MINE SITE VISIT:

NEWMONT GOLD COMPANY
RAIN FACILITY

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

5.0 SITE VISIT REPORT: NEWMONT GOLD RAIN

5.1 INTRODUCTION

5.1.1 Background

The U.S. 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 Newmont Gold Company Rain facility near Carlin, Nevada, on August 20 and 21, 1991.

Sites to be visited were selected by EPA to represent both an array of mining industry sectors and different regional geographies. All site visits have been conducted pursuant to RCRA Sections 3001 and 3007 information collection authorities. Although Newmont Gold Company disputes EPA's authority to proceed under those sections of RCRA, Newmont Gold cooperated with EPA in connection with the Rain site visit. When sites have been on Federal land, EPA has invited representatives of the land management agencies [Forest Service/Bureau of Land Management (BLM)]. 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 reviewed during the visit to ensure accuracy.

In preparing this report, EPA collected information from the State of Nevada and Newmont Gold Company. The Nevada Department of Environmental Protection (NDEP) provided information relating to the Rain facility's Water Pollution Control Permit and associated records including the Final Environmental Assessment (Newmont Services, 1987b), design reports, correspondence, and informal communication with NDEP personnel. EPA also obtained information from telephone interviews with Newmont and NDEP personnel. The following individuals participated in the Newmont Rain facility site visit:

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Participants in the site visit were provided an opportunity to comment on a draft of this report. Comments made by Newmont Gold Company are presented in Appendix 5-E. EPA responses to comments by Newmont are in Appendix 5-F.

5.1.2 General Description

The Rain facility, owned and operated by Newmont Gold Company, is located approximately 9 miles southeast of Carlin in Elko County, Nevada (see Figures 5-1

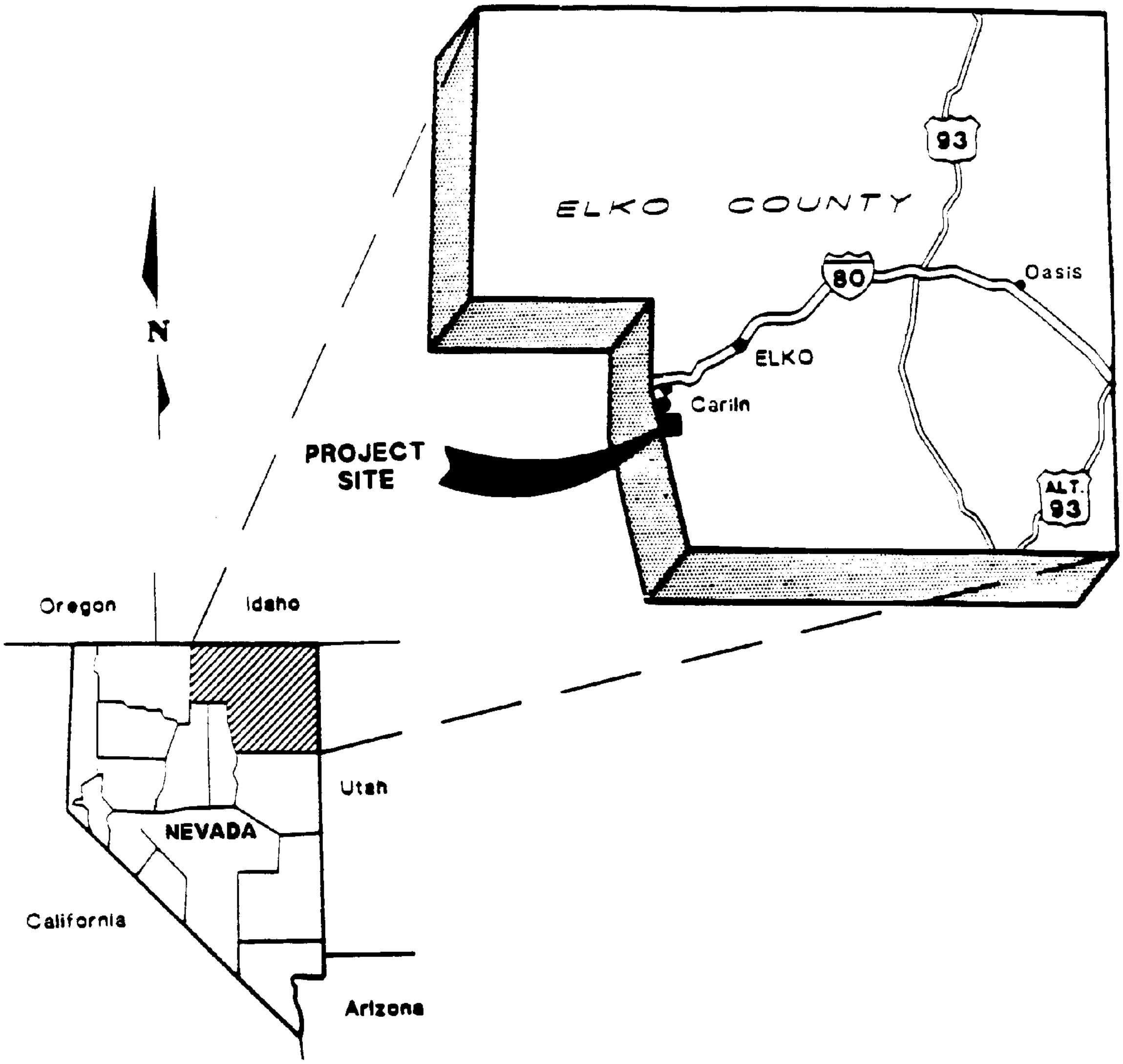


Figure 5-1. Site Location Map

(Source: SRK 1990)

and 5-2). Access to the facility from Carlin is by Ridge Road, which was widened and straightened by

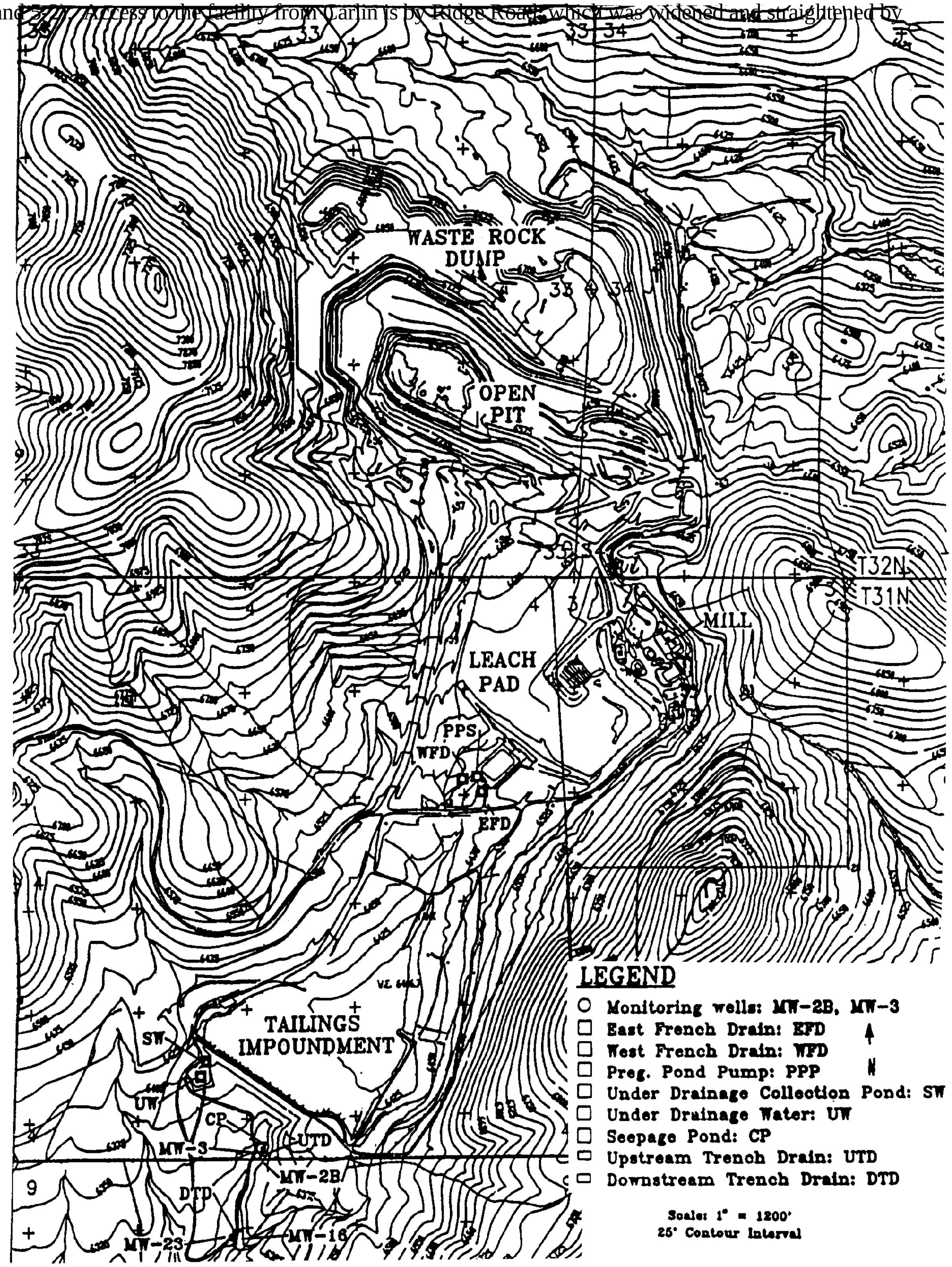


Figure 5-2. Location of Rain Facilities

(Source: Newmont Gold Company)

Newmont during the development of the Rain facility. The road is approximately 14 miles long and crosses BLM lands that are allocated for grazing. This road is well maintained and is bermed along much of its length to control run-off. Diversions and culverts in drainageways serve to minimize run-on. Fugitive dust is controlled by watering with added surfactant. A power line to the facility generally follows the road.

The facility is a mining-milling-leaching operation for beneficiating disseminated gold ore. Ore and waste rock are mined from an open pit. Waste rock is material that does not contain sufficient gold values to justify milling or leaching, and is removed to access the ore. According to the final environmental assessment (Newmont Services, 1987b) 47.6 million tons (all tonnage figures in short tons) of material were planned to be removed from the pit from 1988 project startup through the projected 8-year life span of the mine. Of the total projected volume, approximately 10.1 million tons was expected to be ore grade and 37.5 million tons waste rock. As of October 1990, these figures had been revised: projected waste rock tonnage was estimated to be 41.4 million tons by the end of 1990, and 62.5 million tons during the life of the mine, at a stripping ratio of 3.55:1. Of the ore removed from the mine, over forty percent is milled and beneficiated by the carbon-in-leach method at a current rate of about 840,000 tons per year (TPY). The remaining ore (about 1,000,000 tons per year) is leached using a modified heap method referred to as a valley leach (SRK, 1990).

The facility is located on approximately 627 acres covering parts of four Sections (see Figure 5-2). During the site visit, Newmont explained the distribution of surface and mineral rights to the land held by the BLM and private parties as follows: Newmont Gold Company holds the surface rights in T32N, R53E, Section 33, and T31N, R53E, Section 4; a private party holds the mineral rights to these Sections. These Sections are the current location of the pit, leach pad, and tailings impoundment, and a portion of the waste rock dump. Newmont Gold Company holds the mineral rights for T32N, R53E, Section 34; BLM holds the surface rights to this Section. An ore stockpile and the remainder of the waste rock dump are located in this Section. Private parties hold both surface and mineral claims to T31N, R53E, Section 3; most of the mill facility is located in the northwest quarter of this Section.

5.1.3 Environmental Setting

The Rain facility is located near the northern end of the Great Basin Physiographic Province, in the Pinon Mountain Range, part of the area known as the Carlin Trend. It is 90 miles east of the Central Nevada Seismic Zone. The facility is at an elevation of approximately 6,600 feet above sea level (asl) between Rain Peak (elevation 7,403 feet asl) on the west and Snow Peak (7,128 feet asl) on the east. The mine pit is situated on the east flank of Rain Peak, the east side is the lower elevation at 6,575 feet, the west side is at 7,000 feet. The mill complex and ore stockpiles are located in the saddle area between the peaks. The waste rock dump is located on the north side of the saddle above the Emigrant Springs drainage. The tailings impoundment is on the southwest side of the saddle below the mill in the ephemeral headwaters of Ferdelford Creek (Figure 5-2).

Soils in the project area are made up of both aridisols and mollisols, typically having accumulations of clay and/or calcium carbonate below the surface. Parent materials include andesite and rhyolite from volcanic sources and shale, sandstone, and conglomerate from sedimentary sources. Native vegetation consists of sagebrush, cheatgrass, and bluegrass. Cattle grazing is the primary land use in the area; during the site visit, several cattle were observed along the access road and a cattle trough was observed in the Emigrant Springs drainage between the waste rock dump and Emigrant Springs.

5.1.3.1 Climate

The Rain facility, like all of Nevada, is dominated by continental air masses. High solar energy input and no consistent moisture source result in a dry, warm climate. Precipitation events are typically in the form of thunderstorms in warmer months and snow squalls during the winter. December is typically the wettest month. Annual precipitation at the site averages 12 inches. The average annual snow fall is estimated to be 55 inches, with most snowfall occurring between October and May. July is the warmest month with an average high temperature of 84.6 °F; December is the coldest with an average of 18.2 °F. There are approximately 95 frost-free days at the site. Prevailing winds are from the southwest, averaging six miles per hour (mph). However, local relief influences air flow in the project area (SRK, 1990, and Newmont Services, 1987b).

5.1.3.2 Geology

Sediment-hosted gold of the Carlin trend is characterized by gold in the micron or less size range deposited in carbonaceous, thin-bedded silty limestones or limy siltstones. The suite of elements usually includes arsenic, antimony, mercury, thallium, and molybdenum. Barite is a common gangue mineral. Silicification in the form of jasperoid is used as a major indicator during exploration. According to the environmental assessment, rocks in the project area are composed of the Upper Devonian and Lower Mississippian age sediments (345 million years before present). Most of the site lies on Chainman Shale (Lower Mississippian) and, to a lesser degree, the Webb Formation (Lower Mississippian), and the Devil's Gate Limestone (Upper Devonian) . The Chainman Shale is composed of a variety of rock types including: grey to black shale, quartz and chert-rich sandstone, conglomerate lenses, thin limestone, calcareous sandstone beds, and pebbly mudstone. The Webb Formation consists of grey clay-rich siltstones and shales with interbedded sandstone. The Chainman Shale and Webb Formation unconformably overlie part of the Devil's Gate Limestone, characterized by medium to thick-bedded light to dark grey limestone. This is the material now being encountered at the base of the pit on the east end (see Figure 5-3

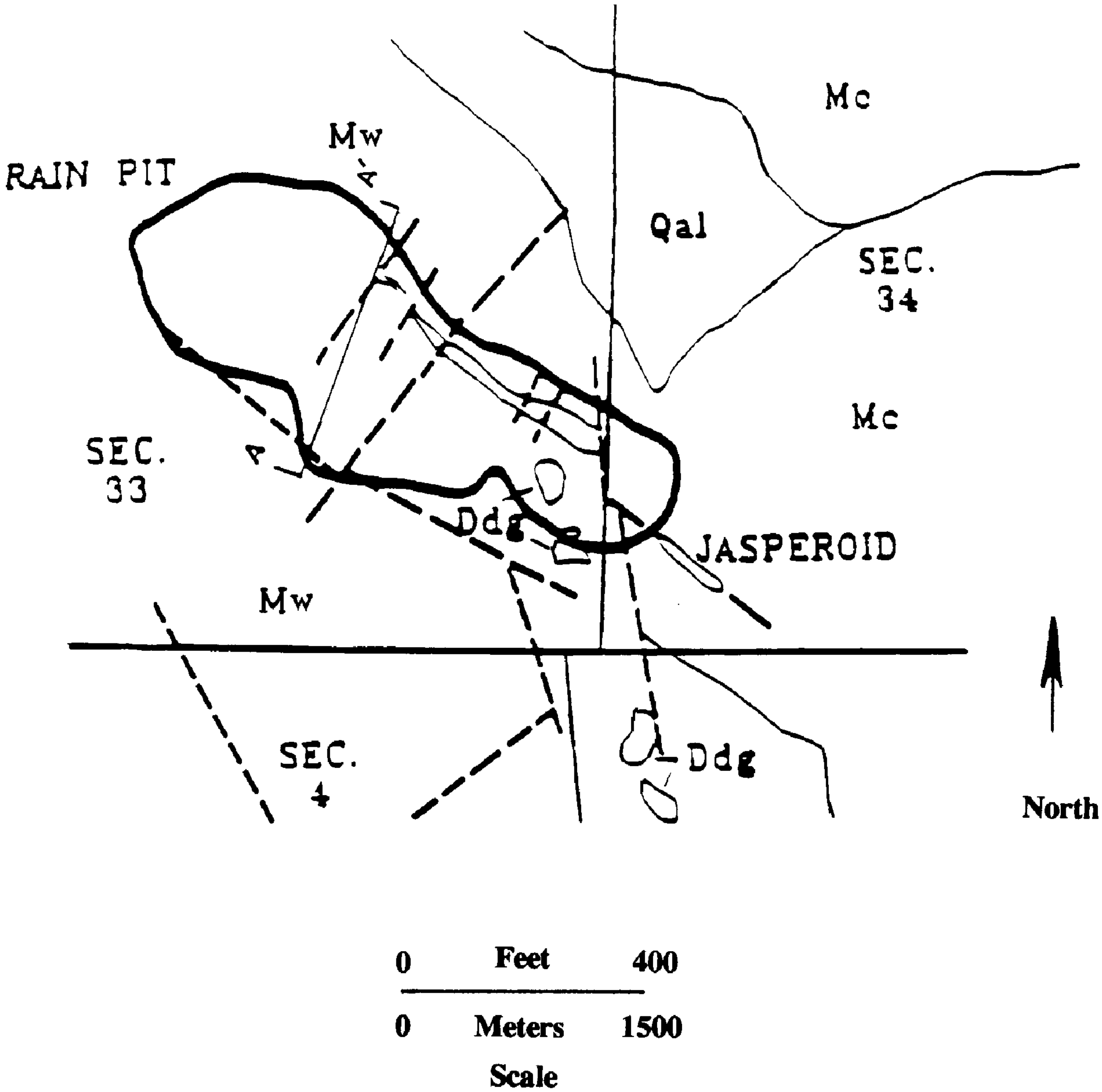


Figure 5-3. Pit Geology

(Source: SRK 1990)

) (Bonham, 1988; Newmont Services, 1987b; and SRK, 1990).

Structural control that led to the deposition of precious and other metals at the Rain site is similar to the processes found throughout the Carlin trend. A high angle reverse fault crosses the Rain pit on roughly a northwest strike. The fault is traceable for 1,800 feet along the surface and is up to 200 feet wide. It is this fault that is believed to be the paleo-conduit for hydrothermal fluids to migrate toward the surface. The Webb Formation hosts the minerals deposited by these migrating fluids. Joints in the Webb Formation intersect the fault and are partially responsible for the enrichment of the ore zone. Silica, gold, silver, mercury, arsenic, and a host of other elements filled voids and replaced material leached by the migrating acidic solutions. Gold occurs predominantly as micron-size particles disseminated in the host rock matrix. Rocks of the Webb formation near the surface are oxidized; consequently, the pyrite has been converted to hematite and/or limonite indicated by liesegang banding. Below the oxidized zone, rocks of the Webb Formation contain abundant carbon and pyrite. Most of the gold associated with the Rain ore zone is located near the Rain fault in oxidized and hematite-stained mudstones and siltstones of the Webb Formation. The vertical extent of gold mineralization ranges from the surface down to the unconformable contact with the Devil's Gate

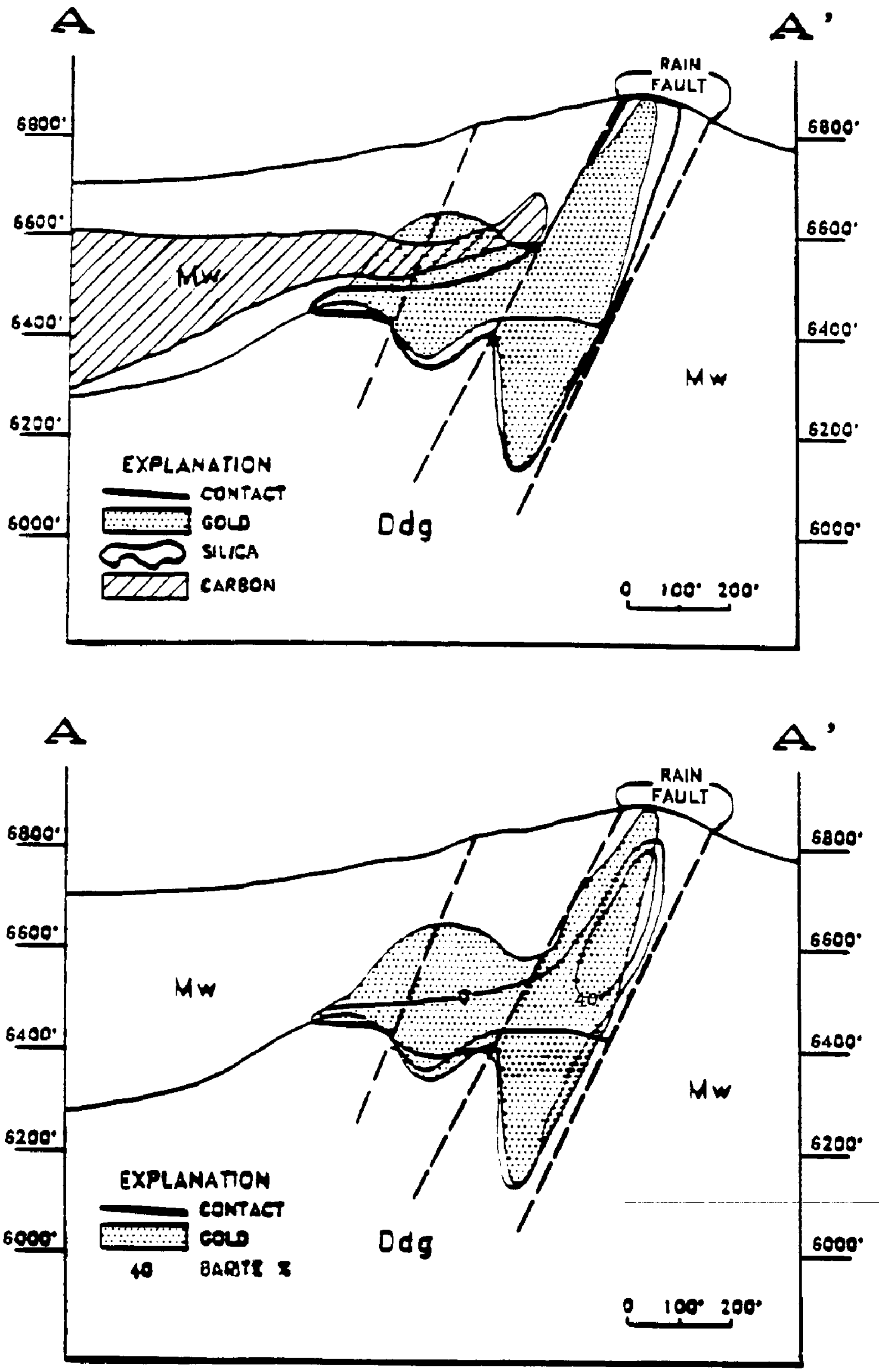


Figure 5-4. Cross Section of Rain Pit, Section 1800SE

(Source: SRK 1990)

limestone. Minor faults that intersect the main fault, possibly in more permeable material, allowed the fluids to migrate southwest of the main fault and therefore expanded the ore zone. Figure 5-4 shows a cross-section of the Rain pit (A - A') identified in Figure 5-3 (SRK, 1990).Six types of mineralization are recognized at the Rain mine: siliceous, siliceous/baritic, baritic, carbonaceous, argillaceous, and calcareous. Siliceous rocks contain greater than 40 percent quartz and less than 30 percent barite. Siliceous/baritic rocks contain 30 to 40 percent barite. Baritic rocks contain greater than 40 percent barite. Carbonaceous rocks contain high (unspecified) total organic carbon and greater than 0.5 percent pyrite (Figure 5-4). Argillaceous rocks have a clay content greater than 40 percent. Calcareous rocks are mostly carbonates, composed of calcite (SRK, 1990).

Most of the ore-grade material is taken from the oxidized sediments of the Webb Formation, proximal to the Rain fault. Ore taken from this area contains siliceous, siliceous/baritic, baritic, and argillaceous mineralization. Gold concentrations of this material range from 0.01 to 0.150 ounces of gold per ton of rock. It is expected that the carbonaceous material contains gold values as indicated by Figure 5-4 (SRK, 1990). According to Newmont, sulfide-bearing rock does not contain gold in sufficient quantity to be economically recoverable.

Of the 62.5 million tons of waste rock expected to be generated by the mine, 77.8 percent is expected to be mostly oxidized mixed sedimentary material of the Webb Formation (some of which will contain sulfide mineralization); 15.4 percent is expected to be carbonaceous and potentially sulfidic; 4.3 percent is expected to be limestone of the Devil's Gate Formation; and 2.5 percent will be alluvium from surface deposits (SRK, 1990).

5.1.3.3 Hydrology

The Rain facility sits on the drainage divide separating two basins. Seasonal surface water in the valley where the pit, mill facility, and tailings impoundment are located drains to the west into the ephemeral headwater drainage of Ferdelford Creek. Ferdelford Creek becomes a perennial stream four miles below the facility, and it runs for ten miles before entering Pine Creek. From this point, Pine Creek flows northwest and joins the Humboldt River six miles further downstream. Surface water on the north side of the saddle between the two peaks, where the waste rock dump is located, drains predominantly eastward in an ephemeral drainage toward Dixie Flats. Emigrant Springs (elevation 6,340 feet; about 900 feet from the toe of the waste rock dump) feeds the headwaters of this drainage, which joins Dixie Creek. Dixie Creek, a perennial stream, flows six miles north to join the South Fork of the Humboldt River. The site visit team also observed standing water immediately below (10 to 20 feet) the toe of the waste rock dump that appeared to be a spring but may have been part of the acid mine drainage collection system.

Baseline data that predate the Rain facility showed that waters of both Ferdelford and Dixie Creek have high pH, bicarbonate concentration, total dissolved solids, and conductivity. According to the environmental assessment, sulfate concentrations in Ferdelford Creek were three to four times higher than Dixie Creek, but decreased at lower elevation. Metals were generally low in Ferdelford Creek with the occasional exception of iron, aluminum, and arsenic. Arsenic, iron, and manganese were present in most samples taken from Dixie Creek (Newmont Services, 1987b).

Ground-water resources at and near the site have been described as limited. Shallow, perched water exists and discharges as perennial or ephemeral springs, such as Emigrant Spring. These discharges occur where alluvial material encounter impervious clays or silts. The shallow ground water is apparently recharged by local precipitation and snow melt and is not considered to be connected to the regional ground water. Deeper ground-water sources exist 350 feet or more below the surface and have been found to produce limited water volumes [maximum of 80 gallons per minute (gpm)]. Current mining in the pit has reached a depth of 460 feet below grade, to an elevation of 6,440 feet asl. Exploration drilling has encountered limited quantities of perched ground water between 6,400 and 6,300 feet. Newmont reports that the actual ground water elevation is between 6,100 and 6,160 feet and the projected pit bottom is 6,240 to 6,220 feet; thus, the final pit bottom should be about 100 feet above ground water. Because of the limited access to ground water, the Rain operation draws its water from wells (100 gpm annual average) in Dixie Flats and pumps it six miles to the mill (SRK, 1990).

5.2 FACILITY OPERATIONS

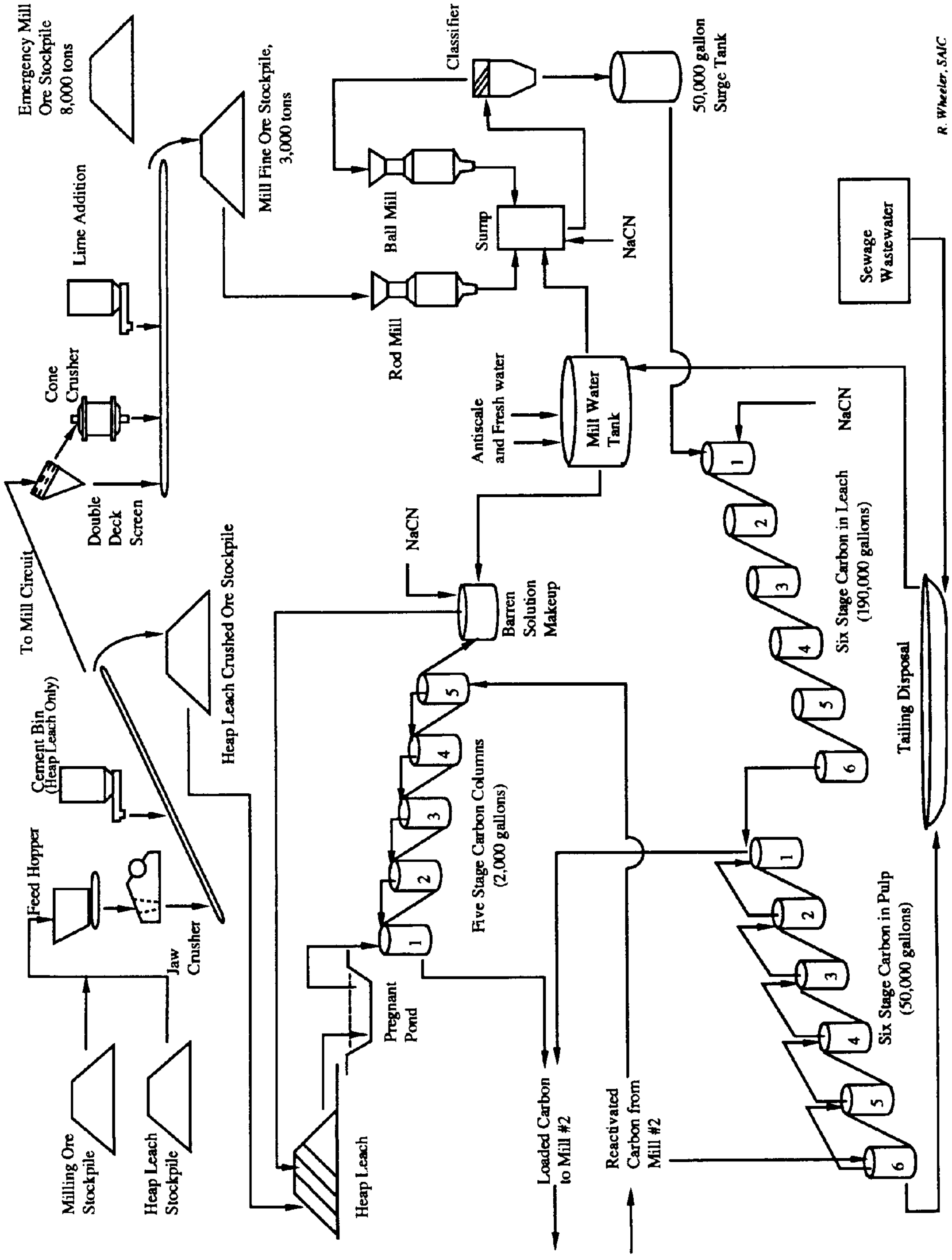
The Rain mine and mill were built between 1987 and 1988. Construction of the tailings dam began in October of 1987. Construction of the crusher foundation, leach pad, access road, and the solution handling system, carbon circuits, and water supply system was completed in April of 1988. According to the FEA, a work force from approximately 40 to as many as 150 people was estimated to be needed during construction, and 132 during normal operations. At the time of the site visit, 160 people were employed at the facility. The first gold production began on July 2, 1988 (Newmont Services, 1987b).

A Newmont Exploration Limited team is examining deposits west and east of the current pit in search of additional reserves. Ore resources in the immediate facility area (e.g., below the leach pad and under Rain peak) and on adjacent land may add to existing reserves and extend the life of the mine and mill. During the site visit, Newmont personnel noted the possibility of future underground mining to extract ore reserves below Rain Peak.

Several changes to the facility design described in the environmental assessment have occurred since the Rain facility began operation. The estimate of the volume of waste rock to be removed from the pit has increased from 37.5 to 62.5 million tons (Newmont Services, 1987b; and SRK, 1990). Original plans showed beneficiation continuing through electrowinning, at which point the steel wool cathode containing the gold would be sent to Newmont's Gold Quarry facility for refining (FEA, 1987). The primary operational difference between design plans in the environmental assessment and the "as built" facility is that beneficiation at the Rain facility ends when the carbon is loaded with gold. The loaded carbon is transported in a specially designed truck to the AARL/ZADRA facility at Gold Quarry (north of Carlin) for further beneficiation.

The total area of disturbance resulting from construction of the mine and mill is approximately 627 acres; widening of the existing Ridge Road for access disturbed a total of 43 acres. In early 1990, the estimate of the volume of material to be removed from the pit was 80.2 million tons (Knight Piesold, 1990). Of this, 6.7 million tons was considered to be mill grade ore, 11 million tons to be heap leach ore. Based on these figures the stripping ratio was about 3.55:1 (3.55 tons of waste rock must be removed to recover one ton of ore). At the time of the site visit, the stripping ratio was reported to be slightly lower, about 3.44:1.

Annual production of ore through the mill and leach pad is approximately 1.84 million tons. Roughly one million tons are heap leached, and the mill processes about 0.84 million tons annually. Ore grades for heap leaching are 0.01 to 0.05 ounces of gold per ton of ore. Mill grade material has a gold concentration of more than 0.05 ounces of gold per ton of ore. In 1988, the Rain facility produced approximately 115,000 ounces of gold. Heap leaching accounted for 13,100 ounces, while the mill produced 101,500 ounces. Material containing less than 0.01 ounces of gold per ton of rock is considered waste and disposed of in the waste rock dump. Individual flow charts showing flows of ore and solution at the Rain mine, mill, heap leach, and tailings process, were provided by Newmont after the site visit and are presented in Appendix 5-A (Newmont Gold Company, 1991b). A detailed description and flow chart (Figure 5-5


Emergency Mill Ore Stockpile 8,000 tons
Mill Fine Ore Stockpile, 3,000 tons
Lime Addition
Cone Crusher
Double Deck Screen
To Mill Circuit
Cement Bin (Heap Leach Only)
Feed Hopper
Jaw Crusher
Heap Leach Crushed Ore Stockpile
Milling Ore Stockpile
Heap Leach Stockpile
Heap Leach
Pregnant Pond
Classifier
50,000 gallon Surge Tank
Ball Mill
Rod Mill
Sump
NaCN
Antiscale and Fresh water
Mill Water Tank
NaCN
Barren Solution Makeup
Five Stage Carbon Columns (2,000 gallons)
Loaded Carbon to Mill #2
Reactivated Carbon from Mill #2
NaCN
Six Stage Carbon in Leach (190,000 gallons)
Six Stage Carbon in Pulp (50,000 gallons)
Sewage Wastewater
Tailing Disposal
R. Wheeler, SAIC

of the Rain operation is provided below.

During the visit, EPA reviewed Newmont's storage and handling methods for materials onsite. Support materials such as lubricating and hydraulic oils, truck fuel, and water are stored in tanks onsite; dry goods such as cyanide, cement, and lime are stored in large bins or bags, depending on the material. There is a 500-gallon tank for emergency generator fuel, a 30,000-gallon tank for truck fuel, a 6,000- gallon hydraulic oil storage tank, a 10,000-gallon waste oil tank, and a 6,000-gallon antifreeze tank. There are no underground storage tanks onsite. Sewage is piped to a treatment lagoon below the mill facility; effluent enters the tailings pipeline at about one gpm. Cyanide briquettes are stored in bins in a fenced area before use in the mill. Cement and lime are stored in 60- and 45-ton bins, respectively, in the crushing circuit. Drums of surfactants, antiscalant bags, and other goods are located near the points of use onsite. Magnesium chloride solution is stored in a tank where it is mixed with water and applied to the access road and other areas to control dust. Ammonium nitrate and fuel oil used during blasting is stored near the waste rock dump (away from most activity) and mixed onsite as needed.

Three wells located east of the facility in Dixie Flats can provide up to 1,200 gpm of fresh water. The water is piped 5.93 miles to the mill site in a 14-inch iron pipe buried four feet below ground. Two booster stations are used to pump the water upslope to the mill site. Two water tanks on the hill above the mill buildings store fresh water for the facility. A 15,000-gallon booster tank feeds a 200,000-gallon process, potable, and fire water tank. Newmont estimates that actual water consumption averages about 100 gpm on an annual basis; during dry months, consumption may reach 600 gpm.

5.2.1 Mining Operations

An open pit mine is used to remove ore and waste rock at Rain. The bottom of the pit is at 6,440 feet above sea level and is expected to reach 6,240 feet. The top of the pit is approximately 300 feet wide and 800 feet across and covers about 100 acres of the original ground surface. The pit is oriented northwest to southeast in alignment with the Rain fault. Access is by ramps entering from the east side; the pit is closed on the north, west, and south sides. The highwall on the west side rises approximately 600 feet from the bottom of the pit.

As the pit is extended downward, working benches are used to access the rock surface for drilling and blasting. Separate safety benches are left in the excavated wall to provide a catchment for localized pit slope failures. The pit is excavated in 20-foot working benches. Prior to blasting, drill hole cuttings (dry) are sampled for assaying and ore grading. The grade determines whether material is waste rock, leach ore, or mill ore. Visual observation determines if waste rock is sulfidic and must be handled separately. (Newmont reports it has undertaken a large-scale testing program to correlate visual classification of waste rock with the results of actual laboratory tests. As noted in section 5.3.2, Newmont samples waste rock for various parameters and for acid generation potential on a quarterly basis.)

After blasting, ore is loaded by front end loaders into 85- and 100-ton haul trucks and transported to either the waste rock dump or leach and mill ore stockpiles, as appropriate. As of 1990, estimates were that during the life of the mine, 80.2 million tons of rock would be removed from the pit. Of this, 6.7 million tons were projected to be mill grade, 11 million tons leach grade ore, and the balance of 62.5 million tons waste rock.

According to information presented during the site visit, an average of 35,000 tons of material is being removed from the mine each day. Of this, 5,500 tons is ore grade, 29,500 tons is waste. This rate may reach 7,000 and 40,000 tons per day, respectively (Newmont Gold Company, 1990d, 1991b). Ore material is separated based on grade and carried by 100-ton haul trucks to the leach or mill ore stockpiles. Of the 5,500 tons of ore mined each day, 3,150 tons is leach grade and 2,350 is mill grade. Waste rock removed from the pit is transported by 100-ton Wabco haul trucks to the waste rock dump for disposal. Mineral characteristics of the rock and disposal methods are discussed in Section 5.3.

The Rain facility employs unlined ore stockpiles. The stockpile for leach ore is referred to as the "primary" stockpile and typically contains about 250,000 tons; the mill ore stockpile is referred to as the "secondary" stockpile and typically contains about 50,000 tons. In some instances, leach ore may be carried directly from the pit or stockpile to the leach pad and not be sent through the jaw crusher. This material is referred to as run-of-mine ore. However, most of the leach ore is carried by truck to a stockpile located near the jaw crusher. Similarly, mill grade ore is carried to a stockpile adjacent to the leach ore stock. These piles near the crusher typically contain 30,000 tons of each ore, separated by a line of posts and old truck tires.

Prior to crushing, a front end loader selects mill or leach grade ore from the stockpiles, based on mill capacity and demand at the time. The primary jaw crusher is 36 by 48 inches, and can process 450 tons per hour to less than 6 inches in diameter. A slewing and luffing conveyor system is pivoted, depending on which ore type is being crushed. Mill grade ore is conveyed to the secondary crushing circuit; leach ore is fed from the conveyor to a pile located between the primary and secondary crushers.

Leach grade ore receives only primary crushing and agglomeration before being transported to the heap. Following crushing, about eight pounds of cement is added per ton of ore from a 60-ton storage bin to agglomerate the fine particles. Water is added through V-Jet sprays at a rate of about 10 gpm to begin cement agglomeration. Leach grade ore is stockpiled on the ground by the conveyor, away from subsequent crushing facilities, to be trucked to the heap. The volume in this stockpile varies.

When mill grade ore is crushed, the slewing and luffing conveyor is pivoted to a position above an ore bin that feeds the secondary crushing system. This system consists of a 5-by-16-foot Simplicity double deck screen and a 5.5-foot Nordberg cone crusher. Oversized material (greater than 3/4 inches) from the screen is passed to the crusher, while undersized ore falls directly to a conveyor belt. The cone crusher reduces the particle size of ore received from the primary crusher to less than 3/4 inches. The product from the screen and cone crusher is transported by conveyor to the 3,000-ton mill stockpile prior to entering the mill on a second conveyor. An emergency mill stockpile of 8,000 tons is maintained in the event the crusher circuit fails. To control pH, pebble lime is metered onto the mill feed conveyer from a 45-ton capacity bin at an average rate of 1.7 pounds per ton.

Dust generated while handling the ore during crushing and transport is controlled by fogging type spray nozzles. Water and a sodium and calcium stearate surfactant (at a total application rate of 600 cc/minute, of which 20 cc are surfactant) are applied where crushing and grinding take place, when cement or lime are added to the ore on the conveyor belt, and where ore is transferred from one conveyor belt to another. V-Jet sprays, as noted above, are used for agglomeration. Baghouses are used to capture dust emitted during loading of the cement and lime storage bins; baghouse material is recycled back to the respective bins.

5.2.2 Mill Operation

Ore is fed by conveyor into an Allis-Chalmers 400-horsepower rod mill at an average rate of 96 tons per hour, along with sufficient mill solution to make a slurry of 68 percent solids. Mill water supply is made up in a tank by adding reclaim water from the tailings impoundment, water treatments such as antiscalants (24 cc/min of polymaleic acid), and fresh water (as necessary), and is distributed throughout the mill. Newmont is required to sample reclaim water on a quarterly basis, and mill water supply is also sampled; recent analytical results for reclaim and mill water are presented in Tables 5-1

Table 5-1. Analysis of Reclaim Water Returned to the Mill from the Tailings Impoundment

Sample: Reclaim Water	Sample Date (values in ppm)			
Parameter	**12-6-90**	**3-4-91**	**4-30-91**	**7-29-91**
pH	9.9	10.0	9.5	8.8
TDS	830	660	830	1600
WAD Cyanide	40.0	14.0	5.8	9.6
Antimony	<0.05	<0.05	<0.05	<0.05
Arsenic	0.19	0.26	0.23	0.14
Barium	0.47	7.4	0.080	0.008
Cadmium	0.009	0.020	<0.005	0.005
Calcium	140	120	140	260
Chloride	69	96	110	260
Chromium	<0.005	0.009	<0.005	0.011
Copper	5.5	4.3	3.7	6.3
Fluoride	5.2	5.2	5.3	5.7
Iron	0.35	2.40	0.28	0.20
Lead	<0.005	<0.005	<0.005	<0.005
Magnesium	0.95	2.8	3.4	2.6
Manganese	<0.005	0.026	<0.005	0.012
Mercury	0.32	0.30	0.33	0.29
Molybdenum	<0.082	0.066	0.065	0.12
Nitrate	17.0	14.0	14.0	24.0
Selenium	0.27	0.08	0.05	0.12
Silver	<0.005	<0.005	<0.005	<0.005
Sodium	140	99	130	250
Sulfate	310	250	310	700
Thallium	<0.005	<0.005	<0.1	<0.1
Zinc	0.99	1.20	0.27	0.21

Source: Data aggregated from quarterly reports submitted by Newmont to NDEQ as required by permit.

and 5-2, respectively.

Table 5-2. Analysis of Mill Water

Sample: Mill Water Supply	Sample Date (values in ppm)
Parameter	**12-30-90**
pH (s.u.)	8.1
TDS	210
WAD Cyanide	<0.005
Arsenic	<0.005
Barium	0.17
Bicarbonate	170
Cadmium	<0.005
Calcium	33.0
Chloride	12.0
Chromium	<0.005
Copper	<0.005
Fluoride	<0.5
Lead	<0.005
Magnesium	<0.01
Mercury	<0.0001
Nitrate + Nitrite	0.14
Selenium	<0.005
Silver	<0.005
Sodium	24.0
Sulfate	16
Zinc	<0.005

Source: Data aggregated from information on file with NDEQ.

Mill solution is circulated at approximately 600 gpm, most of which is recycled from the tailings impoundment (Table 5-1). Fresh water makeup averages 30 to 50 gpm, with maximum fresh water demand (up to 550 gpm) occurring in late summer. The rod mill discharges into the cyclone feed sump, where cyanide is added at an average rate of 0.28 (maximum rate is 0.50) pounds per ton of ore. The cyanide solution is made up by adding 50 pounds of caustic to each 3,000 pounds of sodium cyanide. Caustic is added to maintain the pH of the working solution above 10. At 2,000 gallons per batch, a 3-day capacity of cyanide solution is maintained onsite (approximately 6,000 $\pm$ 2,000 gallons). The cyanide solution is transferred from a mixing tank, through the plant, to the cyclone feed sump in schedule 80 steel pipe (see Appendix 5-B).A pump transfers the slurry from the sump to four cyclone classifiers. Cyclone underflow is transferred to secondary grinding to further reduce the particle size. An Allis-Chalmers 800-horsepower ball mill is used to reduce coarse particles and discharges to the cyclone feed sump pump for transfer back to the classifiers. Cyclone overflow passes a trash screen to remove wood and other coarse material. These screens generate approximately one ton of trash per week, and the material collected is hauled to the leach pad. Ore output from the classifier is 70 percent less than 200 mesh (0.003 inches, or 74 microns) and is transferred to a 50,000-gallon surge tank before entering a series of six leach tanks.

Each of the leach tanks has a capacity of 190,000 gallons (see Figure 5-5). A low concrete retaining wall surrounds the surge and leach tanks; Newmont staff indicate that it would contain at least 190,000 gallons (the volume of one of the leach tanks). Cyanide may be added in the leach tanks as needed, but this is not typically required at Rain. Ore slurry from the surge tank is transferred by pump to the first leach tank. An agitator is used in each leach tank to keep the ore in suspension. Air is injected to supply oxygen necessary for the cyanide to dissolve the gold. The slurry flows continuously by gravity through tanks 1 to 6 (residence time in the leach tanks was not determined). Both the path and flow rate are controlled by gate valves at the top of the tanks. As the slurry moves through tanks 1 to 6, the barren cyanide solution leaches gold, silver, and some mercury from the ore, forming a pregnant solution in the presence of the spent or leached ore. The total residence time in the six leach tanks is approximately 36 hours.

From the leach tanks, the slurry is transferred to a series of six Carbon-In-Pulp (CIP) tanks (see Figure 5-5). Each tank has a 50,000-gallon capacity; an agitator is used to keep the slurry in suspension, and air is injected to promote adsorption of the metal-cyanide complex onto activated carbon. The pregnant solution and spent ore enter tank number 1 and move by gravity toward tank number 6. Activated carbon (6 by 12 mesh; 1.4 to 3.6 millimeters) is added to tank number 6 at a rate of 2.2 tons per day and moves sequentially through tanks 5 to 1 every 24 hours. The carbon slurry flows by gravity across a screen that traps the coarse grain carbon; from there, carbon is advanced by pump to the next tank, counter-current to the slurry flow. With each succeeding tank (from 6 to 1) the carbon adsorbs more of the gold. By contrast, less gold is in solution as the ore slurry moves through succeeding tanks (from 1 to 6).

Loaded carbon exiting tank 1 contains approximately 250 ounces of gold per ton of carbon and lesser quantities of silver and mercury. Carbon from the CIP circuit is washed over screens to remove fine carbon particles. About 2.2 tons per day of coarser particles are pumped to a 10-ton holding tank prior to shipment by truck to Newmont's Gold Quarry facility, where the gold is recovered from the carbon and the carbon reactivated. After reactivation, the carbon is returned to the Rain facility. Fine carbon particles that pass through the screen are collected in drums until sufficient quantities accumulate; about 2.6 tons of fine carbon product is generated each month. This is either shipped to the Gold Quarry facility or to a third party to recover the metal values.

Tailings composed of mill solution, spent ore, and small quantities of carbon that pass the screens in the CIP tanks report to the tailings impoundment via a 12-inch diameter HDPE pipe 2,400 yards long. Tailings exit the mill by gravity flow at approximately 800 gpm, containing 35 to 40 percent solids. The solution has a pH of approximately 10, and weak acid dissociable cyanide of approximately 30 parts per million (ppm) (Newmont Gold Company, Quarterly Monitoring Reports). The facility is required to monitor tailings water quarterly from a spigot in the pipeline. Results of four quarters between 1990 and 1991 are shown in Table 5-3

Table 5-3. Analysis of Tailings Water

Sample: Tailings Water	Sample Date (values in ppm)			
Parameter	**12-6-90**	**3-4-91**	**4-30-91**	**7-29-91**
pH (s.u.)	9.9	10.6	10.4	10.4
TDS	590	440	700	1500
WAD Cyanide	35	25	19	20
Antimony	<0.05	<0.06	0.06	0.17
Arsenic	0.30	0.33	0.11	38.00
Barium	0.14	0.42	0.27	2.50
Cadmium	0.013	0.011	0.006	0.150
Calcium	90	120	140	730
Chloride	53	98	110	280
Chromium	<0.005	<0.005	<0.005	2.300
Copper	4.3	4.4	3.3	10.0
Fluoride	3.8	0.9	4.9	1.6
Iron	0.51	0.15	0.22	1300
Lead	<0.005	<0.005	<0.005	<0.005
Magnesium	0.31	0.12	0.10	32.00
Manganese	<0.005	<0.005	<0.005	11.00
Mercury	0.079	0.340	0.530	3.400
Molybdenum	0.070	0.084	0.070	<0.05
Nitrate	12.0	16.0	16.0	26.0
Selenium	0.250	0.094	0.082	0.140
Silver	<0.005	<0.005	<0.005	0.005
Sodium	90	89	130	260
Sulfate	250	240	120	120
Thallium	<0.005	<0.005	<0.005	3.2
Zinc	0.74	0.41	0.29	0.48

Source: Data aggregated from quarterly reports submitted by Newmont to NDEQ as required by permit.

On August 19, 1988, the tailings line became plugged, causing the mill tailings to leak out of the vents in the line. According to Newmont, most of the leaking vents were within the limits of the tailings impoundment. Newmont estimated that 12.46 pounds of cyanide were released in a 10.4 pH solution. Both the Nevada Department of Emergency Management (Incident No. 81908C) and the National Response Center (Incident No. 11505) were notified. Cleanup consisted of scooping up the material spilled outside the tailings impoundment and placing it within the limits of the impoundment. To prevent the problem in the future, the tailings line was repositioned so that all vents would spill into the limit of the tailings impoundment (Newmont Gold Company, 1988d).

In the event of a spill in the mill, floor drains in the concrete floor run to sumps in the grinding and carbon handling areas. Fresh water may be used to flush material into the sumps for return to the appropriate mill circuit. The surge, leach, and CIP tanks are located outside the mill building and are surrounded by a low concrete retaining wall.

Blowers in the mill building exchange the air to avoid any buildup of cyanide gas. In addition, workers must wear fully self-contained breathing apparatus for protection from fumes during the mixing process. Alarms are located throughout the building and are activated if hydrogen cyanide levels exceed five ppm. As reported during the site visit, this alarm has sounded one time, in response to spilling one or two cyanide briquets on the floor while adding sodium cyanide to the mixing tank.

5.2.3 Heap Leach

The Rain heap leach covers an area of approximately 71 acres in the valley above the tailings impoundment (Newmont Gold Company, 1990d). Prior to constructing the pad, a French drain system was installed to remove soil moisture seepage collected from the natural drainage system. West and east drains were installed. These drains also collect any fugitive process fluids from the pad. Fluid collected by the drains is transported to the tailings impoundment in a High Density Polyethylene (HDPE) pipe (size unknown). According to Newmont, the west French drain discharges an average of 0.88 gpm (maximum of 10.2 gpm), and the east French drain discharges an average of 0.29 gpm (maximum of 4.2 gpm) (Newmont Gold Company, 1991b). Discharge from these drains is reported in Quarterly Monitoring Reports; data for the last three quarters is presented in Section 5.4.1.3.The pad overlies the French drain system; it consists of 12 inches of compacted native soil covered by an 80-mil HDPE synthetic liner; the synthetic liner is protected by an 18-inch layer of gravel. The gravel is drained by a network of perforated collection pipes that collect the gold-laden leachate (pregnant solution) and minimize the buildup of hydraulic head (NDEP, 1988a; Newmont Gold Company, 1990d).

Ore is delivered to the pad in 100-ton haul trucks. The trucks deliver crushed ore from the leach ore stockpile near the mill at an average rate of 3,150 (9,500 maximum) dry tons per day. Run-of-mine ore is delivered directly from the pit at an average rate of 555 (6,000 maximum) dry tons per day. As designed, the pad is divided into 30 cells, each covering approximately 100,000 square feet. The pad is constructed in 20-foot lifts. Two lifts have been constructed. Ultimately, a total of 10 lifts will bring the height of the heap to 200 feet. Leach ore is currently placed on the pad at a rate of about one million tons per year. Total capacity of the heap is 11 million tons.

Barren solution contains a working concentration of about 50 ppm cyanide. An average of 214 pounds of sodium cyanide is added to the barren solution per day to maintain a working concentration, but peak demands may be as high as 400 pounds per day. Sodium hydroxide is added to maintain a solution pH of about 10.0. The average rate of addition is 437 pounds per day (maximum of 1,000 pounds). Antiscalant is added to both the barren and pregnant solution at 14 cc per minute to control scale build-up. Make-up water is added to the solution at a rate ranging from less than one gpm in April and May to as high as 100 gpm during the hot, dry months of July and August. A chemical analysis of the barren solution following makeup is presented in Table 5-4

Table 5-4. Analysis of Barren Solution

Sample: Barren Solution	Sample Date (values in ppm)			
Parameter	**12-6-90**	**3-4-91**	**4-30-91**	**7-29-91**
pH (s.u.)	9.4	10.3	10.1	10.1
TDS	930	660	930	1900
WAD Cyanide	34.0	24.0	34.0	66.0
Antimony	<0.050	<0.005	<0.050	<0.050
Arsenic	0.21	0.67	0.52	0.59
Barium	0.09	0.07	0.07	<0.05
Cadmium	0.018	0.019	0.016	0.014
Calcium	190	150	150	160
Chloride	120	130	110	170
Chromium	0.056	0.100	0.054	0.019
Copper	6.2	6.4	6.2	9.1
Fluoride	1.2	1.9	1.5	1.4
Iron	0.55	0.05	0.11	0.47
Lead	<0.005	<0.005	<0.005	<0.005
Magnesium	1.70	0.33	1.20	1.80
Manganese	0.038	<0.005	<0.005	0.027
Mercury	4.6	3.6	1.7	6.1
Molybdenum	0.100	0.320	0.170	0.082
Nitrate	56	37	38	43
Selenium	0.120	0.090	0.061	0.080
Silver	<0.005	<0.005	<0.005	<0.005
Sodium	120.0	71.0	130.0	430.0
Sulfate	260.0	170.0	250.0	860.0
Thallium	<0.01	<0.005	<0.01	<0.10
Zinc	0.35	0.13	0.23	0.28

Source: Data aggregated from quarterly reports submitted by Newmont to NDEQ as required by permit.

The solution is pumped to the heap at an average of 551 gpm, and applied at a rate of 0.006 gpm per square foot (Newmont Gold Company, 1991b). This rate is sufficient to leach approximately one cell at a time.

In warm months, the barren solution is applied using rotary sprinklers. During the site visit, some ponding was observed on a portion of the heap surface, and spray was felt on another portion of the heap, a short distance away from the cell being leached (according to the representative of the Nevada Department of Wildlife who participated in the site visit, such ponding has not resulted in any wildlife mortality at Rain). In winter, a drip system is used to prevent accumulation of ice on the surface of the heap. Lime is added directly to the top of the heap as needed to maintain the solution pH at or near 10. According to the environmental assessment (Newmont Services, 1987b), 10 percent of the solution applied to the heap was expected to be lost to evaporation and a smaller portion absorbed by the ore material.

Once applied to the heap, the barren cyanide solution dissolves the gold values. The solution, with increasing amounts of gold, percolates through the pile to the perforated pipe located above the liner. The pipes convey the pregnant solution to lined collection ditches that extend around three sides of the pad and connect to the pregnant solution pond. The pregnant pond is located at the base of the heap in the valley bottom above the tailings impoundment. The pond is designed to hold five million gallons of solution. It is double lined with a leachate detection and recovery system between the liners. The lower liner, of unspecified-grade HDPE, overlies 12 inches of compacted native clay. A geotextile material was installed above the lower liner to allow detection and, as necessary, collection of any fugitive pregnant solution escaping the 80-mil HDPE primary liner. In the event that solution is observed, a sump is used to pump liquid to the tailings impoundment. According to Newmont, the leak detection system recovers an average of 0.38 gallons per day (gpd) and a maximum of 15 gpd. If the pregnant pond overflows, solution enters a ditch lined with an 80-mil HDPE liner, which drains by gravity to the tailings impoundment. Solution concentrations and Newmont's management strategy are discussed in Rain's "Fluid Management Plan, Best Management Plan" (NDEP, 1988a; and Newmont Gold Company, 1991b).

As a requirement of their Water Pollution Control Permit, Newmont analyzes pregnant solution chemistry quarterly. In the past 4 quarters, pH values have ranged from 9.8 to 10.3; WAD cyanide from 19 to 53 ppm; sulfate from 180 to 880 ppm; and mercury from 3.9 to 6.9 ppm. Chemical analysis of the pregnant solution for this period is presented in Table 5-5

Table 5-5. Analysis of Pregnant Solution

Sample: Pregnant Solution	Sample Date (values in ppm)			
Parameter	**12-6-90**	**3-4-91**	**4-30-91**	**7-29-91**
pH (s.u.)	9.8	10.3	9.8	10.0
TDS	910	750	900	1800
WAD Cyanide	53.0	28.0	19.0	28.0
Antimony	<0.05	<0.05	<0.05	<0.05
Arsenic	0.22	0.65	0.52	0.56
Barium	0.09	<0.06	0.08	<0.05
Cadmium	0.017	0.019	0.016	0.017
Calcium	160	150	150	160
Chloride	110	130	80	160
Chromium	0.06	0.1	0.056	0.019
Copper	6.2	6.5	6.6	9.2
Fluoride	1.4	1.9	1.6	1.4
Iron	0.56	0.04	0.08	0.45
Lead	<0.005	<0.005	<0.005	<0.005
Magnesium	1.7	0.54	1.2	1.9
Manganese	0.041	<0.005	<0.005	0.027
Mercury	6.9	4.6	3.9	4.3
Molybdenum	0.1	0.32	0.17	0.079
Nitrate	50	38	37	19
Selenium	0.14	0.092	0.084	0.085
Silver	0.006	<0.005	<0.005	0.009
Sodium	95	92	110	400
Sulfate	220	180	240	880
Thallium	<0.01	<0.005	<0.01	<0.1
Zinc	0.36	0.13	0.23	0.28

Source: Data aggregated from quarterly reports submitted by Newmont to NDEQ as required by permit.

A pump transfers the pregnant solution to the Carbon-In-Column (CIC) circuit in the mill building at a rate of approximately 550 gpm. The Rain CIC circuit consists of five columns, each with a capacity of approximately 2,000 gallons. Pregnant solution enters column number 1 (see Figure 5-5). Fresh, activated carbon (6-by-12 mesh; 1.4 to 3.6 mm) enters column number 5 at an average of 0.4 tons per day (maximum 1.0) and is pumped sequentially through tanks 5 to 1. In the tanks, the solution flows by gravity across a carbon screen. The carbon collected on the screen is advanced by pump on an hourly basis to the next tank, counter-current to the solution flow. With each succeeding tank (from 5 to 1) the carbon adsorbs more of the gold. By contrast, less gold is in solution as the pregnant solution moves through succeeding tanks (from 1 to 5). Fully loaded carbon exits tank number 1 and is pumped to the 10-ton holding tank for transfer to the Gold Quarry facility. Barren solution exits tank number 5 and is returned to the barren solution make-up tank in the mill building, where cyanide, sodium hydroxide (to buffer the pH), and water are added prior to recycling it back to the heap.

The Rain operation does not use a barren solution pond in its fluid management system. All the solution resides in the process circuit, the heap, and the pregnant pond.

5.2.4 Facility Control Room

As part of the facility walkthrough, site visit participants viewed the mill control room as well as the equipment and vehicle maintenance building. The control room monitors and controls mill tonnage, slurry flow rates, solution chemistry, and various liquid levels in tanks throughout the mill building. An operator is on duty at all times to note changes and record conditions at scheduled intervals. Cyanide levels in the leach and mill circuits are determined by the operator every two hours by titration with silver nitrate; these values are averaged every 24 hours.

5.3 MATERIALS AND WASTE MANAGEMENT

For purposes of this discussion, materials management practices at the Rain facility are divided into process and waste management units. Process units are those that contain materials that are not considered wastes until after facility closure. Examples of process units (and process materials) are heap leach pads (and spent ore) and the open pit (and mine water that may reside in the pit). Waste units are those that contain materials that will undergo no further beneficiation. Examples of these include waste rock piles and the tailings impoundment.

Waste rock removed from the pit during mining is disposed in the waste rock dump. Mill tailings are disposed in the tailings impoundment. Tailings water is recycled to the mill or heap continuously until facility closure. Smaller volumes of other wastes generated onsite include sanitary sewage, waste oil, grease, used tires, and refuse.

5.3.1 Mine Pit and Heap Leach

According to Newmont, closure is tentatively scheduled for 1995. Mill activity will cease about one year before leaching ends. However, experience at the Newmont Gold Quarry facility indicates active leaching may continue for two to three years following the last addition of ore (Newmont Gold Company, 1990d).

The final depth of the Rain Pit may reach 6,240 feet asl. According to Newmont, it is not expected to extend below the water table, though perched aquifers may be encountered. Inflow to the pit by direct precipitation and ground water is not expected to cause ponding in the pit. In addition, Newmont will construct diversion ditches on the slope above the pit to limit surface water inflow (Newmont Gold Company, 1990d).

The mill leach circuit will stop operation when all mill grade ore is removed from the pit. The remaining mill solution will be combined with the leach circuit. The CIC circuit will continue to recover gold values until heap leaching stops as noted above. Newmont has not indicated what will be done with the mill facility in their Tentative Closure Plan (Newmont Gold Company, 1990d).

Section 5.2.3 above describes the construction of the heap leach and the quantities of spent ore (i.e., up to 11 million tons) that will remain on the pad at closure. At closure, the spent ore will be rinsed to meet State of Nevada regulations, which require that effluent rinse water have weak acid dissociable (WAD) cyanide levels below 0.2 mg/liter and a pH between 6 and 9. As currently planned, fresh water will be used to rinse the heap. The addition of calcium hypochlorite, ferric sulfide, hydrogen peroxide, or other chemicals may be required to detoxify the residual cyanide in the heap. A second rinse with the possible addition of acid may be required to lower the pH. Following the rinse cycle, the leaching solution will require disposal. Newmont is conducting test work on the best method to rinse the spent ore. According to the environmental assessment (Newmont Services, 1987b), the heaps will be covered with topsoil and revegetated. Newmont also is considering reclamation as a means to mitigate the concern for mobilization of contaminants by meteoric water. The premise is that infiltration will be eliminated by a soil and vegetation cover (Newmont Gold

Company, 1990d). As described in Section 5.4.1.2, Newmont is in the process of preparing a reclamation plan for submission to the State (Newmont Services, 1987b).

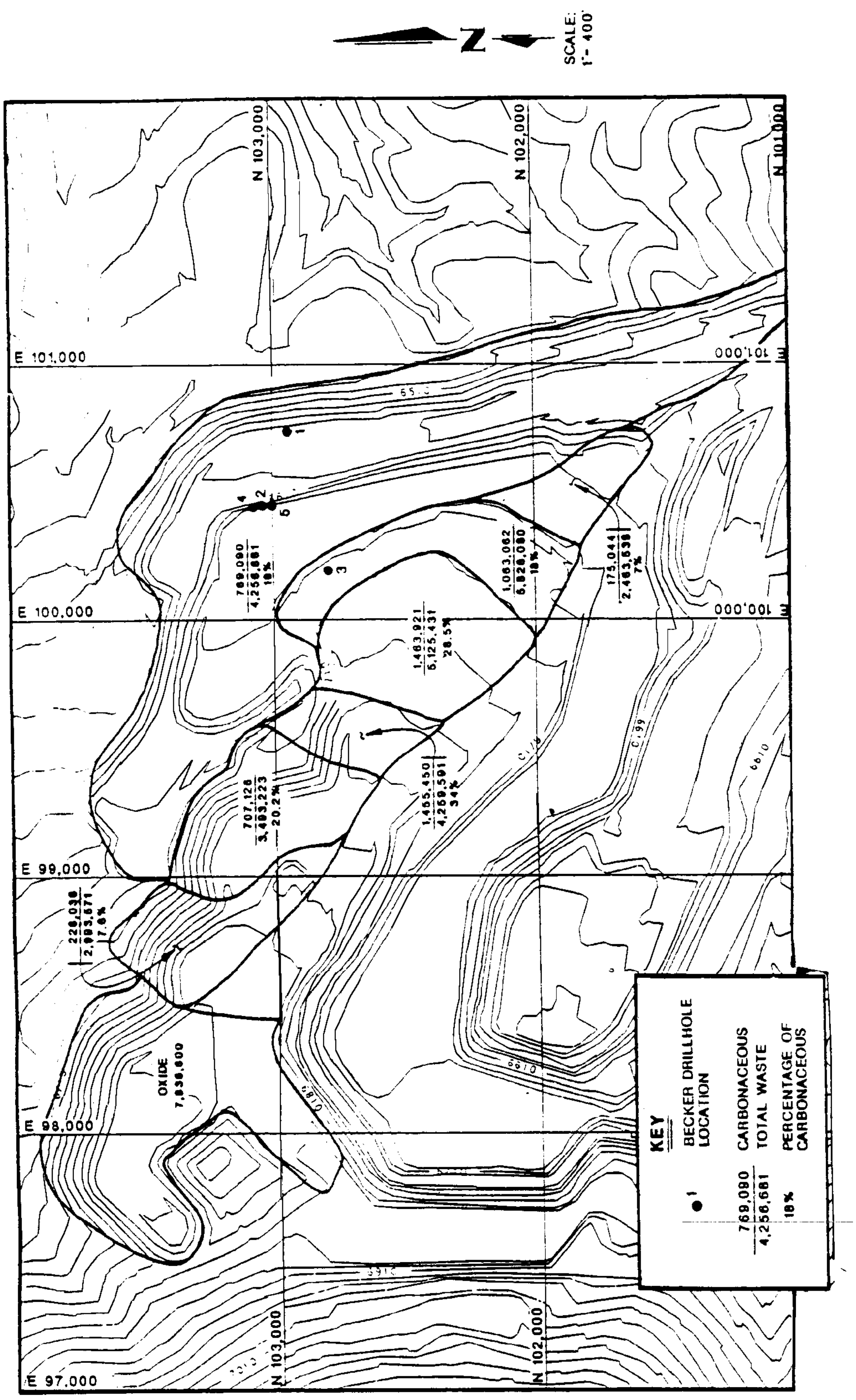
5.3.2 Waste Rock Dump

Currently, the waste rock dump covers 211 acres and is located north and east of the pit. Waste rock production from the pit averages 29,500 tons per day. Of this, 7,500 tons are sulfidic and 22,000 tons oxide. Newmont estimates that by mine closure in 1995, there will be 62.5 million tons of waste rock; of this, 77.8 percent is expected to be mostly oxidized mixed sedimentary material of the Webb Formation (some of which will contain sulfide mineralization), 15.4 percent will be carbonaceous and potentially sulfidic, 4.3 percent will be limestone of the Devil's Gate Formation, and 2.5 percent will be alluvium from surface deposits. Based on mining records prior to August 1990 and the expected future mining schedule, waste rock tonnage by type of rock is presented in Table 5-6. The distribution of carbonaceous versus total waste in the waste rock dump as of June 1990 is presented in Figure 5-6

Table 5-6. Projected Waste Rock Generation (Waste Tonnages X 1000)

Year	Total	Carbonaceous	Limestone	Other	Alluvium
to 8/90	34,768	5,187	222	29,049	310
8/90 to 12/90	6,630	815	---	5,389	426
1991	7,169	2,050	---	4,508	611
1992	6,352	969	645	4,521	217
1993	5,154	544	824	3,786	---
1994	2,180	38	823	1,319	---
1995	267	---	205	62	---
TOTAL	62,520	9,603	2,719	48,634	1,564

Source: SRK, 1990


N
SCALE: 1" = 400'
N 103,000
N 102,000
N 101,000
E 101,000
E 100,000
E 99,000
E 98,000
E 97,000
KEY
BECKER DRILLHOLE LOCATION
CARBONACEOUS
TOTAL WASTE
PERCENTAGE OF CARBONACEOUS
769,090
4,256,681
18%

(SRK, 1990; Newmont Gold Company, 1990d).

Prior to the spring of 1990, sulfide, oxide, and calcareous waste rock were disposed together. On May 8, 1990, acid drainage was observed flowing from the base of the waste rock dump and into the unnamed drainage above Emigrant Spring, toward Dixie Creek. Inspection of the drainage downstream of the dump revealed that approximately two miles of the channel contained a red-brown precipitate. Discharge to the drainage was estimated by Newmont to be 3 gpm. Surface-water samples were taken along 5 points in the drainage above and below Emigrant Springs in May, June, and July of 1990. They showed pH values ranging from 2.37 to 3.21 near the base of the waste rock at the discharge point, and from 6.5 to 8.64 about 4,000 feet downstream. Arsenic near the effluent point was 46 ppm in May and 1.5 ppm in July; at the distant sampling point, arsenic was 0.023 ppm in May and 0.005 ppm in July. Mercury near the discharge point was 0.19 ppm in May and 0.0019 ppm in July; at the distant sampling point, mercury was <0.0001 ppm in May and 0.0003 ppm in July (SRK, 1990). Results of the chemical analyses are presented in Appendix 5-B, Tables 5-14 through 5-19.

In response to the drainage, Newmont took the following actions. By May 9 (one day after the drainage was noted), a small pond was constructed to collect the flow from the dump. On May 11, an HDPE liner was installed in the pond. On May 18, Newmont constructed a cutoff trench across the channel downstream of the collection pond to collect subsurface solution. The trench was twenty feet deep and forty feet across and included a HDPE liner. Inflow to this trench was pumped to the collection pond and then trucked to the tailings impoundment for disposal (Newmont Gold Company, 1990b).

Newmont notified the Nevada Division of Environmental Protection (NDEP) of the situation on May 10, 1990.

Newmont's assessment of the acid drainage problem noted that it occurred during the snowmelt period of 1990 and cites two contributing factors for the occurrence of discharge. First, snow accumulation removed from other areas of the facility was disposed of on a localized area of the dump. The volume in the pile may have represented as much as 5 to 15 times the average snow pack. Second, the premining topography of the dump area collects and concentrates surface drainage from a watershed of about 35 acres. As the snow melted, it infiltrated the waste rock pile, oxidizing sulfur-bearing minerals and generating acid. The solution migrated along premining topography and discharged at the toe of the dump.

Long-term mitigation of the acid drainage problem was proposed by Newmont in the "Rain Project Solution Collection and Return System Design Report" (SRK, 1990). The State and BLM approved the plan and construction began in November of 1990 and was completed in March of 1991. The solution collection and return system consists of surface and subsurface water collection and recovery. Surface water is collected by a ditch and drains to a sump located at the toe of the waste rock pile. Drainage collected by the sump drains by gravity to a 200,000-gallon capacity, double-lined pond. Subsurface flow is recovered in an HDPE-lined trench and also drains to the double-lined pond. At the time of the site visit, discharge from the waste rock dump was estimated to be less than one gpm. Following the site visit, Newmont supplied data indicating that flows average 23.8 gpm with a maximum of 183 gpm (Newmont Gold Company, 1991b). In the event of a power failure, the pond has a capacity to retain in excess of 65 hours of inflow at the maximum projected flow. In addition, storm water from the surface of the waste rock dump and surrounding area is collected in a single-lined, 600,000-gallon pond located just below the double-lined pond. Solution from both ponds is pumped to the mill area and added to the tailings pipeline (SRK, 1990).

In addition to these engineering designs for acid drainage recovery, Newmont has changed its waste rock disposal practices for material with the potential to generate acid drainage. Of the final estimated volume of waste rock, approximately 15 percent (9.6 million tons) is expected to be carbonaceous and potentially sulfidic. More than one half of this was generated before the acid drainage problem developed in May of 1990. Prior to this, sulfide material was mixed with oxidized material or the limited quantity of calcarious material available to buffer any acidic solution generated. The sulfidic materials are fine to coarse grain sedimentary rocks extracted primarily from the Webb Formation.

Sulfidic waste rock is now being encapsulated within oxidized and/or calcareous waste rock that has either no net acid generating potential or some acid neutralizing potential. This is accomplished by placing a pervious layer of coarse oxidized waste rock on the native soil. On this, five feet of compacted oxidized ore is placed. Additional oxide ore is placed against the natural hillslope to act as a barrier. These layers act as barriers to water movement into and out of the sulfide waste rock. Following these steps, sulfidic waste rock is placed on, and in front of, the oxide ore. Several lifts are expected to be added to the sulfide waste pile. Haul trucks follow random routes during construction to compact the material, thereby reducing its permeability. Eventually, the front edge and top will be covered with 15 feet of oxidized material to complete the encapsulation.

As part of the revised Water Pollution Control Permit (see Section 5.4), Newmont reports quarterly on results of Meteoric Water Mobility testing and Waste Rock Analysis (see Appendix 5-E for NDEP guidance on this procedure). The meteoric mobility test is an extraction procedure. The extracted solution is analyzed for nitrate, phosphorous, chloride, fluoride, total dissolved solids, alkalinity, sulfate, and metals. Waste rock analysis is intended to determine the net acid generation potential of the material placed in the waste rock dump during the quarter. Samples are collected daily during the quarter and classified based on their net carbonate value as sulfate, highly basic, basic, slightly basic, neutral, slightly acidic, acidic, or highly acidic. The quarterly composite sample to be analyzed is prepared on a tonnage weighted average for each classification and aggregated prior to analysis.

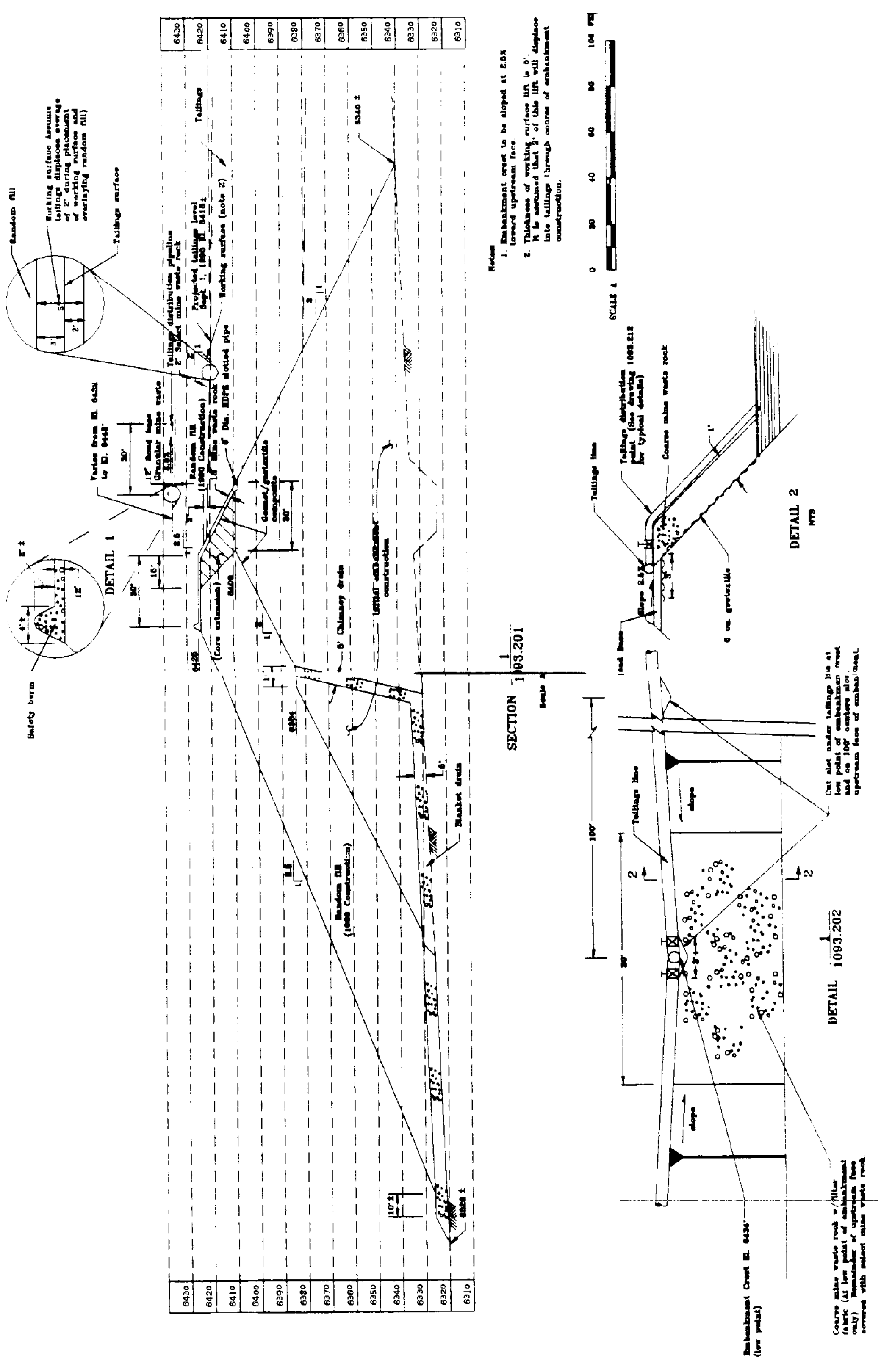
Data were available for the third and fourth quarters of 1990 and the first quarter of 1991. Results of the meteoric water mobility test for this period are presented in Appendix 5-C, Tables C-1, C-2, and C-3. Third quarter results for the waste rock analysis indicate a net acid generation potential of -10.6 tons of $CaCO_3$ for each 1,000 tons of waste. This suggests that the wastes generated during this quarter have sufficient buffering capacity to neutralize any acid solution generated by sulfidic material. Fourth quarter results show a large shift, with an acid generating potential of 5.35 tons of $CaCO_3$ for each 1,000 tons of waste. The total acid generating potential of waste rock disposed during this quarter is equivalent to the amount of acid neutralized by 5.35 tons of $CaCO_3$ for each 1,000 tons of waste rock. For the first quarter of 1991, waste rock analysis data show a net acid generating potential of 8.57 tons. In these circumstances, Newmont is required to perform kinetic testing according to State of Nevada protocol. Results of this analysis were not available; however, in the third Quarterly Monitoring Report for 1991, Newmont indicated that column studies are underway to fulfill this requirement.

The waste rock dump is not expected to require more space than the 211 acres it currently covers; however, waste rock will continue to be added, with a projected total of 62.5 million tons by 1995. At closure, the surface will be graded. Topsoil stockpiled during start-up (and which is presently stockpiled near the dump and was observed during the site visit to have a vegetative cover of grasses) will be distributed over disturbed areas and revegetated.

5.3.3 Tailings Impoundment

The Rain tailings impoundment is located downgradient from the heap leach facility and pregnant pond. According to the environmental assessment (Newmont Services, 1987b), the impoundment was originally planned to cover 109 acres. The ultimate surface area of the impoundment is now anticipated to be approximately 189 acres, with a total capacity of about 6.7 million dry tons of tailings (Newmont Gold company, 1990d). The impoundment is designed to contain the flow in the watershed from the 100-year, 24-hour storm event (the original Water Pollution Control Permit required containment for the 100 year, 72-hour storm event, with an additional two feet of free board; this was modified to the present capacity in a 1990 amendment [the permit is discussed in section 5.4.1.3]). The structure is designed to withstand the maximum credible earthquake expected in the area (Newmont Services, 1987b). Originally, the impoundment was to be a "bathtub" design, containing all fluids with no discharge beyond the tailings impoundment dam (NDEP, 1989); this has since changed, as described below. Monitoring wells were installed downgradient of the dam to verify the facility's compliance with its design standard of zero discharge.

Construction of the tailings dam began in October 1987 and was completed by the summer of 1988. Since initial construction, two additional lifts have been added to the dam to expand the storage capacity of the impoundment, and additional lifts are planned. The first lift was added in 1989, the second in 1990. Figure 5-7

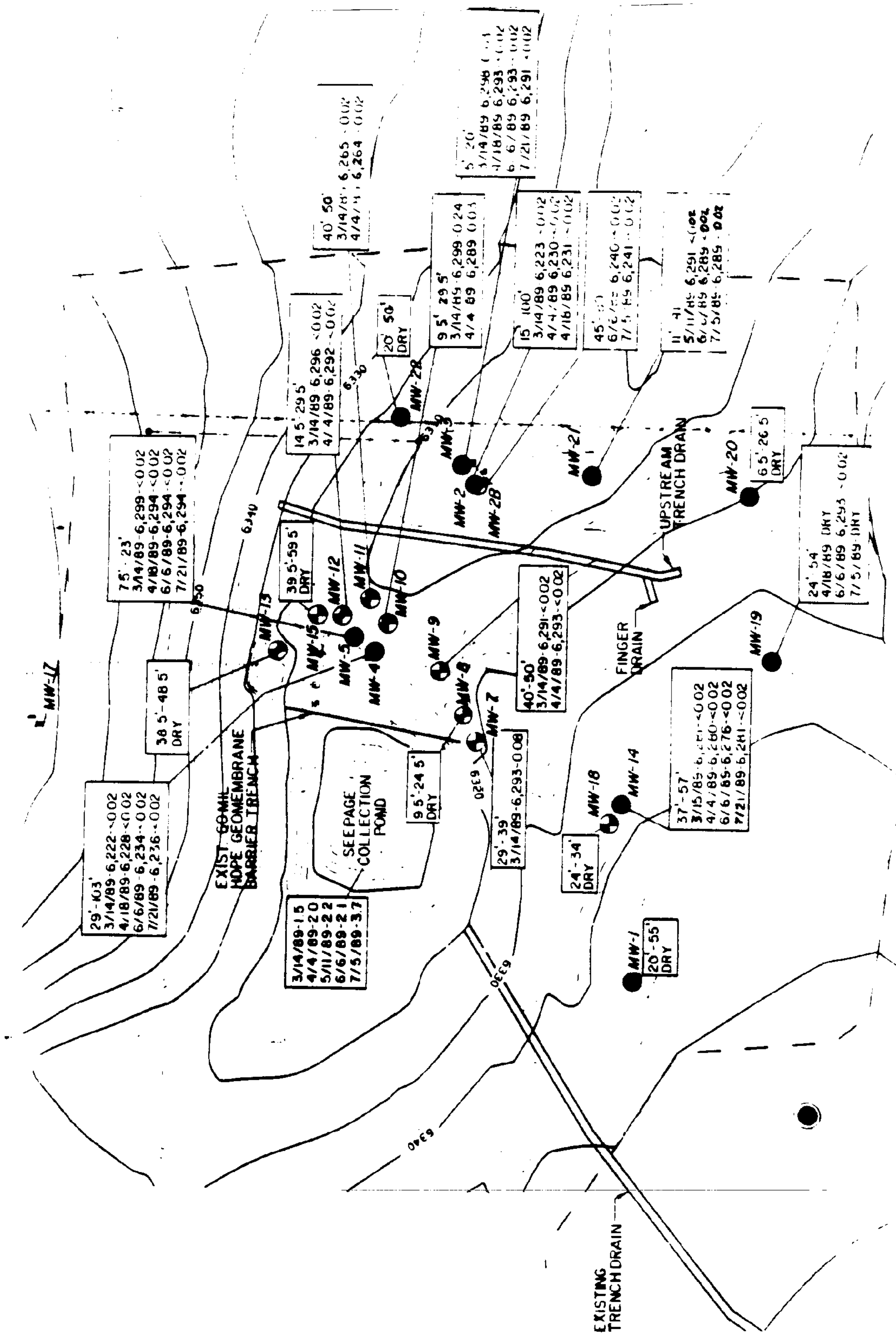

DETAIL 1
SECTION 1/1093.201
DETAIL 2
DETAIL 1/1093.202

is a cross-section of the dam showing the three phases of construction. Tailings from the mill are added to the inside face of the embankment so slimes can accumulate and form a barrier; tailings form an upstream slope away from the dam. Water ponds at the base of this slope, in the upper portion of the impoundment away from the dam. Supernatant is reclaimed and returned to the mill as process water. Keeping the supernatant pond in the upper reaches of the impoundment reduces the gradient of the phreatic line and thus the potential for seepage through the lower impoundment and the dam.

According to the environmental assessment, most of the tailings impoundment was underlain by naturally occurring highly impermeable clay. The maximum permeability was 10^{-7} cm/sec., with some areas having permeabilities of 10^{-8} or 10^{-9} cm/sec. An area on the northwest side of the future dam location consisted of alluvial material having a potentially high seepage rate. This area was to be covered with a clay liner similar to the natural clay material. The core of the dam was also to be constructed of the same material (Newmont Services, 1987b).

The initial dam structure was designed (by Call and Nicholas Inc.) as an earth fill embankment consisting of a compacted clay core with random fill shells of mine waste rock. A cutoff trench was excavated and backfilled with clayey soil to a depth of seven feet below the original ground surface prior to constructing the embankment. A near-vertical granular chimney drain was built along the length of the dam, about halfway up the downstream side of the structure (see Figure 5-7). The chimney drain is hydraulically connected to a blanket drain located at the base of the embankment on the downgradient side. The final elevation of the initial structure was 6409 feet asl (Knight Piesold, 1990).

In April 1988, during construction of the Rain facility, seepage (about 7.5 gallons per minute) was noted in the natural drainage channel about 300 feet downgradient of the tailings impoundment dam. Newmont retained Sergent, Hauskins & Beckwith to develop a mitigation plan to control seepage. Following a tracer study supervised by Geraghty & Miller, Inc., it was determined that the seepage was coming from the dam interior—liquids in the impoundment were migrating through the upstream face of the dam to the chimney drain and exiting the blanket drain on the downstream side. In June, Newmont took action to prevent continued seepage into and through the dam. To control seepage into the structure, a second keyway was excavated along the toe area on the inside face and backfilled with clayey soil (taken from a borrow pit in the upper reaches of the impoundment area--this pit then was used as temporary storage area for tailings while the impoundment remediation was underway). Newmont also placed a four-foot thick clay liner extending from the top of this keyway to the upstream toe of the dam. Soil liners (material unknown) were installed on the bedrock face forming the east abutment with the dam. Downgradient of the dam, a seepage collection pond was excavated to bedrock. Initially, this pond was pumped periodically, and later a permanent pump was installed to return seepage to the tailings impoundment. Just below the collection pond, a 60-mil HDPE barrier wall, backfilled with clay materials and capped with clay and random fill, was installed to prevent further migration of the seepage (see Figure 5-8


SEEPAGE COLLECTION POND
EXIST. 60 MIL HDPE GEOMEMBRANE BARRIER TRENCH
UPSTREAM TRENCH DRAIN
FINGER DRAIN
EXISTING TRENCH DRAIN
MW-1
MW-2
MW-4
MW-5
MW-7
MW-8
MW-9
MW-10
MW-11
MW-12
MW-13
MW-14
MW-15
MW-18
MW-19
MW-20
MW-21
MW-28
6340
6330

In addition, a 15- to 20-foot deep trench drain was excavated to bedrock, below the ultimate extent of the dam, parallel to the northwestern face of the impoundment and extending to the seepage collection pond (this drain is intended to direct any seepage from this end of the dam to the collection pond).

Additional monitoring wells were also constructed downgradient of the impoundment and the seepage collection pond (Newmont Gold Company, 1988e).

The tailings impoundment began operation in July 1988. Cyanide was first detected in the seepage collection pond and, to a lesser degree, in the monitoring wells located downstream of the collection pond, in October of 1988. The location of the monitoring wells in relation to the seepage pond is shown on Figure 5-8. Seepage rates increased in November 1988, causing the solution in the collection pond to overflow the HDPE barrier and enter the natural drainage (the exact distance the fluids traveled was not determined). WAD cyanide concentrations in the seepage pond ranged from a high of 11.6 mg/l in October to 63 mg/l in December of 1988; monitoring well 3 ranged from 0.17 mg/l in October to 8.8 mg/l in December. Information on cyanide concentrations for the seepage pond and monitoring wells between July 1988 and July 1989 is presented in Appendix 5-D, Tables 5-20 and 5-21. Solution chemistry of the seepage collection pond water is presented in Table 5-7

Table 5-7. Analysis of Seepage Pond Water (CP)

Sample: Seepage Pond Water (CP)	Sample Date (values in ppm)			
Parameter	**12-6-90**	**3-5-91**	**5-1-91**	**7-31-91**
pH (s.u.)	7.7	7.1	7.3	7.8
TDS	820	890	900	868
WAD Cyanide	0.590	0.200	0.057	0.088
Antimony	--	--	--	--
Arsenic	<0.005	<0.005	<0.005	<0.005
Barium	0.14	0.12	0.11	0.13
Bicarbonate	210	180	160	210
Cadmium	<0.005	<0.005	<0.005	<0.005
Calcium	120	130	150	130
Chloride	67	61	84	77
Chromium	<0.005	<0.005	<0.005	0.006
Copper	0.049	0.042	0.120	0.082
Fluoride	0.6	<0.5	<0.5	0.5
Iron	0.01	<0.01	<0.01	0.12
Lead	<0.005	<0.005	<0.005	0.120
Magnesium	29	33	34	28
Manganese	2.9	2.7	1.8	2.5
Mercury	0.010	0.002	0.010	0.010
Molybdenum	--	--	--	--
Nitrate	8.0	4.7	7.4	3.1
Selenium	0.010	<0.01	0.016	0.014
Silver	<0.005	<0.005	<0.005	<0.005
Sodium	100	110	82	110
Sulfate	380	360	320	400
Thallium	--	--	--	--
Zinc	0.014	<0.005	<0.005	0.008

Source: Data aggregated from quarterly reports submitted by Newmont to NDEQ as required by permit.

. Following this release, a permanent pump was installed. (As reported by Newmont on April 14, 1989, the seepage collection pond was being continuously pumped at a rate of 288,000 gallons per day, or 200 gpm.) (Newmont Gold Company, 1989e).

Newmont responded to the situation with a description of efforts to control seepage of process fluids. Sergent, Hauskins & Beckwith developed a plan to determine the source and control the seepage. In the short term, work focused on a field program of exploratory drilling and hydrologic testing to identify the seepage pathways downstream of the collection pond and develop remedial alternatives (Newmont Gold Company, 1989c). Based on these investigations, it was determined that seepage from the impoundment was confined to the alluvial material and weathered bedrock of the Webb Formation (Newmont Gold Company, 1989f).

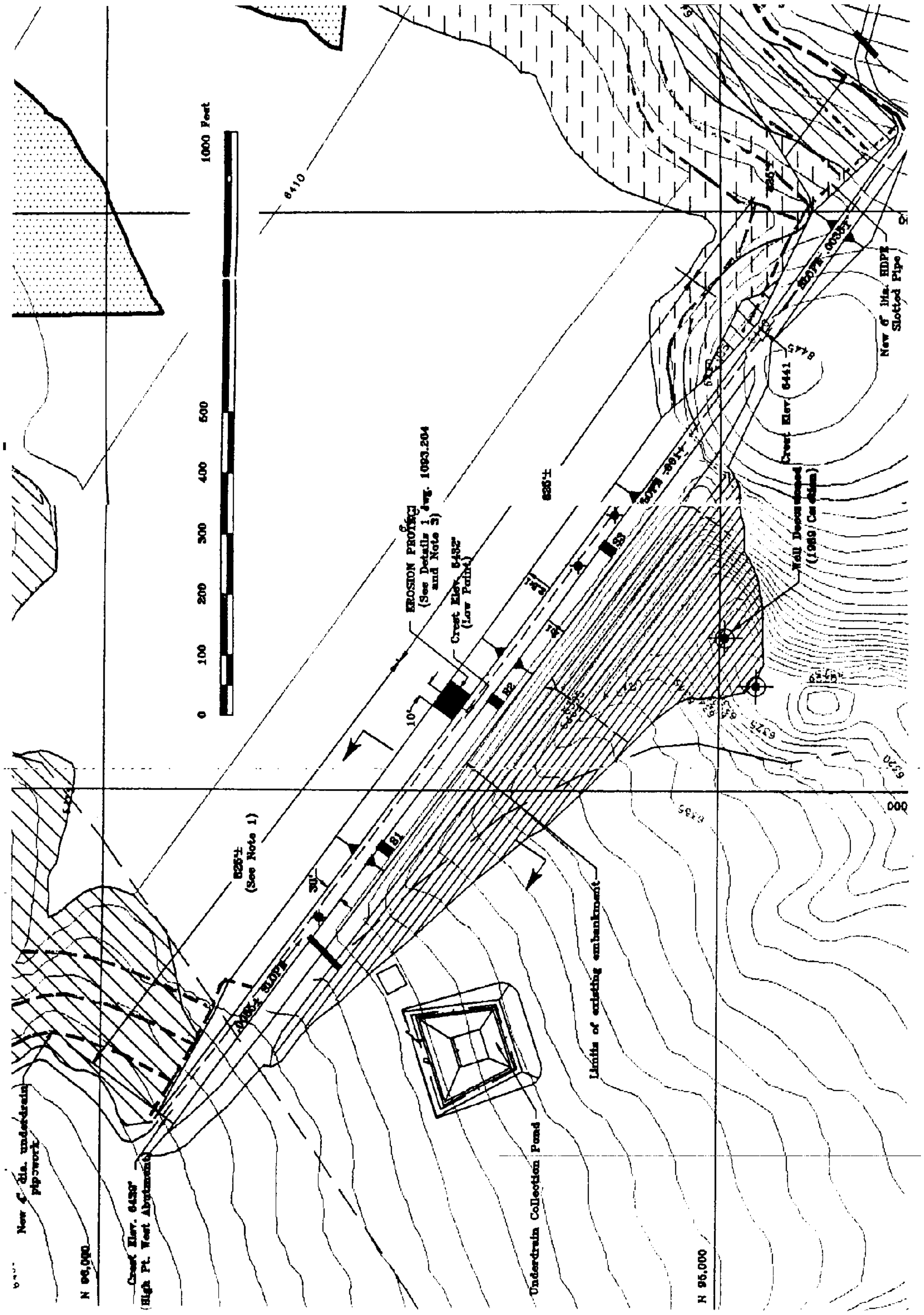
The recovery system selected by Newmont and approved by NDEP on March 15, 1989, consisted of an upstream trench drain and a downstream trench drain. The upper trench drain is located just below the seepage collection pond and HDPE barrier and is designed to intercept fluids that escape or bypass the seepage collection pond and barrier wall. It extends 160 feet across the drainage and is approximately 30 feet deep. The bottom of the trench is keyed into bedrock and slopes to a sump. An HDPE liner was installed on the downstream face and the trench was backfilled with coarse material. A pump was installed to return solution to the seepage collection pond (from which liquids were initially pumped directly to the tailings impoundment and now are pumped to the underdrainage collection pond described below).

The lower trench drain is located about 1,000 feet downstream of the upper trench drain and is intended to intercept the plume that escaped when the seepage pond overflowed in November 1988. Construction of the lower trench drain, also keyed into bedrock, was similar to that of the upper trench drain; however, it is shallower, based on field evidence that the plume is moving near to the surface. As with the upstream trench drain, a pump returns any liquids to the seepage collection pond. (Newmont Gold Company, 1989d).

A downstream lift and additional fluid management components, designed by Knight Piesold and Co., were added to the tailings impoundment dam in late 1989 (see Figure 5-7). These improvements were added both to expand the capacity of the impoundment and to improve the impoundment's environmental performance by "making a gradual transition from an essentially undrained facility to a functionally drained facility" (Knight Piesold, 1990). The clay core and blanket drain of the original dam were extended vertically and the crest of the dam was increased by 16 feet to an elevation of 6425 feet asl. In addition, an underdrainage collection system was added to control seepage as the basin fills and the pond migrates upstream. The underdrain system is also intended to aid in the consolidation of the tailings by accelerating the dewatering process (Knight Piesold, 1990).

The underdrain collection system was constructed in the upper valley areas where tailings would reach as the impoundment filled (and is to be extended as the impoundment is expanded in the future). It consists of a one-foot layer of compacted native soil (1×10^{-6} to 1×10^{-7} cm/sec) overlain with a drainage blanket/hydraulic break of 12 inches of select waste rock. Drainage lines of four-inch diameter perforated pipe are installed at intervals in the waste rock layer. Drainage from the pipes discharge to an 8-inch HDPE pipe around the area, which passes in turn through the tailings dam in a concrete encasement to an underdrainage collection pond. In addition, a transition area between the pond level at the time (late 1989) and the functional elevation of the underdrainage collection system was double-lined, with a 30-mil PVC liner over a natural soil liner (Knight Piesold, 1990).

The underdrainage collection system, as noted above, drains by gravity to an underdrainage collection pond just below the downstream face of the impoundment dam. This pond also receives pumpback from the seepage collection pond. The underdrainage collection pond is HDPE-lined with a capacity of 500,000 gallons. Solution collected in the pond is pumped back to the supernatant pond by means of a submersible pump. Figure 5-9


1000 Feet
0
100
200
300
400
500
EROSION PROFILE
Limits of existing embankment
Underdrain Collection Pond
N 96,000
N 95,000
New 6" Dia. HDPE Slotted Pipe

shows the location of the underdrain system and the collection pond (Knight Piesold, 1990). As part of the quarterly monitoring required by their Water Pollution Control Permit, Newmont analyzes the underdrainage water. A chemical analysis of the underdrainage solution is presented in Table 5-8

Table 5-8. Analysis of Underdrainage Water

Sample: Underdrainage Water	Sample Date (values in ppm)			
Parameter	**12-6-90**	**3-5-91**	**5-1-91**	**8-01-91**
pH	7.6	8.0	8.0	8.0
TDS	1100	1100	1100	1200
WAD Cyanide	2.7	1.4	1.9	0.029
Antimony	<0.05	<0.05	<0.05	--
Arsenic	0.035	0.068	0.100	0.059
Barium	0.26	0.15	0.17	0.1
Cadmium	<0.005	<0.005	<0.005	<0.005
Calcium	160	160	170	180
Chloride	94	130	180	150
Chromium	<0.005	<0.005	<0.005	0.012
Copper	0.68	1.00	1.60	0.35
Fluoride	<0.05	0.5	2.1	0.9
Iron	0.61	0.50	0.20	0.29
Lead	0.032	<0.005	<0.005	<0.005
Magnesium	31	28	23	27
Manganese	2.4	1.8	1.3	2.1
Mercury	0.0099	0.0021	0.0800	0.0091
Molybdenum	0.025	0.034	0.044	--
Nitrate	7.4	8.7	14.0	7.0
Selenium	0.032	0.028	0.042	0.042
Silver	<0.005	<0.005	<0.005	<0.005
Sodium	95	110	120	110
Sulfate	490	410	360	500
Thallium	<0.05	<0.05	<0.005	--
Zinc	0.053	0.065	0.100	0.048

Source: Data aggregated from quarterly reports submitted by Newmont to NDEQ as required by permit.

A second lift, this time an upstream lift with downstream construction, and an expanded underdrainage system, was designed by Knight Piesold and Co. and built in 1990. This construction raised the dam elevation to 6,432 feet asl. Upstream fill construction consisted of earth and waste rock surrounding an extension of the dam's clay core.

A one- to two-foot layer of waste rock was placed on the upstream face; fluid that collects in this system will be drained through collector pipes to the underdrainage collection pond. Future lifts of similar upstream construction are planned, which will raise the final elevation of the dam to 6,475 feet asl. The impoundment's ultimate design capacity is for 6.7 million dry tons of tailings. Designed fluid capacity for the operational pond is for up to 150 acre-feet of water, plus flow from the 100-year, 24-hour storm event, with at least three feet of freeboard. (Knight Piesold, 1990)

With the completion of the 1989 and 1990 expansions and construction, all fluids collected by the seepage collection pond, upper and lower trench drains, and the underdrainage collection system drains by gravity or is pumped to the underdrain collection pond. From there, the solution is pumped back to the tailings impoundment supernatant pond where it is available for recycle to the mill.

Newmont reported the chemistry of the tailings solids as part of the Quarterly Monitoring Report until the third quarter of 1990. Table 5-9 is a summary of monitoring results.

Table 5-9. Chemical Analyses of Tailings Solids for First Three Quarters, 1990

Analyte	**Concentrations in mg/kg except as noted**		
	January 15, 1990	**April 4, 1990**	**Third Quarter, 1990**
Cadmium	0.0086	0.0039	0.0063
Copper	0.0250	0.0065	0.019
Mercury	0.0210	0.023	0.019
Lead	< 0.0150	<0.00025	0.0091
Zinc	0.048	0.007	Not reported

Newmont's "Tentative Permanent Closure Plan" (Newmont Gold Company, 1990d) indicates that limiting runon onto the impoundment and removing existing fluids are primary goals of closure. (According to Newmont, the "Tentative Permanent Closure Plan" is "tentative" in the sense that it has not yet been implemented and may be amended as events require, not because of any lack of development.) Supernatant from the tailings impoundment will be pumped to the leach facility, as will solution collected in the underdrainage collection pond and the seepage collection pond. By controlling runon and disposing of supernatant, Newmont anticipates a "gradual draining of the noncapillary fluid from the facility;" this in turn is anticipated to result in a cessation of seepage into the underdrain system and the seepage collection pond. If drying of the tailings impoundment surface presents a wind erosion problem, the surface may be covered with waste rock and/or native grass hay and/or windbreaks may be used. In addition, solid tailings will be sampled on an annual basis. The environmental assessment (Newmont Services, 1987b) indicated that the impoundment area would be covered with waste rock and that tests would be undertaken to determine the feasibility of establishing vegetation on that waste rock.

5.3.4 Water Management

Process water is carefully managed at the facility. According to Newmont, the Rain operation consumes fresh water at a rate of approximately 100 gpm on an annual basis. During dry periods, consumption may reach or exceed 600 gpm. The average usage represents less than 10 percent of the water moving through the system at any given time and, assuming the water volume onsite remains constant, this amounts to 140,000 gpd. Most water loss is due to evaporation from the tailings impoundment, heap leach, and road watering to control dust. Water from the tailings impoundment and leach circuit are recycled to the mill for distribution. A small volume of additional water is collected from local surface-water run-off control and from the waste rock dump in the form of acid drainage and transferred to the tailings impoundment. Similarly, seepage from the tailings impoundment and any leachate from the leach pads and solution ponds are returned to the tailings impoundment. As described above, Newmont expects seepage from the tailings impoundment to be reduced or to end following closure, and also anticipates that there will be little or no infiltration and seepage from the waste rock dump following closure.

5.3.5 Other Materials and Wastes

Table 5-10 lists several of the materials and wastes handled by the Rain facility. The facility uses a small landfill (Class III under Nevada regulations) to dispose of solid waste generated by the facility. During the site visit, participants observed items such as paper, cardboard, and empty reagent drums in the trench landfill. Hazardous wastes or petroleum liquids are not disposed of in the landfill. A permit was issued for the landfill in October 1989 by the Nevada Waste Management Bureau. The landfill is located on the south rim of the mine pit at an elevation of approximately 6750 feet. As the trench is filled it is covered with soil material. The average amount of waste generated is 40 cubic yards of uncompacted waste per week: 12 cubic yards from the mill and office sources and 28 from the truck shop.

Table 5-10. Selected Wastes and Materials Handled at Rain Facility

Material/Waste	Amount/Disposition
Lubricating and hydraulic oils, oil from HOTSY skimmer, antifreeze	Transported to waste oil recycling facility in California.
Sodium cyanide	Stored in bins, introduced into mill line at 0.28 lb/ton of ore, into barren solution at about 214 pounds/day.
Sodium hydroxide (pelletized)	Introduced into mill line at 50 lb per 3,000 pounds cyanide; into leach line at about 437 pounds/day.
Lime	Stored in bins, added to mill ore at about 1.7 lb/ton of ore. Also added to top of heap.
Cement	Stored in bin, added to leach ore at 8 lb/ton of ore.
Surfactants	Stored in drums, added to crushing/grinding circuit at 10 cc/minute.
Polymaleic acid antiscalant	Stored in bags, added to mill water supply at 24 cc/min, to barren line at 14 cc/min.
Magnesium chloride	Stored in tank, mixed with water for dust control on roads and other area.
Ammonium nitrate/fuel oil	Used as blasting agent.
Mill slurry trash	Collected at trash screens at about one ton/week, hauled to heap.
Water from HOTSY steam cleaner	Transferred to tailings impoundment.
Solid waste	About 40 cubic yards/week, disposed in onsite trench landfill.
Sewage effluent and sludge	Supernatant from lagoons (one gpm) pumped to tailings impoundment. Disposition of sewage sludge not determined.

In an effort to minimize waste associated with facility maintenance such as metal cleaning, the Rain operation is experimenting with a HOTSY (manufacturer's name) steam cleaner. In the past, Safety-Kleen Corporation supplied an asphalt solvent containing trichlorethylene, which was returned to Safety-Kleen for regeneration. The shipments were manifested in accordance with Nevada hazardous waste regulations. The frequency and sizes of shipments were not determined (a shipment on June 12, 1991, involved 258 gallons). The new process uses citrus-based solvents in conjunction with a compound of graphite and aluminum. The new product was reported to be effective, but somewhat caustic. One of the features is a skimmer device that separates oil from water. The oil joins other waste oils (see below); the water is added to the tailings line. According to the environmental assessment, sanitary sewage was to be disposed through septic tanks and leach fields (Newmont Services, 1987b). During the site visit, Newmont representatives indicated that sanitary sewage is treated in a settling lagoon and the supernatant added to the tailings line at an average rate of 1.0 gpm. Information on generation rates or ultimate disposal of sludge from the lagoon was not obtained.

Waste oil is stored in on-site tanks and periodically picked up and transported to a waste oil recycling facility in California. The oil, which is not a hazardous waste, is manifested in accordance with California requirements. The frequency and size of shipments were not determined. One shipment, on January 1, 1991, involved 6,400 gallons.

5.4 REGULATORY REQUIREMENTS AND COMPLIANCE

Prior to operating the Rain mine and mill, multiple permits and approvals were required from State and Federal agencies. Table 5-11

Table 5-11. State and Federal Permits and Approvals, Rain Facility

State	
Department of Conservation and Natural Resources, Division of Water Resources;	
Well and Water Appropriation (one for each of four wells)	Permit Numbers 50664, 50665, 50666, and 46346
Construction of Tailings Dam	Permit Number J-261
Construction of Pregnant Pond Dam	Permit Number J-276
Department of Wildlife	
Industrial Artificial Pond	Permit Number 3435
Department of Conservation and Natural Resources, Division of Environmental Protection	
Water Pollution Control	Permit Number NEV87011
Surface Disturbance (air)	Permit Number 1321
Construction of Primary Crushing Circuit (air)	Permit Number 1617
Construction of Secondary Crushing Circuit (air)	Permit Number 1618
Construction of Portec Cement Bin (air)	Permit Number 1619
Construction of Stanco Projects Lime Bin (air)	Permit Number 1748
Division of Health	
Operate a Public Water System	Permit Number EU-2064-12NC
Operate a Sewage Treatment System	Permit Number EL 2645
Waste Management Bureau	
Class III Landfill	Number not determined
Federal	
U.S. Department of Interior, Bureau of Land Management	
Rain Plan of Operations, Approved in 1986	
Rain Final Environmental Assessment, March 1987	
Amendment to the Final Environmental Assessment, Rain Access Road, October 1987	
Amendment to the Final Environmental Assessment, Water Pipeline, 1987	
Amendment to the Final Environmental Assessment, Powerline, 1987	
U.S. Environmental Protection Agency	
RCRA Identification Number	NVD 982486300.

lists the permits or approvals obtained by Newmont for the Rain facility organized according to granting agency, type of permit, and the identification number. The first section below describes major State permits, and is followed by sections on major Federal approvals.

5.4.1 State of Nevada

This section describes permits issued to the Rain facility by the State of Nevada. The first subsection describes the new reclamation permit that was obtained by October 1, 1993. This is followed by subsections that describe water (section 5.4.1.2) and air (5.4.1.3) permits.

5.4.1.1 Reclamation Permit

Nevada Administrative Code 519A.010 to 519A.415 requires facilities active on or after October 1, 1990, to obtain an exploration or mining permit that provides for reclamation. Facilities active on October 1, 1990, including the Rain facility, had to obtain the permit by October 1, 1993. Permits have a life-of-mine term and are intended to ensure reclamation is sufficient to return land to a "safe, stable condition consistent with the establishment of a productive post-mining use of the land and the safe abandonment of a facility...." (NAC 519A.075). BLM-approved reclamation will satisfy the State (NAC 519A.255).

Reclamation plans must include, among other things, full descriptions of the affected land and operations (including roads); nearby waters; proposed productive post-mining use of the land; schedules for initiation and completion of reclamation activities; and proposed revegetation plans. State regulations contain requirements for each of these components and provide authority to require certain types of reclamation (NAC 519A.345). Financial assurance, based on the costs of reclamation, is required, and the regulations specify the types of surety that are acceptable (NAC 519A.350 to 519A.390). Representatives of Newmont at the time of the site visit indicated that the company was in the process of preparing the application for this permit.

5.4.1.2 Water Permits

Well and Water Appropriation Permits (one for each of four water wells in Dixie Flats)

According to the environmental assessment, the Rain facility was to require about 525 gpm of new water for the operation (as noted previously, actual requirements range from about 50 to over 500 gpm, depending on the season). During facility planning, the only nearby sources known to have this capacity were in the Dixie Flats area, several miles away. Exploratory drilling was conducted to locate a source closer to the facility but no reliable sources were located. Ultimately, wells in Dixie Flats were selected; an amendment to the environmental assessment was prepared for the right-of-way across public land. The NDEP Division of Water Resources issued Water Appropriation Permits for wells located in Dixie Flats, six miles east of the Rain facility. Water from these wells is conveyed by pipeline to the Rain facility. (The permits were not obtained or examined by the site visit team.)

Water Pollution Control Permit

Nevada Revised Statutes (NRS) 445.131 through 445.354 and implementing regulations (Nevada Administrative Code--NAC) protect ground and surface waters of the State and are implemented by the Division of Environmental Protection. Regulations specific to the "design, construction, operation and closure of mining operations" (NAC 445.242 through 243) were added in 1989. Regulatory requirements are placed on facilities, including the Rain facility, in Water Pollution Control Permits.

The regulations include minimum design and monitoring criteria for various process and waste components. When no longer active, tailings impoundments must be characterized and covered to protect wildlife. Spent ore from cyanide leaching must be rinsed until weak acid dissociable (WAD) cyanide levels in the effluent are less than 0.2 mg/l, the pH is between 6 and 9, and the effluent does not degrade waters of the State (unless alternative limits are approved).

This permit is the means by which the State has placed requirements on all components of the Rain facility to protect both ground and surface waters. The Rain facility applied for their Water Pollution Control permit in December 1986; Permit NEV87011 was issued on April 25, 1988 and remains in effect for five years (NDEP, 1988). The permit has been revised twice since it was first issued, the first time in September 1990, the second in January 1991 (NDEP, 1990).

The permit (Section II.C) defines the Rain fluid management system as including the mill and associated processes and piping, the leach pad and French drains, lined solution ditches, the pregnant pond and leak detection system, the tailings impoundment and trench drain, the underdrainage collection system and pond, the seepage collection pond and barrier wall, and the upstream trench drain (the 1990 and 1991 revisions added the components below the tailings dam--trench drains, seepage collection pond, underdrainage collection pond--to the fluid management system, from which there may be no discharge to surface waters). The permit requires Rain to ensure the fluid management system contains all process solutions and the flow from the 100-year, 24-hour storm event (Section II.A.2). Permit limits include zero discharge to surface waters; for ground water, releases may not cause violations of drinking water standards or result in WAD cyanide concentrations over 0.2 mg/l (Section II.A.3). Other limits include flow limits for the various leak detection sumps: none may exceed 150 gpd averaged quarterly or 50 gpd averaged annually. In addition, Newmont must notify the State when static evaluations of waste rock show less than 20 percent neutralization capacity; if kinetic tests indicate acid generation, Newmont must propose methods for containment and evaluate the impact on final stabilization.

The permit also has required Newmont to submit (and revise) a number of reports and plans, including an "Emergency Response Plan" and a "Permanent Closure Plan." Besides the monitoring requirements described below, the permit also requires annual reports on water supply analytical results; spill and release synopses; summaries of operations; effectiveness of seepage pond and upstream trench drain; and summary reports on the downstream trench drain system.

Table 5-12. Permit NEV87011: Monitoring Locations, Parameters, and Frequencies

Monitoring Location	Parameter	Frequency
Water Supply	Profile I[1]	Annually
Monitoring wells MW2B, MW-3, MW-16, MW-23	Profile I	Quarterly
Leach Pad French Drains: East Drain and West Drain	Average Flow (gpd), pH, Free CN Profile I	Weekly Quarterly
Leak Detection Sumps (fluid cap.): Pregnant Pond (30 gal.) Underdrain Collection Pond (30 gal.)	Average Daily accumulation (gpd)	Weekly
Waste Rock/Overburden generated during the quarter	Meteoric Water Mobility Analysis and Acid generation-acid neutralization potential	Quarterly
Pregnant & Barren Leach Solution	Profile II[2]	Quarterly
Tails Water (TW), Reclaim Water (RW), Underdrainage Water (UW)	Profile II	Quarterly
Seepage Pond (CP)	Profile I Pumpback flow	Quarterly Weekly
Upstream Trench Drain UTD)	Profile I Pumpback flow	Quarterly Weekly
Downstream Trench Drain (DTD)	Profile I Pumpback Flow	Quarterly Weekly

1. Profile I includes:

Alkalinity	Chloride	Iron	Nitrate	Silver	WAD cyanide
Arsenic	Chromium	Lead	pH	Sodium	Zinc
Barium	Copper	Magnesium	Potassium	Sulfate	
Cadmium	Fluoride	Mercury	Selenium	TDS	

2. Profile II includes all the constituents of Profile I and the following:

Aluminum	Bismuth	Gallium	Manganese	Phosphorus	Thallium
Antimony	Calcium	Lanthanum	Molybdenum	Scandium	Tin
Beryllium	Cobalt	Lithium	Nickel	Strontium	Titanium
					Vanadium

The Water Pollution Control Permit for the Rain facility contains extensive monitoring and reporting requirements. It stipulates the location, frequency, and parameters to be monitored. NDEQ updated specific conditions for the facility when the permit was revised in January 1991. Monitoring requirements include a variety of parameters grouped by Profile. Profile I consists of the standard drinking water parameters.

Profile II is a list of 40 elements, metals and compounds selected by the NDEQ; some of these overlap with those required by Profile I. Table 5-12 presents the monitoring requirements (including locations, parameters, and frequencies) in Permit NEV87011 as of January 1991; monitoring locations are identified in Figure 5-2.

Monitoring requirements have been modified as facility operations have changed since permit issuance. For example, construction of the upstream trench drain lead to the abandonment of monitoring wells 2, 7, 8, 9,10, 11, 12, 13, 17, and 18. Monitoring requirements also changed to address problems with specific facility units in the fluid management system such as the waste rock pile and tailings impoundment. For example, monitoring wells 2b, 3, 16, and 23 were included in the permit to monitor seepage. Similarly, weekly flow and quarterly analysis of Profile I constituents from the seepage collection pond and trench drains below the tailings dam are now required. The permit also provides that Newmont may request a reduction in the number of elements and frequency of analysis after one year of complete monitoring, based on justification other than cost.

Specific monitoring data for the waste rock, pregnant and barren solutions, and tailings and reclaim water are presented in the preceding discussions of those topics. Table 5-13

Table 5-13. Discharges from Monitoring Locations Reported in Quarterly Monitoring Reports

Monitoring Location	4th, 1990	1st, 1991	2nd, 1991	3rd, 1991
West French Drain				
Flow (gpm)	0 (dry)	0.05	2.02	1.9
pH (ave.)	"	8.0	7.8	7.3
CN (free)	"	<0.1	<0.1	<0.1
East French Drain				
Flow (gpm)	0 (dry)	0.04	0.64	1.87
pH (ave.)	"	7.5	7.5	7.6
CN (free)	"	0.1	<0.1	<0.1
Pregnant Pond PPS Flow (gpm)	NA	0.857	0.464	0.050
Underdrainage SW Flow (gpm)	NA	0.000	0.000	0.000
Seepage Pond CP Flow (gpm)	NA	7.83	21.10	5.96
Upper Trench Drain UTD				
Flow (gpm)	0.81	2.24	0.95	0.57
pH (ave.)	7.2	7.0	7.45	7.2
CN (WAD)	0.510	0.072	0.050	0.040
Lower Trench Drain DTD				
Flow (gpm)	1.55	1.91	3.12	0.13
pH (ave.)	7.4	7.4	5.8	7.3
CN (WAD)	0.320	0.110	0.005	0.020

(Source: Quarterly Reports supplied by the State of Nevada and the Rain facility) is a summary of monitoring data for the French drains, pregnant pond, underdrain collection pond, and the upper and lower trench drains for the four quarters ending August 1991, as provided in the Quarterly Monitoring Reports. As available, pH and cyanide as free or WAD are included for each discharge point. Water from these sources is returned to the tailings impoundment.

5.4.1.3 Air Permits

The Rain facility was granted Point Source Particulate Permits under the authority of Nevada Revised Statutes (445.401 - 445.601) and Administrative Codes (445.430 - 445.846). As part of the construction permit for the primary and secondary crushing circuit, the Rain facility applies water and surfactant at the points of dust generation. These include the jaw feeder, the intake to the jaw crusher, the point where cement is added, and at the conveyor belt drop point from the radial stacker. Sprays are also located at the discharge belt from the cone crusher and the final drop point to the stockpile. The dust suppression system is inspected annually by Bureau personnel. In the information available, no mention was made of the baghouses used to control dust from the cement and lime storage bins.

5.4.2 Plan of Operations (Bureau of Land Management)

A portion of the Rain facility is located on public land managed by the Bureau of Land Management (BLM). In compliance with the National Environmental Policy Act (NEPA), Newmont Services Ltd. completed a draft environmental assessment (EA) for the Rain Project in December 1986 under the direction of BLM. The draft EA was revised and a final EA was issued in March 1987. The Elko District Manager for BLM signed a Decision Notice and Finding of No Significant Impact for the Rain proposal on May 8, 1987. The only conditions set forth in BLM's Decision were specific waste dump reclamation issues and those specified in Newmont's Plan of Operations (U.S. Department of Interior, 1987; Newmont Services, 1987b).

For mining facilities that disturb more than 5 acres of land the BLM requires the owner to submit a Plan of Operations. The BLM approved Newmont's Plan in 1986; a copy of the Plan was submitted with the Final EA in 1987. The Plan is a brief statement describing the size of the facility, estimates of material to be moved, a description of the mill and leach circuit, environmental protection measures to be followed, and reclamation activities. Also included are Process Design Criteria and Flow Diagrams.

Because no portions of the site on BLM lands involve cyanide operations (only portions of the waste rock dump and roads are on BLM lands), BLM's 1990 cyanide policy is not applied to the site. (The BLM policy incorporates Nevada regulations on water pollution control, protection of wildlife, and reclamation. The only substantive difference, were Rain's cyanide operation on BLM land, would be a quarterly inspection by BLM.) In addition, BLM policy requiring full bonding will defer to the State's bonding requirement, which is due to be fully implemented at the Rain facility in 1993.

5.4.3 Hazardous Waste (U.S. Environmental Protection Agency)

The Environmental Protection Agency has assigned a RCRA identification number to the Rain facility since they are (or were) a small-quantity generator of petroleum-based cleaning solvents which were used as part of operations and maintenance. Safety-Kleen transported these spent solvents off-site (for regeneration). This service has been discontinued; it was replaced with the HOTSY steam cleaning process described in Section 5.3.5.

5.5 REFERENCES

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Knight Piesold and Co. 1990 (June 8). "Newmont Gold Company Mill No. 3 Project - Tailings Storage Facility Expansion Program - Final Design Report." Prepared for Newmont Gold Company.

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Newmont Gold Company. 1988a (January 14). Letter from D.A. Deming, NGC, to P. Liebendorf, Nevada Division of Environmental Protection. Subject: Suggested language for draft permit.

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Newmont Gold Company. 1988c. "Rain Project Closure Plan." Submitted to Nevada Division of Environmental Protection on August 17, 1988.

Newmont Gold Company. 1988d (August 30). Letter to Paul Liebendorfer (NDEP) from Steve Botts concerning the release of sodium cyanide and tailings slurries on August 19 due to a plug in the tailings line.

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Newmont Gold Company. 1988g (December 21). Letter from A.M. Tyson, NGC, to P. Liebendorfer, Nevada Department of Environmental Protection. Re: Pregnant Pond Sump Discharge; Rain Permit NEV87011.

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Newmont Gold Company. 1990b (June 28). Letter to Tom Fronapfel (NDEP) from David Baker concerning response to AMD NOV.

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Newmont Gold Company. 1990d (December). Tentative Permanent Closure Plan. Prepared by Newmont Gold Company, Department of Environmental Affairs.

Newmont Gold Company. 1990e (December). Response to Nevada Bureau of Air Quality Notice of Alleged Violation No. 830, Rain Operation. **Note:** State NOV letter not on file with NDEQ.

Newmont Gold Company. 1991a (January 15). Letter from E. Hamer, NGC, to T. Fronapfel, Nevada Division of Environmental Protection. Subject: Fourth quarter 1990 monitoring report and status report.

Newmont Gold Company. 1991b (September). Letter from David Baker, NGC, to Stephen Hoffman, Environmental Protection Agency. Re: transfer of following documents requested during the Site Visit: (1) block diagrams of the mine, mill, heap leach, and tailings processes; (2) Air Quality Permit Summary as of August 1991; (3) site map with elevation contours; (4) estimated uncompacted garbage production; (5) wildlife mortality reports dating back to 1988; (6) sewage flow rates.

Newmont Services Ltd. 1987a (February 11). Letter from N. Greenwald, Newmont, to H. Van Drielen, Nevada Division of Environmental Protection. Subject: Request for issuance of groundwater protection permit and submission of supporting documents (sections of draft environmental assessment, plan of operations, reports on geotechnical investigations for leach pad and tailings impoundment.

Newmont Services Ltd. 1987b (March). Final Environmental Assessment, Rain Project and Amendments for the Access Road, Power Line, and Water Supply Line. Prepared by Newmont Services, Tucson, Arizona.

Steffen Robertson and Kirsten. 1990 (October). Rain Project Solution Collection and Return System Design Report. Prepared for Newmont Gold Company by Steffen Robertson and Kirsten (U.S.), Inc., Lakewood, Colorado.

U.S. Department of the Interior, Bureau of Land Management, Elko District Office. 1988 (December 27). Letter from L. Sweeney, BOM, to L. Dodgion, Nevada Division of Environmental Protection. Subject: Request for meeting on Rain facility tailings impoundment leaks.

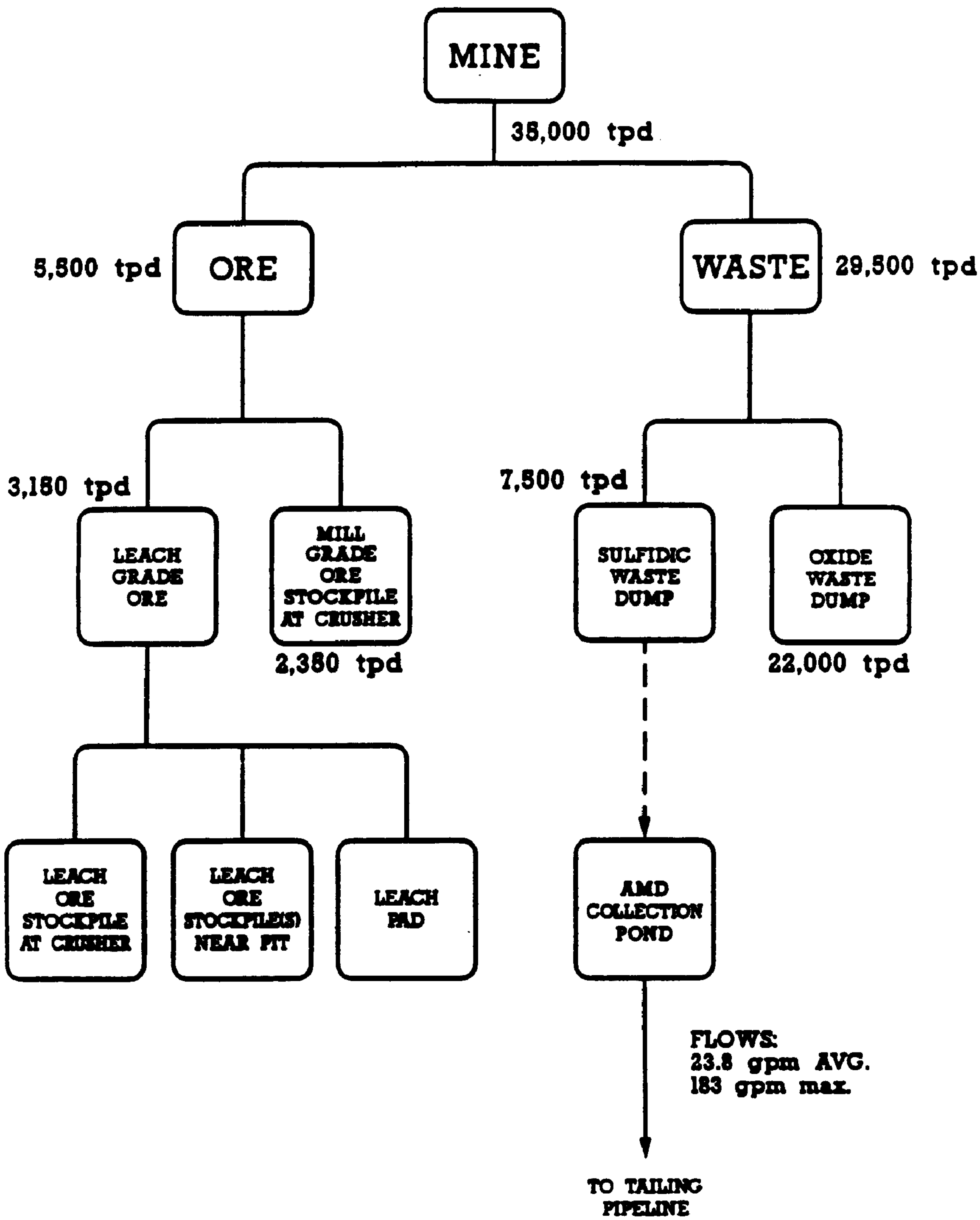
U.S. Department of the Interior. 1987c (June 3). Letter to Joy McBeth (Newmont) from Tim Hartzell (Elko District Manager, BLM) concerning 1) water rights to local springs, and 2) Decision Notice and Finding of No Significant Impact.

U.S. Environmental Protection Agency. 1991 (August). Telephone Checklist: Newmont Gold Company, Rain Mine. Completed August 16, 1991, with David Baker, Vice President for Environmental Affairs and Steve Hoffman, EPA Office of Solid Waste.

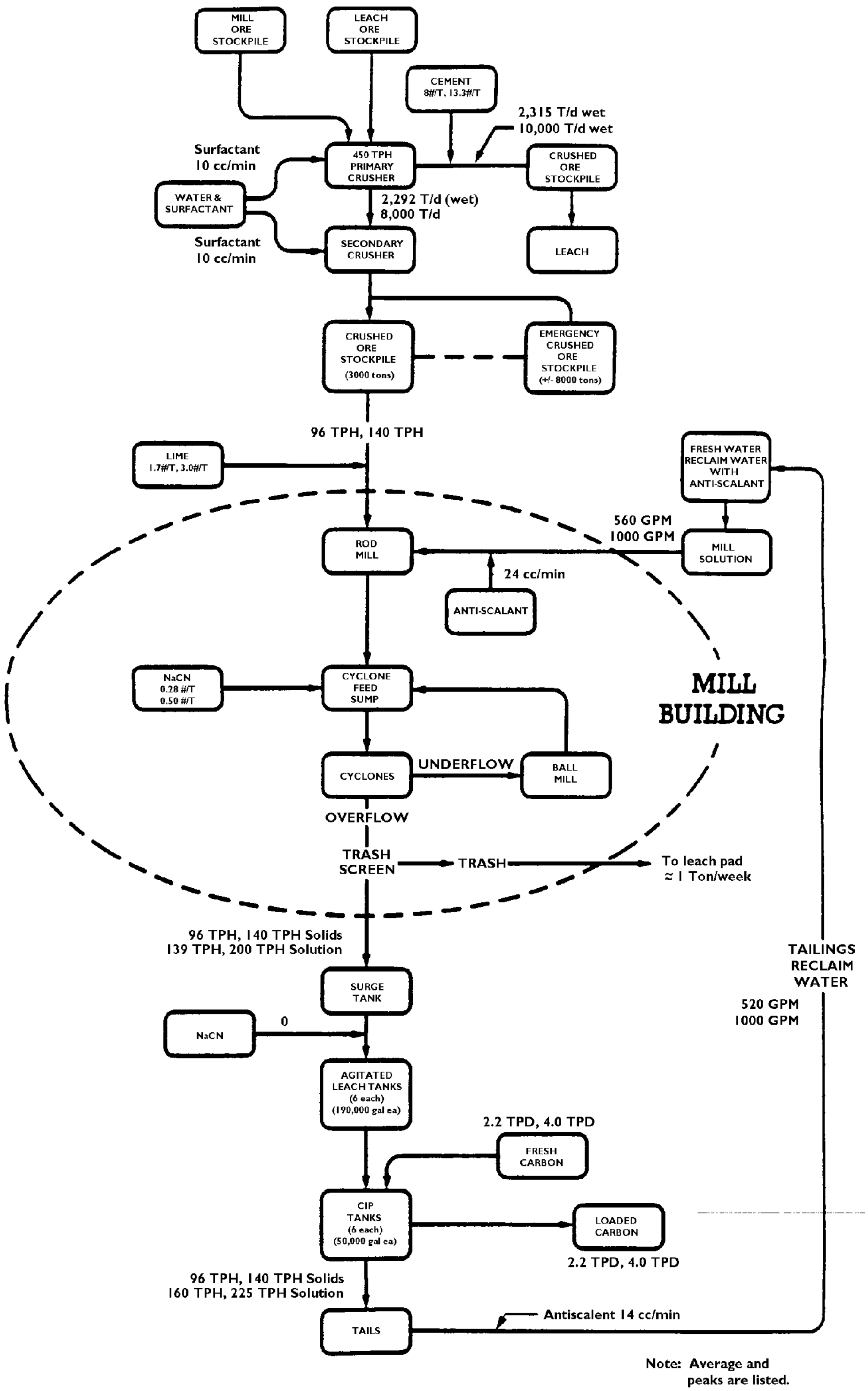
APPENDIX 5-A

FLOW CHARTS OF THE RAIN MINE, MILL, HEAP LEACH, AND TAILINGS PROCESSES

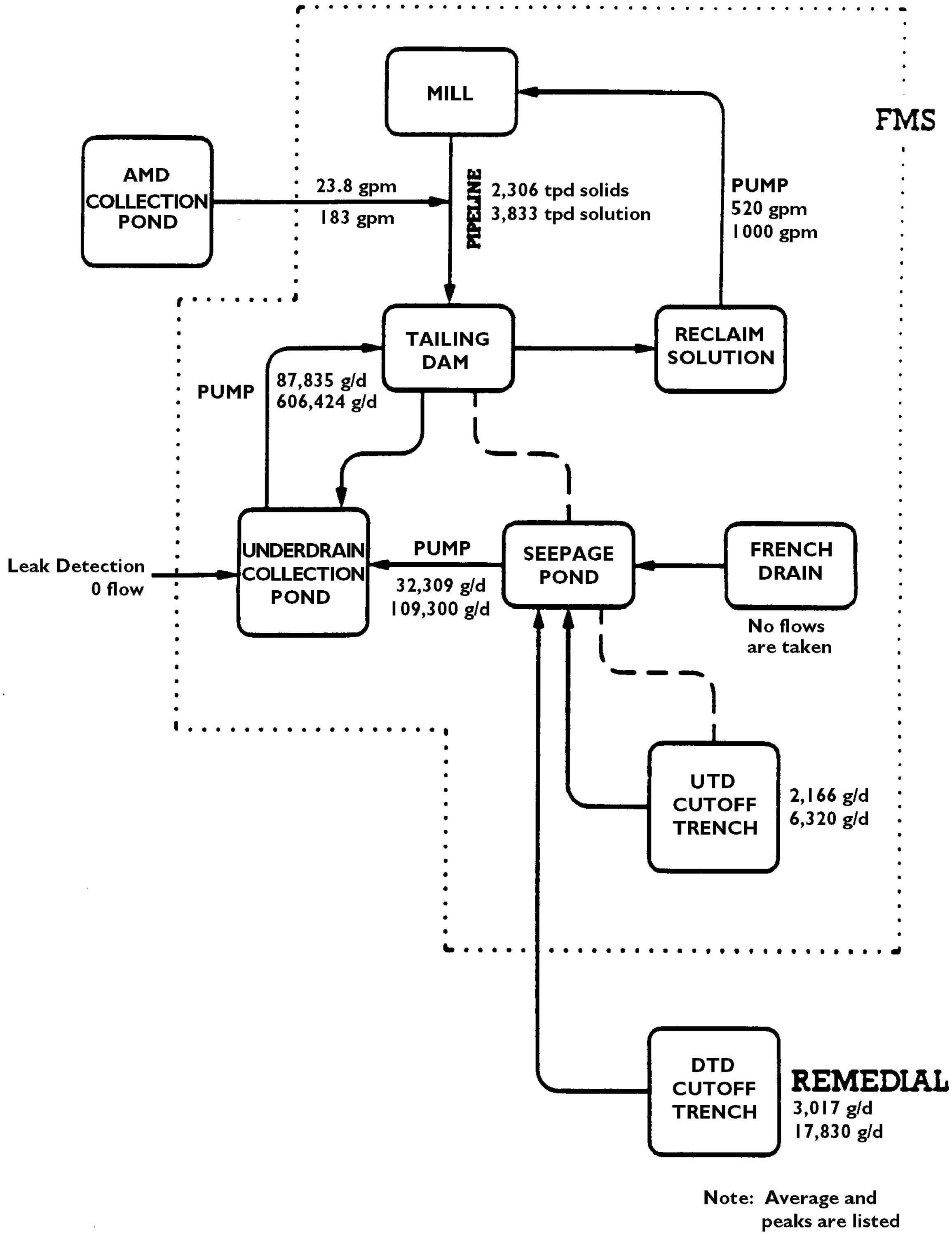
MINE


MINE
35,000 tpd
5,500 tpd
ORE
WASTE
29,500 tpd
3,150 tpd
LEACH GRADE ORE
MILL GRADE ORE STOCKPILE AT CRUSHER
2,350 tpd
7,500 tpd
SULFIDIC WASTE DUMP
OXIDE WASTE DUMP
22,000 tpd
LEACH ORE STOCKPILE AT CRUSHER
LEACH ORE STOCKPILE(S) NEAR PIT
LEACH PAD
AMD COLLECTION POND
FLOWS:
23.8 gpm AVG.
183 gpm max.
TO TAILING PIPELINE

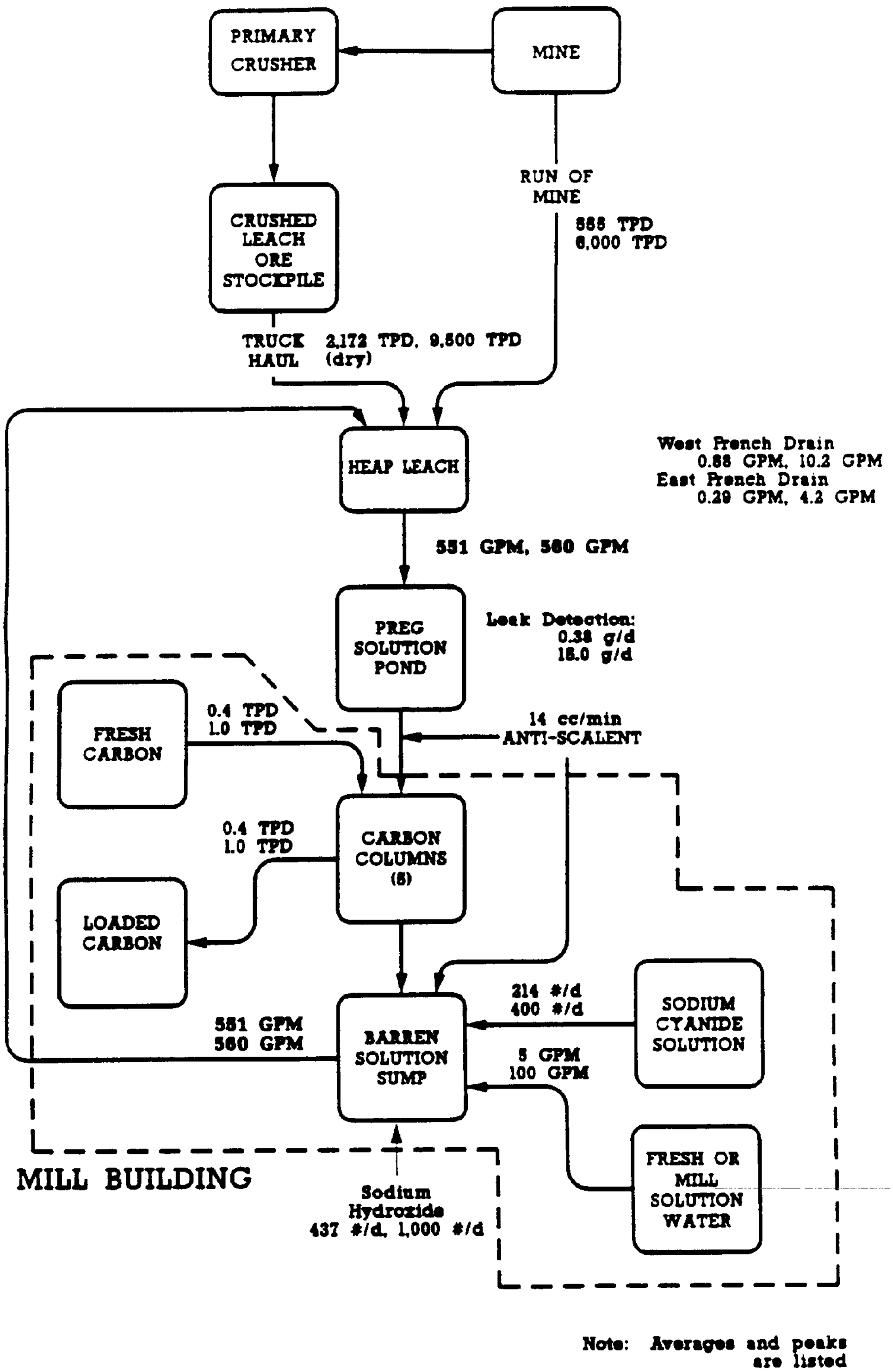
MILL 3 PROCESS



TAILING PROCESS

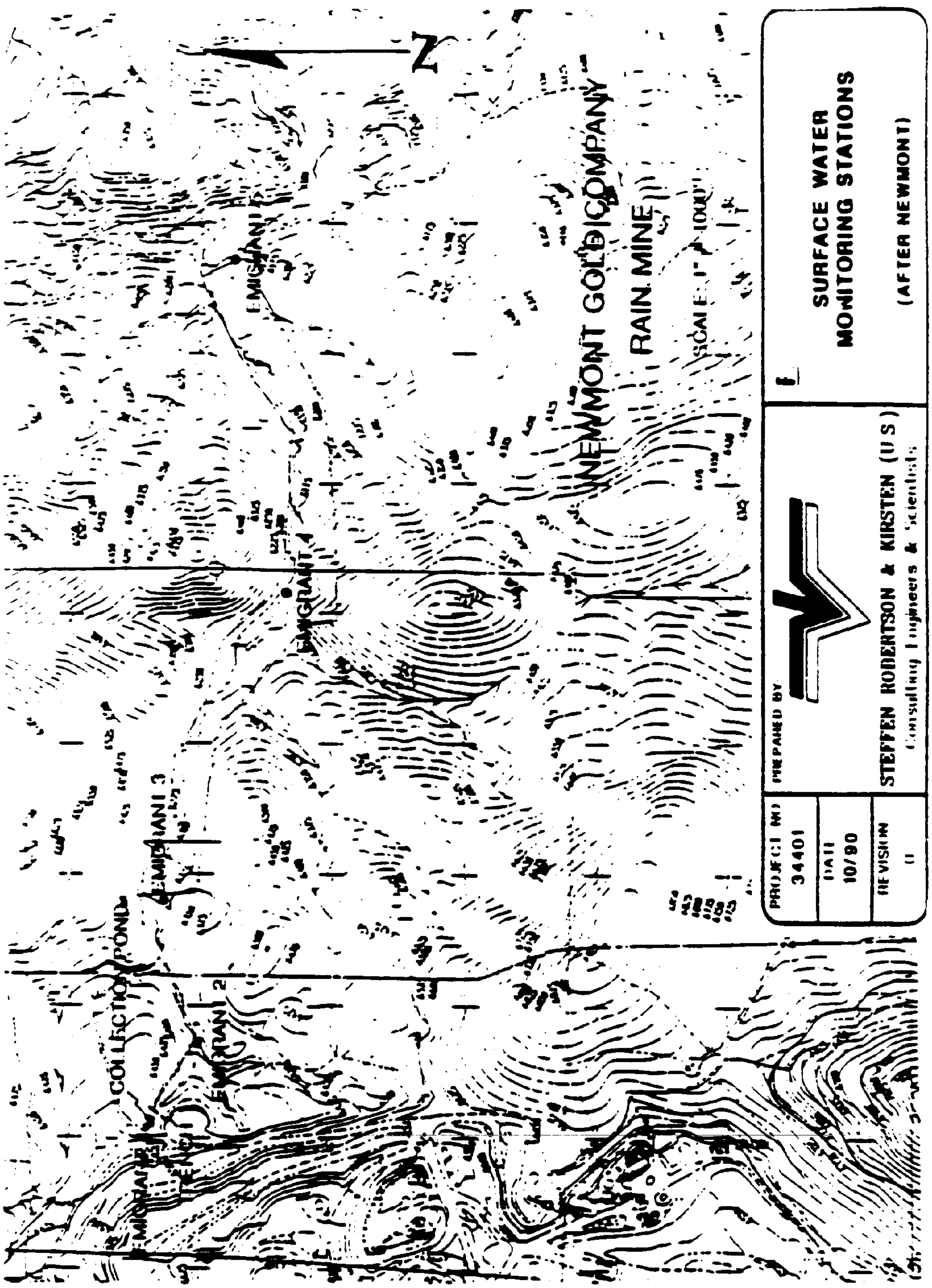


HEAP LEACH PROCESS



APPENDIX 5-B

CHEMICAL ANALYSIS OF FIVE SITES ALONG EMIGRANT SPRINGS



N
NEWMONT GOLD COMPANY
RAIN MINE
SCALE: 1" = 1000'
SURFACE WATER MONITORING STATIONS
(AFTER NEWMONT)
PREPARED BY
STEFFEN ROBERTSON & KIRSTEN (U.S.)
Consulting Engineers & Scientists
PROJECT NO
34401
DATE
10/90
REVISION
0
EMIGRANT 1
EMIGRANT 2
EMIGRANT 3
EMIGRANT 4
COLLECTION POND

Table 5-14. Water Quality and Sediment Data, Rain Facility, June 15, 1988

Parameter	**EMIG 1**	**EMIG 1B**	**EMIG 2**	**EMIG 2A**	**EMIG 2B**	**EMIG 3**
pH	3.21	3.65	6.68	--	--	7.42
AS	1100	<0.005	0.014	120	36	0.076
BA	350	<0.05	0.36	1800	440	1.3
CD	11	0.029	<0.005	2.0	1.9	<0.005
CR	35	0.024	<0.005	40	43	0.008
CU	160	0.82	0.01	54	23	0.015
HG	4.6	<0.0001	0.0003	3.2	<0.10	0.0001
PB	30	<0.005	<0.005	26	19	<0.005
SE	<5	0.005	<0.005	<5	<5	0.009
ZN	110	1.5	0.015	130	110	0.14

Parameter	**EMIG 4**	**EMIG 4A**	**EMIG 6**	**EMIG 6A**	**EMIG 6B**
pH	7.90	--	--	--	--
AS	120	--	48	67	74
BA	790	680	870	1400	260
CD	2.1	<0.5	1.1	1.2	1.0
CR	33	44	26	20	20
CU	87	38	120	31	28
HG	0.47	0.17	0.33	0.36	0.10
PB	20	18	25	25	23
SE	<5	<5	<5	<5	<5
ZN	120	130	160	130	130

- EMIG 1, 1B, 2, 2A, 2B: Represent samples of acid mine drainage, not in Emigrant Springs but in drainage channel upstream of Emigrant Springs, below the waste rock dump.
- EMIG 3: Represent a sample of the confluence of the acid drainage flow and Emigrant Spring.
- EMIG 4, 4A, 6, 6A, 6B: Represent solid samples from stream beds of Emigrant Springs, except pH in EMIG 4, which is liquid flow.
- If samples did not reveal concentrations above detection, the detection limit is shown.

Data Source: Rain Project Solution Collection and Return Design Report, 1990

APPENDIX 5-C

CHEMICAL ANALYSIS OF METEORIC WATER MOBILITY TEST FOR THE THIRD AND FOURTH QUARTERS OF 1990, AND THE FIRST QUARTER OF 1991

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

APPENDIX 5-D

QUARTERLY MONITORING DATA FOR 1988 AND 1989 FOR SELECTED MONITORING WELLS AND THE SEEPAGE COLLECTION POND

Table 5-20. Monthly Average for Selected Sample Results, Rain Facility, 1988 [1]

Sample Location	Parameter	7/88	8/88	9/88	10/88	11/88	12/88
MW-2	pH	7.02/7.48	6.9/7.45	6.74	--	6.66/11.76	6.59/7.28
	EC	205	224	205	--	250	223
	Cyanide WAD	<.005 n=2	--	--	--	<.005 n=5	<.005 n=3 .12 n=1
	Cyanide Free	0.0 n=3	0.0 n=4	0.0 n=1	--	<.02 n=3 (.003,.033,.016) n=4	<.02 n=1 <.05 n=1 (<.005,1.7,.57) n=3
	Cyanide tot	--	--	--	--	--	--
MW-3	pH	--	--	--	6.12/6.7	5.04/6.77	6.0/7.3
	EC	--	--	--	692	785	538
	Cyanide WAD	--	--	--	(.006,.17,.064) n=3	(<.005,.093,.049) n=4	(.046,6.1,1.71) n=4 8.8 n=1
	Cyanide Free	--	--	--	<.02 n=1	<.02 n=2 (.018,.457,.15) n=4	5.3 n=1 7.0 n=1 (.134,4.8,1.57) n=3
	Cyanide tot	--	--	--	--	--	--

[1] 1. The pH values are given as Low/High for the month. 2. Electrical conductivity (EC) va lues are given as the average of reported values for the month. 3. Cyanide values are shown as (Low, High, Mean) for *each laboratory* reporting at least one result abo ve test detection limits during that month. If analysis was performed with no concentrations above detection the test de tection limit is shown. The "n" value on the right of a cell indicates the number of samples performed by a lab during that month.

Sample Location	Parameter	7/88	8/88	9/88	10/88	11/88	12/88
MW-4	pH	--	--	--	--	5.61/6.51	6.03/6.18
	EC	--	--	--	--	1505	1233
	Cyanide WAD	--	--	--	--	(<.005,.005,.004) n=5	<.005 n=2 <.025 n=1
	Cyanide Free				--	0.0 n=3 <.02 n=3 <.005 n=4	<.02 n=1 <.025 n=1 (<.005,.115,.059) n=2
	Cyanide tot	--	--	--	--	--	--
MW-5	pH	--	--	--	6.0/6.8	6.71/7.39	--
	EC	--	--	--	724	752	--
	Cyanide WAD	--	--	--	(<.005,.03,.013) n=3	(<.005,.03,.017) n=4	--
	Cyanide Free	--	--	--	0.0 n=2 <.02 n=1	(<.02,.02,.017) n=3 (<.005,.083,.042) n=4	--
	Cyanide tot	--	--	--	--	--	--
RAIN SEEPAGE COLLECTION POND	pH	6.17	7.27/7.46	6.3	6.43/6.75	6.84/7.15	6.58/7.19
	EC	311	361	410	735	859	922
	Cyanide WAD	--	--	--	(1.5,11.6,5.6) n=3	(11,18,14.3) n=3	(20,45,30.3) n=3 63.0 n=1
	Cyanide Free	--	--	--	<.3 n=3	(11,18,13.7) n=3 (10,30,20) n=2	42.0 n=1 51.0 n=1 (18.5,39.0,28) n=3
	Cyanide tot	--	--	--	--	--	--

Table 5-21. Monthly Average for Selected Sample Results, Rain Facility, 1989 [2]

Sample Location	Parameter	1/89	2/89	3/89	4/89	5/89	6/89	7/89
MW-2	pH	6.0/6.65	6.75/6.77	6.76/6.94	6.98/7.36			
	EC	229	218	204	170			
	Cyanide WAD	<.005 n=3 (.12,2.0,.75) n=3	(<.02,.3,.11) n=4	<.02 n=2	<.02 n=2			
	Cyanide Free	<.02 n=3 (.05,.16,.10) n=3 (<.005,.112,.04) n=3	(<.005,.041,.016) n=3	(<.015,.022,.011) n=4	<.015 n=2			
	Cyanide tot	--	(<.02,1.1,.31) n=4	<.02 n=4	<.02 n=2			
MW-2B	pH					8.41	7.62	7.83
	EC					1370	927	407
	Cyanide WAD					.1 n=1	<.02 n=1	<.02 n=1
	Cyanide Free					.059 n=1	--	--
	Cyanide tot					.10 n=1	<.02 n=1	.03 n=1
MW-3	pH	6.48/7.2	6.56/7.43	7.13/7.27	6.86/7.07	--	6.95	6.69
	EC	847	603	455	454	--	593	572
	Cyanide WAD	(9.3,13.4,11.1) n=3 (14,18,16) n=3	(.03,29.9,8.16) n=4	(.03,8.5,2.9) n=3	<.02 n=2	.09 n=1	<.02 n=1	<.02 n=1
	Cyanide Free	(8.9,13.1,10.6) n=3 (11,16,13.7) n=3 (10.8,11.9,34.5) n=3	(.161,24.4,6.67) n=5	(.026,12.54,6.5) n=3	<.015 n=2	<.015 n=1	<.015 n=1	--
	Cyanide tot	--	(.1,34.8,10.15) n=4	(.05,9.7,3.3) n=3	(.04,.29,.17) n=2	.07 n=1	.1 n=1	--

[2] 1. The pH values are given as Low/High for the month. 2. Electrical conductivity (EC) values are given as the average of reported values for the month. 3. Cyanide values are shown as (Low, High, Mean) for *each laboratory* reporting at least one result above test detection limits during that month. If analysis was performed with no concentrations above detection then the test detection limit is shown. The "n" value on the right of a cell indicates the number of samples performed by a lab during that month.

Table 5-21. Monthly Average for Selected Sample Results, Rain Facility, 1989 (continued)

Sample Location	Parameter	1/89	2/89	3/89	4/89	5/89	6/89	7/89
MW-4	pH	6.09/6.51	5.51/6.55	6.21/6.42	6.30/6.34	6.31	6.56	6.55
	EC	1252	798	782	758	805	820	719
	Cyanide WAD	<.005 n=3 (.11,.18,.147) n=3	(<.02,.09,.03) n=4	<.02 n=4	<.02 n=2	<.02 n=1	<.02 n=1	<.02 n=1
	Cyanide Free	<.02 n=3 (<.01,.07,.045) n=3 (<.015,.08,048) n=3	(<.015,.007,.006) n=4	<.015 n=4	<.015 n=2	<.015 n=1	--	--
	Cyanide tot	--	(<.02,.08,.03) n=4	(<.02,.08,.03) n=4	<.02 n=2	<.02 n=1	<.02 n=1	<.02 n=1
MW-5	pH	--	6.82	7.14/7.48	6.84/7.0	6.61	6.69	6.58
	EC	--	545	344	385	443	491	542
	Cyanide WAD	--	(<.02,.08,.028) n=5	(<.02,.03,.017) n=3	<.02 n=2	<.02 n=1	<.02 n=1	<.02 n=1
	Cyanide Free	--	(.015,.021,.01) n=4	<.015 n=3	<.015 n=2	<.015 n=1	--	--
	Cyanide tot	--	(.03,.3,.116) n=5	(<.02,.1,.05) n=3	<.02 n=2	<.02 n=1	<.02 n=1	<.02 n=1
MW-6		Dry	--	Dry	Dry	Dry	Dry	Dry
MW-7	pH	--	9.95/10.53	8.57/10.3	Abandoned			
	EC	--	382	489	--	--	--	--
	Cyanide WAD	--	(.01,.08,.063) n=4	(.08,.13,.103) n=3	--	--	--	--
	Cyanide Free	--	(<.015,.03,.016) n=4	<.015 n=3	--	--	--	--
	Cyanide tot	--	(.2,1.0,.416) n=4	(.28,.43,.337) n=3	--	--	--	--

Table 5-21. Monthly Average for Selected Sample Results, Rain Facility, 1989 (continued)

Sample Location	Parameter	1/89	2/89	3/89	4/89	5/89	6/89	7/89
MW-8			Dry	Dry	Dry	Abandoned		
MW-9	pH	--	9.02	8.36/9.2	8.73	Abandoned		
	EC	--	468	665	978			
	Cyanide WAD	--	<.02 n=2	(<.02,.03,.015) n=4	<.02 n=1			
	Cyanide Free	--	(.007,.029,.018) n=2	<.015 n=2	<.015 n=2			
	Cyanide tot	--	(<.02,.03,.02) n=2	(<.02,.04,.023) n=4	.08 n=1			
MW-10	pH	--	7.41/8.12	7.54/7.61	7.44	Abandoned		
	EC	--	806	540	531			
	Cyanide WAD	--	(6.7,21.8,13.7) n=3	(.09,.24,.158) n=4	.03 n=1			
	Cyanide Free	--	(8.06,15.5,12.8) n=4	(.07,.444,.183) n=4	<.015 n=1			
	Cyanide tot	--	(9.9,22.4,16.2) n=3	(.25,1.1,.46) n=4	.14 n=1			
MW-11	pH	--	9.66	8.58/8.78	8.5	Abandoned		
	EC	--	424	377	372			
	Cyanide WAD	--	(.06,.2,.12) n=3	(<.02,.07,.03) n=3	<.02 n=1			
	Cyanide Free	--	(.013,.172,.07) n=3	(<.015,.029,.015) n=3	<.015 n=1			
	Cyanide tot	--	(.01,.03,.23) n=3	(.02,.13,.06) n=3	<.02 n=1			

Table 5-21. Monthly Average for Selected Sample Results, Rain Facility, 1989 (continued)

Sample Location	Parameter	1/89	2/89	3/89	4/89	5/89	6/89	7/89
MW-12	pH		Dry	8.62	8.85	Abandoned		
	EC			357	370			
	Cyanide WAD			<.02 n=1	<.02 n=1			
	Cyanide Free			<.015 n=1	<.015 n=1			
	Cyanide tot			<.02 n=1	<.02 n=1			
MW-13			Dry	Dry	Dry	Abandoned		
MW-14	pH		--	7.69	--	7.60	7.76	8.25
	EC		--	330	--	197	192	177
	Cyanide WAD		--	<.02 n=1	<.02 n=1	<.02 n=1	<.02 n=1	<.02 n=1
	Cyanide Free		--	--	<.015 n=1	<.015 n=1	--	--
	Cyanide tot		<.02 n=1	<.02 n=1	<.02 n=1	<.02 n=1	<.02 n=1	<.02 n=1
MW-15	pH		Dry	Dry	Dry	Abandoned		
MW-16	pH		8.3	7.7	7.73/7.93	7.68	7.75	Dry
	EC		1530	832	566	468	535	
	Cyanide WAD		<.02 n=1	<.02 n=2	<.02 n=1	<.02 n=1	<.02 n=1	
	Cyanide Free		<.015 n=1	<.015 n=2	<.015 n=2	<.015 n=1	--	
	Cyanide tot		<.02 n=1	<.02 n=2	<.02 n=1	<.02 n=1	<.02 n=1	

Table 5-21. Monthly Average for Selected Sample Results, Rain Facility, 1989 (continued)

Sample Location	Parameter	1/89	2/89	3/89	4/89	5/89	6/89	7/89
MW-17			--	--	Dry	Abandoned		
MW-18	pH		--	Dry	7.63	Abandoned		
	EC		--		294			
	Cyanide WAD		--		<.02 n=1			
	Cyanide Free		--		<.015 n=1			
	Cyanide tot		--		<.02 n=1			
MW-19	pH		--	--	Dry	Dry	7.9	Dry
	EC		--	--			652	
	Cyanide WAD		--	--			<.02 n=1	
	Cyanide Free		--	--			--	
	Cyanide tot		--	--			<.02 n=1	
MW-20	pH		--	--	Dry	Dry	Dry	Dry
MW-21	pH		--	--	7.8	7.43	7.85	7.3
	EC		--	--	725	851	769	601
	Cyanide WAD		--	--	--	<.02 n=1	<.02 n=1	<.02 n=1
	Cyanide Free		--	--	<.015 n=1	.085 n=1	--	--
	Cyanide tot		--	--	--	<.02 n=1	<.02 n=1	<.02 n=1

Table 5-21. Monthly Average for Selected Sample Results, Rain Facility, 1989 (continued)

Sample Location	Parameter	1/89	2/89	3/89	4/89	5/89	6/89	7/89
MW-22	pH		--	--	Dry	Dry	Dry	Dry
MW-23	pH		--	--	8.65	8.06	7.77	Dry
	EC		--	--	2760	1811	1290	
	Cyanide WAD		--	--	--	<.02 n=1	<.02 n=1	
	Cyanide Free		--	--	<.015 n=1	<.02 n=1	--	
	Cyanide tot		--	--	--	<.02 n=1	<.02 n=1	
RAIN SEEPAGE COLLEC-TION POND	pH	6.73/7.18	7.41/7.62	7.4/7.8	7.5/7.57	7.39	7.02	7.5
	EC	968	783	669	772	842	801	901
	Cyanide WAD	(15,34,22.7) n=3 (24,34,30.7) n=3	(2.7,20.8,12.1) n=3	(1.5,6.6,4.8) n=3	2.0 n=1	2.2 n=1	2.12 n=1	3.73 n=1
	Cyanide Free	(15,27,20) n=3 (27,37,32) n=3 (23,36,277) n=3	(6.9,20.2,14.6) n=4	(1.2,7.2,4.8) n=3	(1.6,2.5,2.0) n=2	--	--	--
	Cyanide tot	--	(6.9,18.5,12.9) n=3	(2.4,7.8,5.6) n=3	2.0 n=1	4.0 n=1	2.76 n=1	4.74 n=1
RAIN SEEPAGE COLLEC-TION POND TRENCH DRAIN	pH	Dry	--	5.81/7.89	6.92/7.44	7.62	--	--
	EC		--	333	452	639	--	--
	Cyanide WAD		--	(<.02,.09,.05) n=3	(.02,.05,.035) n=3	.03 n=1	--	--
	Cyanide Free		--	(<.015,.276,.11) n=3	(<.015,.093,.036) n=3	--	--	--
	Cyanide tot		--	(.1,.21,.14) n=3	(.02,.12,.07) n=2	.09 n=1	--	--

Table 5-21. Monthly Average for Selected Sample Results, Rain Facility, 1989 (continued)

Sample Location	Parameter	1/89	2/89	3/89	4/89	5/89	6/89	7/89
RAIN BACK-GROUND SPRING 1	pH		--	6.75	--			
	EC		--	128	--			
	Cyanide WAD		--	<.02 n=1	--			
	Cyanide Free		--	.003 n=1	--			
	Cyanide tot		--	<.02 n=1	--			

APPENDIX 5-E

COMMENTS SUBMITTED BY NEWMONT GOLD COMPANY ON DRAFT SITE VISIT REPORT

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

APPENDIX 5-F

EPA RESPONSE TO COMMENTS SUBMITTED BY NEWMONT GOLD COMPANY

EPA Response to Comments Submitted by
Newmont Gold Company on Draft Site Visit Report

EPA has revised the report to address all of the comments made by Newmont Gold Company in a letter dated May 15, 1992 (see Appendix E). In some cases, EPA made changes to wording suggested by Newmont, either for brevity, in order to attribute the changes to Newmont, or to enhance clarity.

It should be noted that Newmont states in its comments that it does not believe that RCRA §3001 or §3007 provided EPA with the authority to conduct the site visit and document review at the Rain facility. EPA disagrees. Notwithstanding its position on the authority under which the site visit and data collection occurred, Newmont cooperated with EPA before, during, and after the site visit. Newmont's cooperation is appreciated.