm (whether free, total, or weak-acid-dissociable cyanide was not specified). Following this, spent ore from the heap would be placed on the waste rock dump. It was not determined if this detoxification had begun or had been completed (or even if it would be necessary, since free and total cyanide levels were well below 0.2 ppm in 1989, as shown in Table 4-1).

4.3.3.2 Forest Queen/2A Heap Leach Pad(s) and Pond(s)

Sometime prior to September 1981, Newport Minerals constructed two additional heap leach pads within the Globe Hill permit area, the Forest Queen and 2A pads, and began leaching the Forest Queen heap. The pads were located on the surface of Globe Hill waste rock dump.

The only descriptions of pad site preparation that were obtained were in MLRD correspondence to and from another mining company (there were none in the permit application or related documentation). This correspondence noted that the pads did not have synthetic liners or leak detection systems, but were constructed on 18 to 24 inches of compacted tailings (Reilly 4/6/86; MLRD 5/22/86). The pond(s) apparently were lined, since in 1986 MLRD issued Newport a Notice of Violation for degradation of the Forest Queen/2A pond liners (MLRD 7/1/86). Other information on the ponds' liner system and pond construction was not obtained. Similarly, no information was available on pond capacity.

Ore for the Forest Queen/2A pad(s) came from the Globe Hill pit and/or from waste rock dumps from various underground mines that had operated in the area. As with the Globe Hill heap leach pad, the permit application and other available documents do not describe the means by which barren solution was prepared and stored and by which pregnant solution was conveyed to the pond and processing facilities. Similarly, information on gold recovery operations was not available.

Also similar to the Globe Hill pad, the period of time during which the Forest Queen/2A heap received ore and was actively leached, and when active leaching ended, could not be determined from available documentation (except, as noted above, that the "stripping plant" was dismantled in 1984). It is known that in later years, the Forest Queen and 2A heaps had become a single heap, known variously as the Forest Queen, 2A, or Forest Queen/2A heap.

Although available documentation is not explicit, it is believed the ponds contained only run-off and precipitation-induced seepage, not active leaching solutions. Results of two sampling events, in 1985 and 1986, are presented in Table 4-2; later data were not obtained.

Table 4-2. Concentrations of Selected Parameters in Forest Queen/2A Heap Pond

(milligrams per liter, unless otherwise indicated)

Parameter	Date	
	7/19/85[a]	6/86[b]
pH (s.u.)	NR	10.518
TDS	NR	NR
Total CN	NR	0.0025
Free CN	NR	NR
Radium 226 (pCi/L)	NR	NR
Nitrate	NR	0.06
Arsenic	0.007	NR
Copper	0.03	0.051
Lead	NR	NR
Mercury	0.0013	0.005
Silver	0.011	0.01 (oz/ton)
Sulfate	3,850	210
Zinc	NR	0.008

NR Not reported

SOURCES:
- a Newport Minerals 9/24/85
- b Newport Minerals 7/18/86

Reclamation requirements for the Forest Queen/2A heap(s) included rough-grading to exclude conical peaks or trench-like excavations, but not revegetation since the area was to retain its "mining area flavor." Pond solution was to be circulated and evaporated to reduce volumes. In addition, the heaps were to be rinsed with fresh water, followed by an oxidant if cyanide remained. At cessation of operations, ponds were to be sampled for at least a year; when heap effluent (from run-off and infiltration of precipitation) became "similar in nature to the fluids naturally occurring in [Cripple Creek or Wilson Creek]...downstream," the operator could remove the ponds and fences, then grade and revegetate the pond area. (MLRD 5/22/86; Geddes et al. 11/25/81) In 1985, the ponds associated with the Forest Queen/2A heap were removed from the Newport

permit (77-367) and were apparently conveyed to Nerco Minerals, the operator of the adjacent Victor Mine (permit 81-134) (MLRD 7/1/85).

Dayspring Mining Corporation, which succeeded to Permit 77-367 in 1986, indicated in 1988 that neutralization of the "Forest Queen pads" had been completed (Dayspring Mining Corporation 3/17/88). How this was accomplished was not described. As described in detail in chapter 4.2 above and section 4.3.5 below, Nerco (actually, Pikes Peak Mining Company, which succeeded Dayspring as the permittee in 1990) was constructing a large heap leach pad that will cover portions of Victor Mine and Globe Hill property (i.e., both permits 81-134 and 77-367). Phase II of this project, partially completed by early 1992, is the construction of a double-lined leach pad that covers the area where the Forest Queen/2A heap is currently located. In the permit amendment, Nerco indicated that the Globe Hill pad would be "detoxified" before being graded for use as a base for the new pad. (Nerco 5/10/91, MLRD 10/10/91)

During the site visit, Nerco indicated that the heap would be rinsed with water, and possibly an oxidant, until cyanide levels were below 0.2 ppm; when this is accomplished, the "detoxified" spent ore will be placed on the waste rock dump. It was not determined if this detoxification had begun or had been completed (or whether it would be necessary, since Table 4-2 suggests that cyanide levels may be below that level). Leaching of at least one subcell of the Phase II heap, a subcell not located on the Forest Queen portion of the new pad, had begun by early 1992 (see sections 4.2.2 and 4.3.5.1).

4.3.4 Victor Tailings Piles and Previous Vat Leach Operation (Permit 81-134)

From the time of initial Victor Mine operation in 1981 until a cessation of operations that began in early 1986, the facility operated a vat leach system. As noted previously, Silver State Mining Corporation was the original owner/operator; Nerco became the operator in 1984 when it purchased Silver State (Silver State 4/13/84, MLRD 6/20/84).

Ore from the Ironclad pit was crushed to 0.5 to 1.0 inches in diameter. Portland cement was added at a rate of about 10 pounds per ton of ore and a concentrated solution of sodium cyanide and caustic soda (concentrations were not provided but the reagents amounted to about one percent by weight) was also added. Cement and reagents were added to the ore in an agglomerating drum. Ore was then conveyed to a stockpile in the Victor Mill building, from which it was transported by loader to one of four 1,000 ton indoor vats (each 80 x 50 x 9 feet). The vats were constructed of 9.5 inch rebar-reinforced concrete and had a sloping base to facilitate loading and unloading. Rubber waterstops were used to fill concrete joints and the insides of the vats were periodically re-sealed with epoxy. (MLRD 9/8/81, Lewis 1982, and Nerco 4/25/85)

Once placed in a vat, ore was saturated with a solution containing 2.5 pounds of sodium cyanide per ton of solution (0.1 to 0.12 percent free sodium cyanide). Pregnant solutions drained through the ore into sumps, then were pumped to the processing facilities elsewhere in the mill building. After leaching, but before removal from vats, ore was rinsed with fresh water and drained for at least two hours, after which time the "tailings" were removed by front-end loader and placed on a conveyor, which carried them to the tailings pile.

On the pile, a bulldozer or loader spread tailings on the top and over the advancing face of the pile. Unloading and conveyance gave the tailings another four to six hours to drain residual solution. The vats operated on three- or four-day cycles and at any given time, two vats would be leaching while the other two were being loaded or unloaded. Gold recoveries were said to be about 83.6 percent. (MLRD 9/8/81, Lewis 1982, Nerco 2/12/86)

The spent ore, or tailings, was placed in free-standing tailings piles, one (area 1) immediately to the north of the mill building and a second (area 2) across Range View Road immediately to the northeast. The piles were lined with 20-mil PVC and surrounded by berms. In some areas, the liner was placed on 12 inches of fine-grained (but otherwise undescribed) material; in later years, a 90-mil (300-grade) geotextile fabric was substituted as an underlayer. Drainage from at least some areas of the piles was facilitated by four-inch pipes installed over the liner. (Silver State Mining Corporation 3/25/81 and 5/24/83; MLRD 9/8/81 and 2/26/87; Nerco 5/9/85 and 1/6/87) An extension of tailings area 1, located partially on top of the old Globe Hill heap, also was planned, but apparently was never implemented (Nerco 6/19/84, 4/25/85, and 2/12/86; MLRD 6/11/85).

Tailings, which were dumped at their angle of repose, were set back about 12 feet from a berm that was (or is) four feet high. The liner extended out from the toe of the pile to the top of the berm, and this area served as a seepage/run-off collection ditch; in the downhill corner, a larger area served as a collection pond. As the tailings area advanced downhill and the liner was extended, the collection ponds were advanced as well. Thus, as the tailings piles changed configurations over time, the collection ponds also changed locations and sizes. This culminated in most of area 1 draining to a permanent pond some distance downhill from (and north of) the tailings; this pond was lined with 36-mil Hypalon. This pond, known as pond 4A, was later enlarged and relined for use as the pregnant solution pond for the new Ironclad heap leach (see section 4.3.5.2). (Silver State Mining Corporation 3/25/81; MLRD 9/8/81 and 2/26/87; Nerco 2/12/86 and 1/6/87) In 1987, during the extended shutdown, a second Hypalon-lined pond was constructed below the first one and provided additional capacity; this pond became Pond 4B, as described in 4.3.5.2 below (Nerco 9/87, 5/10/91).

A portion of area 1 drains to pond 1 South, which is located inside the surrounding berm; the size and capacity of this pond were not determined. Ponds 2 South and 2 North (of undetermined size and capacity) receive drainage from area 2. How solutions in the ponds were managed prior to 1984 was not determined (i.e., whether processed for gold recovery, land-applied, or used as barren solution makeup water). In 1984, after succeeding Silver State as the operator, Nerco indicated that solutions would be removed "as necessary" and used as process water (Nerco 6/19/84).

Following Nerco's assumption of the Victor Mine permit (81-134), solutions in the tailings collection ponds were sampled for pH and cyanide monthly and for a full suite of parameters annually. Table 4-3

Table 4-3. Concentrations of Selected Parameters in Tailings Collection Ponds

(units are milligrams per liter except as noted)

Parameter	10/30/87	9/10/88	9/15/89	8/23/90
Pond 4A[a]				
pH (s.u.)	9.31	9.97	9.69	8.6
TDS	474	520	444	550[b]
Total CN	0.61	0.006	0.131	0.1
Free CN	0.02	< 0.1	< 0.05	< 0.1
Radium 226 (pCi/L)	9.4	-	15	8.2
Nitrate	11.5	6.95	7.0	0.19
Arsenic	0.028	0.024	0.033	0.006
Copper	0.55	0.28	0.26	0.053
Lead	0.68	0.6	0.59	0.019
Silver	0.05	0.01	< 0.01	0.0003
Zinc	0.93	0.85	0.75	0.072
Pond 4B[a]				
pH (s.u.)	9.58	8.48	8.35	8.3
TDS	440	348	385	360[b]
Total CN	0.51	0.051	0.068	0.046
Free CN	0.01	< 0.1	< 0.05	< 0.1
Radium 226 (pCi/L)	8.9	-	7.8	3.3
Nitrate	14.7	7.63	8.1	2.0
Arsenic	0.013	0.015	0.017	< 0.005
Copper	0.44	0.18	0.27	0.039
Lead	0.48	0.25	0.61	0.031
Silver	0.05	0.01	< 0.01	0.0003
Zinc	1.02	0.39	0.51	0.082

(continued)

Table 4-3. Concentrations of Selected Parameters in Tailings Collection Ponds (continued)

Parameter	10/30/87	9/10/88	9/15/89	8/23/90
Pond 1 South[a]				
pH (s.u.)	9.03	9.45	10.0	10.1
TDS	666	400	636	780[b]
Total CN	0.4	0.559	0.299	0.54
Free CN	0.04	< 0.1	0.14	0.14
Radium 226 (pCi/L)	15 (+/- 4)	-	12 (+/- 4)	16 (+/- 1)
Nitrate	11.2	4.14	1.32	< 0.05
Arsenic	0.024	0.054	0.056	0.042
Copper	0.38	0.27	0.26	0.35
Lead	0.54	0.85	0.69	0.64
Silver	0.02	0.01	0.01	0.0016
Zinc	1.02	1.22	0.87	0.94
Pond 2 South[a]				
pH (s.u.)	9.83	9.57	10.1	9.8
TDS	486	384	396	350[b]
Total CN	0.10	0.145	0.042	0.18
Free CN	0.03	< 0.1	0.04	< 0.1
Radium 226 (pCi/L)	0.0 (+/- 0.7)	-	0.5 (+/- 1)	0.4 (+/- 0.2)
Nitrate	5.82	1.78	0.16	< 0.05
Arsenic	<0.001	0.011	0.006	0.008
Copper	0.22	0.18	0.11	0.030
Lead	0.08	0.119	0.022	< 0.005
Silver	0.01	< 0.01	< 0.01	< 0.0006
Zinc	0.35	0.18	0.19	0.023

(continued)

Table 4-3. Concentrations of Selected Parameters in Tailings Collection Ponds (continued)

Parameter	10/30/87	9/10/88	9/15/89	8/23/90
Pond 2 North[a]				
pH (s.u.)	9.00	9.45	9.57	8.1
TDS	828	552	644	520[b]
Total CN	0.27	1.08	0.436	0.44
Free CN	0.13	0.4	0.29	0.2
Radium 226 (pCi/L)	0.0 (+/- 0.7)	-	1.0 (+/- 1.2)	4.0 (+/- 0.4)
Nitrate	14.4	9.83	12.5	3.4
Arsenic	0.015	0.019	0.005	0.0005
Copper	0.43	0.69	0.39	0.049
Lead	0.07	0.22	0.17	0.10
Silver	0.03	0.05	0.02	0.0003
Zinc	0.28	0.38	0.37	0.022

NOTES:

a These ponds receive run-off and precipitation-induced drainage from tailings areas 1 (ponds 4A, 4B, and 1 South) and 2 (ponds 2 South and North). No tailings have been placed in either area since early 1986. Area2 has been under reclamation since 1988. Ponds 4A and 4B now receive pregnant solution from the Ironclad heap leach pad.

b Believed by Nerco to be in error due to particulate passing through filter.

Source: Table G-1 in Nerco 10/19/90 (1990 Annual Report to MLRD).

presents sampling data. It should be noted that no additional tailings were added to the tailings piles after the end of 1985 or early 1986. Thus, samples do not reflect drainage from fresh tailings but rather precipitation infiltration and run-off from "old" tailings. Table 4-4 presents the results of samples of solutions taken when the vat leaching operation was active; in addition, the table presents results from single samples of fresh (within a few days of vat leaching) and aged (over 18 months after disposal) tailings solids that were taken in 1984. The fresh tailings were also subjected to an Extraction Procedure (EP) Toxicity test.

In mid-1985, the facility re-opened after a major expansion, during which four 2,000-ton vats (100 x 65 x 9 feet each) were added to the existing four 1,000-ton vats in the Victor Mill building (Nerco 2/12/86). Ore tonnages steadily increased (from and to unspecified levels) after July 1985 (Nerco 10/28/85). On November 6, 1985, the face of area 1, which was advancing northward with an acute-angled face (as the area between the Globe Hill heap and Range View Road, between which the tailings pile was advancing, narrowed), collapsed and sloughed into the collection pond. This led to an escape of about 125,000 gallons of cyanide solution. It also led to a number of proposed changes in tailings pile construction and configuration. These included reducing the design height from over 250 feet to 150 feet and constructing the pile in lifts with periodic benches. (Nerco 2/12/86 and 3/20-24/86; MLRD 1/2/86, 2/20/86, and 3/25/86) Although MLRD had requested in 1984 that final slopes be no greater than 3H:1V, a subsequent geotechnical study by Nerco's consultant led to MLRD approval of 2H:1V final slopes (Nerco 6/19/84, Dames & Moore 1984).

In January 1986, shortly after the tailings slough, the facility entered an extended period of inactivity. In 1990, Nerco applied to remove the temporary cessation notice. Plans were to conduct site preparation work within the approved tailings pile area and begin laying liner material to extend the pile. Although not explicitly described, Nerco presumably intended to re-activate the vat leaching operation and continue use of the (modified) tailings pile. (Nerco 9/17/90) However, the facility's vat leaching operation was not re-activated, since approval of the application to resume operations was not granted until October 29 (after the construction season) and Nerco in May 1991 submitted plans for a change from the vat leaching operation to a heap leach system. (MLRD 10/29/90, Nerco 5/10/91).

Tailings area 1 was permitted to cover over 11 acres--the actual area used was not determined. Apparently, this included the area of the Globe Hill heap that was to be covered with tailings beginning in 1985. (Silver State Mining Corporation 3/25/81; MLRD 7/1/85) The total volume or weight of tailings that were generated by the facility and that are currently located on the site was not determined.Original reclamation plans (in 1981) called for the tailings piles to be rough-graded and left with a "mining area flavor," with revegetation left to nature. The disturbed area around the tailings piles was to be revegetated. (Silver State Mining Corporation 3/25/81) Subsequently, MLRD added the requirement that the tailings piles be reclaimed at closure by regrading and revegetation. The operator at the time, Silver State Mining Corporation, was to establish a number of test plots to aid in reclamation planning. (Silver State 5/26/83). Once they assumed the permit in 1984, Nerco's proposed reclamation was similar. Nerco began reclamation of area 2 in 1985, when the entire area was graded to a slope of 2H:1V and fenced (Nerco 10/28/85). In 1988, Nerco established test plots for the revegetation of area 2 (Nerco 9/88). Through 1990, at least some aspens and other trees had survived, and Nerco had identified at least 15 forb and five grass species that had established themselves by "natural seeding" (Nerco 9/88, 9/89, and 10/90). The south and east sides of tailings area 1 were graded to 2H:1V in 1985, and test plots were established on this pile using Soil Conservation Service (SCS) rootstock (Nerco 10/28/85). In subsequent years, the area 1 test plots were described in the 1986 annual report as "disappointing" (Nerco 1/6/87) and in the 1987 report (Nerco 10/13/87) as having "zero results." According to Nerco, the SCS concluded that the rootstock had been dead at the time of planting.

In 1991, in its application to add the Ironclad heap leach pad to the Victor Mine permit, Nerco indicated that the rest of tailings area 1 would be graded to a 2H:1V slope. Nerco was formulating plans to bench the pile at 20- to 25-foot elevations, load the benches with a growth medium, and establish vegetation on the benches. In addition, Nerco indicated that Ironclad pit expansion would require moving about 90,000 tons of tailings from area 1 to an unspecified location. (Nerco 5/10/91) The current reclamation status of tailings areas 1 and 2 was not determined.

4.3.5 Ironclad Heap Leach Pads and Ponds (Permit 81-134)

In 1991, Nerco began construction of what will become a single 1.5 million square foot heap leach pad served by three solution ponds. Construction is to occur in three phases, with subcells and pads completed in early phases placed in operation while construction continues on subsequent phases. Figure 4-5

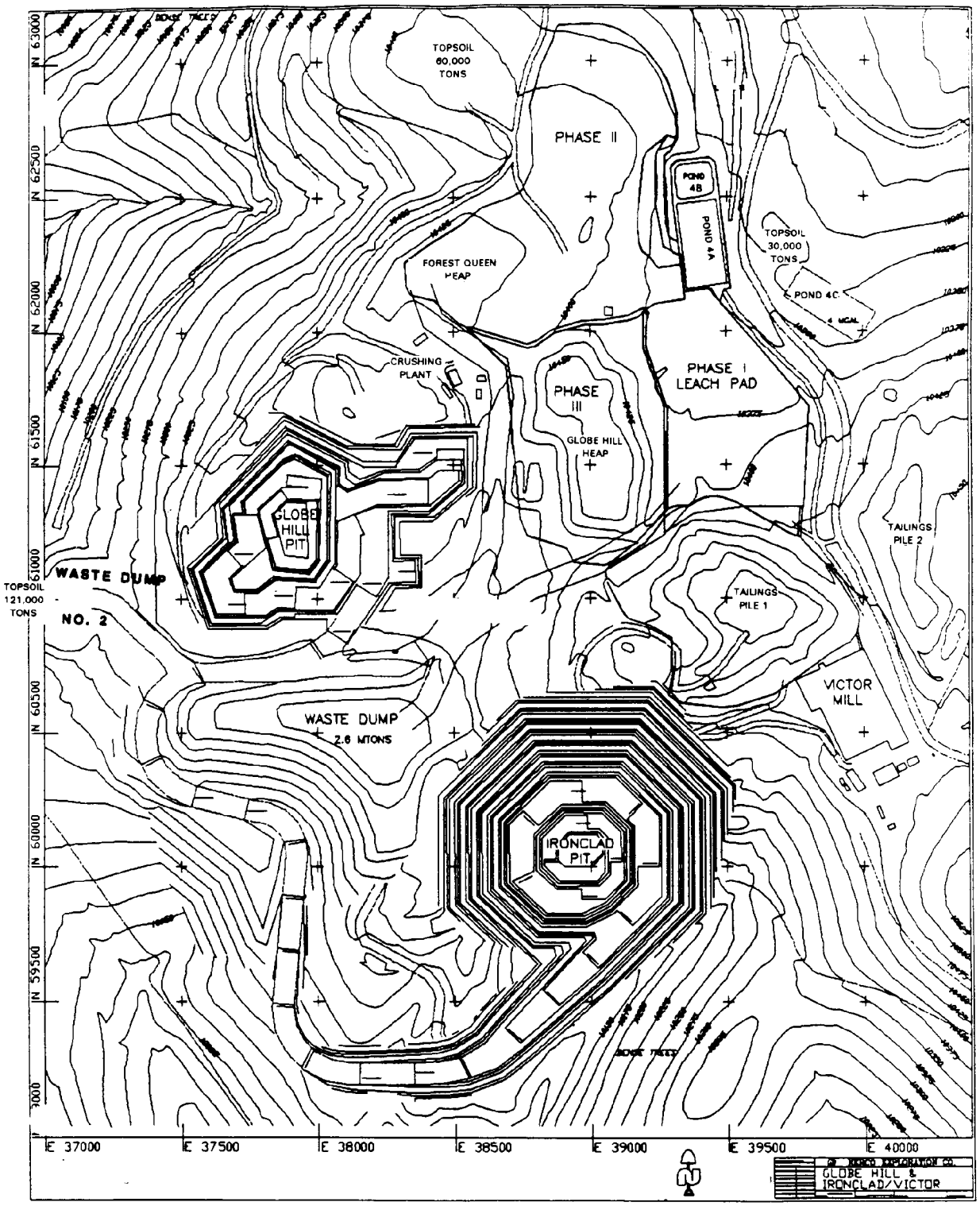


Figure 4-5. Location and Phases of Construction of the Ironclad Heap Leach Pad

(Source: Nerco 5/10/91, with additional labels added by EPA)

shows the location of the pad and the phases of construction. Part or all of two of the phases had been completed and were being actively leached by early 1992. The entire heap leach pad is known as the "Ironclad" pad. It should be noted that the descriptions of pad and pond construction in the following subsections are not based on "as-built" engineering reports but rather on permit applications and other MLRD and Nerco correspondence. Section 4.3.5.1 below describes the "Ironclad" pad, while solution ponds serving the heap leach pad are described in 4.3.5.2. Section 4.3.5.3 describes other wastes and materials managed by the facility.

Figure 4-6. Planned Final Configuration of Phase I Portion of Ironclad Pad

(Source: Nerco 5/10/91, with additional labels added)

shows the planned final configuration of the Phase I pad and heap. The pad covers nearly 375,000 square feet and is surrounded by a three-foot berm. The pad, surrounding ditches, and the inner slope of the berm are all double-lined: the liner system consists of an 80-mil HDPE primary (upper) liner and a 60-mil HDPE secondary (lower) liner. A geonet layer, which connects with a series of wick drains that serve for leak detection, lies between the liners. The underlying surface consists of six or more inches of soils compacted to 90 to 95 percent (according to Nerco, the compaction should result in a permeability of less than 1×10^{-6} centimeters per second). The secondary liner lies on this prepared surface. Internal divider berms underlie the liner system and serve to divide the pad into 80,000 square foot subcells. These divider berms are three feet high with 1.5H:1V side slopes. The leak detection wick drains are installed between the liners along the upslope sides of the berms; the pregnant solution collection pipes (eight-inch slotted HDPE) are on top of the primary liner, again on the upslope sides of the berms. Figure 4-7

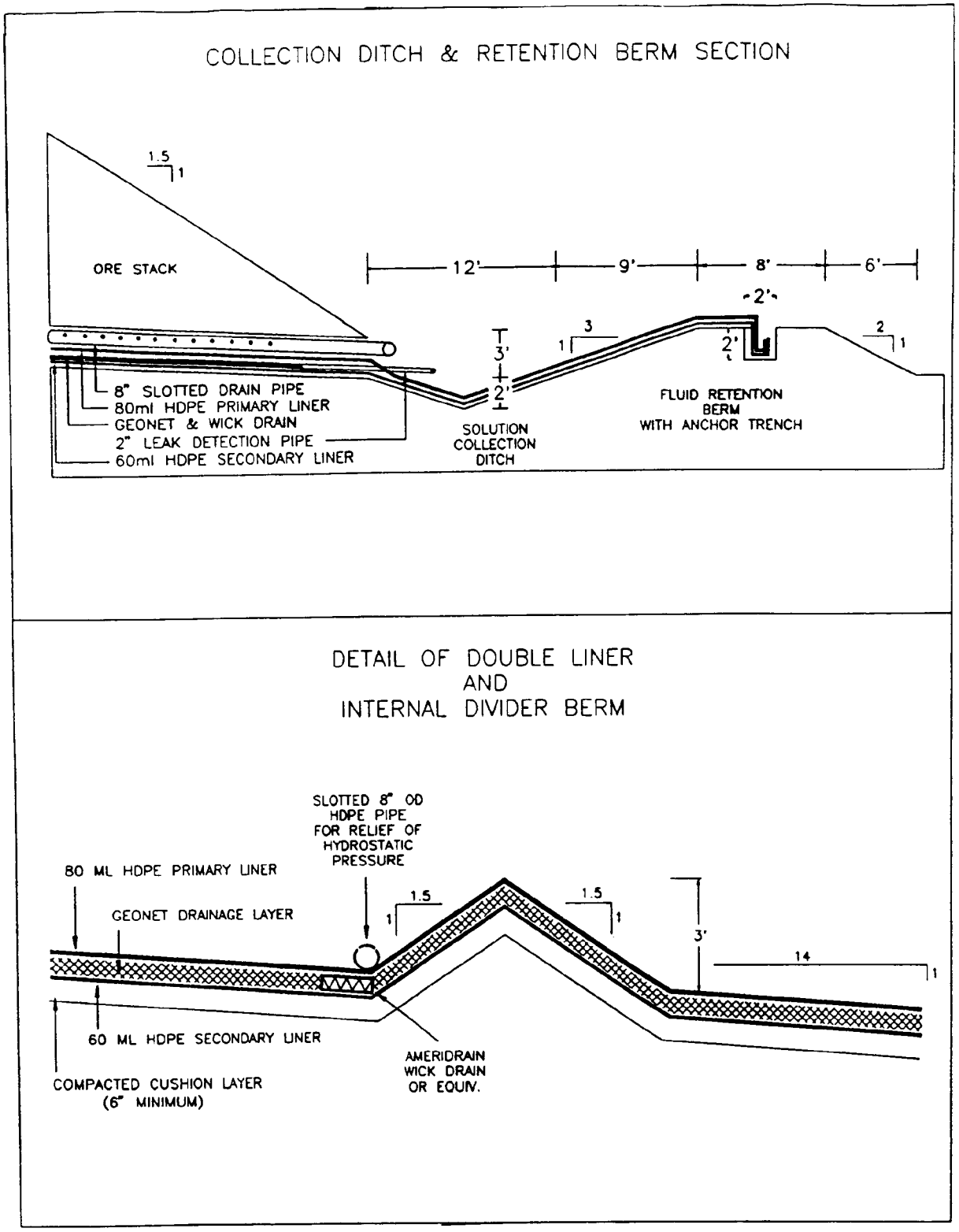


Figure 4-7. Ironclad Pad Liner and Internal Berm Construction

(Source: Nerco 5/10/91)

shows liner and internal divider berm construction. The Phase I pad is designed to hold about 800,000 tons of ore prior to becoming part of the larger Ironclad pad. (Nerco 5/10/91)

A solution collection ditch extends along the east side of the pad; the ditch is 12 feet wide and two feet deep and lined as described below. To the south, the liner was to be shingled under the existing 20-mil PVC liner that drains tailings area 1 (Nerco 5/10/91). The amendment (i.e., the application by which Nerco requested permission for the new construction and which was approved by MLRD) does not mention ditches on the west or north. The south and west are slightly uphill and the north side is to be joined to the full-sized pad during Phase III of construction. During the site visit, Nerco indicated that the shingling of the Phase I liner under the tailings liner was not successful, and that french drains were actually used to drain the tailings. Details on these drains (and how and where tailings drainage is conveyed), and on how the south end of the Phase I pad actually is constructed, were not determined. Although all sides were to be bermed, available documents do not mention collection ditches on any side but the east. (Nerco 5/10/91)

Ditch liners are part of the overall pad liner system described above. The pad liner extends across the ditch and up the inner slope of the three-foot outer berm, in which it is anchored in a two foot trench (a total of 12 feet across the ditch to the inner edge of the berm and four feet up to the anchor trench) (see Figure 4-7). The collection ditch receives fluids from the pregnant solution drain pipes and from two-inch pipes that drain the geonet and wick drains; the ditches convey the solution to Pond 4A. (Nerco 5/10/91)
According to the amendment, ore is stacked on the pad no closer than "15 to 20 feet from the edge of the liner" (whether this was to be measured from the inner edge of the ditch or from the anchor trench was not specified—in the latter case, ore would be stacked to the ditch's edge) (Nerco 5/10/91).

The approved amendment application in which Nerco described the Ironclad heap construction did not specify heap neutralization or reclamation requirements (Nerco 5/10/91).

Phase II Pad

Phase II of the construction, which was initiated and partially completed in 1991, will add an area of 669,557 square feet of lined pad when complete. This area is north of the present Globe Hill heap and immediately to the west of the pregnant solution pond (Pond 4A). The liner system, internal divider berms, and ditches were to be the same as for Phase I construction, with collection ditches along the north and east sides of the pad; the ditches drain to Pond 4A. The amendment did not mention whether berms would be constructed around the Phase II pad. (Nerco 5/10/91) The portion of this pad nearest the pregnant solution pond had been completed and was in operation by February 28, 1992, since a 30-foot lift sloughed into the collection ditch on February 29, as described in section 4.4.5.8 (MLRD 3/2/92). Overall, the Phase II portion of the pad is designed to hold about 1,300,000 tons of ore before it becomes part of the full-sized "Ironclad" pad. Figure 4-8

Figure 4-8. Planned Final Configuration of Phase II Portion of Ironclad Pad

(Source: Nerco 5/10/91, with additional labels added by EPA)

shows the planned final configuration of the Phase II pad.

The Forest Queen/2A heap leach pad (which is in the area covered by Permit 77-367) currently occupies western portions of the Phase II pad area. As noted above, it is constructed on the surface of the Globe Hill waste rock dump. The permit amendment authorizing the phased construction of the new Ironclad pad indicated that the Forest Queen/2A pad was to be "detoxified," then graded to the north and east (i.e., toward the pregnant pond area) (Nerco 5/10/91). The previous Globe Hill permittee (Dayspring Mining) reported to MLRD in 1988 that neutralization of the Forest Queen pad had been completed (Dayspring Mining Corporation 3/17/88). It is not clear if MLRD ever accepted this assurance. During the site visit, Nerco indicated that the heap would be rinsed with water, and possibly an oxidant, until cyanide levels were below 0.2 ppm; when this is accomplished, the "detoxified" spent ore will be placed on the waste rock dump. It was not determined if this detoxification had begun or had been completed (or would be necessary, as described in section 4.3.3.2), or when the Phase II construction would reach the area where the Forest Queen/2A pad is located.

Phase III Pad

Phase III of pad construction was planned to be completed in 1992. This phase requires lining the 463,488 square foot area between the Phase I and II pads. Part of the Phase III pad is to be located where the old Globe Hill heap leach pad is located. Liners and other construction are to be the same as described above for Phase I; liners for the Phase III area will be joined to the Phases I and II liners to make a single 1,500,000 square foot pad. The Phase III portion of the pad will hold 2,300,000 tons of ore. The Phase I and II heaps will join the Phase III heap and become a single heap that ultimately will contain about 4,400,000 tons of ore. Figure 4-9

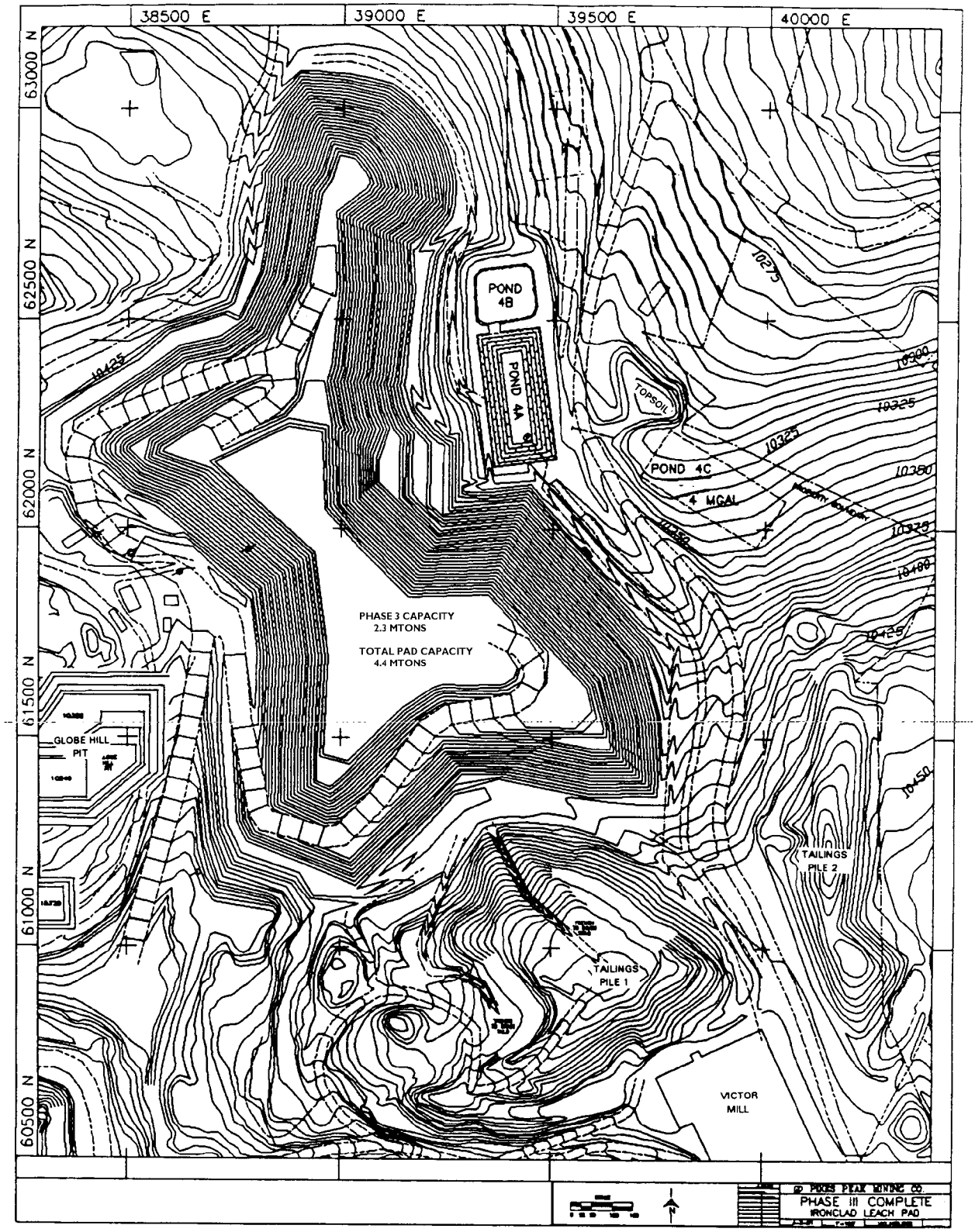


Figure 4-9. Planned Final Configuration of Ironclad Heap Leach Pad

(Source: Nerco 5/10/91, with additional labels added by EPA)

shows the planned final configuration of the Ironclad heap when all phases of construction are complete.

Because the downhill portions of the Phase III pad (north and east) will be joined to earlier construction, collection ditches are not possible for the Phase III portion of the pad. According to the amendment, solution from the Phase III pad is to be collected by a "collection pipe" along the east edge of the Phase III pad where it joins the Phase I pad. Presumably (although this was not described) the same configuration will be used on the north side, where the Phase III and Phase II pads will join. The pipes in these areas will be on the liner underneath the heaps and will convey pregnant solution to Pond 4A. (Nerco, 5/10/91) The size of these pipes and the means by which they will be joined to the eight-inch pipes that drain the pad subcells were not described.

As with Phase II construction in the old Forest Queen pad area, Phase III will require the old Globe Hill heap to be "detoxified" and graded to the north and east (Nerco, 5/10/91). During the site visit, Nerco indicated that the old heap would be rinsed with water, and possibly an oxidant, until cyanide levels were below 0.2 ppm; when this is accomplished, the "detoxified" spent ore will be placed on the waste rock dump. It was not determined if rinsing would actually be necessary, or if it had been initiated or completed at the time of the site visit.

Leaching Operations

Ore is stacked on operating pads via a conveyor from the crusher. At any given time, a solution of 80 to 100 ppm sodium cyanide is applied (via drip irrigation) at 400 gallons per minute to one or more 80,000 square foot subcells (a rate of 0.005 gallons per minute per square foot). The length of time each cell will be leached was not determined.

Although not described in permit applications, ore is to be stacked on the heaps to over 100 feet (based on contour maps provided by Nerco). Ore is stacked in 20- to 30-foot lifts (during the site visit, Nerco indicated 20-foot lifts were used; during an inspection report, MLRD reported a 30-foot lift had failed (MLRD 3/2/92), so lift heights may be variable). Phase I and II pads will have separate heaps which will be joined as the Phase III heap rises between them.

As noted in chapter 4.2, mined ore has a moisture content of about four percent by weight. This is raised to six percent when a cyanide solution is applied to ore on the conveyor to the heap. Ore being actively leached has a moisture content of about 15 to 18 percent by weight. After active leaching is concluded, fully drained ore is expected to retain about 10 percent moisture by weight (Nerco 5/10/91).Solution from the Phase I and II areas of the pad (and possibly drainage collected in french drains downhill of tailings area 1) enters the appropriate collection ditch and is conveyed by gravity to the pregnant solution pond (Pond 4A). As described above, solution from the Phase III portion of the pad will be conveyed to the pond area via a pipe under the heap. (Nerco 5/10/91)

4.3.5.1 Solution Ponds

Three ponds provide primary containment for process fluids and precipitation. They have a combined capacity of 10,500,000 gallons. Each of the ponds is described separately below. Together, they are designed to contain (Nerco 5/10/91):

- Total run-off from their drainage areas of six days of 0.1 inch precipitation per day plus the 100-year/24-hour storm event, an additional 3.5 inches (a total of 4.1 inches of precipitation, or 5,375,200 gallons)
- Three days' pregnant solution discharges from actives areas of the heap(s) in the event of pump failure (1,728,00 gallons), and
- Normal working volumes of pregnant solution (2,000,000 gallons).

Pond 4A

Originally constructed in 1986, this pond was a Hypalon-lined run-off collection pond for tailings area 1 (Nerco 1/6/87). The pond was enlarged in 1991 to serve as the primary pregnant solution pond for the new Ironclad heap leach pad. The pond was enlarged to 150 feet wide, 302 feet long, and excavated in bedrock to a depth of 25 feet. The south end is sloped at 3H:1V and the other sides at 2H:1V. The pond's capacity is 5,000,000 gallons. The pond has two 60-mil synthetic liners over a compacted surface, with a geotextile leak detection system between the liners. There is a sump between the liners near the upper end of the pond, to which any fluids in the leak detection layer drain; fluids in the sump (and thus any leakage in the primary upper liner) are monitored from a leak detection manhole, connected to the sump by a four-inch pipe, on the north end of the pond. (Nerco 5/10/91)

The pond is surrounded by a three-foot-high berm that also is lined. Pregnant solution reaches the pond from lined collection ditches at the bases of the Phases I and II portions of the pad, and will come through pipes (see section 4.3.5.1 above) from the Phase III portion of the pad. (Nerco 5/10/91). The ditches (and presumably the pipes in the future) lead to a stilling basin immediately upgradient of the pond's north berm. This basin serves to slow the flow of pregnant solution before it enters the pregnant pond and also allows excess flow to be diverted to Pond 4C, the emergency overflow pond. The stilling basin is triple-lined; besides a double liner of 80-mil HDPE, a third layer of 80-mil HDPE is intended to enhance the pond's resistance to wear. Details on the basin's leak detection system, if any, were not available. From the stilling basin, solution formerly entered a six-inch PVC pipe, which passed through the Pond 4A liners (and was sealed to the basin's and pond's liners) into pond 4A; excess flow was directed through a similar pipe to Pond 4C. (MLRD 2/27/92 and 3/2/92) In early 1992, following a spill of pregnant solution, the means of conveying solution to Pond 4A was changed from the PVC pipe to a double-lined open trench after it was determined the transmittal pipe to Pond 4C had not been properly sealed to the basin's secondary liner (Nerco 3/6/92).

Pregnant solution is pumped from Pond 4A (and as necessary from the other ponds) at about 250 to 400 gallons per minute to the carbon-in-leach circuit(s) in the mill building.

Pond 4B

This pond was originally authorized by the approval for Technical Revision 4 and was constructed in 1986 (Nerco 3/10/86; MLRD 2/20/86 and 3/25/86). The pond is immediately below Pond 4A and originally served as a second tailings run-off collection pond. It now serves as an overflow pond for Pond 4A, the pregnant pond (Nerco 5/10/91). Pond 4B was excavated from bedrock in 1987. It was 160 feet long, 145 feet wide, and 25 feet deep, with a total capacity of 1,500,000 gallons. It was constructed with a geotextile underliner and 36-mil Hypalon liner. A 36-mil Hypalon-lined ditch conveys excess pregnant solution from Pond 4A to this pond. (Nerco 10/13/87) Pregnant solution from this pond is pumped back to Pond 4A when necessary.

Pond 4C

This pond was constructed in 1990 as an emergency overflow pond. The pond has a total capacity of 4,000,000 gallons. Like pond 4A, the pond is double-lined (two 60-mil HDPE liners) with a geotextile leak detection system between liners. The pond receives excess solution that cannot be accepted by the pregnant pond (Pond 4A). (MLRD 5/10/91) Pregnant solution from this pond is pumped to Pond 4A when needed.

4.3.5.2 Wastes and Other Materials Managed by Nerco

As noted above, gold recovery operations (from carbon-in-column circuits through doré production) take place in the Victor Mill building. This building contains the vats from the former vat leaching operation (see section 4.3.4) and has a concrete floor. The various tanks in the building (barren solution tanks, two operational series of portable carbon columns, caustic wash tanks, etc.) are surrounded by low concrete curbs for secondary containment. Some drains were observed during the site visit but it was not determined if they were individual sumps or if they drained to a central location.

All chemicals used on the site are stored in this building. These include unspecified amounts of sodium cyanide (in reusable flow-bins), Milsperse surfactants (in 20-50 pound plastic sacks), and acids and caustic (in unspecified containers). In addition, an unspecified amount of calcium hypochlorite is stored in the building for use in neutralizing any spills of cyanide solution that may occur. The more hazardous materials are stored in a fenced area within the building.

Maintenance on Nerco's seven haul trucks, three loaders, two drills, and other vehicles and equipment is conducted in a vehicle maintenance shop near the Victor mill building. Fuel oils and gasoline, hydraulic and lubricating oils, antifreeze, and other materials that are used on-site are stored in or near the mill and maintenance buildings; the amounts used and stored and the means of storage were not determined. Some used oil is used to fire two space heaters in the Victor Mill building; the remaining used oil is transported off-

site by a contractor for recycling or disposal. The volumes of used oil burned and shipped off-site were not determined. A contractor provides Nerco with complete tire service: the contractor provides new tires, handles tire maintenance and repairs, and removes old tires; further information on tires was not available.

Nerco has an assay laboratory in the Carlton mill building. The capabilities of the laboratory were not determined. However, Nerco indicated that about 45,000 fire assays had been performed in the previous year for the Cripple Creek operations (these would have included assays of pit blastholes, tails solutions from carbon columns, samples from area waste rock dumps being considered as sources of ore, and exploratory drilling samples). Cupels from these assays are stored in 55-gallon drums but the number of drums and the total weight/volume of cupels were not known. Nerco indicated the cupels have high (but unspecified) levels of lead and that they were actively searching for a market, but had been unsuccessful to date. The laboratory also generates an unspecified amount of liquid, which are piped to the Carlton Mill pregnant ponds.

Nerco purchases five to seven million gallons of water from the town of Victor each year. The water comes from two reservoirs operated by the town and is purchased prior to the town's chlorination treatment (since the chlorine would interfere with leaching). Bottled water is used for potable water. According to Nerco, most of the water purchased from the town is used for drilling and for dust suppression in the mining area and on haul roads. No surfactants are added to the dust suppression water, although that was described as possibly being necessary in the future. Some unspecified quantity of the purchased water also is used as makeup water for barren solution, although most water used for that purpose comes from precipitation. Nerco moves water among its Cripple Creek operations as necessary. According to Nerco, any additional makeup water that may be necessary comes primarily from the Pad 4 ponds (see section 4.3.6.2), which in turn comes from snowmelt as well as excess water moved from the Pad 2 ponds (see section 4.3.6.1).

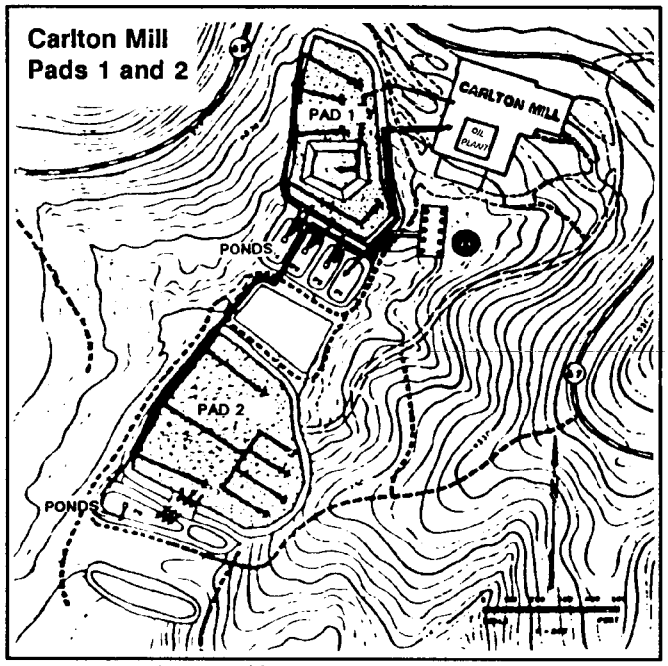
Nerco recycles paper, cardboard, and plastics from their Cripple Creek operations, and these materials are stored in a fenced "recycling" storage area at the Carlton Mill. Proceeds from the sale of such materials supports the local rescue squads.

Nerco also operates two small landfills, one on the Victor Mine and one on the Lillie permit (on what is known as the old Ajax mine property). The Department of Health delegates responsibility for regulating landfills and other waste disposal at mining operations to MLRD, but information on these landfills, and materials disposed in them, was not obtained. In addition, sanitary sewage from the Victor and Carlton Mill buildings is discharged to septic fields near the mills.

4.4 OTHER MAJOR CRIPPLE CREEK OPERATIONS

4.4.1 Carlton Mill (Pads 1 and 2)

The Carlton Mill was a conventional gold mill, using flotation for recovery. It operated from the early 1950s until about 1962. Tailings from the mill were disposed in a series of two or more dammed impoundments immediately below the mill in Arequa Gulch.



Provided by Nerco during site visit (relabeled)

In 1980, Texasgulf Minerals and Metals (actually, Cripple Creek and Victor Gold Mining Company (CC&V), which at that time was the joint venture of Texasgulf and Golden Cycle Gold Corporation) applied for and received MLRD permit number 80-244 to re-open the mill. Although Texasgulf operated the mill briefly, it was not active for long periods during the early 1980s. Beginning in 1985, Texasgulf began construction of what became heap leach Pads 1 and 2 and associated solution ponds. The sources of ore for both heaps were abandoned mine dumps in the Cripple Creek area. Some of these dumps were permitted under the Carlton Mill permit and some were permitted separately. The Carlton Mill permit area now exceeds 137 acres, including some outlying mine dumps. Appendix A presents a detailed history of the Carlton Mill permit. As with other Nerco permits, the Carlton Mill leach project has expanded incrementally since its inception, with successive approvals sought from MLRD for annual expansions.

Pad 1 is immediately uphill of the upper Carlton Mill tailings impoundment. Pad 1 was constructed beginning in 1985 and was actively leached through 1988 (and possibly after that time, although available documents were not clear). The pad is double-lined, but the liner materials were not described. The heap covers about 267,000 square feet and is divided into four cells by internal berms. A french drain system (otherwise undescribed) was installed below the lower liner in order to lower the water table. (CC&V 3/12/85) After the 1987 leaching season (active leaching occurred only in warmer months, six to eight months per year), the heap contained about 330,000 tons of ore, which had been placed in lifts 10 to 22 feet high. The total height was 40 to 50 feet. (CC&V 3/12/85, 11/20/87) During the site visit, Nerco indicated that Pad 1 now contains about 500,000 tons of spent ore and that they do not plan to add additional ore to the heap.

Four solution ponds are located immediately below Pad 1: a barren pond, intermediate pond, pregnant pond, and another pond for solution storage. All these ponds are double-lined (again, the liners were not described) and have a combined capacity of 3,000,000 gallons. Solution was sprayed onto an active cell of Pad 1 by sprinklers at rates of about 250 gallons per minute; solution was then collected in the intermediate pond. It was then applied to another cell and collected in the pregnant pond. Gold recovery was accomplished in a four-tank carbon-in-column series (apparently the same as described above for the current Ironclad/Globe Hill operations). Loaded carbon was removed to the Carlton Mill building, where gold was recovered with pressure caustic stripping, electrolytic plating onto stainless steel wool cathode, and smelting in a furnace to produce doré. Available information did not describe the gold recovery process further. Barren solution from the mill was then refortified with cyanide in the barren pond and re-applied to the heap. (CC&V 3/12/85, 11/20/87)

In early 1988, CC&V received approval to rehabilitate portions of the Carlton Mill and to install a carbon-in-leach gold recovery circuit so the facility could beneficiate high-grade ore in the mill. Tailings disposal was to occur on Pad 1: an unlined "pond" was to be excavated on the surface of the heap for tailings disposal. A total of 25,000 dry tons of tailings were to be disposed in this manner, in a slurry consisting of 45 percent solids. Geotechnical studies showed that the fine tailings (80 percent less than 325 mesh) would not migrate into the leached ore on the heap, but that water would; this water, after leaching through the heap, was to be collected in one of the solution ponds for recycle to the mill. (CC&V 11/20/87; MLRD 1/25/88) It is not known if the carbon-in-column circuit was ever completed or if tailings were actually disposed on the Pad 1 heap. During the site visit, Nerco indicated that Pad 1 contained about 500,000 tons of spent ore, but did not mention tailings.

Pad 2 was permitted in 1986. This heap leach pad is constructed immediately below Pad 1 on top of the upper Carlton Mill tailings impoundment. The tailings on which the pad was constructed ranged from seven feet deep near the upper end to 74 feet at the dam (which is known as Dam 1). The tailings are saturated below a depth of about 30 feet near the center and 45 feet near the dam. The pad was constructed by placing an 80-mil HDPE liner directly on the surface of the old tailings. Geotechnical studies showed that the tailings would support the heap, although the tailings (and thus the liner and heap) were predicted to settle about three feet near the center of the heap. (CC&V 1/16/86; Dames and Moore 1986; MLRD 3/24/86) In 1988, Pad 2 was expanded up an adjacent hillside to a total of 440,820 square feet (CC&V 2/23/87a, 2/22/88; MLRD 2/9/88, 2/26/88) It was not determined if Pad 2 was further expanded after 1988.

A fifth pond (Pond 5) was constructed immediately below Pad 2 but within the area of tailings (i.e., above the tailings dam) to serve as the pregnant pond for the pad. This double-lined (otherwise undescribed) pond was excavated into the tailings; it covers about 42,000 square feet and has a capacity of about 2,120,000 gallons. One of the four Pad 1 ponds serves as the barren pond for this heap. An additional 827,000 gallons of solution storage capacity is provided by the lined area between the Pad 2 heap and Pond 5. Another 2,400,000 gallons can be stored on the unlined tailings surface up to the crest of Dam 1. In 1987, an additional 3,500,000 gallons of capacity was obtained by improving the crest of the dam on the lower Carlton

Mill tailings impoundment (dam 2); this emergency storage area is unlined. (CC&V 1/16/86, 2/23/87a; Dames & Moore 1986; MLRD 3/23/87, 1/25/88) Total Pads 1 and 2 solution storage capacity exceeds 11,000,000 gallons, sufficient to contain normal working volumes, flow from the 100-year/24-hour storm event, and at least some heap drainage (CC&V 3/16/89).

During the site visit, Nerco indicated that Pad 2 contained about 2,000,000 tons of ore and that additional ore would be placed on the heap during the 1992 leaching season. Nerco also indicated that excess water from Pad 2 ponds (presumably during the idle winter season and spring snowmelt) may be transported to the Victory Project (see section 4.3.6.2 below) for storage. Whether Nerco uses run-off and drainage solutions collected in Pad 1 ponds as makeup water for Pad 2 or still recovers gold from it was not determined.

MLRD requires Nerco to monitor water quality in Arequa Gulch upstream and downstream of the tailings impoundments and heaps. Nerco also samples the french drain under Pad 1. Monitoring results from 1987 through 1989 are presented in Table 4-5. In addition, there are six "ground-water" monitoring wells; these wells are driven into the tailings near the base of Dam 1. The only analytical data other than pH and cyanide was for a sample from well PZ-6 on April 6, 1989; results are in Table 4-5.

Table 4-4. Monitoring Results from Pad 1 French Drain and from Arequa Gulch Upstream and Downstream of Pads 1 and 2

(milligrams per liter, unless otherwise indicated)

Parameter	Minimum and Maximum Concentrations 1987 - 1989			April 6, 1989
	French Drain below Ponds 1-4	Arequa Gulch Upstream	Arequa Gulch Downstream	Well PZ-6
Flow or Discharge	1 - 8 gpm	0 - 63 gpm	0 - 29 gpm	NA
pH (s.u.)	6.6 - 7.89	4.32 - 5.1[b]	7.69 - 8.1[b]	8.8[b]
TDS	850 - 860	1,100	1,400	6,200
Total CN	0.039 - 0.82[a]	< 0.005 - 0.065	0.008 - 0.14	NR
Free CN	0.019 - 0.82[a]	< 0.005 - 0.013	0.008 - 0.011	68
Nitrate (as N)	6.6	NR	NR	NR
Sulfate (as SO_4)	350 - 440	450 - 970	400 - 3,500	2,700
Cadmium[c]	< 0.005	0.015 - 0.021	< 0.005 - 0.007	0.079
Copper[c]	0.030 - 0.47	0.024 - 0.53	< 0.005 - 0.21	34
Lead[c]	< 0.005 - 0.0033	< 0.005 - 0.011	< 0.005 - 0.024	0.05
Silver[c]	< 0.0002 - 0.017	< 0.0002 - 0.0022	< 0.0002 - 0.0006	NR
Zinc[c]	0.028 - 0.38	1.8 - 2.7	0.009 - 1.1	10

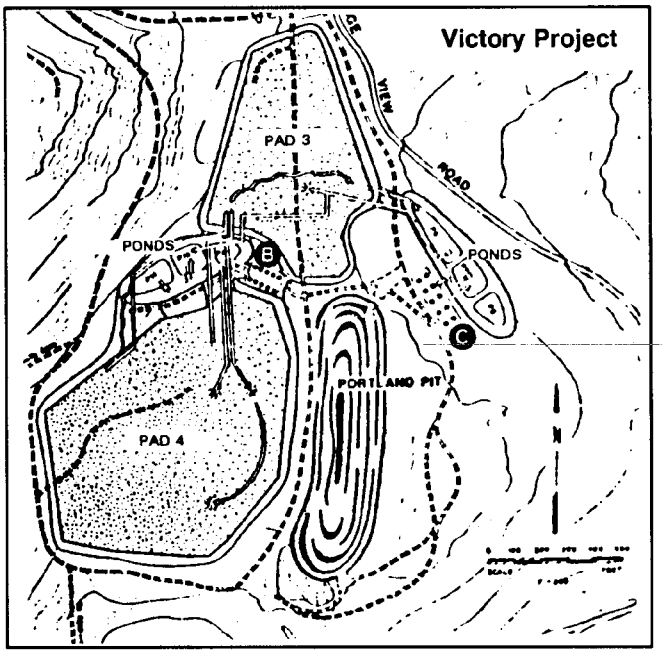
NOTES:

NR Not reported
a Does not include 11/2/88 results, which showed free CN at 9.0, total CN at 16.0.
b Except well PZ-6, reported data are field measurements. Maximum laboratory measurement upstream showed 6.0 s.u., minimum downstream was 7.0 s.u.
c Concentrations of metals are of total metals. In 1990, monitoring requirements were changed to dissolved metals.

Source: Pikes Peak Mining Company 4/27/90.

4.4.2 Victory Project (Pads 3 and 4)

Beginning in 1986, Texasgulf Minerals and Metals (through Cripple Creek and Victor Gold Mining Company (CC&V), which at that time was the joint venture of Texasgulf and Golden Cycle Gold Corporation), constructed and operated the major components of the Victory Project: two heap leach pads and an open pit. The permitted area covers 112 acres and is located on a ridge of Battle Mountain about 1.5 miles southwest of the Victor/Globe Hill area and about 0.5 miles north of the town of Victor. Much of the project area was covered by tailings and waste rock from historic operations, and these materials underlie some of the modern operations. With Nerco's purchase of Texasgulf in 1990 (Texasgulf was renamed Pikes Peak Mining Company), Nerco assumed responsibility for the permit (MLRD permit 86-024). Cripple Creek and Victor Gold Mining Company (CC&V) has managed the site since its inception. A detailed permit



Provided by Nerco during site visit (relabeled)

history of the Victory Project is presented in Appendix 4-B.

In 1986 and 1987, CC&V constructed Pad 3, a double-lined pad that covers about 280,000 square feet. Compacted tailings from an historic operation served as the lower liner, and an 80-mil HDPE secondary liner was placed over that. The base of the pad is sloped an average of about 10 degrees, with a 20 degree maximum slope in any one area. The source of ore for this pad was waste rock from area mine dumps. (CC&V 2/21/86) In 1986, a total of 416,000 tons were stacked on the heap, and an additional 430,000 tons were projected for 1987 (CC&V 2/23/87b, 5/26/87). During the site visit, Nerco indicated that Pad 3 contains a total of about 1,000,000 tons of ore.

Pad 4 was permitted in 1987 and construction was apparently completed in 1988. This 15-acre pad (660,000 square feet) was designed with a capacity of 1,825,000 tons of ore. It is immediately south of Pad 3. This heap was constructed on a prepared base of compacted tailings that were placed partially over waste rock (both historic dumps and 600,000 tons of rock from the adjacent Portland pit). This pad has a double synthetic liner (60-mil HDPE lower and 80-mil HDPE upper liners); a layer of granular tailings crossed by 3-inch HDPE pipes serves as a leak detection system. In 1988, about 672,000 tons of ore were placed on this heap in a single lift that averaged 20-25 feet deep (and ranged from eight to 30 feet, depending on site elevation). Ore came from the Portland Pit and from area waste rock dumps. (CC&V 7/17/87 and 12/8/87; Dames & Moore 3/16/89) The total amount of ore on Pad 4 was not determined.

In constructing Pad 4 and its associated ponds, a total of 12 old mine shafts were discovered; the top few feet of each was cleared out (by backhoe) and examined, then filled with gravel and compacted. (Dames & Moore 3/16/89) An unspecified number of shafts had also been filled and covered during construction of Pad 3 (CC&V 5/26/87, 2/21/86).

The Portland Pit, immediately downhill and to the east of Pad 4, was permitted in late 1987 and developed in 1988 and 1989. As planned, the pit's dimensions were to reach 1,400 feet long (north to south, oriented along the side of the ridge) by 500 feet wide (east to west) by 240 feet deep (near the center). A waste rock:ore ratio of about 2.5:1 was anticipated, reaching totals of 1,300,000 to 1,500,000 tons of waste rock and 500,000 tons of ore. The actual dimensions, and the amount of material mined, were not determined;

during 1988, about 600,000 tons of waste rock from the pit were used in preparing the base for Pad 4. (CC&V 8/12/87, Dames & Moore 3/16/89)

The Victory Project used a total of six solution ponds. A barren, pregnant, and emergency overflow pond serve Pad 3 and parts of Pad 4; the remainder of Pad 4 is served by three more ponds (again, a barren, pregnant, and emergency overflow pond). All of the six ponds are connected by buried and aboveground pipes that allow pumping or gravity flow between any of the ponds. All ponds (with the possible exception of the emergency overflow ponds) have two 60-mil HDPE liners and geotextile leak detection systems. In addition, lined berms surrounding the ponds provide additional storage capacity. Overall, the pond system is designed to contain flows from the 100-year/24-hour storm event, an additional 0.6 inches of precipitation, and one day's operating volume. (CC&V 2/21/86, 2/23/87b, 5/26/87, 7/17/87, and 12/8/87; Dames & Moore 3/16/89)

Details on barren solution makeup and characteristics were not determined. Barren solution was applied to each of the heaps via drip irrigation lines at a maximum rate of about 550 gallons per minute; leachate from the heaps then flowed by gravity through lined ditches to the respective pregnant ponds. Gold was recovered in portable carbon columns similar to those described in section 4.2.3. Carbon columns with loaded carbon were transported to the Carlton Mill for gold recovery. (CC&V 2/21/86, 7/17/87)

Reclamation requirements for the heaps include grading side slopes to an average of 2H:1V or less and detoxification, but not revegetation. The heaps are to be rinsed until effluent is of "acceptable quality" to MLRD. (CC&V 2/21/86, 7/17/87) Nerco indicated during the site visit that no cyanide solution was being applied to the heaps (the most recent time it was applied was not determined) but that the heaps were being sprayed for water balance purposes. Nerco indicated that the heaps would be decommissioned later in 1992. Reclamation for the solution ponds and other disturbed areas will involve seeding and revegetation. For the Portland Pit, there will be a warning/safety bench about 15 feet below the rim and an access ramp for wildlife and trespasser exit will be left. Available topsoil will be spread on benches and the pit floor, and grasses and trees will be established. Reclamation plans for the pit were approved late in 1989; the status of formal planning for other areas was not determined. (Texasgulf 5/10/89).

4.4.3 '76 (Bull Hill) Project

Sometime prior to September 1981, Newport Minerals began cyanide leaching operations at the '76 Project (also known as the Bull Hill Project), an area about 1.5 miles southwest of the Globe Hill site. This site, which Newport or other operators began operating in 1976, was a heap leach system that used waste rock from area waste rock dumps as ore. On August 27, 1981, the Mined Land Reclamation Board issued a Notice of Violation to Newport, citing the fact that MLRD had never received or approved an application for the "mining and reclamation operations" at the site. Newport was ordered to stop all leaching/mining operations at the '76 site and to submit a permit application or an application to amend the Globe Hill permit. Newport's attorneys responded that Newport questioned whether cyanide heap leaching in general was a "mining operation" and thus subject to permitting. In addition, Newport's attorneys questioned whether the

Table 4-5. Concentrations of Selected Parameters in '76 Project Barren and Pregnant Solution Ponds

(milligrams per liter, unless otherwise indicated)

Parameter	6/17/86[a]	9/14/88[b]
Barren Pond		
pH (s.u.)	NR	8.3
Total CN	NR	0.056
Free CN	NR	0.030
Silver	NR	< 0.005
Zinc	NR	< 0.005
Pregnant Pond		
pH (s.u.)	NR	9.1
Total CN	8.09	0.056
Free CN	2.11	0.29
Weak-acid-dissociable CN	2.79	NR
Silver	NR	0.030
Zinc	NR	0.006

NR Not reported

Sources:
a Newport Minerals 7/3/86
b Accu-Labs Research 10/7/88.

removal of waste rock from old dumps could be considered mining under the definition in Colorado's statutes (which referred to removal of ore from "natural occurrences"). MLRD's position was that both activities (i.e., heap leaching and waste rock removal) were considered mining. Notwithstanding Newport's retention of their arguments as possible defenses, the company submitted an application to amend the Globe Hill permit by adding the '76 site to the permitted area. The Mined Land Reclamation Board subsequently approved the amendment. (MLRD 9/2/81 and 12/21/81; Geddes et al. 9/15/81 and 11/25/81)

The heap, ponds, and plant covered an area of 14.2 acres. The 5.2 acre heap (225,400 square feet) had an "impervious soil pad" (no further description of the liner system was available). Barren solution with an "alkaline pH" and a sodium cyanide concentration of 0.05 percent was pumped from a barren pond and applied to the heap with a "pump and spray line system" (actual pH and application rates were not provided,

nor was pond construction described). Pregnant solution drained (whether through drain pipes or directly on the soil pad was not described) to a "plastic lined launder" in the front of the pad, thence through "launder channels" to a Hypalon-lined pregnant pond. There also was an emergency overflow pond, but no details on construction were provided. Total capacity of all ponds was 807,840 gallons, sufficient to contain precipitation from the 100-year/24-hour storm event as well as at least 24 hours of heap drainage. Berms outside the ditch (i.e., outside the "launder") kept solution flow in the ditch. The heap was actively leached for six months a year; during winter, solutions were held in the ponds. Unspecified metallurgical difficulties in the "leaching plant" (otherwise undescribed) in late 1976 caused a cessation of operations until 1978. The amount of waste rock used as ore in 1976 was not determined; in 1978, about 12,000 tons were added to the heap and in 1981, another 100,000 tons were added. (Newport Minerals 9/14/81)

The quantity of ore added to the heap after 1981 was not described in available documentation. However, cyanide leaching apparently ended sometime in 1985 (Dayspring Mining Corporation 10/28/88).

Reclamation plans included rough-grading of the heap. The heap was to be rinsed with fresh water and, if cyanide were still detected, a "suitable oxidant" was to be added to the rinse. (Newport Minerals 9/14/81) When cyanide was no longer detected, the ponds were to be backfilled. The backfilled ponds and other disturbed areas were to be revegetated, but not the heap itself (MLRD 5/22/86).

Through the 1980s, the ponds were sampled at various times. Available monitoring data for the '76 site ponds are presented in Table 4-6. The current status of the '76 project was not determined during the site visit.

4.5 REGULATORY REQUIREMENTS AND COMPLIANCE

A number of State agencies are responsible for regulating various aspects of Nerco Minerals Company's Cripple Creek operations. These agencies and the permits they have issued to Nerco are described in sections 4.4.1 through 4.4.4 below.

4.5.1 Colorado Mined Land Reclamation Division

The agency with by far the most extensive involvement with the Ironclad/Globe Hill facility and Nerco's other Cripple Creek operations has been the Mined Land Reclamation Division (MLRD) in the Colorado Department of Natural Resources. MLRD is responsible for implementing the Mined Land Reclamation Act. MLRD reviews permit applications, inspects sites, and makes recommendations to the Mined Land Reclamation Board on permitting and enforcement actions. The Board issues rules and regulations under the Act; approves and issues permits, including bonding requirements; issues Notices of Violations and Cease and Desist Orders; and imposes civil and criminal penalties on operators that violate permits or Colorado statutes and rules.

Permits are issued under sections 110 and 112 of the Act. Regular Operations Permits, or "112 Permits" are required of operations that affect 10 or more acres or that extract more than 70,000 tons of material per year. Limited Impact Operations Permits, or "110 Permits," are required of facilities that will affect less acreage and extract less material than the 112 cutoffs.

A permit application is required prior to facility construction and operation. The application must describe the surrounding area and proposed construction in some detail, and must describe planned facility operations and reclamation. The right to conduct the mining operations must be demonstrated (e.g., through leases, proof of title, etc.), and mineral and surface owners of land in the proposed permit area and adjacent areas must be identified.

Following receipt of a permit application, MLRD notifies the Colorado Department of Health (agencies of which administer the water and air programs of the State), the Division of Water Resources in the Office of the State Engineer (which is responsible for water rights), and other State and local agencies. The various agencies may then provide comments and recommendations on the application. In the case of Teller County (and possibly other counties as well), the County and/or towns must find that the proposed operation is consistent with local requirements, including zoning. Applicants also place advertisements in local newspapers to inform the public that an application has been received and to indicate that records can be reviewed in MLRD offices. MLRD staff review the application and notify the applicant when additional information is necessary. Finally, MLRD inspects the site and recommends approval, conditional approval, or disapproval to the Board. The Board considers applications in open meetings. Upon approval, the Board issues the permit, which incorporates by reference the application, as well as any correspondence and technical reports that describe the permitted activities/facilities.

To add additional acreage to a permitted area, a permittee must apply for an Amendment to the permit. For changes that do not add additional areas (e.g., operational or other changes within the permit area), operators must apply for Technical Revisions to the permit. The review and approval process for Amendments and Technical Revisions is the same as described for original applications, except that Technical Revisions may not require public notice. There is no single "permit" that incorporates all the requirements applicable to an operator, as there is, for example, for NPDES permits (see section 4.4.2 below). Rather, the requirements are in approved applications for permits, Amendments, and Technical Revisions, in related MLRD and operator correspondence, and in technical studies and reports that are used to support applications.

When MLRD inspectors identify possible violations of permit conditions or Colorado regulations, they recommend specific remedies to the operator, who receives a copy of the inspection report. When potential violations are serious or are not remedied within time frames specified by the inspector, MLRD recommends appropriate actions to the Board. Such actions can include warnings, Notices of Violation, Cease and Desist Orders, permit revocation, and bond forfeiture. The Board also can impose civil penalties up to $1,000 per day per violation; actual penalties are based on a sliding scale based on seriousness and the operator's intent (e.g., inadvertent versus negligent versus willful); again, recommendations on penalties are made to the Board by MLRD.

MLRD typically inspects facilities at least annually, although more frequent inspections are conducted if conditions warrant. During the extended period when the Globe Hill and Victor Mine permits were not active (from 1986 through 1991), for example, MLRD conducted a number of inspections. MLRD also inspects facilities prior to Board consideration of applications or enforcement actions.

Table 4-6. Colorado Mined Land Reclamation Division Permits Issued to Nerco [a]

Permit Type	Permit Number[b]	Project Name	Project Description
112	M-77-367	Globe Hill	See text and Table 4-3. Globe Hill open pit mine, waste rock dump, three inactive heap leach pads, and portion of new Ironclad heap.
112	M-81-134	Victor Mine	See text and Table 4-2. Ironclad open pit mine, waste rock dump, most of new Ironclad heap, and gold recovery facility (through smelting). Formerly included vat leaching and tailings disposal.
112	M-80-244	Carlton Mill Project (Pads 1 and 2)	See section 3.6.1 and Appendix A. Previously, mill and carbon- in-leach facility, gold recovery facility (through smelting). Since mid-1980s, heap leach and CIC circuit, with old mine dumps serving as sources of ore. Pad 2 still operational.
112	M-86-024	Victory Project (Portland Pit, Pads 3 and 4)	See section 3.6.2 and Appendix B. Open pit, waste rock dump, two heap leach pads, and formerly portable carbon columns. Pit under reclamation, heaps to be "decommissioned" in 1992.
112	M-86-009	Lillie Project	Permitted as heap leach of many old waste dumps. Heap leach not constructed but dumps stripped for use as ore on Victory Project and Carlton Mill heaps (CC&V 3/31/86). • Originally, 241.33 acres permitted for following dumps: Joe Dandy, Last Dollar, Portland #2, Golden Cycle/Teresa, Lillie, Ajax, Upper Independence, Lower Independence, Portland #3, Victor, Deadwood, South Burns, Empire, Isabella, Wildhorse, and Morning Glory dumps. Total of 1,556,000 tons of rock. • Over the course of the permit, some areas were removed from this permit and placed under Gold Star and Victory permits.
112	M-88-064	Gold Star Pit	119.61 acres, open pit mine on Bull Hill to provide ore for Pad 4. • Permitted at 1,100 feet east-west x 900 north-south x unspecified depth. • In application, estimated 625,000 to 1,500,000 tons of ore, 2,400,000 to 3,000,000 tons of waste rock. Rock dump on nearby saddle, possibly to use some rock to replace other area dumps removed for leaching. • $32,600 bond proposed. • Inactive since August 1989 but drilling was to continue in 1992. (MLRD 10/26/88)
112	M-91-134	Cameron and School Section heap leach pads	Reclamation-only permit. Originally, these were Newport Minerals operations (permits 82-16 and 81-98). Following Newport's bankruptcy in 1985, MLRD revoked the bond and confiscated Newport's assets, including these heap leach pads. Under this permit, Nerco (CC&V) is to remove 600,000 - 700,000 tons of ore from heaps and transport to Ironclad heap for releaching. Not clear if Nerco or MLRD is responsible for final site reclamation (permit application indicates MLRD would be responsible, but undated "Reclamation Plan for Cameron and School Section Heap Leach Pads" indicates CC&V would reclaim the site.) (MLRD 3/4/92) A major spill occurred on the site in 1984, when 150,000 - 200,000 gallons of barren solution overflowed the ponds and reached Grassy Creek. A total of about 700,000 gallons of solution were stored in the vats in the Victor Mill building for several years during the Victor Mine's extended period of inactivity from 1986 through 1990.

Table 4-7. Colorado Mined Land Reclamation Division Permits Issued to Nerco (continued)

Permit Type	Permit Number[b]	Project Name	Project Description
Mine Dumps Permitted for Removal of Rock for Leaching			
110	M-82-214	Lower Mary McKinney Dump	7 acres: originally mined for decorative rock by Pioneer Sand Company, permit transferred to CC&V in 1986. (MLRD 4/18/83)
110	M-88-025	Anchoria Leland Dump	8.5 acres, 100,000 tons to Pads 2 and 4 beginning in 1988-1989 (MLRD 5/16/88a)
110	M-88-026	Chicago Tunnel	5.16 acres. Chicago Tunnel to be used to gain access to Proper Mine (underground) for mining of undetermined amount of ore, to be removed to Pad 2. (MLRD 5/16/88b)
110	M-88-096	Ocean Wave Mine Dump	9.8 acres, 40,000 tons to Pad 4 beginning in 1988-1989. (MLRD 11/28/88a)
110	M-88-097	Tornado/Raven Dump	7.3 acres, 50,000 to 70,000 tons to Pad 4 beginning in 1988-1989. (MLRD 11/28/88b)
110	M-88-098	Blue Flag Mine Dump	9.7 acres, 40,000 tons to Pad 4 beginning 1988-1989. (MLRD 11/28/88c)
110	M-88-099	Howard Mine Dump	9.9 acres, 55,000 tons to Pad 2 or 4 beginning in 1988-1989. (MLRD 11/28/88d)
110	M-88-100	Index Mine Dump	9.9 acres, 95,000 tons (< 70,000 tons per year) to Pad 2 beginning in 1988-1989. (MLRD 12/9/88)
110	M-89-059	Rigi Mine Dump	6.0 acres, 5,000 tons to Pad 4 beginning in 1989. (MLRD 7/14/89)
110	M-89-060	Upper Mary McKinney Mine Dump	8.9 acres: 60,000 tons to Pad 2 beginning in 1989-1990. Required studies, stabilization, and retention of existing cribbing supporting dump. Permit issued following NOV for mining without a permit (removal began after application but before issuance). (MLRD 7/27/89a)
110	M-89-061	Hull City and Sacramento Mine Dumps	9.9 acres, 18,000 tons to Pad 4 beginning in 1989. Permit issued following NOV for mining without a permit (removal began after application but before issuance). (MLRD 7/27/89b)
110	M-90-109	Bertha B and Maggie Dumps	5.0 acres, 27,000 tons to Pad 2 or 4 beginning in 1990-1991. (MLRD 10/2/90a)
110	M-90-110	Midget Mine Dump	5.0 acres, 57,000 tons to Pad 2 beginning in 1990-1991 (MLRD 10/2/90b)
110	M-90-111	Moon Anchor Dump	9.0 acres, 70,000 tons to Pad 2 beginning in 1990-1992. (MLRD 10/2/90c)
110	M-91-114	Clyde/Modoc Dump	10 acres, unspecified tonnage (< 70,000 tons per year) to Pad 2 in 1991-1992. (MLRD 11/7/91)

NOTES:

a Most permits are actually issued to Cripple Creek and Victor Gold Mining Company, although some are issued to Nerco or Pikes Peak Mining Company.

b The first number in the permit number reflects the year in which the original permit was issued.

shows MLRD permits issued to Nerco (and/or its subsidiaries and operating companies). As noted previously, the area affected by Nerco's Ironclad/Globe Hill project was formerly two separate permitted operations with two separate operators: the Globe Hill project under permit 77-367 and the Victor Mine under 81-134. The areas have now been consolidated by Nerco into a single project, with some facilities extending over both permit areas (e.g., the Ironclad heap leach pad) and some facilities used in common (e.g., the crusher, the waste rock dump, and the Victor Mill).

At the time of the site visit, the Victor site was held solely by Nerco, while the Globe Hill site was a joint venture between Nerco subsidiary Pikes Peak Mining Company and Golden Cycle Gold Corporation. According to Nerco, the Victor operation has since been added to the joint venture. Nerco's other Cripple Creek operations are generally permitted separately, as shown in Table 4-7. As can be seen, individual waste rock dumps that Nerco (or predecessor operators) proposed to remove and leach on the Victory or Carlton Mill pads are often permitted separately. MLRD and Nerco indicated that at least some of the 110 permits for waste rock dumps were in the process of being consolidated into a single permit.Reclamation of each of Nerco's Cripple Creek sites is guaranteed by a bond, which is in the form of a surety by St. Paul Fire and Marine Insurance Company in the favor of Nerco (or Pacificorp). The total surety is for $1,000,000, with stipulations for individual bonds for individual sites. Bonds are based on the operators' and MLRD's estimate to reclaim the site in accordance with the Mined Land Reclamation Act and local requirements. During the site visit, MLRD indicated that bonds established prior to 1991 would be re-examined and re-calculated in the near future. The total amount of bonding required of Nerco for its various operations was not determined. Reclamation bonds ranged from $1,000 for some of the areas where waste rock was removed for leaching to $391,948 for the Ironclad/Victor permit area.

For Nerco's Ironclad/Globe Hill project and the other Cripple Creek operations, MLRD operational and performance requirements are found throughout the many applications (for the original permits and for numerous Amendments and Technical Revisions) and the extensive correspondence for each permit area (i.e., permits 77-367 and 81-134 in the case of Ironclad/Globe Hill). Table 4-8 presents a permit history of MLRD permit 81-134, originally issued to Silver State Mining Corporation for the Victor Mine and assumed by Nerco in 1984. Table 4-9 presents a similar history of permit 77-367, originally issued to Newport Minerals in 1977 for the Globe Hill project and subsequently assumed by Dayspring Mining Corporation in 1986 and Nerco (actually, Pikes Peak Mining Company) in 1991. The tables show the dates when applications (for the permits, amendments, and technical revisions) were submitted or approved, identify the permittee at the time, and describe the permitted operations.

The tables are based on materials in MLRD permit files, as cited in the table. Similar tables for the Carlton Mill and Victory Projects are presented in Appendices A and B, respectively.

4.5.2 Colorado Department of Health, Water Quality Control Division

The Water Quality Control Division in the Colorado Department of Health is authorized to implement the National Pollutant Discharge Elimination System (NPDES) in Colorado by means of the Colorado Discharge

Permit System (CDPS). The State has not issued CDPS permits to Nerco's MLRD-permitted operations since they are designed not to discharge to surface waters (except storm water from some areas and some sites). However, the State has issued CDPS permit CO-0024562 to the Cripple Creek and Victor Gold Mining Company for discharges from the Carlton Tunnel to Fourmile Creek. The permit was reissued on March 12, 1992, and is effective from May 1, 1992 through March 31, 1997.

Mine water proved to be a problem throughout the history of the Cripple Creek mining district. The Carlton Tunnel was completed in 1941 and drains hundreds of miles of underground workings in the district. It extends six miles from the Cripple Creek area to Fourmile Creek, a tributary of the Arkansas River. In the mining district, the tunnel is at an elevation of about 7,000 feet above sea level, or 2,000 to 3,000 feet below the surface. At its discharge end, the elevation is about 6,700 feet.

Table 4-8. Permit History of the Victor Mine (MLRD Permit 81-134)

Permit 81-134: Victor Mine			
Date	**Event**	**Permittee**	**Description**
March 25, 1981 to September 8, 1981 (Silver State Mining Corporation 3/25/81; MLRD 9/8/81)	Permit application	Silver State Mining Corporation Lessor (surface and mineral): Gaston Coblentz and Cherry M. Lawrence	7.4 acre 5-year, mine, including: • 1.8 acre open pit (Ironclad mine), partly in previously mined pit. Final size to be 225 x 350 feet x 100-150 feet deep. 15-foot wide benches at 30 foot intervals (height). • Plastic lined 4.43 acre tailings area with 15-20 foot dam downslope to impound tailings water. • 0.15 acre crushing plant, 0.05 acres for field conveyors, 0.93 acres for processing plant (no further descriptions) • Reclamation: generally, leave as "mining area." Fence entire pit perimeter, grade tailings dump to 2H:1V or less, resoil/reseed impoundment dam and benches; grade and revegetate other areas. • Described in MLRD notes only (correspondence not obtained): closed vat cyanide system in 200 x 200 building. 9.5 inch concrete rebar construction, with rubber waterstops in joints. 4 vats, 3-day cycle; double-rinse tailings, conveyor to tailings. Ore drained for at least two hours before 4-6 hour unloading process. • No waste rock, No water diversion needed (no upslope area). • $7,000 bond proposed; actual amount required not determined.
December 1983 (Silver State 12/7/83)	Technical Revision 1	Silver State Mining Corporation	Add vehicle maintenance building, enlarge another building and parking lot, all on existing permit area.
March 1983 through June 1984 (Silver State 5/26/83, MLRD 5/30/84)	Amendment 1	Silver State Mining Corporation	Increase sizes of pit, waste rock dumps, and tailings. Added tailings area 2 across Range View Road. Also included tailings reclamation plan: establish test plots to allow development of final revegetation/reclamation plan. New permit area was 54.2 acres. Bond increased by $36,400 to $127,896.
June 1984 MLRD, (6/20/84)	Change in operator	Nerco Minerals Company	

Table 4-8. Permit History of the Victor Mine (MLRD Permit 81-134) (continued)

Permit 81-134: Victor Mine			
Date	**Event**	**Permittee**	**Description**
June 1984 to October 1984 (Nerco 6/19/84, MLRD 10/17/84, 3/21-22/85, and 1/2/86)	Amendment 2	Nerco Minerals Company	Expansion of facilities and operations: • Regrade and deactivate tailings area 2, extend tailings area 1 to north, with perimeter berms and 20-mil PVC liner. Reclamation plan for tailings: regrade to 2H:1V and revegetate. Establish test plots to assess revegetation options. • Build two new collection ponds in addition to four existing ponds. • Sample tailings collection ponds monthly for pH, free CN; sample annually for full suite of parameters. • Re-locate Range View Road to east. • Deactivate old and establish new waste rock dump. • Increase water usage five-fold to 100 gpm. • Increase mining rate to 3,000 tpd. • Increase bonding to $373,948. • Apparently added four 2,000 ton vats (Nerco 2/12/86 refers to this addition).
August 1984 (Nerco 8/22/84)	Technical Revision 2	Nerco Minerals Company	Replace 3.2 acres of undisturbed lands with 3.2 acres to be used for haul road from pit to dump. (Presumed approved; no correspondence obtained.)
March 1, 1985 (MLRD 3/1/85)	Technical Revision 3	Nerco Minerals Company	Exchange 11.2 undisturbed areas designated for waste dump with another 11.2 acres, where dump was actually proposed to be located.
1985 (MLRD 7/1/85)	Amendment	Nerco Minerals Company	7-acre tailings area on adjacent Globe Hill project (the old Globe Hill heap) removed from Newport Minerals permit 77-367, to be added to permit 81-134. Nerco also was to assume responsibility for Globe Hill heap leach pregnant pond. (Documentation on actual addition of the area to permit 81-134 not obtained.)
January 24, 1986 (Nerco 1/24/86; MLRD 1/28/86)	Notice of Temporary Cessation	Nerco Minerals Company	Cease operations for at least 180 days. During hiatus: • Transfer solution in tailings disposal area to empty vats as necessary to maintain capacity for 100-year/24-hour storm event. . • Stabilize and seed topsoil stockpiles. • Divert run-on from undisturbed areas. • Continue monitoring integrity of facilities and monthly/annual sampling of collection ponds. Cessation lasted until 1990.

Table 4-8. Permit History of the Victor Mine (MLRD Permit 81-134) (continued)

Permit 81-134: Victor Mine			
Date	**Event**	**Permittee**	**Description**
March 25, 1986 (Nerco 2/12/86, 3/20&24/86; MLRD 1/2/86, 2/20/86, 3/25/86)	Technical Revision 4	Nerco Minerals Company	Site in cessation status. Revisions to tailings disposal system in response to November 6, 1985, tailings slough. Some were previously approved in Amendment 2: • Change pile foundation preparation, reduce planned height to 150 feet. • Avoid steep slopes as tailings liner advances • Relocate county road 84 to allow room for 500-foot-wide front for tailings advance. • Reduce working face slope to 2:1. • Relocate tailings collection ponds to permanent location: one to be constructed immediately, one on resumption of production. • Convey drainage/run-off from pile to pond in 18-inch pipe laid in Hypalon-lined ditch.
February 26, 1987 (MLRD 2/26/87; Nerco 1/6/87)	Technical Revision 5	Nerco Minerals Company	Site in cessation status. Change in method of transfer of run-off/seepage from tailings area to collection pond. Formerly, 18-inch plastic pipe in 20-mil PVC-lined ditch. Pipe failed due to faulty resin. Changed to: from tailings ditches directly into open double-lined bermed ditch (36-mil Hypalon liner over geotextile over existing 20-mil PVC liner); drain into 18-inch pipe enclosed in underliner to pass through berm around pond. Inside berm, discharge end of pipe to rest on top of lined portion of pond.
October 17, 1990 (Nerco 9/17/90; MLRD 10/29/90)	Reactivation of Victor Mine	Nerco Minerals Company	End cessation that began in late 1985. Planned work included expansion of tailings pile to north (as planned in TR 4): • Site preparation within approved tailings pile area • Laying upgraded liner material (described only as "upgrade from the approved PVC liner")
May 10, 1991 (Nerco 5/10/91)	Amendment 1	Nerco Minerals Company	Three-phased construction in 1991 and 1992: • New 1,500,000 square foot double-lined "Ironclad" heap leach pad, partially built where Globe Hill (Phase III) and Forest Queen (Phase II) heap leach pads were located. See section 3.5 for construction details. • Globe Hill and Forest Queen pads to be "detoxified" (not described further). • Move 90,000 tons of existing tailings pile for pit expansion (relocation site not specified). • Existing tailings pile to be graded to 2H:1V with 20- to 25-foot benches. Formulate plans to load benches with growth medium and establish vegetation. • At closure, construct six-foot fence around Ironclad pit. • Reclamation of new pad not described. • Add 12 or 20 acres to permit (application cited both figures) for a total of 217.1 acres. • Total reclamation costs and bonding: $391,948 ($18,000 from additions, $373,948 already existing).

Table 4-9. Permit History of the Globe Hill Project (MLRD Permit 77-367)

Permit 77-367: Globe Hill Project			
Date	**Event**	**Permittee**	**Description**
September 30, 1977 (Gold Resources Joint Venture 1977)	Permit application	Gold Resources Joint Venture: Caithness Corporation, managing partner. Surface owner and lessor: Stratton Cripple Creek Mining & Development Company	26.9 acre open pit mine and heap leach (entire lease area was 630 acres): • 6.5 acre main pit and 0.67 east pit (12.63 acres total disturbed area) • 4 acre heap leach pad (350 x 500 feet) • 8 acre waste rock dump (600 x 580 feet) • 0.28 acre pond site (120 x 100 feet) • 2.2 acres of roads. • Seasonal mine (April through November) of oxidized telluride gold ore. • Zero discharge facility, no NPDES permit. • $12,500 reclamation bond • Previously, site had been mined since 1892, most recently in summers of 1972-1976.
June 5, 1978 (Gold Resources Joint Venture 1978; MLRD 4/12/79)	Amendment 1	Gold Resources Joint Venture	Added 11.34 acres to permit to cover planned 1978 operations: 1.14 acres to open pit; 3.7 acres to pad site, 1.44 acres to pond site, 5.06 acres to waste rock dump. Total permitted area: 39 acres. Additional bond not specified.
March 29, 1979 (Newport Minerals, Inc. 3/29/79)	Change in operator	Newport Minerals succeeded Gold Resources Joint Venture (Newport's parent company was Gold Resources, Inc.).	
September 2, 1981 (MLRD 8/2/81 and 12/21/81; Geddes, MacDougall, Geddes & Paxton 9/15/81 and 11/25/81)	Notices of Violation and Cease and Desist Order	Newport Minerals, Inc.	• NOV for constructing/operating heap leach system (Forest Queen pad) within permitted area although not described in approved plans. Also constructed pad and pond (pad 2A) in permit area. Required to submit technical revision to incorporate operations and facilities into approved plan. • A second NOV for operating cyanide leaching operation on Bull Hill (the '76 site). Ordered to cease leaching/mining operations and to submit permit application or amendment. Newport, through its attorneys, took the position that heap leaching was not "mining" and thus did not require a permit but nevertheless submitted the technical revision and amendment (see below and text).

Table 4-9. Permit History of the Globe Hill Project (MLRD Permit 77-367) (continued)

Permit 77-367: Globe Hill Project			
Date	**Event**	**Permittee**	**Description**
September 1981 (Geddes, MacDougall, Geddes & Paxton 11/25/81; MLRD 12/21/81)	Technical Revision (1?) (associated with Amendment 2)	Newport Minerals, Inc.	[Application not obtained; technical revision described in references cited.] Existing Forest Queen and 2A pads added to permitted operations within permit area (previously cited for operating heaps without describing in approved application). Pads are located on surface of waste rock dump (MLRD 7/1/85).
September 14, 1981 (Newport Minerals 9/14/81)	Amendment 2	Newport Minerals, Inc.	Added '76 site, about 14.2 acres, to existing permit. About 1 to 1.5 miles SW of original permit area, on ridge between two dry gulches. • 225,400 square foot (5.2 acres) heap leach pad and ponds; originally constructed in 1976, with waste rock from area dumps used as ore. Experienced metallurgical difficulties in "plant" in late 1976, shut down until 1978. In 1978, 12,000 tons added to top of heap; another 100,000 tons added in 1981. Orpha May, Logan, Blue Bird, Dexter, Specimen, and American Eagle dumps served as ore. Heap constructed in 20 foot lifts. Pond capacity 807,840 gallons (> 100-year/24-hour storm event). • Used 0.05 percent NaCN solution. "Prepared pad" of "impervious design" (no other description). "Plastic lined" "launder channels" convey solution to plastic lined collection ponds. Seasonal operation, with solutions held in ponds over winter. • Also an emergency catch basin downhill of ponds for overflow. Relined by Newport. • '76 site to be fenced. (Site had been mine dumps prior to 1976). Newport "relined" the pond and fenced the area; they also agreed, when leaching was complete, to measure effluents until quality approximated nearby streams. The amendment brought the total permitted acreage to 53.2 acres. Additional bonding (if any) was not determined.
March 26, 1982 (MLRD 3/26/82)	Amendment 3	Newport Minerals, Inc.	Incorporated 6.8 acres (for new total of 60 acres) of five old mine dumps on west of Globe Hill into permit. Dumps to be used as source of ore for one or more heap leach pads. Dumps included: Colorado King, Proper, Geneva, Chicago and Cripple Creek Tunnel, Abe Lincoln. Increased bonding by $8,500 (total not determined).

Table 4-9. Permit History of the Globe Hill Project (MLRD Permit 77-367) (continued)

Permit 77-367: Globe Hill Project			
Date	**Event**	**Permittee**	**Description**
September 1982 (MLRD 9/27/82)	Technical revision (2?)	Newport Minerals, Inc.	Added 0.68 acre of new heap to SE corner of existing '76 pad and enlarged pond. No change in acreage or bond. (Described in MLRD 7/1/85)
May 1984 MLRD (5/30/84 and 7/1/85)	Amendment 4	Newport Minerals, Inc.	Added to permit: 7 or 8 acre storage area for tailings from contiguous Silver State Mining Company (permit 81-134) vat leach operation ("short term solution to Silver State's waste disposal problems"). • 6.4 acre area to be lined with 20-mil PVC, sealed with Silver State liner at boundary (on south). About 662,000 tons of tailings, 100 feet high at highest point. 1,500 tpd for six months (June - November 1984), 3,000 tpd through June 1985, when full capacity reached. Surrounded on N, E, and W by 12-foot buffer ditch and 8-foot berm. • Solution collection pond (210 x 100 x 4 feet, 1.65 acre-feet) at NE corner, with drainage ditch from surrounding berm. 4-inch pipes in tailings to drain to pond. To contain 100-year/24-hour storm event. Leachate/run-off to be pumped to Victor mill. • 12,500 cubic yards of topsoil stored on W corner (on liner). • Final contours: Benches at 30-foot intervals, 2H:1V slope. • Including access roads, total acreage after amendment: 68.12 acres (or 67, according to Amendment 5). • Additional financial warranty: $17,500. • This entire area removed from this permit in 1985 and added to Nerco permit 81-134. See amendment 5 below.
September 28, 1984 (MLRD 9/28/84)	Technical Revision 4	Newport Minerals, Inc.	On-site disposal of triple-rinsed and crushed "disused" cyanide containers in area of waste rock dump. To be covered with 12 inches soil/clay, then rock. Change followed inspection orders.

Table 4-9. Permit History of the Globe Hill Project (MLRD Permit 77-367) (continued)

Permit 77-367: Globe Hill Project			
Date	**Event**	**Permittee**	**Description**
July 1, 1985 (MLRD 7/1/85)	Amendment 5 (and additional permit conditions)	Newport Minerals, Inc.	• Deepen and enlarge pit: increase approved area 4.5 acres to 8.5 acres, depth from 125 to 300 feet. Not known if implemented. • Add 13 acres to waste rock dump, for total of 27 acres. Not known if implemented. • Construct and operate new vat leach and tailings disposal operation similar to adjacent Nerco operation. Never implemented. • Change from nonreusable barrels for cyanide and caustic to reusable containers. Not known if implemented. • Remove the 7-acre storage area (including Globe Hill heap) for Permit 81-134 tailings authorized by amendment 4 (see above) from this permit and convey to Nerco. (Reilly 4/6/86, MLRD 5/22/86). • Financial warranty increased from $25,00 to $90,000. Never posted since most construction not implemented. • Over five year period, four waste dumps about 0.75 miles SSE of plant (the Logan, American Eagle, and Lucky Gus 1 and 2 dumps), to be removed and sold as decorative rock. At least partially accomplished.
May - September 1986 (MLRD 6/3/86, 7/1/86, 9/4/86, 9/29/86)	NOVs and Cease and Desist Order	Newport Minerals, Inc.	Globe Hill (Forest Queen) violations, described in text. Delay in corrective action led to $109,800 civil penalty. Culminated in Dayspring Mining Corporation succeeding Newport Minerals as operator.
September 25, 1986 (MLRD 9/25/86)	Change of operator	Dayspring Mining Corporation	
September - November 1988 (MLRD 9/13/88, 9/22/88a, 11/15/88, 1/23/91)	NOV M-88-013 and Cease and Desist Order	Dayspring Mining Corporation	'76 site violations, described in text. Led to civil penalty of $2,600. Finally resolved in 1991 upon succession of Cripple Creek and Victor Gold Mining Company as operator, with Pikes Peak Mining Company as manager.
February 6, 1991 (MLRD 2/6/91)	Change in operator	Pikes Peak Mining Company	Included $25,000 bond (by St. Paul Fire & Marine Insurance Co. of Minnesota, coverage from 11/13/90 through 11/13/93.

Table 4-9. Permit History of the Globe Hill Project (MLRD Permit 77-367) (continued)

Permit 77-367: Globe Hill Project			
Date	**Event**	**Permittee**	**Description**
October 10, 1991 (Nerco 5/10/91, MLRD 10/10/91)	Technical Revision 4 (and unnumbered revision to Permit 81-134) [This was the second revision #4.]	Pikes Peak Mining Company	Detoxify and grade Forest Queen pad to northeast. Where heap pad is located, install part of new Ironclad pad and collection ditches. Solution to drain to pregnant pond 4A on adjacent Victor Mine permit. Part of phased construction under permit 81-134, described in sections 4.2.2 and 4.3.5. Ultimately, this pad to be joined to other components of Ironclad heap leach pad.
Summary	Reclamation requirements for entire site (MLRD 5/22/86): • Pit: rough-grade, leave warning bench and access/exit ramp, fence area, no revegetation. • '76 and Forest Queen/2A heap: rough-grade, rinse until no detectable cyanide, no revegetation. • Ponds: Monitor for one year or more: when fluids are similar to Cripple Creek or Wilson Creek, backfill ponds and revegetate. • Waste rock dump: rough-graded, with dome-like upper surface (to eliminate ponding/infiltration); maximum slope 1.5H:1V, no revegetation. • Other areas: grade to slopes less than 3H:1V, mulch and revegetate. Remove buildings and equipment.		

Table 4-7. Discharge Limitations and Monitoring Data for Carlton Tunnel

(units are milligrams per liter except as noted)

Effluent Parameter	Effluent Limits Effective May 1992[a]		Effluent Limits 1986 - 1992[b]		Concentrations Reported January - December 1991[c]
	30-Day Average	Daily Maximum	30-Day Average	Daily Maximum	Minimum - Maximum
Flow (MGD)	2.58	N/A	2.57	N/A	1.87 - 2.40
pH (s.u.)	6.5 - 9.0		6.5 - 9.0		7.8 - 8.1
Total Suspended Solids	30	N/A	30	45	< 5.0 - 14
Silver	0.0008	0.0212	0.0001	0.0002	< 0.0001 - < 0.0002
Zinc	0.130	1.00	0.14	0.28	0.006 - 0.13
Lead	0.03	0.920	0.08	0.16	< 0.005
Copper	0.059	0.098	0.04	0.08	< 0.005
Cadmium	N/A		0.007	0.014	< 0.005
Mercury	N/A		0.0001	0.0002	< 0.0001
Acute WET[d,e]	N/A	50 %/ IWC=37%	N/A		N/A
Chronic WET[e]	Report		N/A		N/A

NOTES:

N/A Not applicable

a These effluent limits are effective May 1992. Limits for silver, zinc, lead, and copper are on "potentially dissolved" metals. Twice-monthly sampling is required for all parameters except WET, which is tested quarterly (for acute) or semi-annually (for chronic).

b These effluent limits were effective prior to May 1992 (and were applicable during the period covered by the monitoring data presented in the table). Limits and monitoring results are on "potentially recoverable" metals except mercury, which is on "total" mercury. All parameters were required to be sampled monthly.

c Although there are limits on 30-day average and maximum daily concentrations, monthly averages generally were based on single samples, whose results were reported both as averages and daily maxima. Thus, the ranges presented are simply the maximum and minimum concentrations reported during the year.

d WET: Whole Effluent Toxicity limits added in 1992 revision. Acute 48-hour tests are to use Ceriodaphnia sp. and acute 96-hour tests are to use fathead minnows. Chronic tests also are to use these species the first year, after which CC&V may petition for one-species testing.

e Through March 31, 1995, there are reporting requirements only. Acute toxicity limits will begin April 1, 1995. Limits: no acute toxicity in effluent from discharge point Limit will be considered exceeded if species mortality in any dilution (including 100 percent effluent) exceeds 50 percent; or if there is a statistically significant difference in mortality (at 95 percent confidence level) between control and any dilution less than or equal to an Instream Waste Concentration (IWC) of 37 percent.

Sources: Colorado Department of Health, Water Quality Control Division CDPS permit CO-0024562 (3/12/92) for limits effective May 1992; Monthly Discharge Monitoring Reports for 1991, submitted to Colorado Water Quality Control Division, for prior limits and 1991 monitoring data.

Flow from the Carlton Tunnel can be discharged directly to Fourmile Creek (discharge point 001) or can be routed through a series of four settling ponds prior to discharge (discharge point 002). The CDPS permit places the same effluent limits on both discharge points. The CDPS permit includes limits on flow and on conventional and toxic pollutants; it also requires whole effluent toxicity testing. Effluent limits from the previous and the new permits are show in Table 4-10. Also presented in Table 4-10 are the results of 1991

effluent monitoring. In 1991, discharges to Fourmile Creek averaged over 2,000,000 gallons per day, and all discharges during the year were from the settling ponds.

The new permit limits are conditional on no mining occurring in the Carlton Tunnel; if there is mining activity in the tunnel or at a level underground that requires active pumping of water out of the Carlton Tunnel, alternate limits (not presented in Table 4-10 since no underground mining is occurring or planned) would apply. The permit requires that acute whole effluent toxicity (WET) be monitored quarterly, chronic WET semiannually, and other parameters twice monthly.

4.5.3 Colorado State Engineer, Division of Water Resources

The Division of Water Resources (DWR) in the Office of the State Engineer is responsible for water rights issues in the State. MLRD routinely informs DWR of pending permit applications and amendments. On July 30, 1991, after reviewing Nerco's application to amend permit 81-134 (to add the Ironclad heap leach pad, including solution ponds), DWR recommended against approval of the amendment. According to DWR, Nerco "cannot legally store or use precipitation run-off [in the solution ponds described in section 4.3.5] without a Water Court decree, or a substitute water supply plan approved by this office [i.e., DWR] unless all decreed water rights in the Arkansas River basin downstream of this location are fully satisfied." DWR records showed no existing decreed water rights and no substitute water supply plan, so DWR recommended against approval of the amendment. (Colorado Office of the State Engineer, 7/30/91) Notwithstanding this recommendation, MLRD approved the amendment after being assured by Nerco that the company would immediately apply for a substitute water supply plan. According to Nerco during the site visit, this process is still underway. It is not clear why the State Engineer took exception to this particular amendment and these particular ponds: previous ponds on this site and other sites have long been used to collect run-off, and there is no indication that DWR had taken exception to any previous permitting action, for this or any other of Nerco's operations.

4.5.4 Other Permits

A number of other permits have been issued for various Nerco operations (permits may have been issued to Cripple Creek and Victor Gold Mining Company, Pikes Peak Mining Company, or Nerco--this was not determined). These are shown in Table 4-11. As noted in chapter 4.2, a contractor operates the crusher and conveyor system at the Ironclad/Globe Hill site and is permitted separately. EPA did not obtain and examine the permits listed in Table 4-11 or those issued to Nerco contractors.

Table 4-8. Other Permits Issued to Nerco Minerals for Cripple Creek Operations

Permit number	Type permit	Operations covered
Colorado Department of Health		
83TE351	Air emissions	Not determined.
88TE241	Fugitive air emissions	Clyde/Modoc mine dump crushing and rock removal
87TE301F	Fugitive air emissions	Portland Pit: operations covered not determined
C-13, 269-1-5, C-7	Not determined	Ajax (Lillie project?) Carlton Mill
Colorado Division of Mines		
Not determined	Magazine permit	Not determined

Source: Provided by Nerco during site visit.

4.6 ANNOTATED LIST OF REFERENCES

Accu-Labs Research, Inc. 1988 (October 7). Letter from M. Fabisiak, Water Laboratory Supervisor, to B. Mountford, Dayspring Mining Corporation. Sample results from sampling of '76 Project Ponds.

Cripple Creek and Victor Gold Mining Company. 1985 (March 12). Amendment to Mined Land Reclamation Permit 80-244. Application for permit amendment (Carlton Mill project: add heap leach Pad 1 and ponds.)

Cripple Creek and Victor Gold Mining Company. 1986 (January 16). Amendment No. 2 to Mined Land Reclamation Permit 80-244. Application for permit amendment 2 (Carlton Mill project: add lower heap leach pad (Pad 2) and ponds on top of old tailings impoundment.)

Cripple Creek and Victor Gold Mining Company. 1986 (February 21). Victory Project: Application for Regular 112 Permit. Approved as permit 86-024 on April 29, 1986. (Includes associated reports and correspondence.)

Cripple Creek and Victor Gold Mining Company. 1987 (February 23). Victory Project, Permit 86-024: Application for Technical Revision 2: expand pad 3 to design size to accommodate 1987 operations. (Presumed approved with TR 2, no correspondence obtained.)

Cripple Creek and Victor Gold Mining Company. 1987a (February 23). Carlton Project, Permit 80-244: Application for Technical Revision 1: increase height or expand area of Pad 2, add additional water storage capacity for 1987 operations. (Includes July 14 letter clarifying pad options and Dames & Moore letters on proposed actions.)

Cripple Creek and Victor Gold Mining Company. 1987b (February 23). Victory Project, Permit 86-024: Application for Technical Revision 3: actually a revision to TR 2 (2/23/87). Includes June 2, 1987, approval letter from MLRD.

Cripple Creek and Victor Gold Mining Company. 1987 (April 27). Letter from C.A. Tapp, Resident Manager, to A. Baldridge, Colorado Mined Land Reclamation Division. Carlton Mill Pads, Permit 80-244: Description of April 20 spill of cyanide solution.

Cripple Creek and Victor Gold Mining Company. 1987 (July 17). Victory Project, Permit 86-024: Application for Amendment 1: Construct additional heap leach pad (Pad 4) and ponds. Includes October 28, 1987, approval letter from MLRD.

Cripple Creek and Victor Gold Mining Company. 1987 (August 12). Victory Project, Permit 86-024: Application for Amendment 2: Add Portland Pit open pit mine to permitted operations. (Presumed approved, no correspondence obtained).

Cripple Creek and Victor Gold Mining Company. 1987 (November 3). Letter from C.A. Tapp, Manager, to A. Baldridge, Colorado Mined Land Reclamation Division. Carlton Project, Permit 80-244: Description of October 8 spill of barren leach solution.

Cripple Creek and Victor Gold Mining Company. 1987 (November 19). Letter from C.A. Tapp, Manager, to A. Baldridge, Colorado Mined Land Reclamation Division. Carlton Project, Permit 80-244: Description of repairs to primary liner of Pad 1 following detection of fluids in leak detection system.

Cripple Creek and Victor Gold Mining Company. 1987 (November 20). Letter from C. Gerity, Manager of Mining, to A. Baldridge, Colorado Mined Land Reclamation Division. Carlton Project, Permit 80-244: Application for Technical Revision 2 (Rehabilitation of Carlton Mill for carbon-in-leach recovery of gold from high-grade ore and placement of tailings on heap leach Pad 1). Includes Dames & Moore letter of November 5, 1985 detailing geotechnical engineering study results.

Cripple Creek and Victor Gold Mining Company. 1987 (December 8). Victory Project, Permit 86-024: Application for Amendment 3: Revised plans for Pad 4 approved in Amendment 1. (Presumed approved, no correspondence obtained.)

Cripple Creek and Victor Gold Mining Company. 1987 (December 18). Letter from C.A. Tapp, Manager, to A. Baldrige, Colorado Mined Land Reclamation Division. Victory Project, Permit 86-024: Documented conversations and provided history of leak in primary liner of Pad 3 (solution in leak detection pipe).

Cripple Creek and Victor Gold Mining Company. 1988 (February 22). Letter from C. Gerity, to J.T. Doerfer, Colorado Mined Land Reclamation Division. Carlton Mill Project, Permit 80-244,

Amendment 3: Response to MLRD adequacy letter of 2/9/88 on Amendment 3 application. Includes Dames & Moore letter dated 2/22/88 that provided responses to some items.

Cripple Creek and Victor Gold Mining Company. 1988 (May 31). Victory Project, Permit 86-024: Application for Technical Revision 4: Construct haulage road across Pad 3. (Includes July 7, 1988, MLRD approval letter.)

Cripple Creek and Victor Gold Mining Company. 1988a (May 31). Carlton Mill Project, Permit 80-244: Application for Technical Revision 3. Change in construction of leak detection system in expansion of Pad 2 approved in Amendment 3. Includes Dames & Moore letter of 5/19/88 describing actual construction.

Cripple Creek and Victor Gold Mining Company. 1988 (July 21). Letter from C.A. Tapp, Manager, to J. Doerffer, Colorado Mined Land Reclamation Division. Victory Project, Permit 86-024: Notice of errant blast in Portland Pit.

Cripple Creek and Victor Gold Mining Company. 1988 (August 22). Letter from A. Tapp, Manager of Mining and Development, to J. Doerffer, Colorado Mined Land Reclamation Division. Victory Project, Permit 86-024: Description of August 12 cyanide spill.

Cripple Creek and Victor Gold Mining Company. 1988 (September 20). Letter from C. Gerity, to C.M. Farrell, Colorado Mined Land Reclamation Division. Victory Project, Permit 86-024: Transmittal of soil sampling results from August 12 cyanide spill.

Cripple Creek and Victor Gold Mining Company. 1990 (February 12). Letter from E.T. Hunter, Project Manager, to J. Doerfer, Colorado Mined Land Reclamation Division. Victory Project, Permit 86-024: Notice of January 9 spill of cyanide solution on Pad 4.

Cripple Creek and Victor Gold Mining Company. 1990 (November 5). Letter from J.P. Rovedo, Safety/Environmental Engineer, to J. Doerfer, Colorado Mined Land Reclamation Division. Victory Project, Permit 86-024: Notice of November 5 spill of cyanide solution on Pad 4.

Cripple Creek and Victor Gold Mining Company. 1991 (January 23). Letter from J.P. Rovedo, Safety/Environmental Engineer, to J. Doerfer, Colorado Mined Land Reclamation Division. Permit M-77-367: Proposed responses to NOV M-88-013 upon succession of CC&V as operator of Globe Hill and '76 Project.

Cripple Creek and Victor Gold Mining Company. 1992 (March 6). Letter from E.T. Hunter to C. Mount, Colorado Mined Land Reclamation Division. Permit M-81-134: Submission of internal company memoranda describing February 26 pregnant solution spill incident and February 29 ore slide and pregnant solution spill.

Dames & Moore. 1984 (December 12). *Report, Geotechnical Engineering Studies, Stability of Mine Waste Dumps and Tailings Disposal Piles, Victor Mine, Cripple Creek, Colorado, for Nerco Minerals Co*. Prepared for Nerco Minerals Company (Job No. 12077-005-14). Submitted to Colorado Mined Land Reclamation Division on December 26, 1984.

Dames & Moore. 1985. *Report, Subsurface Exploration and Preliminary Design, Proposed Lower Carlton Heap Leach, Carlton Mill, Near Victor Colorado, for Cripple Creek and Victor Gold Mining*

Company. Prepared for CC&V. Submitted to Colorado Mined Land Reclamation Division with application for Permit 80-244, Amendment 2, on January 16, 1986.

Dames & Moore. 1989 (March 16). *Report; As-Built Construction; Heap Leach Pad No. 4 Near Victor, Colorado; for Cripple Creek and Victor Gold Mining Company*. Prepared for Texasgulf Minerals and Metals, Inc. (Job No. 09077-033-19). Submitted to Colorado Mined Land Reclamation Division on March 30, 1989.

Dayspring Mining Corporation. 1988 (October 28). Letter from B. Mountford, President, to F. Banta, Colorado Mined Land Reclamation Division. (Response to MLRD letter of September 22 and September 21 Notice of Violation M-88-013 and Cease and Desist Order.)

Geddes, MacDougall, Geddes & Paxton (attorneys for Newport Minerals). 1981 (September 15). Letter from M.E. MacDougall to P.H. Evans, Colorado Mined Land Reclamation Division. Permit 77-367: Response to MLRD letter of September 2 letter transmitting two NOVs and a Cease and Desist Order.

Geddes, MacDougall, Geddes & Paxton (attorneys for Newport Minerals). 1981 (November 25). Letter from M.E. MacDougall to P.H. Evans, Colorado Mined Land Reclamation Division. Permit 77-367: Request for 9/21/81 technical revision to be incorporated into Amendment 2 and agreement to reline the '76 Project pond, fence the area, and monitor effluents at closure.

Gold Resources Joint Venture. 1977 (September 30). Application for Mining and Reclamation Permit, Regular (112) Permit Application Form. Submitted to Colorado Mined Land Reclamation Board. Application for Globe Hill project. Subsequently approved as Permit M-77-367.

Gold Resources Joint Venture. 1978 (June 5). Application for Amendment 1, Permit 77-367; Regular (112) Permit Application Form. Submitted to Colorado Mined Land Reclamation Board. Application to add 11.34 acres to Globe Hill project.

Lewis, A. 1982 (October). "Producing Gold for $160/Tr Oz in Victor, Colorado." *Engineering and Mining Journal*: pp. 102-105.

Nerco Minerals Company. 1984 (June 19). Letter from M.L. Clark, Vice President for Operations, to D.C. Shelton, Director, Colorado Division of Mined Land Reclamation. Permit 81-134: June 22, 1984, application for Amendment 2 following succession of Nerco as operator. (Grade and deactivate tailings area 2, extend area 1 and build collection ponds, new waste rock disposal area, add Globe Hill heap to this permit). Includes Nerco and MLRD correspondence, including revisions to application dated 9/20/84 and 9/21/84. Approved by MLRD 10/17/84.

Nerco Minerals Company. 1984 (August 22). Letter from J.R. Woodward, Senior Permitting Engineer, to B. Janes, Reclamation Specialist, Colorado Division of Mined Land Reclamation. Permit 81-134: Request for Technical Revision 2--replace 3.2 undisturbed acres for 3.2 acres for use as on-site haul road.

Nerco Minerals Company. 1985 (April 25). Letter from T.J. Schamberger, Chief Engineer, to P.C. Saletta, Colorado Division of Mined Land Reclamation. Permit 81-134: Response to MLRD inspection report on March 20-21 inspection of Victor Mine (MLRD 3/20-21/85).

Nerco Minerals Company. 1985 (May 9). Letter from T.J. Schamberger, Chief Engineer, to P.C. Saletta, Inspector, Colorado Division of Mined Land Reclamation. Victor Mine Permit 81-134: Letter advising of as-built modification to tailings liner construction.

Nerco Minerals Company. 1985 (October 28). Annual Report to Colorado Mined Land Reclamation Division for the year 1985. Permit 81-134.

Nerco Minerals Company. 1986 (January 2). Letter from T.J. Schamberger, Engineering Superintendent, to D.C. Shelton, Director, Colorado Division of Mined Land Reclamation. Permit 81-134: Certification of compliance with Cease and Desist Order dated December 20. (Tailings deposition on Victor Mine tailings pile west of Rangeview Road had been stopped.)

Nerco Minerals Company. 1986 (January 24). Letter from T.J. Schamberger, Engineering Superintendent, to D.C. Shelton, Director, Colorado Division of Mined Land Reclamation. Permit 81-134: Notice of temporary cessation of production at Victor Mine.

Nerco Minerals Company. 1986 (February 12). Letter from T.J. Schamberger, Engineering Superintendent, to C. Farrell, Colorado Mined Land Reclamation Division. Permit M-81-134: Application for Technical Revision 4. (Revised tailings disposal system after tailings slough on November 6, 1985.)

Nerco Minerals Company. 1986 (March 10 and March 14). Letters from E. Hunter, Senior Project Engineer, to C. Farrell, Colorado Mined Land Reclamation Division. Permit M-81-134, Technical Revision 4: Responses to Colorado Mined Land Reclamation Division letter of February 20 requesting clarification of items in Technical Revision 4.

Nerco Minerals Company. 1987 (January). Annual Report to Colorado Mined Land Reclamation Division for the year 1986, October 1, 1985 - September 30, 1986. Permit 81-134.

Nerco Minerals Company. 1987 (January 6). Letter from E. Hunter, Senior Project Engineer, to C. Farrell, Colorado Mined Land Reclamation Division. Permit 81-134: Application for Technical Revision 5. (Modification of method of transfer of run-off from tailings area to collection pond: remove failed 18-inch pipe and use lined open ditch.)

Nerco Minerals Company. 1987 (January 29). Letter from E. Hunter, Senior Project Engineer, to C. Farrell, Colorado Mined Land Reclamation Division. Permit 81-134, Technical Revision 5: Response to Colorado Mined Land Reclamation Division letter of January 12 requesting clarification of specific items prior to Board consideration of application for Technical Revision 5.

Nerco Minerals Company. 1987 (October 13). Annual Report to Colorado Mined Land Reclamation Division for the year 1987, October 1, 1986 - September 30, 1987. Permit 81-134. Includes addendum submitted January 1988.

Nerco Minerals Company. 1988 (September). Annual Report to Colorado Mined Land Reclamation Division for the year 1988, October 1, 1987 - September 30, 1988. Permit 81-134. Includes addendum submitted November 3.

Nerco Mineral Company. 1989 (March 30). Letter from E. Hunter, Senior Project Engineer, to C. Farrell, Colorado Mined Land Reclamation Division. Permit 81-134: Sampling results from Globe Hill heap run-off pond.

Nerco Minerals Company. 1989 (September). Annual Report to Colorado Mined Land Reclamation Division for the year 1989, October 1, 1988 - September 30, 1989. Permit 81-134. Includes addendum submitted November 17, 1989.

Nerco, Inc. 1990 (August 22). Letter from J.F. Resch, Jr., Director of Insurance and Risk Management, to D. Heyer, Colorado Mined Land Reclamation Division. Notice of Nerco purchase of Texasgulf Minerals and Metals from ELF Aquitane, Inc. Cited were MLRD permits 80-244, 82-214, 86-009, 86-024, 88-025, 88-064, 88-099, 88-097, 88-097, 88-100, and 88-098.

Nerco Minerals Company. 1990 (September 11). Letter from J.P. Rovedo, Safety/Environmental Engineer, to J. Doerfer, Colorado Mined Land Reclamation Division. Letter informed MLRD of pilot test using two truck loads of waste rock as aggregate for asphalt or other uses.

Nerco Minerals Company. 1990 (September 17). Letter from J.P. Rovedo, Safety/Environmental Engineer, to D. Hernandez, Colorado Mined Land Reclamation Division. Permit 81-134: Request for removal of temporary cessation notice (approved by Mined Land Reclamation Board on October 17). Re-activation of Victor Mine.

Nerco Minerals Company. 1990 (October 2). Letter from J.P. Rovedo, Safety/Environmental Engineer, to D. Hernandez, Colorado Mined Land Reclamation Division. Permit 81-134: Response to August 14, 1990 inspection report. Also includes October 8 letter.

Nerco Minerals Company. 1990 (October 24). Letter from J.P. Rovedo, Safety/Environmental Engineer, to D. Hernandez, Colorado Mined Land Reclamation Division. Permit 81-134: Response to August 14, 1990 inspection report.

Nerco Minerals Company. 1990 (October). Annual Report to Colorado Mined Land Reclamation Division for the year 1990, October 1, 1989 - September 30, 1990. Permit M-81-134.

Nerco Minerals Company. 1991 (May 10). Letter from J.P. Rovedo, Safety/Environmental Engineer, to D. Hernandez, Colorado Mined Land Reclamation Division. Permit M-81-134: Application for Amendment to Regular Operation Reclamation Permit, Victor Mine. (Add new Ironclad pad, enlarge pond 4A, add new storage pond 4C).

Newport Minerals, Inc. 1979 (March 29). Request to Succeed Operator at an Uncompleted Operation. Submitted to Colorado Mined Land Reclamation Board. Permit 77-367: Newport Minerals to succeed Gold Resources Joint Venture as operator of Globe Hill project.

Newport Minerals, Inc. 1981 (September 14). Application for Amendment 2, Permit 77-367; Regular (112) Permit Application Form. Submitted to Colorado Mined Land Reclamation Board. Application to add 14.2 acre '76 site to Globe Hill permit.

Newport Minerals, Inc. 1985 (June 24). Letter from V.F. Reilly to P.C. Saletta, Colorado Mined Land Reclamation Division. Results of 4/9/85 sampling of Globe Hill and other ponds.

Newport Minerals, Inc. 1985 (September 24). Letter from V.F. Reilly to P.C. Saletta, Colorado Mined Land Reclamation Division. Results of 7/19/85 sampling of Globe Hill and other ponds.

Newport Minerals, Inc. 1986 (July 3). Letter from V.F. Reilly to C. Farrell, Colorado Mined Land Reclamation Division. Results of 6/17/86 sampling of '76 Project ponds (Permit 77-367).

Newport Minerals, Inc. 1986 (July 18). Letter from V.F. Reilly to C. Farrell, Colorado Mined Land Reclamation Division. Results of June 1986 sampling of Forest Queen/2A ponds. (Permit 77-367).

Pontius, J.A. and R.A. Butts. 1991. "Geology and Gold Mineralization of the Cresson Deposit, Cripple Creek, Colorado." Presented at the 97th Annual Northwest Mining Association convention, Spokane, Washington, December 4-6, 1991.

Pikes Peak Mining Company. 1990 (April 27). Letter from E. Hunter to L. Oehler, Colorado Mined Land Reclamation Board. Victory Project, Permit 86-024 and Carlton Mill Project, Permit 80-244: Application for Technical Revisions to modify monitoring requirements. (Includes MLRD and CC&V correspondence, culminating in MLRD letters advising of Board approval.)

Pontius, J.A. and R.A. Butts. 1991 (December). "Geology and Gold Mineralization of the Cresson Deposit, Cripple Creek, Colorado. Presented at the 97th Annual Northwest Mining Association Convention; Spokane, Washington; December 4-6, 1991.

Reilly, V.F. 1986 (April 6). Letter from V.F. Reilly, PNT Mining Inc., to E. Bischoff, Colorado Mined Land Reclamation. Permit 77-367: Inquiry as to reclamation requirements and "environmental obligations" of the Globe Hill permittee. (Includes synopsis of Globe Hill permit transactions and reclamation requirements.)

Silver State Mining Corporation. 1981 (March 25). Application for Permit for Regular Mining Operation (for Victor Project - Ironclad Pit). Subsequently approved (on September 8, 1981) as Permit 81-134.

Silver State Mining Corporation. 1983 (May 26). Application for Amendment 1 to Victor Mine Permit 81-134: Enlarge pit, add waste rock dump and new tailings disposal area to permit. Includes May 1983 and January 1984 revisions to application and September 1983 plan for reclamation of waste rock dumps and tailings areas. Approved May 1984 (MLRD 5/30/84).

Silver State Mining Corporation. 1983. Annual Report [for 1983]. Permit 81-134.

Silver State Mining Corporation. 1983 (December 7). Victor Mine, Permit 81-134: Application for Technical Revision 1. (Add vehicle maintenance building, enlarge buildings and parking lot. Includes MLRD approval letter dated January 11, 1984.

Silver State Mining Corporation. 1984 (April 13). Letter from W.R. Reid, President/CEO, notifying vendors of imminent joint venture between Silver State and Nerco Minerals Company, with Nerco becoming Victor Mine operator.

State of Colorado, Department of Health, Water Quality Control Division. 1985 (November 6). Notes of Gary Soldano (?) on telephone notification by Teller County Health Services of a cyanide spill at Victor Mine.

State of Colorado, Department of Health, Water Quality Control Division. 1992 (March 12). Authorization to Discharge Under the Colorado Discharge Permit System, Permit No. CO0024562. NPDES permit issued to Cripple Creek and Victor Gold Mining Company, authorizing discharge from Carlton Tunnel.

State of Colorado, Mined Land Reclamation Division. 1979 (April 12). Letter from J.L. Schmieding, Reclamation Specialist, to M.H. MacDougall, attorney for Newport Minerals, Inc. Transmittal letter for permit 77-367. (Including copy of permit and application).

State of Colorado, Mined Land Reclamation Division. 1981 (August 14). Letter from J.L. Schmieding, Reclamation Specialist, to Silver State Mining Corporation. Notice that Silver State was conducting an unpermitted gold operation and that Board would hold a hearing on August 26, 1981.

State of Colorado, Mined Land Reclamation Division. 1981 (September 2). Letter from P.H. Evans, Reclamation Specialist, to T. Downing, Newport Minerals, Inc. Transmittal letter for two NOVs and a Cease and Desist Order. (For cyanide operations at unpermitted '76 site and undescribed cyanide operations [Forest Queen and 2A pads] at permitted Globe Hill site.)

State of Colorado, Mined Land Reclamation Division. 1981 (September 8). Letter from M. Stanton, Reclamation Specialist, to B. Reid, Silver State Mining Company. Permit 81-134: Notice of Board approval of permit application dated March 25, 1981. Includes prior correspondence, NOV and Cease and Desist order concerning disturbance before permit issuance.

State of Colorado, Mined Land Reclamation Division. 1981 (December 21). Letter from P.H. Evans, Reclamation Specialist, to T. Downing, Newport Minerals, Inc. Permit 77-367: Notice of December 16 Board approval of Amendment 2 (add '76 site to permit) and technical revision (add Forest Queen and 2A leach pad to permitted operations).

State of Colorado, Mined Land Reclamation Division. 1982 (March 26). Letter from P.H. Evans, Reclamation Specialist, to T. Downing, Newport Minerals, Inc. Permit 77-367, Globe Hill Project: Approval for amendment 3 (adding waste dumps to permit area for use as ore). Includes application and related correspondence.

State of Colorado, Mined Land Reclamation Division. 1982 (April 18). Mining and Reclamation Permit M-82-214. Issued to Pioneer Sand Company for removal of rock from (lower) Mary McKinney Dump for use as decorative rock. Property and permit transferred to Cripple Creek and Victor Gold Mining Company in 1986. Includes application and correspondence.

State of Colorado, Mined Land Reclamation Division. 1982 (September 27). Letter from M. Stanton, Reclamation Specialist, to T. Downing, Newport Minerals, Inc. Permit 77-367, Globe Hill Project: notice of Board approval for (unnumbered) Technical Revision (add 40,000 square feet to existing heap--to receive ore from old mine dumps). Includes application and correspondence.

State of Colorado, Mined Land Reclamation Division. 1984 (May 30). Letter from C. Russell, Reclamation Specialist, to B. Hester, Newport Minerals Inc. Globe Hill Permit 77-367: Notice of Board approval of amendment 4 (storage area for tailings from Silver State Mining Company mill). Includes application for amendment and related correspondence.

State of Colorado, Mined Land Reclamation Division. 1984 (June 20). Letter from M.S. Loye, Reclamation Specialist, to E.T. Hunter, Silver State Mining Company. Permit 81-134: Notice of June 27-28 Board consideration of request for transfer of permit from Silver State Mining Company to Nerco Minerals Company (pending payment of fees).

State of Colorado, Mined Land Reclamation Division. 1984 (September 28). Letter from C. Russell, Reclamation Specialist, to B. Hester, Newport Minerals Inc. Permit 77-367: Notice of Board approval of Technical Revision 4 (disposal of rinsed "disused" cyanide containers in an area to be covered by waste rock). Includes application for revision and related correspondence.

State of Colorado, Mined Land Reclamation Division. 1984 (October 11). Permit 81-134: Notice of Inspection and Inspection Report on October 11 inspection of Victor Mine by P.C. Saletta.

State of Colorado, Mined Land Reclamation Division. 1984 (October 17). Permit 81-134: Notice of Board approval of Amendment 1 (Nerco 6/20/84). Increase in bond to $373,948.

State of Colorado, Mined Land Reclamation Division. 1985 (March 1). Letter from P.C Saletta, Hydrologist/Geological Engineer, to B. Jacobs, Nerco Minerals Company. Permit 81-134: Notice of Board approval of Technical Revision 3 to Victor Mine permit. (Relocation of waste dump: Exchange 11.2 undisturbed acres designated for waste dump for another 11.2 acres where dump will occur.) Includes application for Technical Revision.

State of Colorado, Mined Land Reclamation Division. 1985 (March 20-21 and June 5). Notices of Inspection and Inspection Reports on March 20-21 and June 5 inspections of Victor Mine (Permit 81-134) by D. Berry, C. Farrell, and P.C. Saletta (March 20-21) and P.C. Saletta (June 5).

State of Colorado, Mined Land Reclamation Division. 1985 (May 30). Letter from P.C. Saletta, Hydrologist/Geological Engineer, to C. Gerity, Texasgulf Minerals and Metals, Inc. Permit 80-244, Carlton Mill project: Notice of Board approval for amendment 1 (add heap leach pads and ponds).

State of Colorado, Mined Land Reclamation Division. 1985 (June 11). Notice of Inspection and Inspection Reports on June 11 inspection of Victor Mine by P.C. Saletta.

State of Colorado, Mined Land Reclamation Division. 1985 (July 1). Letter from P.C. Saletta, Hydrologist/Geological Engineer, to K. Ennis, Newport Minerals, Inc. Permit 77-367, Globe Hill Project: Notice of Board approval for amendment 5 (enlarge pit, construct and operate vat leach facilities). Includes application and related correspondence.

State of Colorado, Mined Land Reclamation Division. 1985a (November 6). Memorandum to file by M.S. Loye, Reclamation Specialist, on notification by Nerco Minerals of tailings failure and resulting spill of "seep water" and other telephone conversations during the day (with EPA and Colorado Department of Health). Permit 81-134.

State of Colorado, Mined Land Reclamation Division. 1985b (November 6). Notice of Inspection and Inspection Report on November 6 inspection of Victor Mine by A.C. Baldridge, P. Saletta, and C. Farrell. (Following notification of tailings pile failure on same date.)

State of Colorado, Mined Land Reclamation Board. 1985 (December 20). Notice of Violation M-85-081 and Cease and Desist Order, issued to Nerco Minerals Company. (Issued for inadvertent violations resulting from a November 6, 1985, tailings failure and resulting runoff-collection pond spill at Victor Mine (Permit 81-134) . Assessed but waived $100 civil penalty.) Includes MLRD and Nerco correspondence, logs, analytical results related to tailings pile failure and November and December Board meetings and hearings (and MLRD notes on meetings).

State of Colorado, Mined Land Reclamation Division. 1986 (January 2). Letter from C. Farrell, Reclamation Specialist, to E. Hunter, Nerco Minerals Company. Permit 81-134: Request for clarification of items in report on November 6, 1985, tailings failure submitted by Nerco in preparation for anticipated Technical Revision.

State of Colorado, Mined Land Reclamation Division. 1986 (January 28). Letter from C.M. Farrell, Reclamation Specialist, to T.J. Schamberger, Nerco Minerals Company. Permit 81-134: Notice that Nerco's January 26, 1986, Notice of Temporary Cessation satisfied the requirements of Colorado Minerals Rules and Regulations Number 1.62.

State of Colorado, Mined Land Reclamation Division. 1986 (January 29). Notice of Inspection and Inspection Report on January 29 inspection of Victor Mine (Permit 81-134) by A. Baldridge, K. Hellner, M. Loye, and E. Bischoff.

State of Colorado, Mined Land Reclamation Division. 1986 (February 20). Letter from C. Farrell, Reclamation Specialist, to T. Schamberger, Nerco Minerals Company. Permit 81-134, Technical Revision 4: Acknowledgement of receipt of Technical Revision 4 on February 14 and request for clarification of specific items prior to Board consideration.

State of Colorado, Mined Land Reclamation Division. 1986 (March 24). Letter from A.C. Baldridge, Reclamation Specialist, to C. Gerity, Cripple Creek and Victor Gold Co. Permit 80-244, Carlton Mill project: Notice of Board conditional approval for amendment 2 (add Pad 2 and ponds). Conditional upon liner verification, as-built submissions, test plots, ground-water monitoring, etc.

State of Colorado, Mined Land Reclamation Division. 1986 (March 25). Letter from C.M. Farrell, Reclamation Specialist, to E. Hunter, Nerco Minerals Company. Permit M-81-134, Technical Revision 4: Notice of Board approval of Nerco's February 14, 1986, application for Technical Revision 4 and incorporation of terms into permit. (On-site corrective action to tailings piles and ponds.)

State of Colorado, Mined Land Reclamation Division. 1986 (March 31). Letter from D.C. Shelton, Director, to Cripple Creek and Victor Mining. Permit M-86-009: Notice of March 20 approval of 112 permit application for Lillie Project. Includes original and other applications and correspondence.

State of Colorado, Mined Land Reclamation Division. 1986 (May 22). Letter from C.M. Farrell, Reclamation Specialist, to V.F. Reilly, PNT Mining, Inc. Response to Reilly letter of April 15 summarizing Permit 77-367. (Included summary of reclamation requirements.)

State of Colorado, Mined Land Reclamation Division. 1986 (July 1). Letter from C. Farrell, Reclamation Specialist, to B. Knocks, Newport Minerals, Inc. Permit M-77-367: Notice of Board issuance of NOV M-86-036 and Cease and Desist Order for Globe Hill/'76 Project. (Includes NOV and Order; also includes June 3, 1986, letter from D.C. Shelton, MLRD, to B. Knocks, summarizing earlier inspections and Newport's failure to respond).

State of Colorado, Mined Land Reclamation Division. 1986 (July 10). Notice of Inspection and Inspection Report on July 10 inspection of Victor Mine (permit 81-134) by C. Farrell.

State of Colorado, Mined Land Reclamation Board. 1986 (September 4). Notice of Violation M-86-049 and Cease and Desist Order, Permit M-77-367. (For noncompliance with July 1, 1986, NOV M-86-036 and Order).

State of Colorado, Mined Land Reclamation Division. 1986 (September 25). Letter from C. Farrell, Reclamation Specialist, to B. Horn, Dayspring Mining Corporation. Permit M-77-367: Notice of Board approval for Daysprings Mining Corporation to succeed Newport Minerals, Inc., as operator of Globe Hill Project.

State of Colorado, Mined Land Reclamation Division. 1986 (September 29). Letter from D.C. Shelton, Director, to G.P. Reed, Newport Minerals, Inc. Notice of Board issuance of NOV M-86-0057 and Cease and Desist Order for Globe Hill/'76 Project. Issued to Newport Minerals for noncompliance with NOVs M-86-036 (July 1, 1986) and M-86-049 (September 4, 1986) and associated Cease and Desist Orders. (Includes NOV and Order; notes Dayspring Mining Corporation succession as permittee.)

State of Colorado, Mined Land Reclamation Division. 1987a (January 12). Letter from C. Farrell, Reclamation Specialist, to E. Hunter, Nerco Minerals Company. Permit 81-134, Technical Revision 5: notice of completeness for application for Technical Revision 5 and request for clarification of specific items prior to Board consideration.

State of Colorado, Mined Land Reclamation Division. 1987b (January 12). Memorandum to File from A. Baldridge, Reclamation Specialist. Record of telephone conversation with A. Tapp, Cripple Creek and Victor Gold Mining Company, concerning water balance at Victory and Carlton Mill ponds.

State of Colorado, Mined Land Reclamation Division. 1987 (February 26). Letter from C. Farrell, Reclamation Specialist, to E. Hunter, Nerco Minerals Company. Permit 81-134, Technical Revision 5: Notice of February 25 Board approval of Technical Revision TR-05 and incorporation of terms of revision into permit.

State of Colorado, Mined Land Reclamation Division. 1987 (March 26). Letter from A. Baldridge, Reclamation Specialist, to C. Gerity, Cripple Creek and Victor Gold Co. Carlton Project, Permit 80-244, Technical Revision 1: Notice of March 25 Board approval of Technical Revision 1 and additional permit stipulations.

State of Colorado, Mined Land Reclamation Division. 1987 (October 22). Minerals Programs Inspection Report for Victor Mine inspection conducted October 22, 1987, by C.M. Farrell.

State of Colorado, Mined Land Reclamation Division. 1988 (January 25). Letter from J.T. Doerfer, Reclamation Specialist, to C. Gerity, Cripple Creek and Victor Gold Co. Carlton Project, Permit 80-244, Technical Revision 2: Notice of January 21 Board approval of Technical Revision 2 (placement of mill tailings on Pad 1). Includes MLRD staff notes.

State of Colorado, Mined Land Reclamation Division. 1988 (February 9). Letter from J.T. Doerfer, Reclamation Specialist, to C. Gerity, Cripple Creek and Victor Gold Co. Carlton Project, Permit 80-244, Amendment 3: Results of adequacy review of amendment application and request for additional information. (Original application not obtained.)

State of Colorado, Mined Land Reclamation Division. 1988 (February 26). Letter from J.T. Doerfer, Reclamation Specialist, to C. Gerity, Cripple Creek and Victor Gold Co. Carlton Project, Permit 80-244, Amendment 3: Notice of February 24 Board approval of Amendment 3 (expansion of Pad 2 on adjacent hillside). Included stipulation that pre-construction notice be provided.

State of Colorado, Mined Land Reclamation Division. 1988a (May 16). Letter from F.R. Banta, Director, to C. Gerity, Texasgulf Minerals and Metals. Permit M-88-025: Notification of May 12 Board approval of Anchoria Leland Mine Dump 110 permit. Includes permit application and correspondence.

State of Colorado, Mined Land Reclamation Division. 1988b (May 16). Letter from F.R. Banta, Director, to C. Gerity, Texasgulf Minerals and Metals. Permit M-88-026: Notification of May 12 Board approval of Chicago Tunnel 110 permit. Includes permit application and correspondence.

State of Colorado, Mined Land Reclamation Division. 1988 (July 7). Letter from J.T. Doerfer, Reclamation Specialist, to C. Gerity, Cripple Creek and Victor Gold Co. Charlton [sic] Project, Permit 80-244: Notice of July 7 Board approval of Technical Revision 3 (change in liner design of Pad 2 expansion approved in Amendment 3).

State of Colorado, Mined Land Reclamation Division. 1988 (August 16). Minerals Program Inspection Report on August 16, 1988, inspection of Victory Pad (#3), Permit 86-024, by C. Farrell and F.R. Banta. (Following cyanide spill on August 12.)

State of Colorado, Mined Land Reclamation Division. 1988 (September 6). Memorandum to MLRD files from J.T. Doerfer, Reclamation Specialist. Victory Project, Permit 86-024: Documentation of August 15 telephone conversation between J.T. Doerfer and A. Tapp, Cripple Creek and Victor Gold Mining Company, concerning cyanide spill on August 12.

State of Colorado, Mined Land Reclamation Division. 1988 (September 13). Letter from F.R. Banta, Director, to B. Mountford, Dayspring Mining Corporation. Permit 77-367: Transmission of September 9 Minerals Programs Inspection Report for Globe Hill ['76 Project] and notice of Board hearing on possible violations.

State of Colorado, Mined Land Reclamation Division. 1988 (September 22). Letter from F.R. Banta, Director, to B. Mountford, Dayspring Mining Corporation. Permit 77-367: Transmission of Notice of Violation M-88-013 and Cease and Desist Order arising from September 9 inspection of Globe Hill ('76 Project).

State of Colorado, Mined Land Reclamation Division. 1988 (September 22). Letter from F.R. Banta, Director, to C. Gerity, Cripple Creek and Victor Gold Mining Company. Victory Project, Permit 86-024: Transmission of Notice of Violation M-88-015 arising from August 12 cyanide spill. (Includes August 29 notice of Board hearing on possible violation.)

State of Colorado, Mined Land Reclamation Division. 1988 (October 26). Letter from F.R. Banta, Director, to C. Gerity, Texasgulf Minerals and Metals. Permit M-88-064: Notification of October 5 Board approval of Gold Star Pit 112 permit. Includes permit application and correspondence.

State of Colorado, Mined Land Reclamation Division. 1988 (November 15). Letter from F.R. Banta, Director, to B. Mountford, Dayspring Mining Corporation. Permit 77-367: Transmission of re-issued Notice of Violation M-88-013 and Cease and Desist Order, originally issued September 21; and order of payment of civil penalty.

State of Colorado, Mined Land Reclamation Division. 1988a (November 28). Letter from F.R. Banta, Director, to T. Aragon, Cripple Creek and Victor Gold. Permit M-89-096: Notification of November 21 Board approval of Ocean Wave Mine Dump 110 permit. Includes permit application and correspondence.

State of Colorado, Mined Land Reclamation Division. 1988b (November 28). Letter from F.R. Banta, Director, to T. Aragon, Cripple Creek and Victor Gold. Permit M-89-097: Notification of November 21 Board approval of Tornado/Raven Mine Dumps 110 permit. Includes permit application and correspondence.

State of Colorado, Mined Land Reclamation Division. 1988c (November 28). Letter from F.R. Banta, Director, to T. Aragon, Cripple Creek and Victor Gold. Permit M-88-098: Notification of November

21 Board approval of Blue Flag Mine Dump 110 permit. Includes permit application and correspondence.

State of Colorado, Mined Land Reclamation Division. 1988d (November 28). Letter from F.R. Banta, Director, to T. Aragon, Cripple Creek and Victor Gold. Permit M-89-099: Notification of November 21 Board approval of Howard Mine Rock Dump 110 permit. Includes permit application and correspondence.

State of Colorado, Mined Land Reclamation Division. 1988 (December 9). Letter from F.R. Banta, Director, to T. Aragon, Cripple Creek and Victor Gold. Permit M-89-100: Notification of November 21 Board approval of Index Mine Dump 110 permit. Includes permit application and correspondence.

State of Colorado, Mined Land Reclamation Division. 1989 (April 21). Letter from J.T. Doerfer, Reclamation Specialist, to T. Aragon, Cripple Creek and Victor Gold Co. Carlton Project, Permit 80-244, Technical Revision 4: Notice of April 17 Board approval of Technical Revision 4 (water balance information for 1989 operating year).

State of Colorado, Mined Land Reclamation Division. 1989 (July 14). Letter from L.D. Oehler, Reclamation Specialist, to T.L. Aragon, Texasgulf Minerals and Metals. Permit M-89-A059: Notification of July 14 Board approval of Rigi Mine Rock Dump 110 permit. Includes permit application and correspondence.

State of Colorado, Mined Land Reclamation Division. 1989a (July 27). Letter from F.R. Banta, Director, to C. Gerity, Texasgulf Minerals and Metals. Permit M-89-060: Notification of July 28 Board approval of Upper Mary McKinney Mine Dump 110 permit. Includes permit application and correspondence, including reports on cribbing wall and closure report.

State of Colorado, Mined Land Reclamation Division. 1989b (July 27). Letter from F.R. Banta, Director, to C. Gerity, Texasgulf Minerals and Metals. Permit M-89-061: Notification of July 28 Board approval of Hull City and Sacramento Mine Dumps 110 permit. Includes permit application and correspondence.

State of Colorado, Mined Land Reclamation Division. 1990 (August 14). Minerals Programs Inspection Report for Victor Mine (Permit 81-134) inspection conducted August 14, 1990, by D.I. Hernandez.

State of Colorado, Mined Land Reclamation Division. 1990a (October 2). Letter from F.R. Banta, Director, to J.P. Rovedo, Cripple Creek and Victor Gold. Permit M-90-109: Notification of Director, to J.P. Rovedo, Cripple Creek and Victor Gold. Permit M-90-109: Notification of October 1 Board approval of Bertha B/Maggie Mine Dumps 110 permit. Includes permit application and correspondence.

State of Colorado, Mined Land Reclamation Division. 1990b (October 2). Letter from F.R. Banta, Director, to J.P. Rovedo, Cripple Creek and Victor Gold. Permit M-90-110: Notification of October 1 Board approval of Midget Mine Dump 110 permit. Includes permit application and correspondence.

State of Colorado, Mined Land Reclamation Division. 1990c (October 2). Letter from F.R. Banta, Director, to J.P. Rovedo, Cripple Creek and Victor Gold. Permit M-90-111: Notification of October 1 Board approval of Moon Anchor Dump 110 permit. Includes permit application and correspondence.

State of Colorado, Mined Land Reclamation Division. 1990 (October 29). Letter from D. Hernandez, Reclamation Specialist, to J.P. Rovedo, Nerco Minerals Company. Permit M-81-134: Notice of Board approval on October 17 of September 20 (dated September 17) request to reactivate Victor Mine.

State of Colorado, Mined Land Reclamation Division. 1991 (January 29). Letter from J.T. Doerfer, Reclamation Specialist, to J.P. Rovedo, Cripple Creek and Victor Gold Mining Company. Permit M-77-367, NOV M-88-013: Approval of actions, proposed in letter of January 23, to respond to NOV 88-013, upon succession of CC&V as operator (from Dayspring).

State of Colorado, Mined Land Reclamation Division. 1991 (February 6). Approval of Transfer of Permit and Succession of Operators Application Form. (Pikes Peak Mining Company succeeded Daysprings Mining Corporation as operator of Globe Hill/Bull Hill.)

State of Colorado, Mined Land Reclamation Division. 1991 (August 5). Minerals Programs Inspection Report for Victor Mine (Permit 81-134) inspection conducted August 5, 1991, by T. Schreiner.

State of Colorado, Mined Land Reclamation Division. 1991 (October 10). Letter from T.A. Schreiner, Reclamation Specialist, to J.P. Rovedo, Pikes Peak Mining Company. Permit 77-367, Globe Hill Mine: Notice of Board approval for Technical Revision 4 (Install double-lined leach pad where existing Forest queen leach pad was currently in place). Includes application and correspondence.

State of Colorado, Mined Land Reclamation Division. 1991 (November 7). Letter from D.L. Bucknam, Acting Director, to E.T. Hunter, Cripple Creek and Victor Gold. Permit M-91-114: Notification of November 6 Board approval of Clyde/Modoc Dump 110 permit. Includes permit application and correspondence.

State of Colorado, Mined Land Reclamation Division. 1992 (February 27). Minerals Programs Inspection Report for Victor Mine (Permit 81-134) inspection conducted February 27, 1992, by C.B. Mount (following Ironclad heap pregnant cyanide solution spill beginning on February 26).

State of Colorado, Mined Land Reclamation Division. 1992 (March 2). Minerals Programs Inspection Report for Victor Mine (Permit 81-134) inspection conducted March 2, 1992, by C.B. Mount and B. Keffelow (following Ironclad heap failure and solution flow).

State of Colorado, Mined Land Reclamation Division. 1992 (April 3). Letter from M.B. Long, Director, to E.T. Hunter, Nerco Minerals Company. Permit M-81-134: Notice of Board issuance of Notice of Violation M-92-022 and assessment of civil penalty ($350) for cyanide spill on February 26.

State of Colorado, Office of the State Engineer, Division of Water Resources. 1991 (July 30). Memorandum from D.L. Nettles, Water Resources Engineer, to D.I. Hernandez, Mined Land Reclamation Division. Permit M-81-134, Victor Mine Amendment: Recommendation against approval of Victor Mine amendment (Nerco 5/10/91) pending resolution of water rights.

Teller County, Colorado. 1988 (August 22). Letter from R.E. Bergman, Teller County Commissioners, to G. Tuffino, Vice President, Texasgulf Mining and Materials, Inc. (Letter citing August 12 cyanide spill and requesting immediate notification in case of future incidents.)

Texasgulf Minerals and Metals, Inc. 1988 (September 19). Letter from T.L. Aragon, Legal Counsel, to D. Holder, Colorado Mined Land Reclamation Division. Victory Project, MLRD Permit 86-024:

Response to MLRD letter of August 29, 1988, advising Texasgulf of Board hearing on possible violation (August 12 cyanide spill).

Texasgulf Minerals and Metals, Inc. 1989 (March 16). Letter from T.L. Aragon, Legal Counsel, to J. Doerfer, Colorado Mined Land Reclamation Division. MLRD Permits 80-244 (Carlton Mill Pad 2) and 86-024 (Victory Project Pad 4): Water balance information. Subsequently approved as Victory Project Technical Revision 5 and Carlton Mill Project Technical Revision 4.

Texasgulf Minerals and Metals, Inc. 1989 (April 14). Letter from T.L. Aragon, Legal Counsel, to J. Doerfer, Colorado Mined Land Reclamation Division. Victory Project, MLRD Permit 86-024: Copies of internal Texasgulf reports on cyanide spills on April 11 and 12.

Texasgulf Minerals and Metals, Inc. 1989 (May 10). Letter from T.L. Aragon, Legal Counsel, to J. Doerfer, Colorado Mined Land Reclamation Division. Victory Project, MLRD Permit 86-024: Topsoil/Growth medium balance information and proposed replacement plan. (Includes MLRD and Texasgulf correspondence culminating in MLRD's 12/6/89 approval of Technical Revision for reclamation of the Portland Pit; does not include 8/30/89 Technical Revision application.)

Texasgulf Minerals and Metals, Inc. 1989 (July 24). Internal Texasgulf memorandum from W.S. Moser to J.S. Burt. Victory Project, Permit 86-024: "De Minimus Solution Spill on Pad #4, July 23, 1989."

Thompson, T.B. 1992 (February). "Mineral deposits of the Cripple Creek district, Colorado." *Mining Engineering* (February 1992), pp. 135-138.

APPENDIX 4-A

PERMIT HISTORY OF THE CARLTON MILL HEAP LEACH PADS (MLRD PERMIT 80-244)

Permit History of Carlton Mill Project Heap Leach Pads 1 and 2 (MLRD Permit 86-024)		
Date	**Event**	**Description**
1980 (application not obtained	Permit application/ approval	69.7 acres. Previously had been conventional flotation mill. Tailings were disposed in impoundment immediately below mill area. Active from early 1950s through 1962, then briefly in 1982. Extent of 1980s operations as conventional mill was not determined.
May 30, 1985 (CC&V 3/12/85; MLRD 5/30/85)	Amendment 1	Add heap leach pad and recovery system. Use Cresson and Gold Sovereign mine dumps as sources of 150,000 tons of ore for Carlton Mill leach pad (no. 1) in 1985 season. Crushing to occur at pad. Seasonal leaching, six months per year. Only preliminary design presented in amendment application. • Two double-lined pads planned but actually constructed as single pad: planned sizes were 147,750 and 167,000 ft^2 with maximum slope of 10 percent (requiring cutting and filling, removal of old tailings and soil); actual size of single pad not determined but described as "slightly larger." Maintain 20-foot unstacked apron on liner around heap. Liners not described. Nominal design: four cells divided by internal (below liner) berms; each to be leached separately. Pads immediately uphill of existing tailings impoundment. French drains were installed under pad to lower water table. • Crush ore to 0.5 - 1 inch, add cement and cyanide agglomeration, convey to stacker or loader on heap. • Sprinkler application of sodium cyanide solution at 217 (150-250) gpm: First applied to primary module, then to secondary module, then conveyed to pregnant pond and recovery. Modules leached for 30-45 day period. • Four ponds: double-lined barren and intermediate working ponds plus pregnant and backup ponds--liners not described. Each pond to measure (nominally) 100 x 100 x 12 feet, with 544,000 gallon capacity. Total capacity sufficient for process solutions and 100-year/24-hour storm. Area immediately downslope of ponds (upper end of old tailings impoundment) bermed to serve as emergency catchment area. • Gold recovery in portable columns in adjacent concrete-lined and -curbed area; then, in Carlton Mill building, pressure caustic stripping, electrolytic plating onto stainless steel wool, smelting to doré. Rates not specified. • 200-pound cyanide barrels to be triple-rinsed, crushed, landfilled (at unspecified site). • Entire area fenced with barbed wire, with chain link fence around ponds. • Water obtained from town of Victor. • Reclamation--Heap: Reclaim in place. Detoxify to "acceptable quality," grade side slopes to 2H:1V, compact and slope upper surface to promote runoff. Ponds: Puncture, fold, and backfill. Re-spread salvaged topsoil on ponds and other areas but not heaps (insufficient topsoil), mulch, fertilize, and seed. • Required to monitor pad/ponds and downgradient areas for metals and other parameters.

Permit History of Carlton Mill Project Heap Leach Pads 1 and 2 (MLRD Permit 86-024)		
Date	**Event**	**Description**
March 24, 1986 (CC&V 1/16/86; MLRD 3/24/86; Dames & Moore 1986)	Amendment 2	• Increase permitted area to 116.1 acres by adding more old mine dumps as sources of ore. Additional $9,700 bond for total of $75,000. • Add another 150,000 tons to Pad 1. • Construct another heap leach pad (Pad 2) and pregnant pond immediately downgradient from Pad 1, on top of Tailings Dam No. 1 impoundment. Use Pad 1 pond for barren pond. Use area mine dumps as source of ore. Crush and agglomerate at dumps or on-site. • Tailings on which heap to be constructed ranged from 7 to 74 feet deep. Saturated at depths of 30 feet (under center of impoundment) to 45 feet (near dam). There was a 12-inch pipe on west abutment with continuous slow seepage. Consultant recommended plugging with grout. Not determined if actually plugged. • Heap to reach 100 feet height, four 25-foot angle of repose lifts set back 25 feet between lifts, for 2H:1V side slope. Total lined pad 320,000 ft^2, with 20-foot heap setback. Single 80-mil HDPE liner, with old tailings to serve as secondary liner. It was anticipated that the tailings under the heap, and thus the base of the heap, would settle about three feet near the center of the heap. Pad was to be sloped to maintain positive drainage. Plans were to add about 250,000 tons of ore per year through 1989. Capacity: "600,000 tons or more." • Pregnant pond: Double-lined, excavated into tailings--liners not described. Remainder of tailings impoundment below pond (i.e., to raised dam) described as potential emergency storage, as was Dam 2 impoundment immediately downgradient. Capacity of lined pond about 2,120,000 gallons plus one foot freeboard. Unlined area in Dam 1 impoundment provided an additional 827,000 gallon capacity. • Consultant recommended: place pneumatic piezometers in tailings, establish survey monuments on pad liner ahead of ore placement, and slope indicators between heap and pond. Not known if installed/implemented.
April 20, 1987 (CC&V 4/27/87)	Cyanide spill	Coupling hose for portable carbon column separated and total of 7,500 gallons (500 gpm for 15 minutes) of cyanide solution escaped. Cyanide concentration was less than 0.5 pounds per ton of solution. Most (5,500 to 6,500 gallons) were contained in outdoor concrete-lined and -curbed area, from which solution drained to solution ponds. About 1,000 to 2,000 gallons overtopped curb and flowed across unlined surface 300 feet to unlined emergency storage pond, where it was diluted with 1,500,000 gallons of stored storm water. No solution reached off-site areas. Cleanup of flowpath not described. Remedies included regrading and installation of automatic shutoff devices.

Permit History of Carlton Mill Project Heap Leach Pads 1 and 2 (MLRD Permit 86-024)		
Date	**Event**	**Description**
March 26, 1987 (CC&V 2/23/87a; MLRD 3/23/87)	Technical Revision 1	1987 plans for Pad 2: • Add an additional 500,000 tons of leach ore to 1986's 462,000 tons. Stack ore to height of 130 feet or extend lined pad to north to within 20 feet of a ditch between this pad and Pad 1. This would result in an additional three inches of settling of the pad. • Also add additional water capacity: to use unlined top of tailings impoundment (on which the pad is constructed) and an additional 3,500,000 gallon unlined emergency pond below the dam of the tailings impoundment. The latter required improvements to the crest of the lower tailings impoundment dam (dam 2). In approval, MLRD required notice if unlined areas were actually used to store water.
October 8, 1987 (CC&V 11/3/87)	Cyanide spill	Spray header on Pad 2 broke, creating washout on northwest side of pad. Washed-out toe reached to within three feet of liner edge and some solution ran off pad. 20-gallon puddle off the liner resulted. Sampling (no results presented) showed cyanide in the solution but not the soil. Cyanide was neutralized (no details provided) and followup sampling showed no detectable cyanide in soils.
November 1987 (CC&V 11/19/87)	Leak in primary liner of Pond 4	Noted that cyanide had been detected in the leak detection system of Pond 4 on an unspecified date during 1986 (?) operating system. The pond had been removed from operation. After emptying pond, several holes in primary liner were discovered and repaired. Secondary (lower) liner was intact. Pond was to be returned to service in 1988.
January 1988 (CC&V 11/20/87, MLRD 1/25/88)	Technical Revision 2	• Rehabilitate portions of Carlton Mill circuit: receiving, crushing, surge capacity, grinding, and thickening. • Install new six-stage carbon-in-leach circuit with capacity of 150 tons per day. To use mill for high-grade ore stockpile. To grind to 80 percent -325 mesh. • Slurry a total of 25,000 tons of tailings (about 45 percent solids) from mill to top of heap leach Pad 1. Excavate and construct (via berms) an unlined "pond" on the top surface of the pad for tailings disposal. Decant water to be recycled to mill. • Geotechnical studies indicated that tailings would not filter through leached ore material in appreciable amounts but fluids would leach through for collection in existing Pond 4. • No change in reclamation requirements. Fine mill material was thought to be more amenable to revegetation without topsoil amendments.
February 1988 (MLRD 2/9/88 and 2/26/88; CC&V 2/22/88)	Amendment 3	Application for amendment not obtained. References include MLRD adequacy review and CC&V response. • Expand Pad 2 to 440,820 ft^2, with lined "spray apron" of 20 feet around heap. To leach about 200,000 tons of ore in one 50-foot lift in the expansion area. Expansion to extend up adjacent hillside, which required innovative liner-joining techniques. • Added 7.9 acres to permit area, for total of 130 acres.

Permit History of Carlton Mill Project Heap Leach Pads 1 and 2 (MLRD Permit 86-024)		
Date	**Event**	**Description**
July 1988 (MLRD 7/7/88; CC&V 5/31/88a)	Technical Revision 3	Redesign of leak detection system for expansion of Pad 2 approved with Amendment 3. Originally, liner was to be laid on the steep slope in upper and lower sections, with leak detector drains at toes of both sections. Redesign led to installation of liner in a single section, thus eliminating the drain below the upper section. The nature of subgrade actually encountered (some hard rock, some rocky colluvium) made original design infeasible. Also, angular cobbles made it necessary to change from 16-ounce geotextile underlayer (for liner cushion) to a layer of old tailings.
April 1989 (CC&V 3/16/89; MLRD 4/21/89)	Technical Revision 4	Water balance information for 1989 operating season. No change in pond capacity required (existing ponds sufficient for operating volumes, 100-year/24-hour storm, and some heap desaturation).
June 1990 (Pikes Peak 4/27/90; MLRD 6/22/90)	Technical Revision 5	Changes to water quality monitoring requirements. Requirements include sampling of: • Arequa Gulch upstream and downstream of Carlton Mill • Pad 1 French drain • Six "ground-water" monitoring wells in tailings below Pad 2. Semiannual monitoring of full suite of parameters; monthly for pH and WAD, free, total CN. Parameters include dissolved, not total, metals.

APPENDIX 4-B

PERMIT HISTORY OF THE VICTORY PROJECT (MLRD PERMIT 86-024)

Permit History of Victory Project Pads 3 and 4 and Portland Pit (MLRD Permit 86-024)		
Date	**Event**	**Description**
February 21, 1986 (CC&V 2/21/86)	Permit application	34.5 acre cyanide heap leach operation 0.5 miles north of Victor, 1.5 miles SE of Ironclad/Globe Hill facility. On ridge of Battle Mountain. • Nearby mine dumps to serve as sources of ore. Seasonal operation, April through November. • Most of site void of vegetation and covered with old tailings (from inches to "tens of feet" thick). • One pad: 381,000 square feet, including 20-foot "safety apron." 1,000,000 ton capacity, 360,000 tons expected during 1986. Less than 10% average slope, < 20% maximum. Double lined (80-mil HDPE over compacted old tailings). All pipes six-inch or less PVC. • Heap to be constructed in lifts: 35 feet in 1986, subsequently 10-12 foot lifts to final height of about 100 feet. • Recovery plant: portable carbon columns for adsorption, with loaded carbon trucked to Carlton Mill for stripping, etc. • Three ponds with total capacity of 4,090,000 gallons, sufficient for 100 year/24-hour storm plus operating volumes. 500-550 gpm spray rate at 0.004 gpm/ft^2. All ponds double-lined and surrounded by dikes/berms. Construction required substantial cut and fill. Ponds include: 1,680,000 gallon barren 1,040,000 gallon pregnant 1,775,000 gallon emergency storage pond 598,000 gallon emergency overflow capacity (also lined). • Barbed wire fence around entire area, chain link fence around ponds. • All upslope run-off diverted around site and unspecified number of old mine openings sealed. • Required to sample surface water in North Fork of Wilson Creek semi-annually. • Reclamation: detoxify heap until effluent reaches unspecified "acceptable quality", contour slopes to < 2H:1V. Backfill and revegetate ponds but not heap. • $21,500 bond.
January 1987 (MLRD 1/12/87)	Excess water	500,000 gallons of water hauled from Victory emergency pond to Carlton Mill Pond 1.
February 23, 1987 (CC&V 2/23/87b and 5/26/87)	Technical Revisions 2 and 3*	• Enlarge pad for 1987 operations. • 416,000 tons had been stacked in 1986, 430,000 more tons to be added in 1987, in 25-foot lifts. Pad area covered 291,980 ft^2. • Increase pond capacity by adding 4-foot lined berm around ponds: to add 2,392,000 gallons additional storage, to a total of 7,485,000 gallons. Ponds covered 79,980 ft^2.

Permit History of Victory Project Pads 3 and 4 and Portland Pit (MLRD Permit 86-024)		
Date	**Event**	**Description**
July 1987 (CC&V 7/17/87 and 12/8/87; Dames & Moore 3/16/89)	Amendments 1 and 3	• Add 49.83 acres to permit (including 21.27 acres from permit 86-009) for new Pad 4. Much of area covered with old tailings and waste rock. Constructed in 1988. • New 15 acre heap leach pad (Pad 4 or Portland Pad), to be constructed in four subcells. Partially built on top of waste rock dumps, including new rock from Portland pit (see amendment 2 below). Double-lined pad (60-mil HDPE, granular tailings with 3-inch pipes as drainage layer, and 80-mil HDPE) constructed on base of compacted tailings. Pad covers 660,000 ft^2, capacity of about 1,825,000 tons. • Ore from old dumps in area and new pit (see amendment 2 below) • Part of pad drains to Pad 3 ponds, part to three new ponds: 1,935,000 gallon pregnant, 491,500 gallon barren, 1,616,000 gallon emergency overflow ponds. All have double 60-mil liners with geotextile leak detection system. Later described as having 6,300,000 gallon capacity (Texasgulf 3/16/89), presumably reflecting expansions for which documents not obtained for this report. All six ponds for Pads 3 and 4 connected by pipes for gravity/pumping flows. • 12 old shafts in construction area filled with gravel and compacted. One large shaft remained between pad and ponds. • Reclamation: similar to Pad 3. • 672,000 tons placed on Pad 4 in 1988; one lift 8-30 feet high, averaging 20-25 feet (Texasgulf 3/16/89).
August 1987 (CC&V 8/12/87)	Amendment 2	Add 28.18 acres to permit (including 9.94 from another permit). • Construct open pit mine, the Portland Pit, adjacent to and downhill of Pad 4. • Expected to reach 500 feet (east to west) by 1,400 feet (north to south) by 240 feet deep. Waste:ore ratio of about 2.5:1---predicted 500,000 tons ore and 1,300,000 to 1,500,000 tons waste rock. About 600,000 tons waste rock used for fill in Pad 4 construction. • Waste rock at angle of repose on hillside. Some minor smooth grading anticipated for reclamation. • Reclamation: Safety/warning bench about 15 feet below top; remainder benched as recommended by MSHA. Re-soil and vegetate benches and pit floor if sufficient topsoil or other medium is salvaged.
December 1987 (CC&V 12/18/87)	Solution in leak detection system, Pad 3	On December 5, CC&V noted solutions flowing out of leak detection pipe on Pad 3: analyses showed high (but unspecified) cyanide, pH, and gold. On December 6, shut down spray on that portion of heap; within 24 hours, flow had slowed significantly. Notified MLRD on December 7. CC&V attributed flow to tear in primary liner along seam where expansion joined original construction; "probably" the result of late-season slough (otherwise undescribed). CC&V planned to leave this area unsprayed, then try to find and fix leak. CC&V noted a "remote possibility" of permanently shutting down this part of heap. No further information obtained.

Permit History of Victory Project Pads 3 and 4 and Portland Pit (MLRD Permit 86-024)		
Date	**Event**	**Description**
May 31, 1988 (CC&V 5/31/88)	Technical Revision 4	Construct haulage road across bench on face of Pad 3 to provide easier access to Pad 4.
July 5, 1988 (CC&V 7/21/88)	Damage to pads and ponds	Errant blast in Portland Pit: fly rock punctured primary liners in Pads 3 and 4 and in five of the six solution ponds. All being repaired. Attributed to use of "extra powder" in wet blastholes.
August 12, 1988 (MLRD 8/16/88, 9/22/88b)	Cyanide spill	1,500 to 2,000 gallons of barren solution spilled from pipe ruptured by loader. Flow followed gully off-site for 300 yards before entering abandoned mine shaft. Led to NOV M-88-015. Described in chapter 4 text.
March 16, 1989 (Texasgulf 3/16/89)	Technical Revision 5	Water balance information for 1989 operations: Total storage volume needed for 100-year/24-hour storm containment plus operating volumes calculated at 13,064,000 gallons, compared to 13,400,000 gallons actual capacity in Pads 3 and 4 ponds.
April 11, 1989 (Texasgulf 4/14/89)	Cyanide spill	Cracked pipe (the result of freezing) spilled up to 2,880 gallons (3 gpm for 16 hours) of pregnant solution. Solution contained 0.65 pounds sodium cyanide per ton of solution, so up to 7.75 pounds of NaCN were involved. Most solution was contained by the Pad 4 pond liner system but some escaped into pond embankment material. Area treated with calcium hypochlorite.
April 12, 1989 (Texasgulf 4/14/89)	Cyanide spill	Hose emptying barren solution into mix tank fell out of tank and landed across the curb that surrounded the cement pad near heap leach Pad 3. About 3,000 gallons of barren solution (0.45 pounds cyanide per ton of solution, pH about 10.2) ran across the ground for 50 feet, where the flow entered the lined Pad 3 solution ponds.
July 23, 1989 (Texasgulf 6/24/89)	Cyanide spill	Some unspecified cause resulted in flow from a "blown 1/2-inch dripper line" leaving the pad (via an old access ramp) and trickling 40 to 50 yards down the road to the east. An estimated 240 gallons containing 0.8 pounds cyanide escaped. Five pounds of calcium hypochlorite in a water solution was applied to the flowpath.
September 11, 1989 (Nerco 8/22/90)	Change in name	Nerco changed name of Texasgulf Minerals and Metals to Pike's Peak Mining Company (changed to "Pikes Peak" in 1990). It should be noted that Nerco's 100 percent purchase of Texasgulf from ELF Aquitane was not effective until August 31, 1990, nearly a year after Nerco changed the name of Texasgulf.
May - December 1989 (Texasgulf 5/10/89)	Technical Revision (6?)	Reclamation plan for Portland Pit. Texasgulf reported 30,000 yd^3 of old tailings and topsoil had been salvaged and stored. It was proposed to place this on waste dump, areas of process ponds, pit benches and floor, and other disturbed areas prior to revegetation. No revegetation of Pads 3 and 4 heaps planned. (Note: Final plans not obtained.)
January 9, 1990 (CC&V 2/12/90)	Cyanide spill	Ice buildup in ditch around a Pad 4 pond blocked ditch flow and solution flowed onto and over surrounding berm. Flow did not reach bottom of berm. About 500 gallons (1.04 pounds sodium cyanide, pH of 9.6) was involved. Neutralized with calcium hypochlorite; intended to raise berm by 2-3 feet.

Permit History of Victory Project Pads 3 and 4 and Portland Pit (MLRD Permit 86-024)		
Date	**Event**	**Description**
April 27, 1990 (Pikes Peak Mining Company 4/27/90)	Technical Revision 9*	Improve water quality monitoring. Sample Wilson Creek upstream and downstream of Victory Project: semi-annual monitoring of full suite of parameters (Free CN, pH, nitrate, nitrite, and metals). Included data from 1987, 1988, and 1989.
November 5, 1990 (CC&V 11/5/90)	Cyanide spill	100 gallons containing 0.52 pounds CN per ton of solution "got off the edge of the pad liner" of Pad 4. No other details on cause or extent of spill were provided. The spill was neutralized with two pounds of hypochlorite.

* Technical revision one not obtained. Of technical revisions 6, 7, and 8, only one was obtained.

APPENDIX 4-C

COMMENTS SUBMITTED BY NERCO MINERALS COMPANY ON DRAFT SITE VISIT REPORT

The letter reproduced in this appendix accompanied a copy of the draft site visit report on which Nerco Minerals Company had made comments and corrections. A copy of the marked-up draft is not reproduced here for brevity's sake. In general, Nerco's comments were clarifying in nature, providing information that the draft report indicated had not been obtained during the site visit or correcting minor factual errors in the draft. EPA's response to Nerco's comments are provided in Appendix 4-D

[Comments not reproduced for this electronic version. Copies may be obtained from U.S. EPA, Office of Solid Wastes, Special Waste Branch.]

APPENDIX 4-D

EPA RESPONSE TO COMMENTS SUBMITTED BY NERCO MINERALS COMPANY ON DRAFT SITE VISIT REPORT

EPA Response to Comments Submitted by
Nerco Minerals Company
on Draft Site Visit Report

EPA has revised the report to incorporate all of the comments and suggestions made by Nerco Minerals Company. In some cases, EPA made minor changes to wording suggested by Nerco in order to attribute the changes to Nerco or to enhance clarity.