Appendix 1: TES Conservation Measures Implemented to Date on Kootenai National Forest (June 1992)

Bald Eagle

- Osprey/eagle nesting surveys done annually, 1980-present.
- Monitoring of reported eagle sightings.
- Participation in national mid-winter bald eagle surveys.
- Funding of aerial survey for bald eagle nests in 1989.
- Public education/school programs on TES species.

Peregrine Falcon

- Monitoring of reported sightings.
- Funding of 1989 aerial survey to identify potential peregrine habitat.
- Monitoring of historical nest site in the Yaak since 1979.
- Public education/school programs on TES species.

Wolf

- Monitoring and evaluation of reported sightings and sign.
- Funding Wolf Ecology Project to aerially monitor radio collared wolf.
- Coordination with Idaho Department of Fish and Game, Montana Department of Fish, Wildlife, and Parks, and USFWS on wolf management and planning.
- Management of habitats for ungulate prey base through road closures, prescribed habitat burning, forage seeding, timber sale coordination.
- Public contacts and educational presentations to the local schools in Troy, Libby, Eureka, and Yaak areas.

Grizzly Bear

Habitat Improvement (since 1975)

- Approximately 900 acres of prescribed burning of grizzly bear habitat.

- Approximately 2000 acres of big game habitat burning with secondary benefits to grizzly bears and wolves.

- Approximately 225 acres of forage seeding for grizzly bears.

- Approximately 1350 acres of forage seeding for big game with secondary benefits to grizzly bears and wolves.

- Approximately 450 miles of roads closed year round or seasonally.

- Approximately 2,826 acres replacement habitat proposed for Montanore

Habitat Inventorv and Cumulative Effects Analvsis (CEA)

- Participated with Border Grizzly Project (BGP) in reconnaissance surveys of the Uaak to assess habitat and populations.

- Conducted habitat component mapping.

- Developed and implemented grizzly bear Cumulative Effects Analysis process, and calculate CEA annually since 1984 on all BMU's.

Studies

- 1986-87, Yaak black bear study with secondary information collected on grizzlies. Provided administrative support, facilities, and equipment.

- 1989-present, Uaak grizzly study. Provided funding, vehicles, housing, equipment, and administrative support.

- 1985-present, funded aerial bear occurrence/shrubfield survey.

Grizzlv Relocations

- 1976-83, provided relocation sites for a total of 7 bears from other ecosystems. Participated in monitoring these bears, also provided housing and administrative support to BGP trackers.

- 1991-1994, 4 female grizzly brought from Canada and placed in Cabinet Mountain wilderness as part of population augmentation plan

Monitoring;

- Annually collect, record, and evaluate all grizzly reports since 1975.

- Aerial surveys during late summer to document grizzly occurrence.

Resource coordination

- Active participant in all interdisciplinary planning of activities within grizzly habitat; provide biological input at all levels and phases; develop Biological Evaluations for activities; initiate consultation with USFWS and MDFWP as needed.

- In the process of adopting a MOU with MDFWP and USFWS to oversee Montanore project grizzly bear mitigation plan.

Information/Education, Law Enforcement

- Annual road patrols concentrated mostly during rifle hunting seasons.

- Signing grizzly habitat with bear identification materials.

- Participate with MDFWP and USFWS in investigating mortality instances, coordinating additional closures, and informing the public.

- Established "Grizzly Bear Mortality Working Group" in conjunction with Interagency Grizzly Bear Committee in 1989.

- Public education/school programs on TES species. In the process of establishing I&E and Law enforcement positions as mitigation for Montanore project.

Lynx

⇒ Active participation in all interdisciplinary planning of actvities in lynx habitat. Provide biological input at all levels and phases. Develop Biological Evaluations for activities. Annual collection, recording and evaluation of all lynx reports, (on going)

⇒ Established a lynx taskforce that researched and summarized research information on lynx. Developed lynx habitat component defintions. Designed Iynx habitat model. Produced Lynx Conservation Strategy for the Kootenai National Forest. (1994-1997)

⇒ Provided funding, administrative suppor,t and field participation in Lynx track surveys in partnership with the Montana Fish, Widlife and Parks. (1995)

⇒ Provided funding, administrative support, and field participation in "DNA Identification of lynx hair for assessing population status" study by John Weaver. (1996-1998)

⇒ Provided funding, administrative support, and field participation in "Lynx prey species habitat evaluation" study in partnership with the Northern Rockies Conservation Cooperative. (1997-present)

⇒ Provided field participation in lynx surveys (forest wide lynx hair snagging sampling program) (1997-98).

Appendix 2: **Detailed Proposed Project Description**
(taken from the Supplemental Draft EIS, January 1998)

Wetlands Mitigation Plan. Alternative IV would impact 6.0 acres of wetlands and 0.4 acres of Waters of the U.S. (see Table 2-6). Only 10.5 acres of wetlands mitigation sites proposed by ASARCO would still be available for use. Other locations within the riparian areas along Rock Creek and within the proposed permit area might have the necessary wetland hydrologic characteristics to replace the access road mitigation site acres. ASARCO might be required to identify additional mitigation sites to comply with its 404(b)(1) permit. Other components of the wetlands mitigation plan would be the same as for Alternative III.

Alternative V — Rock Creek Project with Tailings Paste Deposition and Alternate Water Treatment Preferred Alternative)

The major modifications distinguishing this alternative from Alternative IV as described in the draft EIS are the deposition of tailings as a paste, an alternate water treatment system, an enclosed rail loadout facility, and relocation of the evaluation adit support facilities (see Figure **2-26).** Table **2-11** lists the significant issues pertinent to this project and indicates which of the following sections addresses mitigating measures for those issues. Chapter 4 contains a more detailed discussion of how the mitigating measures would reduce or eliminate environmental impacts.

In addition, to the major modification mentioned above, Alternative V includes the following applicable modifications. mitigations, and monitoring plans from Alternatives III and/or IV, described in the draft EIS:

Modifications.

- Alternate mill and mine portal location at confluence of east and west forks of Rock Creek (Alternative IV) and subsequently shorter access road and utility corridor
- Alternate rail loadout location near Miller Gulch (Alternative III)

TABLE 2-11

Alternative V **Modifications and Mitigations**

Significant Issues	Categories: Mine Plan & Ore Processing	Tailings Disposal	Water Use & Management	Transportation	Utilities	Employment	Reclamation	Monitoring & Mitigation Plans
Surface & Ground Water Quality		x	x	x	x		x	x
Fish, Wildlife, and T&E Species	x	x	x	x	x	x	x	x
Impoundment/Paste Facility Stability		x						
Socioeconomics	x							
Old Growth Ecosystem	x							
Waters of the U.S. and Wetlands	x	x						x
Public Access/Traffic Safety	x			x				
Aesthetic Qualities	x	x			x		x	

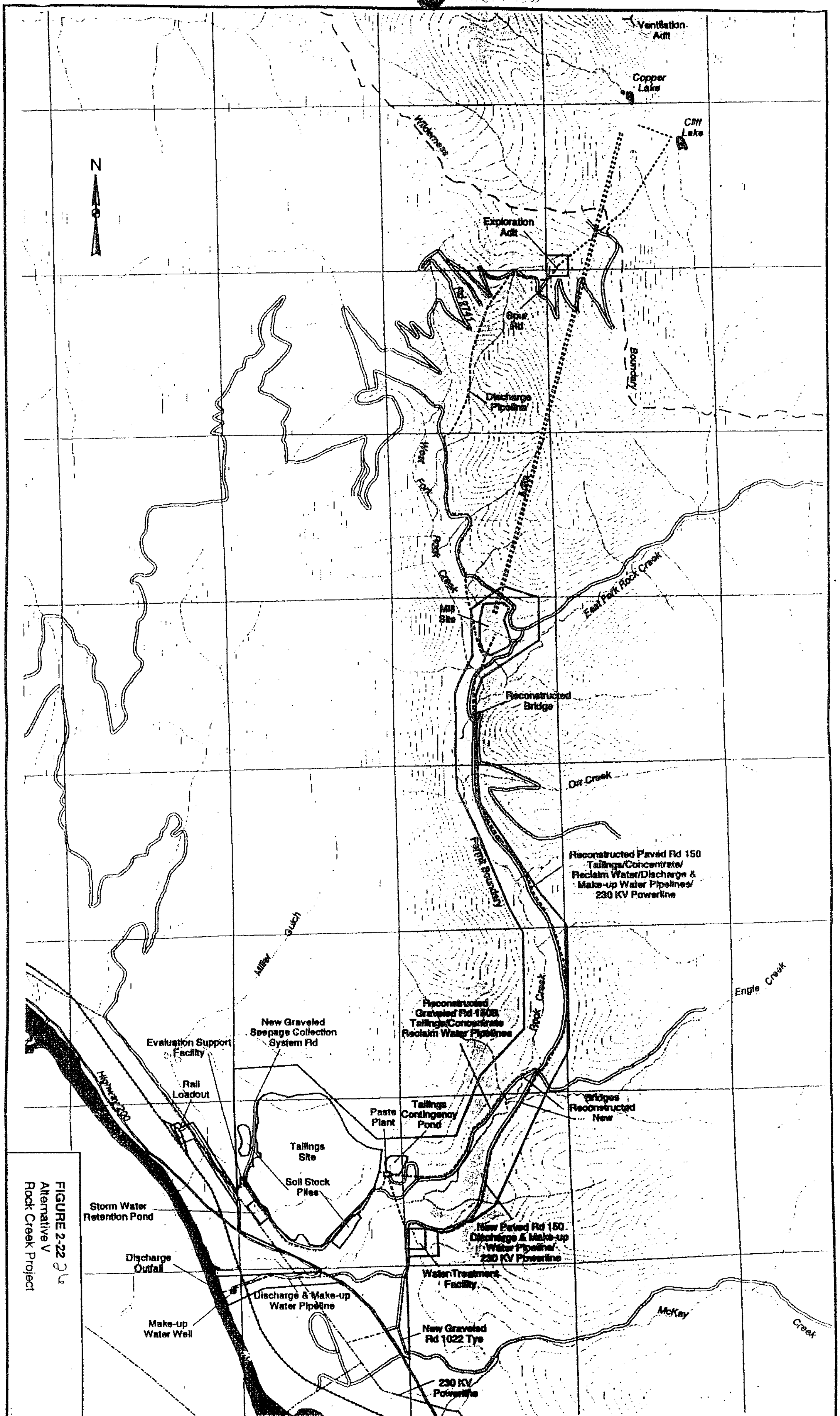


FIGURE 2-22
Alternative V
Rock Creek Project

Source: Kootenai National Forest GIS database 6-97 s.ague

- Alternate location for wilderness ventilation adit (Alternative III)
- Combined utility and road corridor (Alternative III)
- Relocation and reconstruction of FDR No. 150 (Alternative III)

Mitigations:

- Subsidence control and monitoring plan (Alternative III)
- Rock mechanics and hydrogeologic sampling. testing and monitoring program to include an acid-base testing program (Alternative (III)
- Visual and sound mitigations for the mill site (alternatives III and IV), and ventilation and evaluation adits (Alternative 111)
- Technical panel review of final tailings impoundment design (paste facility under Alternative V) (Alternatives III and IV)
- Development of a transportation management plan (Alternative III)
- Visual mitigations for the utility corridor and tailings impoundment site (paste facility site under Alternative V) (Alternative III)
- Revised grading and revegetation plans for the mill site to mitigate visual impacts (Alternative IV)
- Deeper soil salvage (24 to 36 incnes) and replacement depths (average of 24 inches) to facilitate revegetation (Alternative III)
- More detailed long-term reclamation monitoring plan than Alternative II (Alternative III)
- More detailed aquatics/fisheries. wildlife. threatened and endangered species monitoring and mitigation plans than under Alternative II. including a sediment source reduction plan (Alternative III)
- A comprehensive. long-term water monitoring plan which includes monitoring lake levels at Cliff and Copper lakes to be coordinated with subsidence control and monitoring plan and fisheries/aquatics monitoring plans (Alternative III)
- An alert level and contingency/corrective action plan for each monitoring plan (Alternative III)
- Maintenance and possible long-term post-closure waste water treatment (Alternative III)

Evaluation Adit

Evaluation activities would remain essentially the same as described for Alternative II in the draft EIS and summarized above in this chapter. However, the support facilities site has been relocated to a site within the paste facility footprint (see Figure **2-26).** The power source for the adit has been changed to propane generators and is discussed under *Utilities.* Changes to waste water treatment are discussed under ***Water Use and Management.***

Mine Plan

The mine plan would remain the same as described for Alternatives II through IV in the draft EIS. The mill site would be located at the confluence of the East and West forks of Rock Creek, as described for Alternative IV in the draft EIS. However. the mine portal would be moved to the west side of FDR No. 150 just north of the coarse ore storage. This lines the adits up with the mill facilities and eliminates two transfer points on the ore conveyor belt system. There would be no mine facilities on the east side of FDR No. 150 at the confluence mill site other than storm water control features. Some of the waste rock from driving the mine adits would be used for mill pad construction, road graveling, and paste facility construction. Hauling of waste rock from the adits to the tailings paste facility site would be restricted to mid-August through May as a mitigation to impacts on harlequin ducks.

There would be a minimum 100-foot vegetative buffer between FDR No. 150 and mine/mill facilities including the relocated mine portal for visual screening. There also would be a 300-foot buffer between the mill and either fork of Rock Creek.

Reduced-emission diesel engines would be used in place of standard diesel engines underground. Electric underground ore trucks would also be used. These modifications would reduce concentrations of NO,. SO,. and CO released to the atmosphere and underground workings.

Surface Disturbance

A total of about 481 acres would be disturbed within the permit area under Alternative V (see **Table 2-2).** The Forest Plan would be amended so that management allocations on 147 acres would be consistent with the intended use.

Ore Production Schedule

The development schedule has been lengthened because of the additional time needed to develop the longer adit.

The ore production schedule has been adjusted based on a more conservative recovery estimate of 65 percent and a revised amount of ore to 136,000,000 tons (see **Table 2-12).**

After limited ore production during early mine start-up there would be approximately 28 years of remaining production. The schedule is summarized below. This schedule could be affected by unforeseen delays related to permitting. design approvals, development or construction delays or accelerations. financial considerations. actual mining conditions and ore recoveries, and metal market conditions. An earliest estimated start date based on the EIS development schedule and possible riming of agency decisions would be no sooner than June 1999. however. actual project construction would be determined by ASARCO based on market conditions and other business considerations.

TABLE 2-12
Estimated Project Development Schedule

Project[1] Year 1	Evaluation Adit
Project Years 2 and 3	Mine Development'
Project Years 4 through 5.5	Mine Development[2]/Surface Facilities Construction'
Project Years 5.5 through 6	Start-up/Limited Production
Project Years 7 through 33	Production

Notes: [1] Project year goes from beginning to end of that year. That is. project year 1 goes from 0 to end of year I.
[2] Waste rock would be hauled seasonally during mine development (years 2 through 6).
Includes construction of mill site. waste water treatment plant, paste plant and utilities corridor.

Ore Processing and Shipment

The ore-processing facility or mill would remain generally the same as is described for the proposed action, Alternative II, but located at the confluence of the east and west forks of Rock Creek as described for Alternative IV (described in the draft EIS). The primary difference from the other action alternatives is that there would be no tailings thickener facility at the mill site due to the change in tailings disposal (see Paste Deposition of Tailings below). The thickener would not be necessary as the tailings would be dewatered at the paste production plant adjacent to the tailings paste facility. However, the emergency dump pond and the storm water pond would be enlarged to provide additional water storage (see **Figure 2-27).**

ASARCO modified the milling operation to reduce particulate emissions under Alternative V. The surface dry milling operation or secondary crushing would be replaced with a semi-autogeneous **(SAG)** mill, a fully wet milling operation. Concenrrate would be sent from the mill to the rail loadout facility as a slurry in a 3-inch HDPE-lined steel pipe with leak detection sensors and buried in the same corridor as the tailings and water pipelines. The rail-loadout process including concentrate de-watering. drying. filtering. and storage and railcar loading would take place within an enclosed building. Covered railcars would eliminate the use of a tackifier that would have been needed to minimize dust generation during transport to the smelter. Approximately 13 railcars of concentrate per week would be removed from the site. Reclaimed concentrate water would be piped to the paste plant and then to the mill for reuse.

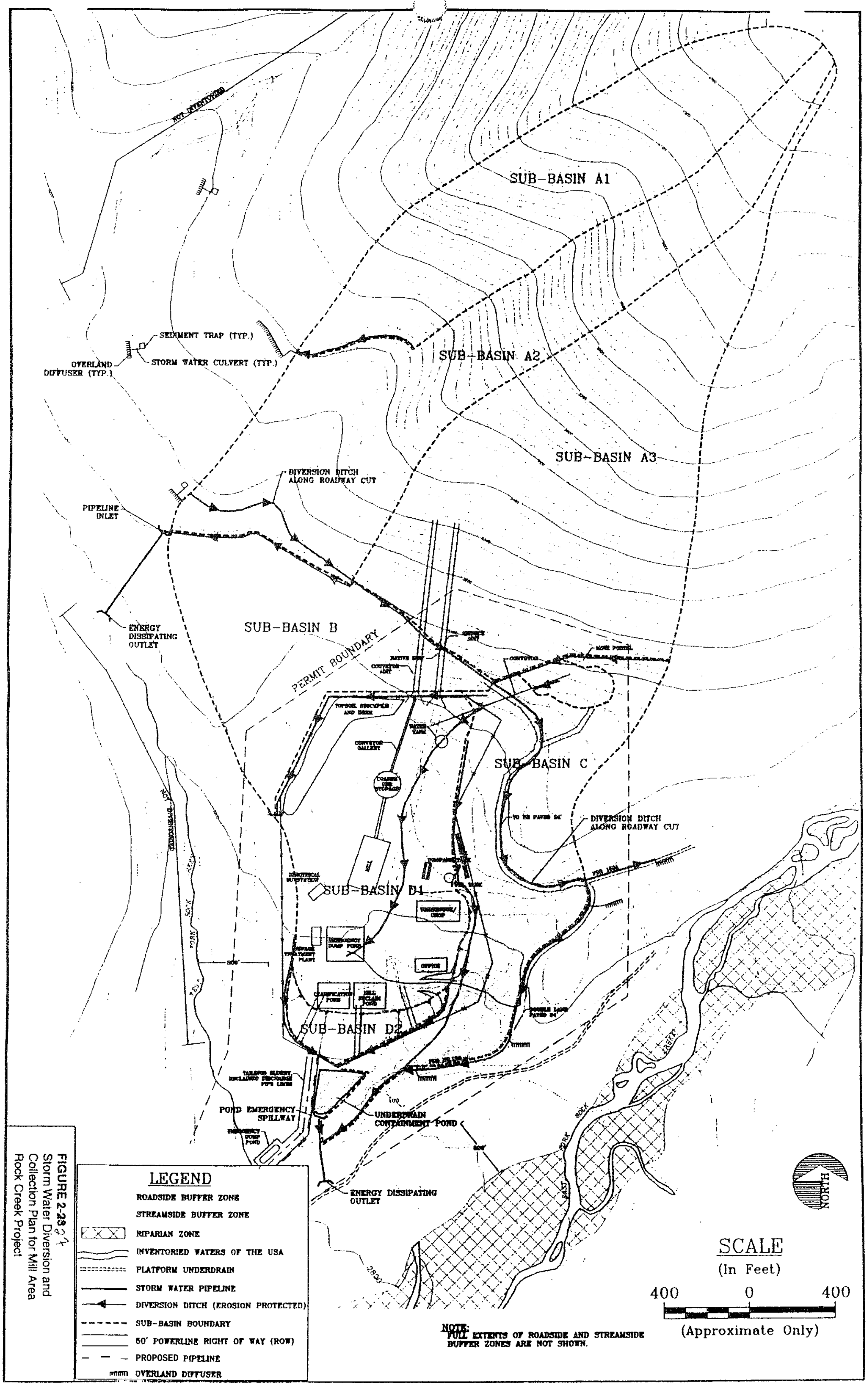


FIGURE 2-28
Storm Water Diversion and Collection Plan for Mill Area
Rock Creek Project

Paste Deposition of Tailings

Tailings Transport. Tailings would be transported 4.1 miles from the mill to the paste plant as a slurry (30 percent tailings. 70 percent water) in a 16- to 24-inch. urethane-lined. steel pipeline (a double-walled pipeline) with leakage detection devices. This pipeline along with the 15- to 18-inch return process water line, which would also be used as the make-up water line. and the concentrate pipeline would be buried 24 inches deep (see **Figure 2-28).** Burying the pipelines will provide better protection from vandalism, eliminate the visible presence of the pipelines. and facilitate concurrent reclamation in the pipeline corridor along most of the route between the mill and the paste plant. The pipelines would be visible at the three above ground crossings of Rock Creek, West Fork Rock Creek, and Engle Creek. All lines would be encased in a larger steel pipe at creek crossings adjacent to or near bridge crossings to guard against the unlikely event of a leak or rupture.

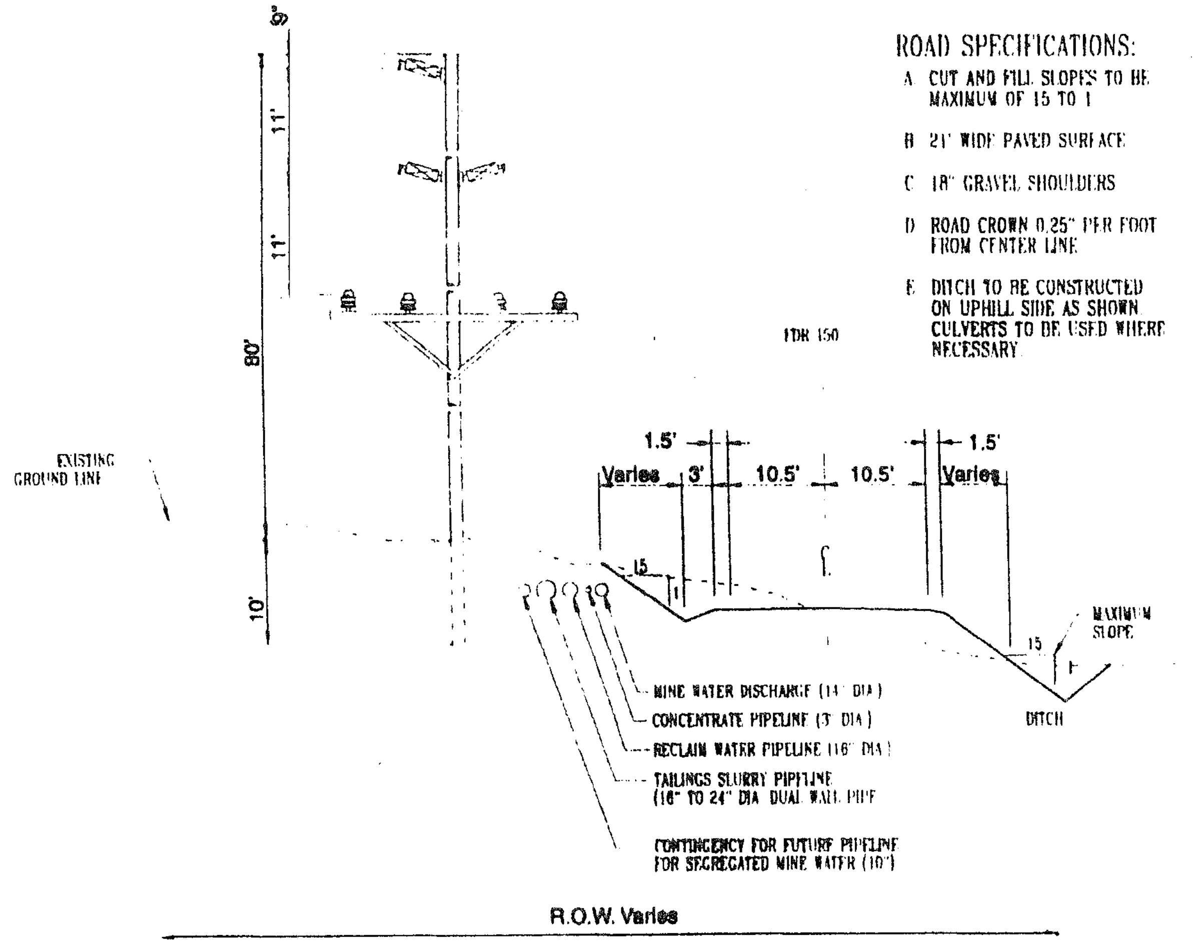
Paste Production. In general, the tailings would be delivered to the paste plant and dewatered to make a paste with a known proportion of water (approximately 20 percent by weight). This paste would be applied to the ground surface after sediment and erosion control features are in place and soil has been salvaged.

The paste plant building, approximately SO-feet by 80-feet by 110-feet high. would be located on the hillside adjacent to the tailings paste facility site. The building would be built into the hillside and painted to help reduce its visual impact. Trees and vegetation surrounding the paste plant would be retained or planted to help visually blend the plant site with adjacent hillsides. ASARCO would conduct a site study verified by a visit with the Agencies prior to final siting of the plant and access road to select a location that would reduce plant visibility and avoid harlequin duck habitat to the extent possible.

The paste plant would be designed to receive, dewater, mix, and pump 10,000 tons of tailings per day, 365 days per year. The paste process schematic is shown in **figures 2-29 and 2-30**. The tailings slurry would be deposited into a tailings surge tank and then fed into two cyclone/separators. The cyclone underflow, composed of the coarser tailings, would be discharged into an agitated storage tank (35-foot-diameter by 50-foot-high) and could be discharged at a rate of 50 tons per hour (tph). The overflow. composed of primarily finer tailings, would be fed through a distributor box into one or more of the four 33-foot-diameter by 60-foot-high dewatering tanks. The tailings would be discharged from each tank at a rate of 67 tph. Maximum discharge rate could reach 90 tph to allow for maintenance of one tank while continuing paste production in the other three tanks.

Process water for paste production would come from the water discharged from the dewatering tanks. Process water would be stored in a 30.000-gallon tank: excess water would be pumped back to the mill for reuse or discharged from the mill to the waste water treatment facility for disposal.

The full plant tailings paste would be produced by combining the fine tailings paste from the dewatering tanks. the coarser tailings in the agitated storage tank, and additional process water as needed. Supplemental material such as a binder (Portland cement. fly ash, or slag cement) or seed and/or fertilizer to facilitate reclamation may be added as needed. Each dewatering tank would have a separate mixer capable of handling the maximum discharge from the dewatering tank plus the coarse material from the storage tank. The paste production would be monitored and regulated so that the resultant paste



NOTE:

1. ALL PIPELINES WOULD BE INSTALLED WITH LEAK DETECTION SYSTEMS.

FIGURE 2-24
Pipeline Corridor Drawing
Rock Creek Project

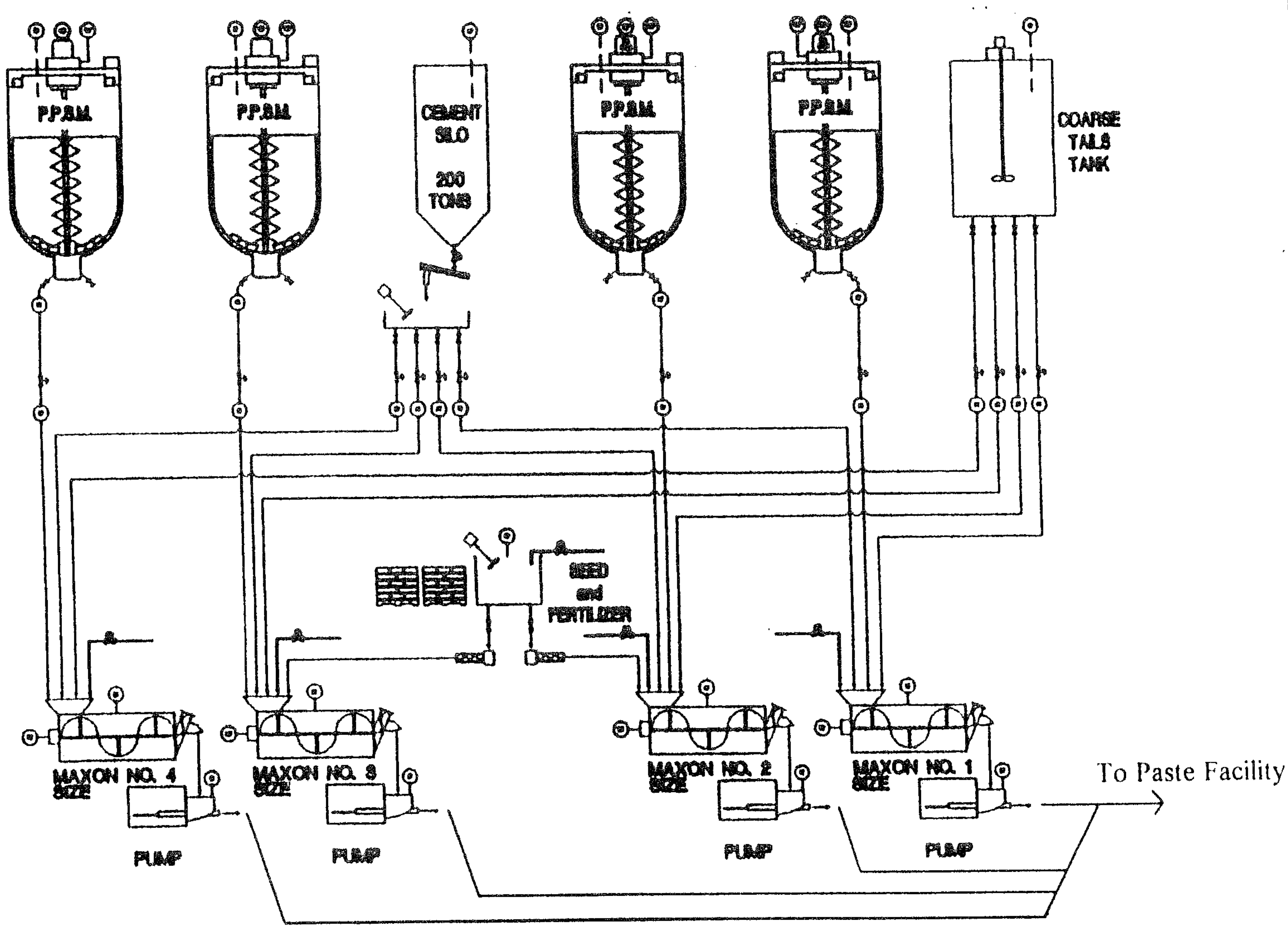


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FIGURE 2-25 24
Paste Plant Process Schematic - Paste Production and Mixxing
Rock Creek Project

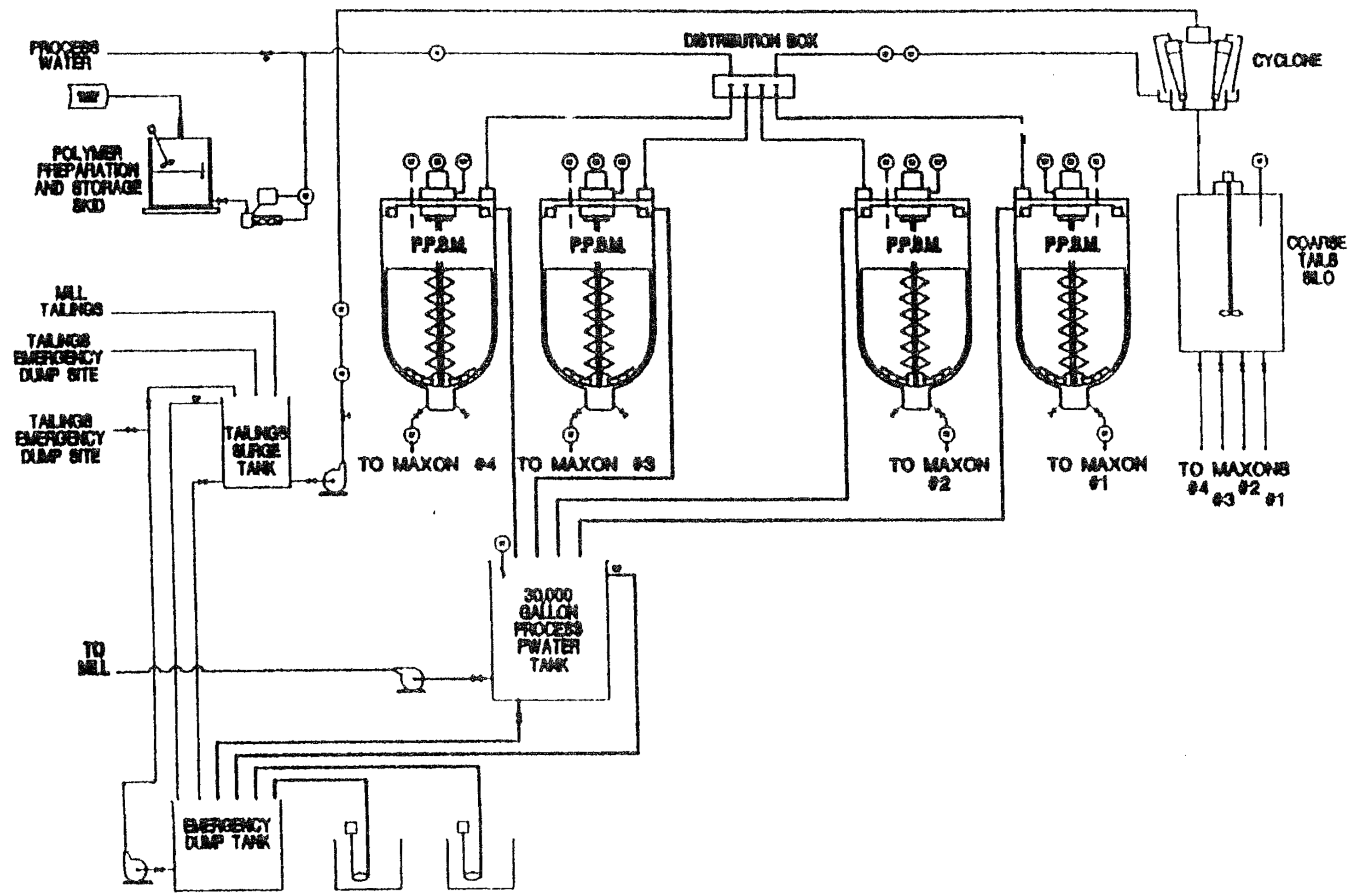

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FIGURE 2-26
Paste Plant Process Schematic -
Dewatering of Tailings Slurry
Rock Creek Project

would have the consistency of a 7-inch slump. Positive displacement pumps would transport the paste via a high-pressure pipeline to the disposal location at tlie tailings paste facility.

The dewatering tanks would be designed to allow for continuous feed of tailings and production of paste even when one tank was off line for maintenance or repairs. The surge capacity of the dewatering tanks and the coarse tailings agitated storage tank would allow tlie paste production system to be shut down for 7 hours without stopping the tailings slurry feed from the mill or before using a tailings slurry feed containment site adjacent to the plant. In addition, each mixer has a surge capacity of 15 tons or approximately 10 minutes of down time for one mixer/pump pair without shutting down the paste production process.

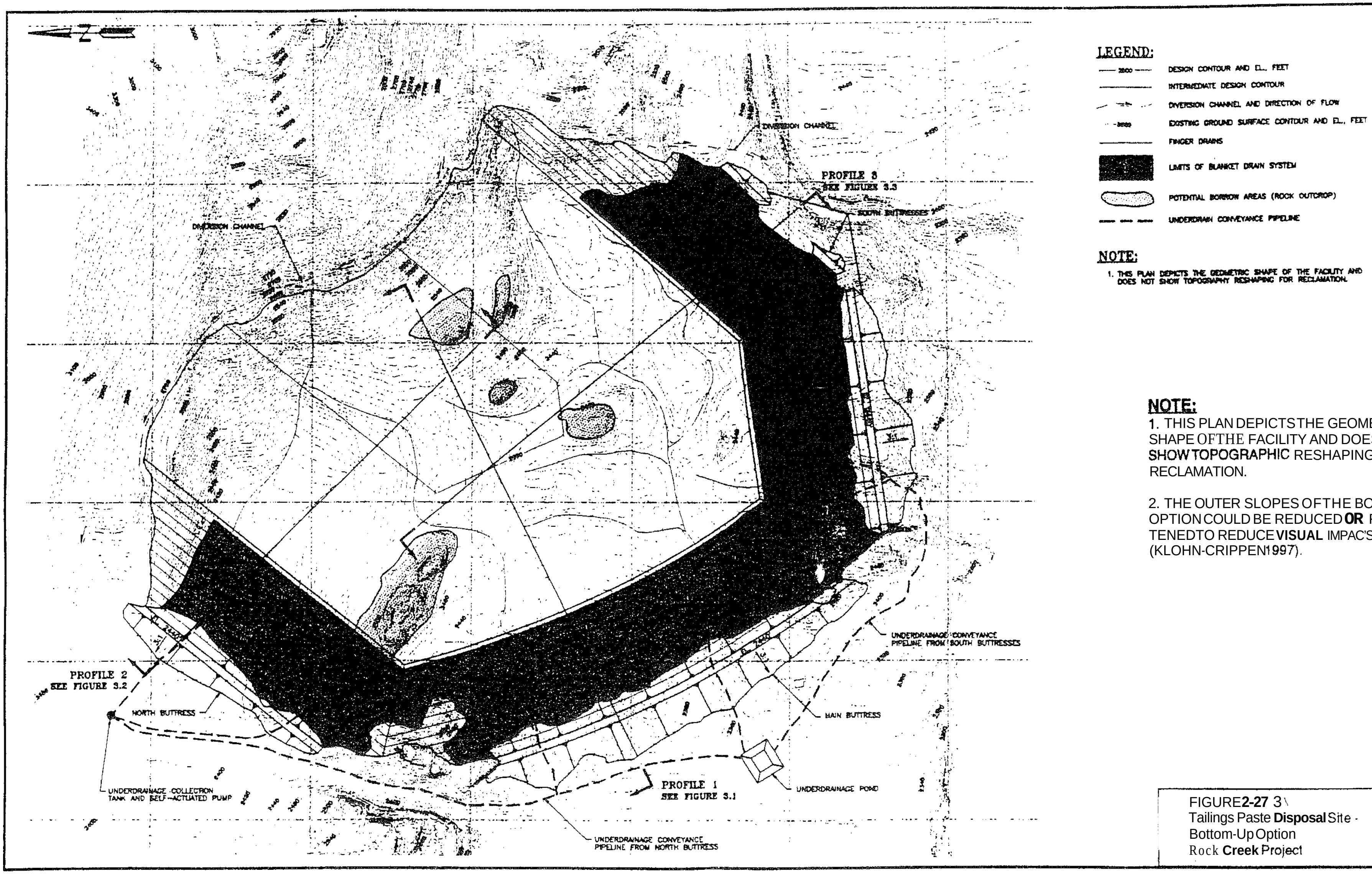
A 7-acre contingency tailings slurry feed containment site would be near the paste production plant to contain approximately *6* days of tailings production should the paste production plant be totally disabled or in the event of a major failure beyond the control of the plant design (see **Figure 2-26)**. This facility would be designed using traditional slurry impoundment design methods with a dam or embankment and would be lined with low permeability native materials (clay-type soils) to control seepage. The tailings stored in the containment pond would be dredged from the pond and reintroduced into the plant for disposal as a paste after the plant resumed operation. A paste plant shutdown of more than 6 days would result in the suspension of milling.

Tailings Paste Deposition. The location of the paste plant was selected to utilize a hillside location adjacent to the paste facility for convenient tailings materials handling and disposal. The paste plant design provides operational flexibility and avoids duplication in pump transport. Positive displacement pumps with a combined design capacity of approximately 680 dry tph would be used in an arrangement that would allow one pump to be shut down for either preventative or unscheduled maintenance. The paste would be pumped to the paste delivery system.

There are two primary paste deposition options for Alternative V and one combined paste deposition option. These options are named according to the direction in which the paste is deposited and the landform is built (see **Figure 2-31, 2-32.** and **2-33)**. These options are termed Bottom-Up option (Alternative V-a), Top-Down option (Alternative V-b), and Combined option (Alternative V-c).

The Bottom-Up option would initially involve spigotting paste from the lower elevations and moving the spigot point upslope. The Top-Down option would result in deposition of the paste by spigotting the paste from the upper-most slopes and moving the spigot point towards the highway; the deposit would gradually progress to the southern most portion of the deposit site. Under the Combined option the direction of paste deposit and spigot location would depend on the method being used at the time as described for the Bottom-Up and Top-Down options. The combined option would be used on a seasonal basis each year or alternate between a number of years with each of the first two options. The tailings paste facility would encompass approximately 305 acres for the paste facility and another 20 acres for associated features. such as soil stockpiles. under all options but acreage would vary slightly based on the final approved design.

A series of toe buttresses would be required for all options to assist in containing the paste on the downslope sides, improving slope stability, and retaining sediment eroding off the slopes. Under these conceptual designs. the buttresses would reach an ultimate height of approximately 80 feet (elevation of



NOTE:

1. THIS PLAN DEPICTS THE GEOMETRIC SHAPE OF THE FACILITY AND DOES NOT SHOW TOPOGRAPHIC RESHAPING FOR RECLAMATION.

2. THE OUTER SLOPES OF THE BOTTOM-UP OPTION COULD BE REDUCED OR FLATTENED TO REDUCE VISUAL IMPAC'S (KLOHN-CRIPPEN 1997).

FIGURE 2-27 3\
Tailings Paste Disposal Site - Bottom-Up Option
Rock Creek Project

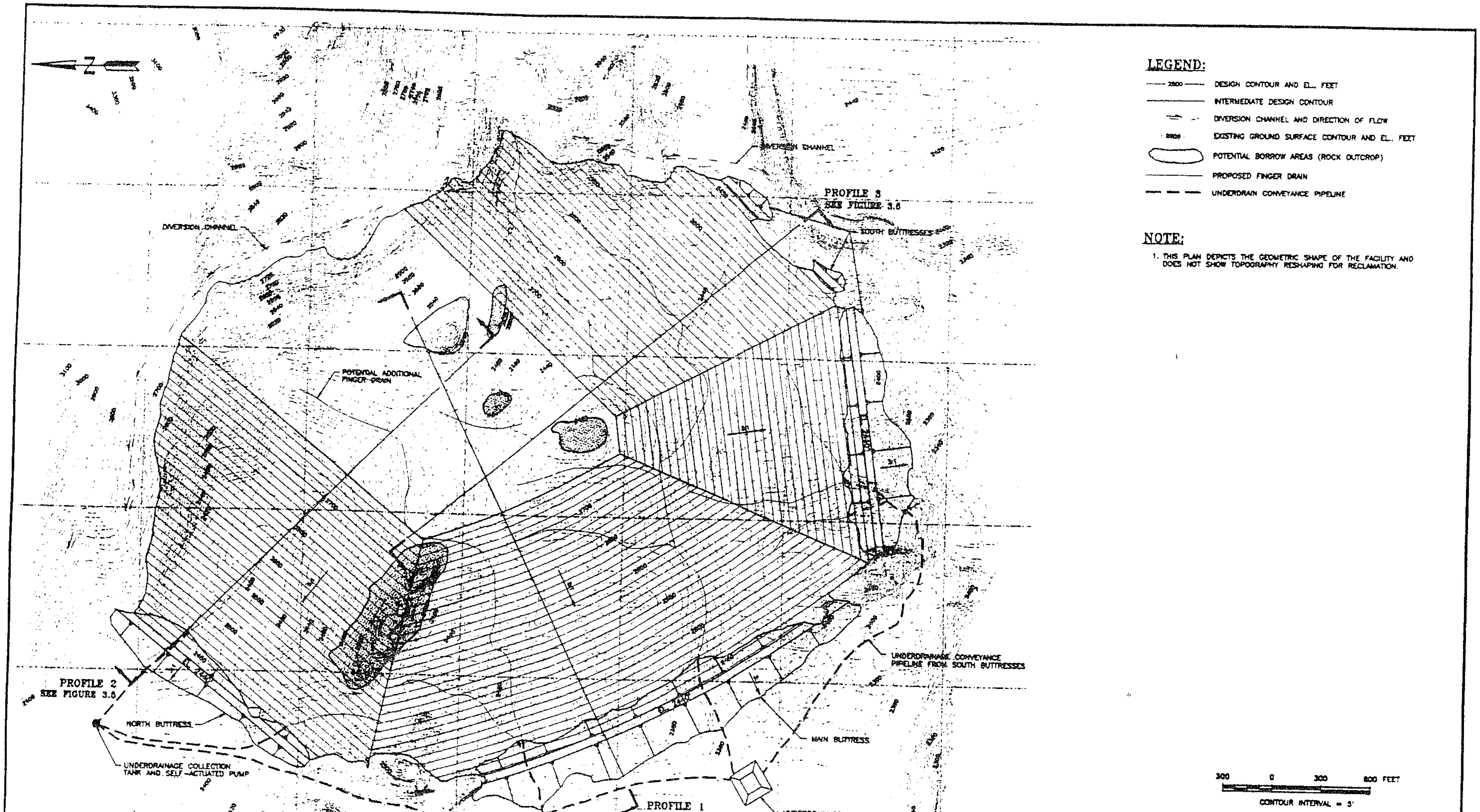


FIGURE 2-28 32
Tailings Paste Disposal Site -
Top-Down Option
Rock Creek Project

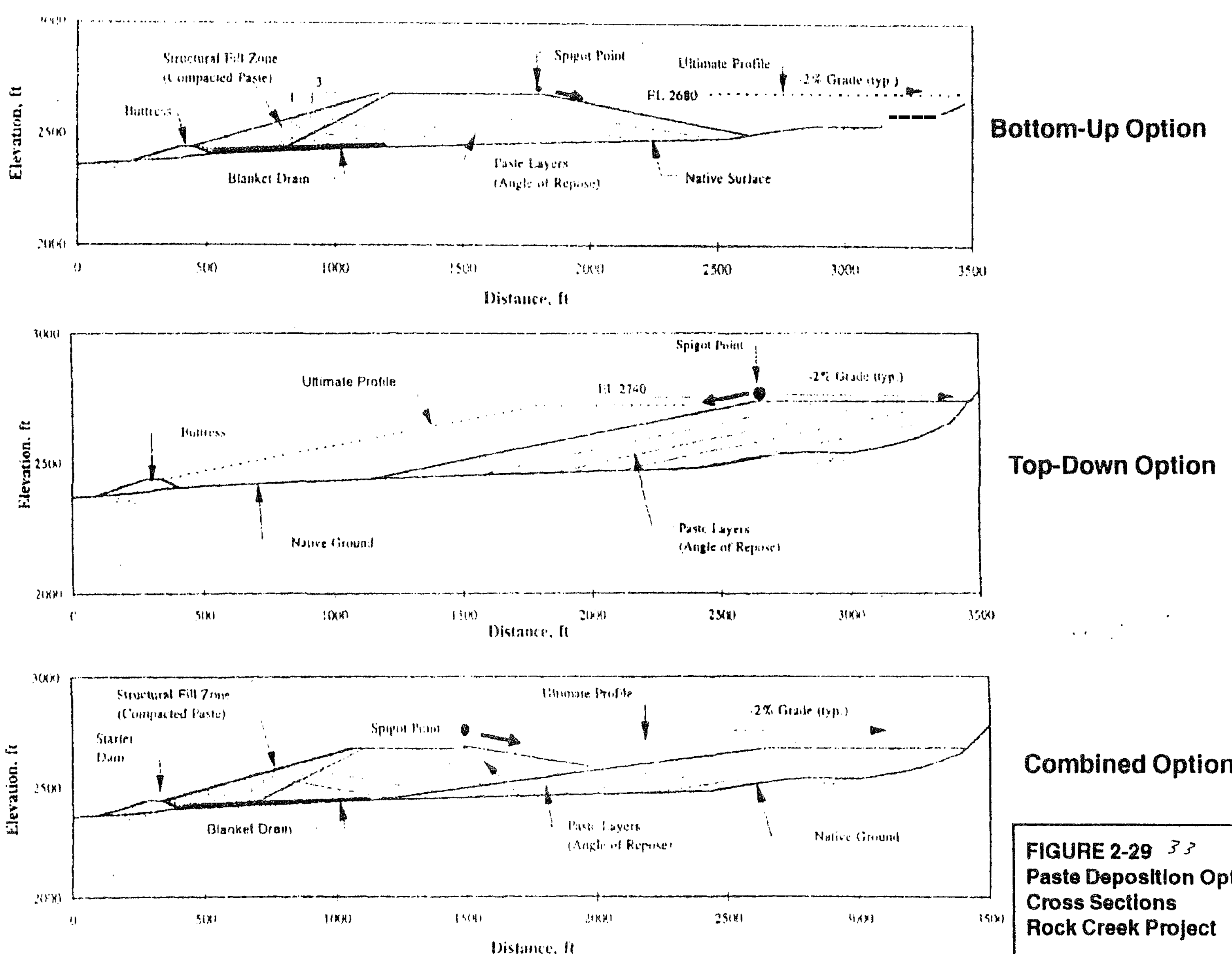


FIGURE 2-29 33
Paste Deposition Options
Cross Sections
Rock Creek Project

2-67 10

2440 feet), but the actual height would depend upon engineering behavior of foundation soils to be analyzed in more detail in the final design. The toe buttresses would be located in approximately the same location as the starter-dams for the tailings impoundment designs in alternatives II through IV. The buttresses would be built during initial stages of mine development as rock was salvaged from within the deposit footprint or became available during adit construction. The buttresses would consist predominantly of rockfill totaling approximately 1,360,000 cubic yards. The rockfill could be obtained from rock outcrops within the deposit site, borrow areas within the deposit site, and waste rock produced from mine adit development (see **Table 2-13** for preliminary estimates of materials obtained from these sources). Waste rock from the adits would be hauled to the tailings paste facility site and used immediately for buttress construction to avoid rehandling this material or the need for a waste rock dump at the mill site. The waste rock could only be hauled between August 1st and March 31 to minimize impacts to harlequin ducks.

TABLE 2-13
Preliminary Volumes of Paste Facility Toe-Buttress Waste Rock Requirements

Source	Quantity (Cubic Yards)
Rock Outcrops	480,000
Borrow Areas	130,000
Mine Waste	750,000
Total	**1,360,000**

The paste pipeline would be located either on the crest of the toe buttress for the Bottom-Up option or along the upper end of the deposition site for the Top-Down option. The location of the spigot or spigots for the Combined option would depend upon the method(s) being used at the time. A low load-bearing crawler crane would be used to position the pipe and spigotting would commence. Once a layer or a lift of paste had been completed, the crane, pipes, and spigot would be relocated further down the row onto the oldest portion of the previous paste layer, or to a new row if the previous one had been completed. A new layer of paste would then be spigotted onto the previous layer(s). There may be some delay in relocating the crane when using the Top-Down option as the paste would need to solidify or compact enough to support the equipment. Although earliest reports (Golder 1996) proposed paste deposit lifts of 3 to 4 feet, a later report recommends that the lifts be reduced to 1 foot until actual field construction experience indicates that a thicker lift can be deposited to ensure paste facility stability (Knight Piesold 1997).

In the Bottom-Up option and the Bottom-Up portion of the Combined option, a structural zone of compacted paste would be constructed upslope of the toe buttresses to permit the construction of a 3:1 slope. The paste would be spigotted behind the structural zone at its angle of repose. The outer slope of the structural zone would crest at an elevation of approximately 2680 feet (320 feet high) (see **Figure 2-31**). The Top-Down option would be constructed at the angle of repose (approximately 5:1), resulting in longer overall side slopes than the Bottom-Up option. Compaction of slopes would only occur if found to be necessary under the Top-Down option. This would depend on actual field experience. The Top-

Down option would have a crest of approximately 9740 feet (380 feet high): although the crest is slightly higher it would be positioned farther away from the highway (see **Figure 2-32).** The Combined option would have some flatter slopes on the upper portions of the deposit and steeper slopes closest to the highway. The Combined option would have an ultimate elevation somewhere between the first two options, the actual elevation would. depend upon when the Bottom-Up component was begun relative to the Top-Down component. It may be possible in final design for either the Bottom-Up or combined option to flatten the outer slopes and deposit the remaining mass of the tailings facility closer to Government Mountain and away from Montana Highway 200 such that the resultant landform would more resemble the Top-Down option. Topographic relief of the upper surface ofthe paste facility constructed by any of the options could be created by preferential spigotting of the paste and the paste could also be reshaped by dozer to achieve the final grading prior to reclamation. Manipulation of the paste to vary the side slopes could be done more easily during construction under the Top–Down option than under the Bottom-Up option. The paste material would be reclaimed on the surface and outer edges when final grade was achieved and timing of reclamation varies somewhat depending upon the option used (see **Reclamation**).

A system of basin drains would be incorporated into any of the options to maximize recovery of seepage of residual process water in the paste and storm water infiltration through the paste. **A** blanket drain adjacent to the outer slopes and beneath the compacted structural zone would be constructed to maintain a drainage ofthe structural zone under the Bottom-Up option and the Bottom-Up portion ofthe Combined option. For **all** options an extensive system of finger drains would be constructed beneath the paste facility. Conceptually these drains would consist of 4-inch diameter, slotted pipe surrounded **by a** zone of crushed rock 10 feet wide and **2** feet thick. The actual location of these **finger** drains would be determined during the final design. The water collected by the finger drains would be routed to a single collection pond located outside the main buttresses (see **figures 2-31** and **2-32), pumped back** to the paste plant and, if not needed for paste production, returned to the mill for reuse.

Land would be cleared and topsoil salvaged in advance of paste deposition (see **Reclamation** for more detail). While a tailings impoundment would require the entire footprint of the impoundment to be cleared or disturbed prior to construction of the impoundment, the paste deposit alternative restricts disturbance to the active areas. There would be more land disturbed initially under the Bottom-Up option due to construction of the toe buttresses and blanket drain than under the Top-Down option (see **Table 2-14**).

Storm Water Control

All storm water detention and retention ponds would be lined with 30-mil HDPE liners for primary seepage containment, The mill pad underdrains would provide secondary collection for the mill site. Underdrains or blanket drains according to final design specifications wouid provide secondary collection of storm water seepage through the tailings paste facility.

TABLE 2-14
Summary of Estimated Active Versus Reclaimed Areas Over Time
for Alternative Paste Facility Construction Scenarios

Year	Area of Active Disturbance	Area at Final Grade (reclaimable area)	Total *Area*	Comments
BOTTOM-UP CONSTRUCTION SEQUENCE				
YR 0	0 acres	0 acres	0 acres	
YR 7	78 acres	0 acres	78 acres	Southern face under construction
YR 19	190 acres	0 acres	190 acres	Southern face completed
YR 21	97 acres	115 acres	212 acres	25% of top completed to final elevation
YR 31	74 acres	190 acres	264 acres	50% of top completed to final elevation
YR 33	41 acres	250 acres	291 acres	75% of top completed to final elevation
YR 34	0 acres	305 acres	305 acres	100% of top completed to final elevation
TOP-DOWN CONSTRUCTION SEQUENCE				
YR 0	0 acres	0 acres	0 acres	
YR 7	57 acres	2 acres	59 acres	5:1 depositional surface started across 1/2 of northern boundary
YR 10	110 acres	4 acres	114 acres	5:1 depositional surface completed across northern boundary
YR 14	105 acres	48 acres	153 acres	25% of top completed to final elevation
YR 20	119 acres	80 acres	199 acres	50% of top completed to final elevation
YR 26	121 acres	135 acres	255 acres	75% of top completed to final elevation
YR 33	93 acres	211 acres	304 acres	
YR 34	0 acres	305 acres	305 acres	100% of top completed to final elevation

Note: Disturbed acreages do not include soil stripping in advance of paste deposition. If soil is removed for a distance of 500 feet in advance of paste deposition, an additional 30 acres of disturbance can be assumed.

Source: Hydrometrics 1997

The lined storm water pond at the mill would be enlarged along with all diversions to handle a 100-year/24-hour storm event. Storm water collected at the adit portal and mill sites would be collected and recycled to the mill for reuse. Water collected from the outer slopes of the mill pad and the mill site underdrains would only be allowed to discharge under conditions specified in the revised MPDES permit (see **Appendix M).** Otherwise water from the underdrain containment pond would be pumped back to the mill for reuse. Storm water diverted from undisturbed lands above and adjacent to the mill would be discharged through overland flow diffusers or energy dissipating outlets outside the 300 foot streamside-buffer zone (see **Figure 2-27).**

Since the tailings paste facility and the undisturbed portion of the disposal site would not retain storm water like an impoundment, one or two lined **storm** water ponds would be constructed at the lower elevations in the tailings disposal site (see Figure **2-26).** These ponds would be removed and reclaimed **after** the tailings facility was completed and reclaimed. These ponds also would be sized to handle the runoff from the active portion of the tailings paste facility site during an 100-year/24-hour storm event. Water collected in the storm water pond could be pumped to the paste plant and then to the mill as process water or used for irrigating reclaimed portions of the railings paste facility if water quality was acceptable.

Sediment and runoff control of the taiiings facility would be handled in two methods. First. limiting unreclaimed areas to the active disposal areas could minimize sediment and runoff. Second. localized sediment retention structures and BMP's would be used in the downslope perimeter of the active panels for control, sampling and recovery of drainage from the tailings paste facility, sediment, and storm water runoff. These structures and coliection ditches would act as storm water diversions to channel the water and sediment from the active portion of the tailings paste facility into the tailings facility site storm water ponds. The ditches would also be sized to accommodate a 100-year/24-hour storm event.

Storm water from undisturbed lands above the tailings paste facility would be diverted around the active portions into the north **fork** of Miller Gulch and to Rock Creek during mine operations. Runoff from reclaimed and fully revegetated, stabilized portions of the tailings paste facility would be diverted to settling basins before mixing with runoff from undisturbed areas. Settling ponds for runoff from newly reclaimed areas along the perimeter of the tailings paste facility would be unlined and would discharge through a constructed drainage network to existing drainages. However, settling ponds on the upper portion of the paste facility would require lining to prevent excess infiltration of water. Storm water from reclaimed areas that were not fully stabilized would be captured along with runoff from the active areas of the tailings paste facility. Undisturbed portions of the paste facility would either drain into existing drainages or be diverted away from active areas, soil stockpiles, and the storm water pond. **All** these diversions would be sized to handle a 100-year/24-hour storm event. These diversions would be reclaimed and permanent drainage ways established when mine operations ended and the site was fully reclaimed.

The final design for the storm water and sediment control structures at the paste facility must be approved by the Agencies prior to being constructed.

Water Use & Management

Water Use and Supply. Water use and supply for evaluation and underground mining operations would remain the same as described for Alternatives II through IV in the draft EIS. **Figure 2-34** provides **a** schematic diagram of project water handling for mine operation during the end of mine life. Additional water balance detail can be found ASARCO's Alternative V Water Management Plan (Hydrometries, Inc. 1997b). Process water for the mill would come from five sources: reclaimed tailings sluny water, mine discharge water, reclaimed concentrate slurry water, mill site and tailings paste facility site storm water, and if needed, make-up-well water. Process water would remain in an essentially closed loop. Approximately 5 to 10 percent of the flow in the process loop will be diverted to the waste water treatment system and fresh water added to the circuit on an ongoing basis to prevent buildup of excess constituents in the process water.

General Waste Water Treatment. Two waste water treatment systems designed primarily for nitrate removal would be installed: an anoxic (low oxygen content) semi-passive biotreatment system and **a** reverse osmosis treatment system. Neither system would be designated as the primary or back-up system. A portable version of the reverse osmosis system would be built to handle mine discharge water from the evaluation adit and placed at the support facilities site. This unit would be moved to the water treatment facility site if a decision was made to continue with the mining operation and expanded to accommodate greater flows that would occur during mine construction and operation. It may take some

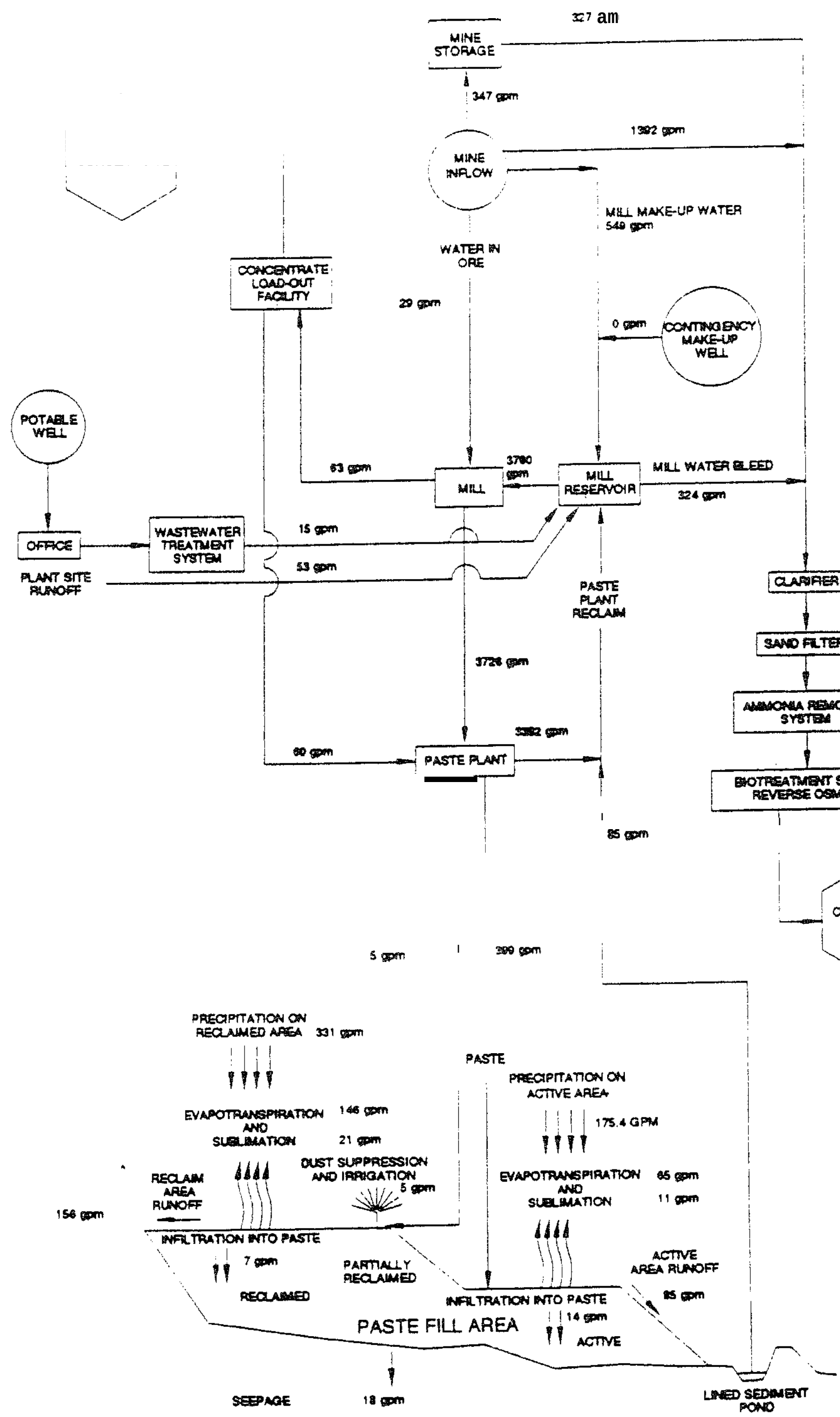


FIGURE 2-~~30~~ 34
Alternative V Schematic Diagram of Project Water Handling Production - Final Year
Rock Creek Project

time for the biological treatment system to become fully operational during mine start-up when variable flows and conditions could be expected: the reverse osmosis system would have the primary water treatment role during evaluation and mine start-up compared to the passive biotrearment system under Alternative II. ASARCO expects that the biotreatment system would become the main treatment system: however, the reverse osmosis system would still be available to operate during bioreactor upsets or if higher treatment efficiencies were required. A schematic diagram of the biotreatrnent waste water process is found in **Figure 2-35. Figure 2-36** displays the proposed layout of the water treatment facilities. At the final design stage, modifications to the treatment system may be made depending on a number of factors, including the actual discharge water characteristics, the final MPDES permit limits, and the technology available at the time.

Mine water would flow through a pipeline to the water treatment facility. Sedimentation tanks (clarifiers) would remove a high percentage of suspended solids in the discharge water (at least 95 percent). The sludge from the clarifiers would be taken to the paste plant and incorporated into the tailings paste for deposition. Water leaving the clarifiers would also flow through sand filters for final suspended solids removal (80 percent of the remaining fraction). The partially treated water would then be directed to one or both of the water treatment systems depending on system capacity, amount of flow, and other variable conditions.

Anoxic Biotreatment System. The semi-passive biological system for treating mine water would consist of one or more anoxic biotreatment cells, which would consist of gravel-packed, attached-growth denitrification reactors. An in-ground concrete biotreatrnent cell designed to treat 100 gpm would be 6 feet deep and **28.5 x 28.5** feet in area (810 ft^2), or about 136 x 136 feet (18,500 ft^2) for 2,300 gpm (maximum design flow). These cell dimensions are based on preliminary design data for 80 percent nitrate-nitrogen removal at 6°C. **A** maximum of **2** acres would be required to contain either a single large cell or several smaller cells and required support buildings.

The pretreated (clarified and filtered) water would flow through a trickling filter to convert the ammonia to nitrate (nitrification). The trickling filter may need to be enclosed or insulated to allow for proper functioning during colder seasons.

The biotreatment process would rely on methanol as the carbon source for the denitrification process instead of the manure and straw included in the passive biotreatment system proposed and discussed for alternatives II through IV in the draft EIS. Methanol at a concentration of approximately 60 mg/L would be continually added to the influent water. Methanol concentrations would be monitored and adjusted as necessary to achieve optimal nitrogen removal. **A** 300 gallon tank (approximate volume) would be located adjacent to the biotreatment system building for initial use of the biotreatment process. A larger tank would be installed if biotreatment proves to be successful. Daily methanol consumption, if the biotreatment system was the primary waste water treatment system, would range from several gallons during initial startup to approximately 250 gallons during maximum discharge of 2,300 gpm. Phosphorus may also need *to* be added for microbial growth. It is estimated that approximately 1 milligram of phosphate (as phosphorus) would have to be added for every 30 milligrams of nitrate (as nitrogen) removed.

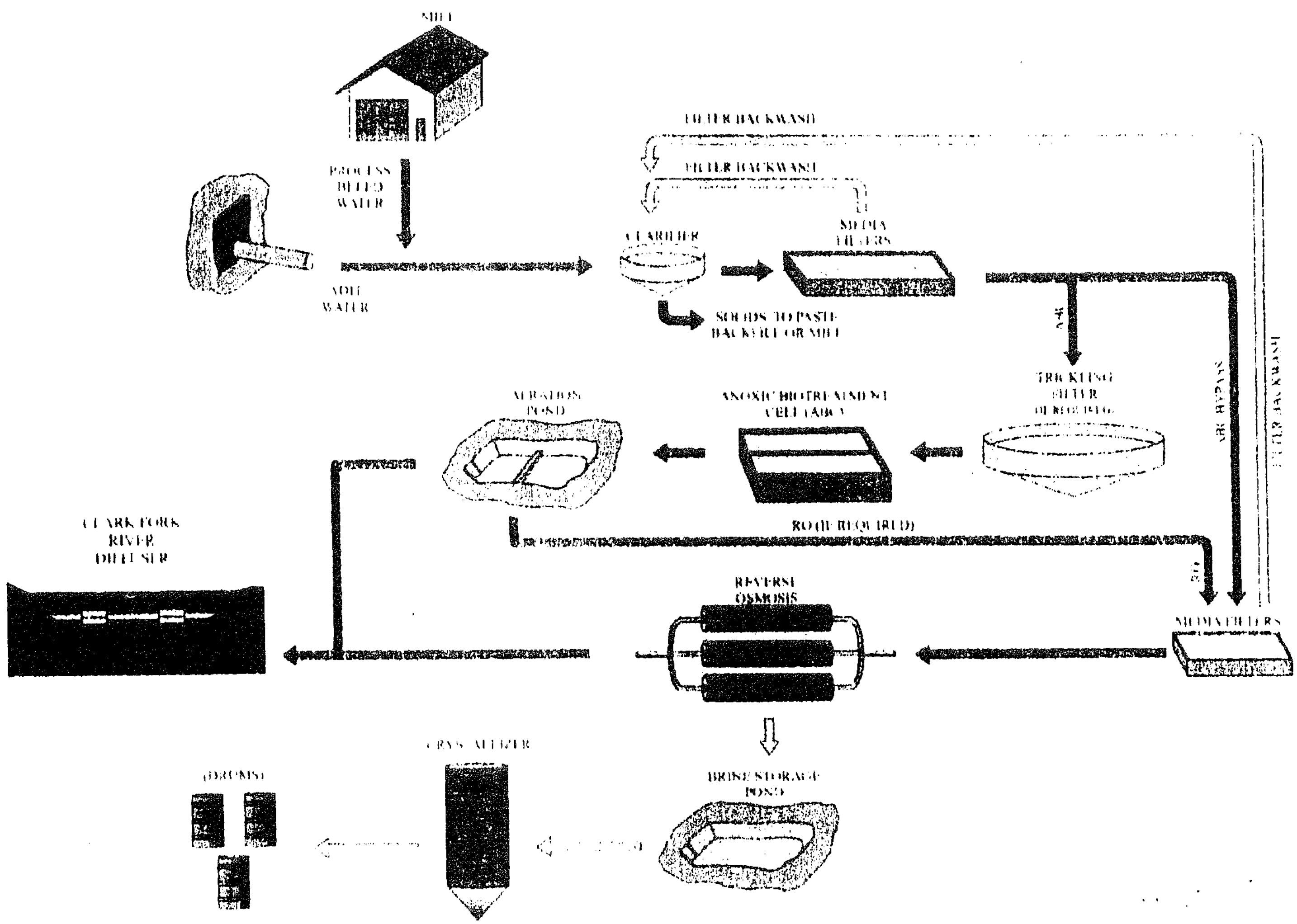


FIGURE 2-31 35
Biotreatment Waste Water
Rock Creek Project

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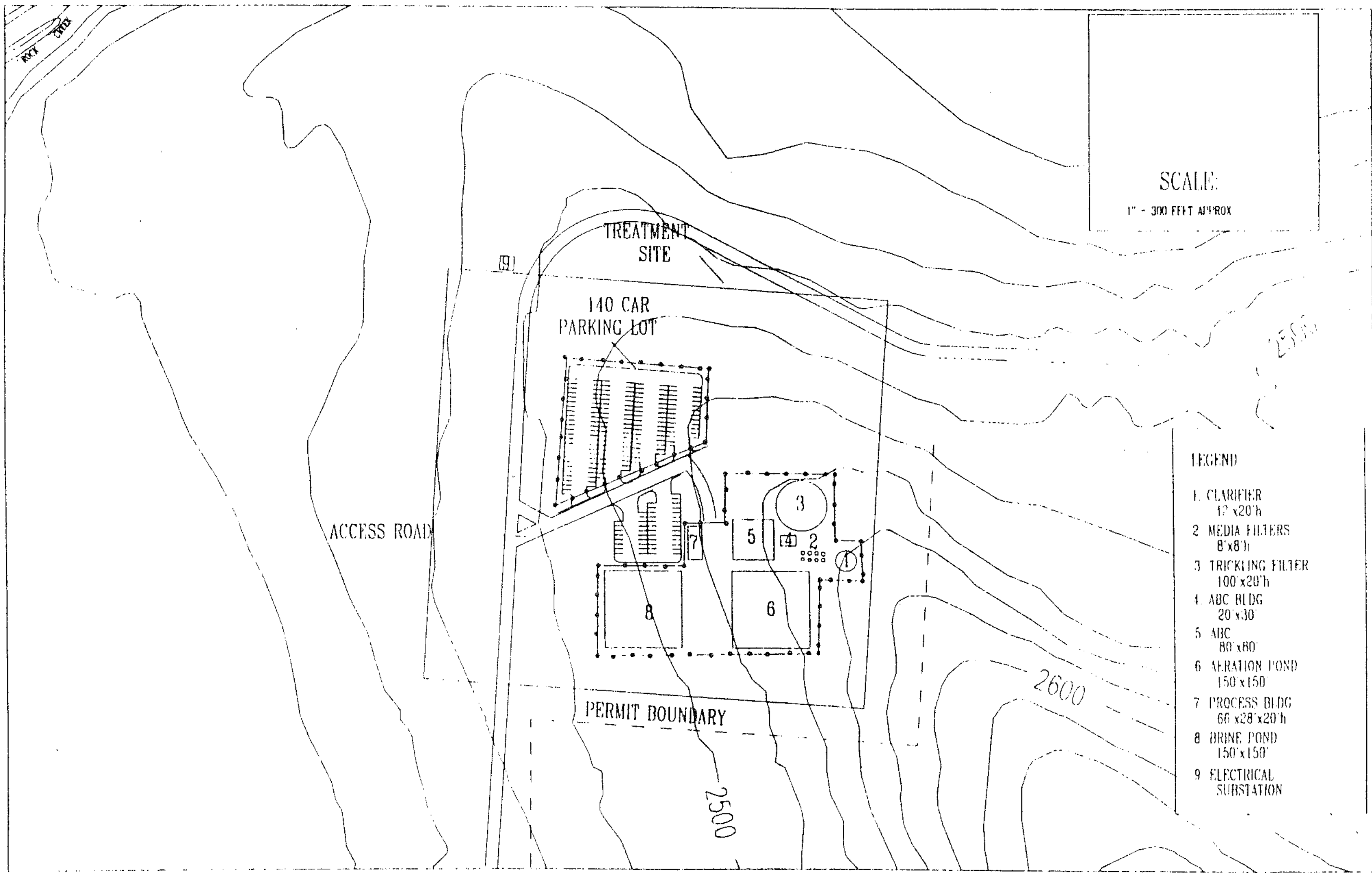

FIGURE 2-32 34
Water Treatment Facility Plan
Rock Creek Project

Mine water and methanol would enter the bottom of the biotreatment cell(s), and upwards Row through the cells would be controlled by a pump. The cell(s) would be filled with gravel and inoculated with several hundred gallons of sludge taken from the nitrogen-removal recycle loop at the Kalispell wastewater treatment plant. The cell(s) should not require reinoculation. The biotreatment cell(s) would not generate sludge or reject material requiring disposal. Nitrate would have been converted to nitrogen gas (denitrification) and methanol to carbon dioxide; these nontoxic gaseous by-products would be vented to the atmosphere, Relatively small amounts of biomass may be generated which would discharge to the aeration pond where it would be broken down.

After biological treatment for nitrate removal, the effluent would flow to an aeration pond with a 12-hour minimum residence time prior to reaching the final monitoring point before discharging to the Clark Fork River. The aeration pond would be lined with 30 mil HDPE. The aeration pond would include a calm pre-discharge zone and a multi-level discharge structure to minimize suspended solids in the effluent. Excess methanol and biomass from the biological nitrate removal system would be reduced through aerobic biological action. Dissolved hydrogen sulfide, if present, would also be reduced through aeration. At the full flow rate of 2,300 gpm near the end of mine life, the required ten-foot-deep pond would encompass approximately one-haif acre. If the effluent did not meet discharge limits, it would be returned to the treatment facility for further treatment.

Reverse Osmosis Water Treatment. Reverse osmosis was selected for several reasons as the second water treatment system instead of ion exchange, which was proposed in the draft EIS. The reverse osmosis system is less complex, requires less operator attention, generates a smaller waste stream, and has no added chemicals. In addition, reverse osmosis technology has been proven to be capable of removing dissolved pollutants, such as nitrate, from water in many large capacity waste water treatment facilities throughout the world. Because the reject water or waste stream cannot be easily disposed of at the project site, the reverse osmosis system would operate at a high recovery rate to minimize the waste volume.

The reverse osmosis would most likely be the primary waste water treatment system used during evaluation and early stages of mine operation. When the biotreatment system became fully operational, the reverse osmosis systems would primarily be used during biotreatment system upsets or maintenance. It may also be used as a polishing step when the effluent did not meet standards. During such an event a portion of the biotreatment system effiuent would be treated with reverse osmosis such that the recombined effluent from both systems met the limits of the MPDES permit.

The reverse osmosis system would be housed in a building approximately **66** feet long, **28** feet wide, and **12** feet high. It would contain reverse osmosis units sufficient to treat flows up to 650 gpm, the maximum flow expected in year 5 of production and year 10 of project life. The modular nature of reverse osmosis would allow simple installation of additional reverse osmosis units if reverse osmosis were still required for the treatment of 100 percent of the mine discharge in later years of mine operation. These units are complete with high-pressure pumps, cartridge filters, membrane modules and all other necessary equipment. This operation would probably require one operator around-the clock initially and after operations had been finalized, only a day-shift operator. The clarifier and media filters would probably be located outside the reverse osmosis building.

Once the influent water had undergone pretreatment for removal of suspended solids, the reverse osmosis couid run continuously and reduce dissolved ion concentrations, including nitrate. nitrite, ammonia, and metals. by more than 90 percent. As flows increased during the life of the project, additional modules could be incorporated easily into the existing facility. Routine maintenance would include instrument calibration, chemical cleaning, and periodic membrane replacement. Membranes would require replacement every three to five years.

Only minimal quantities of brine (liquid waste from the reverse osmosis process containing elevated levels of nitrate, nitrite, ammonia, metals, and other ions) would be generated if the biotreatment becomes the primary treatment system with occasional use of the reverse osmosis. The waste brine that is generated, approximately 10 percent of system inflow when reverse osmosis treatment is required, would either be stored and gradually blended back into the biotreatment treatment system or crystallized/evaporated. The waste would not be classified as a hazardous waste as defined in 40 CFR 261.21-261.25. The brine or crystallized solid would not be ignitable, corrosive, or reactive and it would be non-toxic based on EPA's Toxicity Characteristic Leaching Procedure (TCLP) criteria (Hydrometrics, 1997a). Estimated concentrations of waste brine presume no nitrogen removal by biotreatment. Waste brine concentrations would decrease in direct proportion to nitrogen removal efficiencies in biotreatment.

The brine would be stored in 500,000 gallon, epoxy-coated, covered, vertical, bolted steel **tanks** (60 feet **in** diameter and 25 feet high). ***A*** single tank would provide **5** days of brine storage for the initial **650** gpm RO facility. Three tanks would be required to hold approximately 5 days of **brine** storage for estimated maximum mine operation waste water flow of 2,300 gpm.

A crystallizer/evaporator would be installed on site to treat any RO brine generated. The brine would be reduced to one 55-gallon drum of waste per day for every 250 gpm of water treated. This waste would either be stored in drums or in a tanker trailer based on the actual waste volume being produced. The end product would be a solid which could be used by fertilizer companies in western Montana, Idaho, eastern Washington, and Canada or disposed as a regulated waste in an approved landfill such as those in Missoula, Kalispell, and Spokane.

Transportation

Access *to* the evaluation adit and the minor improvements to FDR No. 2741 would remain the same as for alternatives III and IV as described in the draft EIS. Evaluation adit construction workers would be bused from the relocated support facilities site along FDR No. 150 and 2741. Road maintenance and snow plowing of FDR No. 150 would also remain the same. FDR No. 150 would be realigned with Montana Highway 200 as described for Alternatives III and IV in the draft EIS. However, FDR No. 150 would connect to an old existing road in the vicinity of the waste water treatment plant if final siting proved the old road to be suitable. This modified alignment would take advantage of an existing road farther away from Rock Creek and reduces the amount of new construction. This existing road would be upgraded and paved and **a** new segment constructed to connect to existing **FDR** No. 150 approximately 1200 feet above the confluence with Engle Creek as described for Alternative III in the draft EIS. However, mine construction workers would be bused from the support facilities site until FDR No. 150 had been relocated and the parking lot at the waste water treatment plant had been constructed. The relocated portions of FDR No. 150 and the parking lot **at** the proposed waste-water treatment facility site would be constructed during the first part of the development phase (year 2) to keep construction related-traffic away from Rock Creek, to provide a road capabie of handling the expected mine construction-related and public levels of traffic, and to allow for busing of mine adit construction workers to the mill site and mine portal. Access to the paste plant and the tailings paste facility site from the mill would require mine vehicles travel down FDR No. 150 to Montana Highway 200 and then northwest on the highway to Government Mountain Road and then southeast on FDR No. 150B.

All roads used during mine operation between the mill. the mine, the paste plant, the water treatment facility, the'highway, and the rail loadout facility would be paved or gravel (see **Table 2-15 and Figure 2-26).** FDR No. 150 above the mine and the Chicago Peak Road, FDR No. 2741, would not be paved. The service road FDR No. 150B, around the outer edge of the tailings disposal site from the paste plant to Government Mountain Road would be paved; a short stretch of maintenance road along the west side of the disposal site would be gravel. FDR No. 150B from the paste plant to the junction with FDR No. 150 would be reconstructed as a gravel road and used only for pipeline maintenance after mine production begins. FDR No.150B would be gated at both ends and access would be restricted to mine-related traffic. The existing bridge over Rock Creek near the junction of FDR nos. 150B and 150 would not be reconstructed because there would be no concentrate hauled from the mill to the rail loadout facility; however some repairs may be necessary to provide safe crossings for trucks hauling waste rock to the paste facility site during mine development. if during mine operation this bridge deteriorated and the Forest Service determined it was unsafe, it would be removed by ASARCO. A 10-foot wide gravel maintenance road would be constructed along the cross-country portion of the discharge water pipeline between the Clark Fork River and FDR No. 150. A small parking lot for 6-8 vehicles would be required at the paste plant for operators' and mine management vehicles and supply deliveries.

Truck hauling of concentrate from the mill to the rail loadout facility would be replaced by pipeline transport of the concentrate. This wouid eliminate eight trucks per day making the round trip between the mill and the loadout facility. **ASARCO** must submit a traffic management plan to mitigate impacts on harlequin duck as well as grizzly bears. This plan would address evaluation, construction, and operation mine-related traffic (excluding public recreation, Forest Service, logging traffic and other private and public traffic). The plan must include provisions for busing employees during mine construction and operation between the waste water treatment facility area and the mill and mine. A parking lot capable of handling the parking needs of the largest shift plus visitors to the mine, estimated at 150 to 175 vehicies, would be necessary. The most logical place for this parking lot would be adjacent to the waste water treatment facility (see **Figure 2-36).** Busing employees from this location would reduce the mine construction- and operation-related traffic to primarily supply vehicles, mine management vehicles, and two or three buses twice per shift including the administrative workers shift.

A portion of FDR No. 150B may be removed and reclaimed after the tailings paste facility has been reclaimed and the paste treatment plant decommissioned, removed, and reclaimed. The need for closure, reclamation, or modification of Forest System roads used by **ASARCO** during mine operation to gravel or dirt roads would be determined by the KNF at mine closure. The post-mining treatment of roads would depend on forest land uses, needed road densities, and KNF's ability to maintain paved roads versus gravel or dirt roads.

TABLE 2-15
Summary of Roads To Be Used
Under Alternative V

Road	Section	Type	Length	Width	Access
FDR 150	Hwy 200 to mill site	Paved	5.5 mi	24 ft	Open
FDR 150	Mill site to FDR 2741	Gravel	0.19 mi	20 ft	Open
FDR 2741	FDR 150 to evaluation adit portal	Gravel	1.25 mi	20 ft	Open only when there is no snow, plowed during year 1, but no public parking/turnarounds available during winter
FDR 150B	FDR 150 to paste plant	Gravel	1.07 mi	14 ft	Locked gates/ASARCO pipeline maintenance access only
FDR 150B	Paste plant to Government Mtn. Rd.	Paved	1.52 mi	14 ft	ASARCO and supply traffic only
FDR 150	Government Mtn. Rd. From FDR 150B to rail loadout facility	Gravel	0.19 mi	24 ft	Open
Access Rd.	FDR 150 to parking area/waste water treatment plant	Paved	0.15 mi	24 ft	ASARCO visitor, and supply traffic only
Access Rd.	North from 150B along west side if disposal site	Gravel	0.52 mi	14 ft	ASARCO maintenance only
Access Rd.	From Hwy 200 to Clark Fork River	Gravel	0.57 mi	10 ft	ASARCO pipeline maintenance only
Access Rd.	FDR 150B to paste plant	Paved	0.37 mi	14 ft	ASARCO and supply traffic only

Utilities

Evaluation activities at the adit would be powered with propane generators instead of diesel generators. The support facilities would be supplied with power from a local distribution line as described for Alternatives II through IV in the draft EIS.

The original proposal called for two 500 kW diesel-fired generators; Alternative V replaces the diesel generators with two propane-fired generators (545 kW and 735 kW).

A single utility corridor would be developed along FDR No, 150 and would include the transmission powerline, a tailings slurry pipeline, ore concentrate pipeline, mine discharge pipeline, and return water pipeline (see **Figure 2-28).** The pipelines would split into two corridors at the junction of FDR nos. 150 and 150B. The tailings slurry pipeline and concentrate pipeline and a return water line would follow or parallel the FDR No.150B road alignment to the paste plant. The concentrate pipeline and return water line would continue along FDR No. 150B and a short stretch of the Government Mountain Road to the rail loadout facility. The mine water discharge line and return water line would follow the new FDR No. 150 alignment to the waste water treatment plant and the discharge line would continue to the discharge outfall in the Clark Fork River and connect with the make-up water well located adjacent to the river. See **Table 2-16** for information on the size and types of pipe proposed for use.

TABLE 2-16
Summary of Pipeline Information for Alternative V

Pipeline	Location	Size	Type
Tailings Slurry Line	Mill to paste plant	16 to 24 inches(1)	Steel/polyethylene dual-wall pipe w/leak detection
Tailings water return line	Paste plant to mill	16 inches	Dual-wall pipe w/leak detection(2)
Mine discharge pipeline/make-up water pipeline(3)	Mine to waste water treatment plant to Clark Fork river diffuser	12 to 14 inches	Jingle-walled pipe w/leak detection
Mine segregation water pipeline (option for later development)	Mine to waste water treatment plant	10 inches	Type undetermined at this time
Concentrate pipeline	Mill to rail loadout facility	3 inches	Dual-wall pipe w/leak detection(2)
Concentrate return water line	Rail siding to paste plant	2 inches	Dual-wall pipe w/leak detection(2)
Storm water return pipeline	Paste facility site storm water retention pond to paste plant	6 inches	Single-walled pipe w/leak detection

Source: Hydrometrics 1997

Notes: (1) The final pipeline diameter will need to be determined based on tailings viscosity and topographic analysis of final pipeline corridor.
(2) The type of dual wall pipe has not been determined at this time.
(3) Mine water is estimated to meet mill make-up water requirements; however, a contingency make-up water well site **has** been identified near the **Clark** Fork River in the event that insufficient mine water is available. In this event, make-up water would utilize the discharge pipeline.

The transmission line would follow the same route along the new FDR No. 150 and existing FDR No 150 from a new switchyard on an existing 230 kV line near Montana Highway 200 to the mill as described for alternatives III and IV in the draft EIS. The substations at the mill and in the impoundment area would remain the same as for alternatives II through IV. The rail loadout facility and the relocated evaluation adit support facilities site would be supplied power from a local distribution line along Government Mountain Road. Although the draft EIS identified a power provider, no power provider has been selected for supplying the mine's estimated annual consumption of 95,000,000 kW-hours.

Erosion and Sediment Control

ASARCO would be required to implement all BMPs detailed in its permit application and which are described in the draft EIS. These include measures for fugitive dust control, site grading, soil handling, surface water protection, and revegetation. In addition, a vegetation management plan would be developed by ASARCO and approved by the Agencies to minimize disturbance during clearing and construction and to maximize revegetation success on ail cut-and-fill slopes and reclaimed road segments. A field review would be required by agency hydrologists/soil scientists after facilities and roads have been staked in the field but before construction begins to identify any additional BMPs needed on a site-specific basis. There will be 114 acres of sediment reduction work done as mitigation for BMP's being less effective than planned.

Employment

Estimated employment would remain as described for Alternative IV in the draft EIS; a peak employment of350 workers during mine construction and **340** during mine operation. Evaluation adit employment would peak at 55 employees in the fourth quarter of the year of evaluation construction. The paste production plant and waste water treatment facility would require specialized operators to ensure proper facilities operation.

Adit Closure

The adit closure plan would need to be finalized and submitted to the Agencies for review and approval prior to mine closure.

The evaluation adit would be plugged with reinforced concrete at mine closure. Since this adit would **be** a decline and the portal is above the water table, the purpose of the plug would be primarily to close ***off*** access and eliminate any potential for surface water inflow.

The service and conveyor adits would be plugged with reinforced concrete near the elevation of the orebody within the mine. This would prevent 1,500 feet of water pressure that would develop if adit seals or plugs were placed at lower elevation; in the adits. The adits would be closed at the portal with non-mineralized waste rock to prevent access, Drainage from the portal (inflow to the adits below the elevation of the plugs) would be treated until it meets water quality standards without treatment at which time it would be allowed to infiltrate into the reclaimed mill pad and underlying alluvium. Monitoring data would be used to establish discharge requirements prior to the time of adit closure.

Reclamation

Reclamation of the evaluation disturbances, adits, mill site and utility corridors would remain the same as described for Alternative IV in the draft EIS. The revegetation plan and seed mixes are described in Appendix G of the draft EIS. **A** detailed reclamation plan that covered revegetation of all mine facilities would need to be submitted for Agency review and approval before implementation. The plan would provide the means to ensure adequate reclamation and minimize visual impacts of the project. Plans for reclaiming any Forest System roads, if required, would be submitted to the Forest Service for review and approval.

Pipeline Corridor Reclamation. The pipeline would be built and installed and covered with at least **24** inches of soil that had been salvaged prior to construction. No trees or shrubs would be seeded along the pipeline corridor, but any trees or shrubs that volunteered would be left. Trees that encroached on powerline conductors or were in the way of maintenance vehicles would be removed. Maintenance or replacement of a pipeline liner would require some redisturbance of a small area that would be immediately reclaimed after the work was done. When the pipelines were no longer needed they would be removed for a distance of 15 to 20 feet from stream crossings and where the pipes surfaced at the mill, the paste plant, the waste water treatment facility, and the Clark Fork River. The pipes would be completely drained, capped, sealed, the ends reburied, and the redisturbed section regraded, stabilized if necessary, and revegetated. The remaining buried segments of the pipeline would remain in place.

Reclamation of Tailings Paste Facility. Reclamation of the tailings paste facility would be somewhat different from that of a traditional tailings impoundment. Concurrent topsoiling and reclamation would allow the portion of the top and outer slopes of the paste facility that had achieved final grade to be reclaimed while the next segment was constructed. However, the timing of final reclamation would vary somewhat depending upon which option is selected. Final reclamation of the Bottom-Up option would occur on an annual **basis** unless specified otherwise by the Agencies. Reclamation of a small portion of the Top-Down option could begin in year 7 of mine operation (see Table 2-14) and could only be done when the row had reached its maximum height as each succeeding paste layer would cover the preceding layer, The sides and ***top*** of the Top-Down option could still be reclaimed concurrently with the stripping of soil from the next area proposed for disturbance rather than waiting until the facility was completely constructed. Reclamation of the Combined option would depend upon which method was being used at the time.

Interim reclamation would occur on an on-going basis for all paste options. An interim seed mix would be added to the paste before its deposition to limit erosion off paste slopes during operations and *to* reduce aesthetic impacts. A color tackifier or hydroseeding could also be applied to deposit lifts as needed for interim reclamation and stabilization prior to initiation of final reclamation activities. Both toe buttresses and paste deposit slopes for any of the deposition options would be seeded annually with final revegetation mix on any portion that reaches final grade.

Because the paste would be deposited in rows, layer upon layer, soil would be stripped just ahead of the extent of the proposed disturbance for each layer. The soil stripped from the first two or three rows would need to be stockpiled for reclaiming the final segment and outer slope. At times soil being salvaged may not be suitable for the portions of the facility that need to be reclaimed; this soil would also need to be stockpiled until needed. The soils would be segregated according to rocky or non-rocky soils and first lift versus second lift and, if necessary, stockpiled adjacent to the deposit site (see **Figure 2-26).** Sufficient volumes of the colluvial and alluvial soils, including their rocky subsoils, within the tailings paste facility footprint would need to be salvaged and stored for use in reclaiming slopes **8** percent or greater and along reconstructed drainage ways to minimize erosion. Based on experience and preliminary research to control erosion at Golden Sunlight Mines, the lacustrine soils could be mixed with the rocky subsoils or crushed bedrock to produce a soil with **20%** rocks greater than 1 inch in diameter. The mixed soil must also have less than 20% very fine sand in the fine soil matrix (Golden Sunlight Mines 1995). The lacustrine soils could be placed on all siopes less than 8 percent (approximately 12.5:1) without the addition of rock materials as long as the slope length is limited by armored drainageways or other erosion control features. Soil would be salvaged in a two-lift process with the first lift being the more suitable topsoil and the second lift being subsoils excavated up to 36 inches; average total salvage depth equaling **24** inches. Replaced soil depths would average **24** inches over the tailings paste facility. The final design of the paste facility would need to include a volume determination of soil types needed based on the slope breakdown of the paste facility.

ASARCQ would need to conduct a detailed soil survey to more accurately determine the amounts and types of soils available for reclamation prior to construction of the paste facility and associated facilities. Since rocky materials are also needed for constructing the toe buttresses, the survey is especially important to ensure there is enough material available for both requirements or to identify the need to obtain more rocky material from other sources than has been estimated in **Table 2-13.**

The tailings paste could, if needed, have organic amendments or fertilizer added to the uppermost lift. This material, which would have no cement added, may need to be ripped prior to topsoil replacement to minimize the development of a root-barrier zone. Both regrading this material and selective placement of the paste during deposition would be used to create diverse topographic pockets, swales, ridges and surface water drainages constructed to a predetermined surveyed gradient in the final design. Overall outer slopes would range between **2H:1V** and 5H:1V. These **slopes** would be protected against erosion using best management practices described in detail for Alternative II in **the** draft EIS. The compacted slopes of the Bottom-Up or Combined option would have less potential for slope variability due to the method of construction and would have a general appearance similar to that of a conventional tailings impoundment. The flatter slopes of the Top-Down option appear to offer greater flexibility to develop a more natural appearing landform.

Trees would be planted on each segment as it was reclaimed and seeded with approved planting mixes of grasses, forbs, and shrubs. ASARCQ has planted trees for screening between the main power line and Montana Highway 200; however, the planting would be inspected during evaluation activities and any dead, dying or missing trees would be replaced to achieve the required density.

ASARCQ would be required to submit detailed design, regrading, and revegetation plans for all mine facilities for Agencies' approval in conjunction with the final design of the paste facility. Landform design for the tailings paste facility would incorporate topographic templates from the surrounding area to help meet reclamation goals and Forest Service visual standards. These plans would result in reclaimed sites that decrease landform and vegetation differences between mine facilities and surrounding natural landscapes. Final reclamation of portions of mine facilities, such as outer slopes of the mill site pad and compieted portions of the tailings paste facility would be done as early as possible to assist in decreasing the visual impact of the project. Toe buttresses and paste layers creating the deposit surfaces for all options, and the compacted paste zone of the Bottom-Up option, would be designed to minimize straight horizontal crests, long linear contours and uniformly sloping surfaces; however, stability requirements would have precedence. Contours of reclaimed surfaces, including those on the top surface of the deposit, would mimic those of surrounding topography. Both regrading and selective placement of the paste during deposition would be used to create topographic pockets, swales, ridges and surface water drainages. Rocky soils and possibly cement additive would be used in steepened drainageways to create naturalized swales and help break up the massiveness of the deposit.

Monitoring and Mitigation Plans

ASARCO would be required to submit for Agency review and approval the monitoring and mitigations plans described for Alternatives III and IV in the draft EIS (also see **Appendix H** for summaries of these plans). These plans include: rock mechanics monitoring, water resources monitoring, wildlife monitoring, aquatics and fisheries monitoring, and reclamation monitoring. Additional or modified plans are briefly described below.

Acid Rock Drainage and Metals Leaching Plan. Alternative V incorporates recommendations from a third party technical analysis and risk assessment (Failure Modes Effects Analysis) that evaluated geochemistry data that relates to the Rock Creek Project (Klohn-Crippen 1997). This plan would include additional testing (of the Rock Creek Project and Troy Mine) before and during operations to confirm the mineralogy and geochemistry of ore, waste rock, and tailings, monitoring of water quality in surface and groundwater, and a response plan for collection and treatment of contaminated water. In addition, selection of waste rock to be used in the paste facility buttress would be based on mineralogy and acid base accounting **and** kinetic leaching tests.

Influent and Effluent Monitoring. The influent to the water treatment **systems would be monitored for nitrogen and other parameters** identified in the **revised draft** MPDES permit and the **monitoring plan attached in Appendix H**. Characterizing the influent is critical for maintaining a consistent effluent. The influent would be monitored continuously so that system adjustments could be made whenever required.

Monitoring the effluent frequently is also critical in determining whether the treatment systems are operating properly and allowing adjustments *to* be made to the system to maintain a quality discharge. Effluent measurements would be made more frequently than required in the draft MPDES permit; the revised draft permit would require weekly or monthly monitoring depending on the parameter. Nitrates would be measured continuously with an on-line analyzer. These water quality results would be verified through weekly or monthly samples, depending on the parameter, and would be analyzed by a certified lab for permit compliance purposes.

Monitoring of Biological Oxygen Demand (BOD). Methanol would be added to the ABCs in an amount sufficient to sustain biological activity, but in small enough amounts to avoid excess BOD in the effluent. Excess BOD, similar to excess nitrogen, could cause unwanted aquatic growth. BOD in the effluent would be measured on at least a weekly basis.

Wildlife Mitigation Plan. All mitigations proposed under Alternatives III and IV in the draft EIS would remain, with the following additions. Design features to prevent disturbance to harlequin ducks during breeding season include limited operating seasons during construction, busing of mine employees, change in location of evaluation adit support facility to lower elevation, eventual closure and obliteration of FDR No. 150B, screening of disturbance zones, area closures of Rock Creek during critical breeding season periods, and water quaiity monitoring and hazardous material spill plan relative to harlequin ducks. Additional harlequin duck mitigations are planned and identified in the Wildlife

Mitigation Plan pending agency and ASARCO negotiations. Design features to prevent road impacts to fisher include wildlife diversion structures along FDR No. 150. Design features would be incorporated at the millsite to avoid attraction and mortality to songbird nipht migrants.

Mitigation for several species would be accompiished concurrently with grizzly bear mitigation. These would include road closures for wolverine, and securing of private land habitat for fisher and lynx. Although the securing of private land would not create any additional habitat (although road closures increase habitat effectiveness), this mitigation would secure the sites from almost inevitable habitat alteration as a result of regional increases in human development unrelated to the project. Other concurrent mitigation would be funding for personnel to protect mountain goats and other wildlife species through law enforcement, removal of carcasses killed by vehicles from roadsides to reduce mortality risk to carrion eaters. and inform and educate the public about Threatened and Endangered and other wildlife species.

Monitoring leading to an increased understanding of wolverine and mountain goat population trends as a result of mine-related effects and other regional effects, is included in the mitigation plan to help ensure prompt detection of declining population trends, should they occur. Current monitoring levels would not enable wildlife biologists to detect trends in a timely fashion.

Threatened and Endangered Species Mitigation Plan. Nearly all aspects of the Threatened and Endangered Species Mitigation Plan proposed for Alternatives III and IV would be the same. **ASARCO would have to provide 2,350 replacement or conservation easement acres as part** of the mitigation for grizzly bear. The reduction of mine-related traffic proposed for inclusion in the Wildlife Mitigation Plan, the transportation management plan, and additional road closures would also benefit threatened and endangered species such as the grizzly bear.

Aquatics and Fisheries Monitoring and Mitigation Pan. This plan, prepared and implemented in cooperation with DFWP and th. Agencies, would remain essentially the same as described for alternatives III and IV in the draft EIS. However, the sediment source reduction plan would need to incorporate two additional items. ASARCO would be encouraged to negotiate to the extent possible with private landowners in the Rock Creek drainage to repair severe sediment sources such as the eroding bank on Engle Creek, which is believed to be on private lands. The plan would also include measures to improve in-stream sediment transport such thar streambed scouring and sediment storage would be enhanced. This strategy will also result in the development of pools and stable riffles; therefore increasing habitats for fish and macroinvertebrates.

Mitigation would include funding for personnel (in conjunction with the personnel mentioned under Wildlife Mitigation) to protect bull and westslope cutthroar trout through law enforcement and informing and educating the public. Angling pressure in Rock Creek and it tributaries would likely increase due to improved access and increased use. Bull trout harvest is not allowed, but the fish is often misidentified by the public. Westslope cutthroat trout are highly susceptible to angling, therefore harvest rate information and protection are needed.

Hard Rock Impact Plan. Under the approved Hard Rock Impact Plan (ASARCO Incorporated 1997), ASARCO expects to hire 80 percent of workers employed directly by ASARCO during construction and operations from the local study area (Sanders County, Lincoln County, and northern

Idaho). The expected local hire of mine construction contract labor would be 40 percent. During the first three years of project development. the workforce would total about 70 workers (all directly employed by ASARCO). During mine start up and operations. ASARCO expects that about 68 of the 340 total mine workers would be hired from outside the study area. Sixty-five percent (44 workers) of the 68 in-migrating operational mine workers are expected to settle in Sanders County; 30 percent (20 workers) are projected to in-migrate *to* Lincoln County; and five percent (4 workers) are expected to reside in Idaho.

Local governmental units within the defined study'area that may be affected by development of the Rock Creek Project include:

1. Sanders County Government (including Rural Fire Districts of Thompson Falls, Trout Creek, Noxon, and Heron)
2. City of Thompson Falls
3. Town of Plains
4. Elementary School District # 10 (Noxon)
5. High School District # 10 (Noxon)
6. Elementary School District #6 (Trout Creek)
7. Elementary School District #2 (Thompson Falls)
8. High School District #2 (Thompson Falls)
9. Elementary School District #1 (Plains)
10. **High** School District #1 (Plains)
11. Lincoln County Government
12. City of Libby
13. City of Troy
14. Elementary School District #4 (Libby)
15. High School District #4 (Libby)
16. Elementary School District #1 (Troy)
17. High School District #1 (Troy)
18. Noxon County Water District (Sanders County)
19. Bull River Rural Fire District

ASARCO would pay $883,500 in grants and prepaid taxes during the project impact period. Impact payments are expected to occur in year 1, year 2, and year **4** of the project. In addition to the base mitigation. ASARCO would also be responsible to make conditional payments should actual in-migration exceed projections.

Due to local government fiscal disparities, ASARCO has recommended that tax base sharing should occur between local governments in Sanders County. Tax base sharing would equal five percent for the municipality of Thompson Falls, The elementary school districts in Sanders County would share the taxable value of the mineral development in the following proportions: 75 percent for Noxon Elementary; 10 percent for Trout Creek Elementary; and 15 percent for Thompson Falls Elementary. For the high schools in Sanders County, the **tax** base sharing would be in the following distribution: 80 percent for Noxon High School and 20 percent for Thompson Falls High School. All tax base sharing would be in effect at those proportions until tax crediting is completed.

Tax crediting is scheduled to begin in year 7 for each local government that receives prepaid taxes. The amount of tax credits available for each year would be equal to 20 percent of total tax credits available. although the amount would be subject to restrictions and limitations as outlined in 90-6-309, MCA, and inherent in 90-6-307. MCA. and as described in Appendix 13 of the Guide to Implementation of the Hard-Rock Mining Impact Act.

Wetlands Mitigation Plan. The use of tailings paste landfill technology for tailings disposal eliminates the need for borrow materials outside of the paste facility site to construct starter dams although some rocky material would be required for constructing the toe buttresses. The primary mitigation site proposed in the draft EIS relied on the excavation of borrow material from "Borrow Site #3" adjacent to Rock Creek near the tailings impoundment. The elimination of this 7.5 acre mitigation site has required a modification in ASARCO's 404(b)(1) application to the Corps of Engineers (ASARCO March 26, 1997). Pertinent details and aspects of ASARCO's wetland mitigation plan for Alternative V are provided in **Appendix N.** Changes in the Agencies' 404(b)(1) preliminary showing as a result of these modifications are contained in **Appendix C**. The primary functions and values of the created wetlands would be to reestablish diversity and abundance of habitat for aquatic and terrestrial species, reduce sediment transport to Rock Creek and Miller Gulch, and attenuate peak flows.

ASARCO has identified 7.0 acres of higher terraces, benches, and abandoned channels that are typically above the water table and located adjacent to Rock Creek that would be suitable for the development of linear wetlands (see **Figure 2-37).** The Miller Gulch Tributary sites identified in Alternative II would still be used for wetland mitigation (see **Figure 2-37).** Additional mitigation sites have also been identified for use should the proposed sites prove unfeasible or if the projected created wetlands fail to meet the proposed goals of any of the sites. The mitigation sites would be developed for wetland establishment by excavating the sites, topsoiling. and planting appropriate wetland vegetation species. Whenever possible, soils taken from impacted wetlands would be used. These sites would be constructed during evaluation and project construction to allow the maximum amount of time for stabilization and any required modifications to achieve that prior to mine closure and reclamation (see **Table 2-17).**

The upper Rock Creek wetland mitigation site is located on the East side of Rock Creek near mile post 3. north of the confluence of Rock Creek with Engle Creek. The wetlands would be constructed in the streamside terrace. Trees and shrubs would be removed from the site and topsoil stockpiled in non-wetland areas adjacent to the site. Linear channels would be excavated down to groundwater depths, estimated at 6 to 8 feet below the surface. The width of the bottom of the linear channels would van from 10 to 25 feet. Benches, 6 to 12 inches tall, would be constructed on one or both sides of the bottom to create zones with variable periods of saturation or inundation. Side slopes would vary reflecting excavation depth and adjacent natural topography. In general. one side of the excavation would be relatively steep (40 to 50 percent) with the opposite side constructed at a gentle to moderate slope (10 to 40 percent). Since the wetland hydrology will be provided by groundwater, no amendments would be placed on the channel bottom to decrease the permeability.

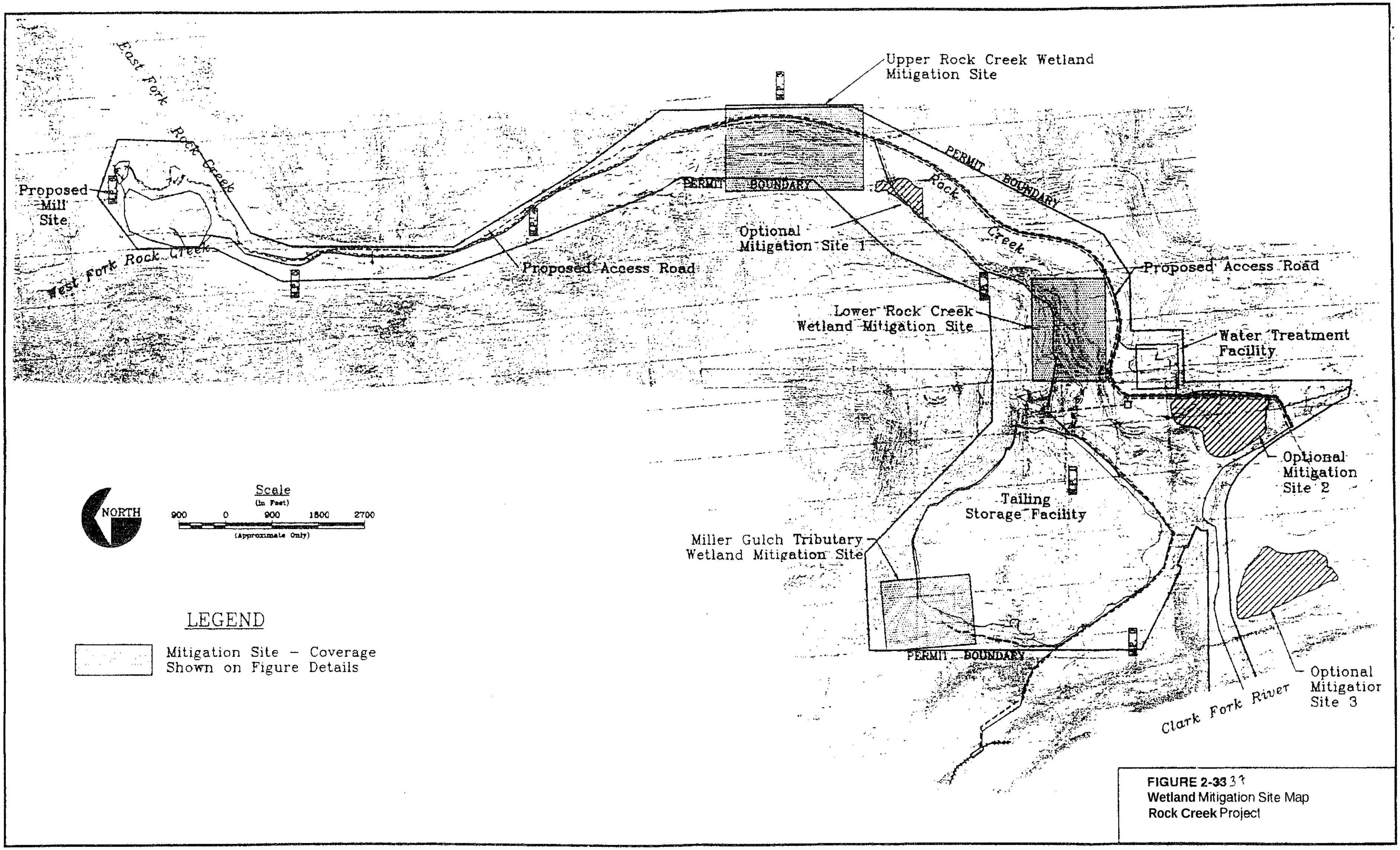

FIGURE 2-33 37
Wetland Mitigation Site Map
Rock Creek Project

TABLE 2-17
Proposed Acreage and Schedule[1] for Created Wetlands for Alternative **V**

Wetland Mitigation Sites	Created Acreage	Site Construction	Projected Resumption of Comparable Functions
Miller Gulch Tributary	1.2	Preproduction Year 3	Production Year 22
Lower Rock Creek	1.4	Preproduction Year 5	Production Year 3
Upper Rock Creek			
Stage 1	1.1	Preproduction Year 1	Preproduction Year 4
Stage 2	3.3	Preproduction Year 3	Production Year 1
Total Wetland Mitigation	**7.0**		

Note:
[1] Schedule based on 5 years preproduction activity, 30 years production, and 5 years post-production closure and reclamation.

The lower Rock Creek site is located on a gently sloping toe-slope and bench primarily between FDR No. 150 and Rock Creek just opposite the road leading to the paste plant and northwest from the water treatment plant. **A** small segment would be located west of the road. The site entails a portion of the area designated as Borrow Area 3. Alternative V does not incorporate the use of borrow from this site at the tailings disposal site; however, if the final tailings paste disposal design changes that requirement, the wetland mitigation design would be modified to account for any topographic changes. After tree and shrub removal and soil salvage and storage had taken place, linear channels would be excavated to a depth of 2 *to 3* feet with variable widths between 10 and *25* feet. Side slopes would vary between 50 and 20 percent. Small depressions would be constructed along the longitudinal profile of each channel to increase water retention. If necessary, small flow barrier (detention dikes) similar to those proposed for the Miller Gulch Tributary mitigation site would be constructed across the channel to create additional diversity in wetland hydrology by creating longer periods of inundation or saturation upstream of the dike. If scouring occurred at the outlet of the channels. rock energy dissipators would be constructed.

The Rock Creek mitigation sites would be topsoiled with 12 to 13 inches of salvaged soil. The sites would be revegetated with a herbaceous revegetation mix. Channel side slopes and any berms created with excavated materials would be seeded with the project's standard upland herbaceous mix as described in the draft EIS. Since the narrow configuration of the mitigation sites would preclude effective drill seeding, the sites would be broadcast seeded. The sites would then be mulched with noxious weed-free straw (2,000 pounds/acre) or cellulose fiber hydromulch (1,500 pounds/acre).

Appendix 3: Record of Informal Consultation with U.S. Fish and Wildlife Service

Feb. 16, 1988	U.S. Fish and Wildlife Service response to ASARCO scoping document.
Mar. 31, 1988	Kootenai National Forest requests species list from U.S. Fish and Wildlife Service.
Apr. 21, 1988	U.S. Fish and Wildlife Service provides Species list for ASARCO project area.
Dec. 15, 1988	Meeting with Larry Lockard (USFWS) and Forest Service biologists to discuss mitigation and compensation for ASARCO Rock creek mine proposal.
Dec. 20, 1988	USFWS letter to verify species list provided in April 21, 1988 letter
Mar. 27, 1989	Documentation of Phone conversation between Larry Lockard (USFWS) and Brian Kahn and Bob Kiesling (Nature Conservancy) on the Nature Conservancy being a third party participant in grizzly bear recovery.
Mar. 27, 1989	Documentation of Phone conversation between Larry Lockard (USFWS) and Chris Servheen (Grizzly Bear Coordinator - USFWS) on grizzly bear mortality as related to public education and the augmentation program.
Jun. 29, 1989	USFWS letter to verify species list provided in April 21, 1988 letter and reconfirmed on Dec. 20, 1988.
Jan. 30, 1990	USFWS letter to verify species list provided in April 21, 1988 letter and reconfirmed on Dec. 20, 1988 and June 29, 1989.
May 4, 1990	USFWS response as an informal review of a draft biological assessment on the Montanore and Rock Creek mine projects.
Nov. 19, 1993	Meeting with Kevin Shelly (USFWS), Lisa Fairman (QEA contract biologist), Paul Kaiser (KNF IDT Leader), Wayne Johnson (Cabinet District Biologist). Parties agree to a number of items regarding analysis of effects on grizzly bear. Also clarified USFWS position concerning **ASARCQ** and Montanore project overlap.
Dec. 1, 1993	District Ranger requests updated list of endangered, threatened, and proposed species in or near the planning area from the U.S. Fish and Wildlife Service.

Jan. 25, 1994	U.S. Fish and Wildlife Service provides updated list of threatened, endangered, and proposed species that may be present in project area.
April 29, 1994	Meeting between USFWS, MDFWP, KNF biologists to discuss 4-27-94 Draft Mitigation Plan of ASARCO. Team reviewed draft and accepted, modified or deleted items as appropriate. Draft Mitigation plan to be included in Draft BA.
July 22, 1994	District Ranger requests updated list of endangered, threatened, and proposed species in or near the planning area from the U.S. Fish and Wildlife Service.
Aug. 24, 1994	U.S. Fish and Wildlife Service provides updated list of threatened, endangered, and proposed species that may be present in project area.
Dec. 21, 1994	Meeting with MDFWP and USFWS to review agency's draft ASARCO mitigation plan. Changes made to draft plan based on input from Harvey Nyberg (MDFWP), Kevin Shelly and Wayne Kasworm (USFWS).
May 18, 1995	District Ranger requests updated list of endangered, threatened, and proposed species in or near the planning area from the U.S. Fish and Wildlife Service.
June 6, 1995	U.S Fish and Wildlife Service provides updated list of threatened, endangered, and proposed species that may be present in project area.
May 2, 1996	Meeting with Kevin Shelley (USFWS), Paul Kaiser (KNF), Joe Elliot (ASARCO contract biologist), Wayne Johnson (Cabinet RD). ASARCO concerns about Draft BA shared. Discussion of mitigation plan.
June 4, 1996	Conference call between Kevin Shelley (USFWS), Bob Summerfield (KNF) and Wayne Johnson (Cabinet RE)). Discussed USFWS informal response to Draft BA. Identified desired additional analysis for final BA.
Jan. 7, 1997	KNF submitted assessment of potential mitigation lands to USFWS for review in advance of mitigation planning meeting.
Mar. 10, 1997	Meeting with Kevin Shelley (USFWS), Bob Summerfield, Paul Kaiser, Rich Steams and Wayne Johnson (USFS). USFWS requests use of Moving Windows analysis. Kevin states "mitigation lands assessment looks good".

July 2, 1997	Conference call with Kevin Shelley (USFWS), Wayne Johnson, Paul Kaiser, Sandy Jacobsen (USFS), Joe Elliot and Doug Parker (ASARCO) and Kathy Johnson (MDEQ). USFWS request seasonal habitat analysis of Core habitat as it is the "replacement area". ASARCO has concern on timing of mitigation - can mitigation be phased? Yes?but separate from NORANDA. Monthly meetings set to complete final mitigation package.
July 9, 1997	Meeting with Kevin Shelley (USFWS), Wayne Johnson, Sandy Jacobson, Bob Summerfield and Paul Kaiser (USFS). How to approach to mitigation - is it more than just replacement of habitat units?
Aug. 4, 1997	Kootenai Forest requests updated list of endangered, threatened, and proposed species in or near the planning area from the U.S. Fish and Wildlife Service.
Aug. 15, 1997	U.S. Fish and Wildlife Service provides updated list of endangered, threatened, and proposed species that my be present in the project area.
Aug. 26, 1997	Kootenai Forest submits draft Biological Assessment to USFWS with request for a draft Biological Opinion.
Sept. 26, 1997	USFWS responds to KNF Aug. 26, 1997 request by identifying it as "early consultation" and therefore did not provide a draft B.O..
Dec. 18, 1997	Phone conference notes between KNF & USFWS biologists discussing predicisional information on USFWS position and finding on draft B.A. Jeopardy and take elements covered and ideas for potential reasonable and prudent alternatives considered.
Mar. 30, 1998	Kootenai Forest requests updated list of endangered, threatened, and proposed species in or near the planning area from the U.S. Fish and Wildlife Service.
April 15, 1998	U.S. Fish and Wildlife Service provides updated list of endangered, threatened, and proposed species that my be present in the project area.

APPENDIX 4

"Cumulative Effects Model" (CEM) Process

T&E ANALYSIS PROCESSES AND ANALYSIS AREAS

FOR

ASARCO ROCK CREEK MINE

INTRODUCTION

This paper documents the project specific replacement habitat needs due to project impacts. It also identifies the analysis areas used for each species and the elements used in cumulative effects analysis. Projects included in the cumulative effects analysis are listed in the project file. Data from aerial, vehicle, and foot surveys and sightings, radio telemetry, historical sightings. scat analysis, and vegetative mapping were used in the analysis. This provides information on populations and habitat. Literature reviews pertinent to the species and the proposed project supplemented detailed studies.

BALD EAGLE AND PEREGRINE FALCON

The primary study area centers around the proposed permit area for peregrine falcon and bald eagles. Cumulative effects analysis area expands to cover the Clark Fork and Bull river corridors (1 mile either side of the river).

GRAY WOLF

The primary study area centers around the proposed permit area. Cumulative effects analysis area expands to cover that portion of the Cabinet Ranger District that lies north and east of the Clark Fork River. This is based on the territory size, and the assumption that a pack territory could exist on each side of the Clark Fork River.

GRIZZLY BEAR

A larger area was used for analysis of cumulative impacts to the grizzly bear. This area includes all of bear management units (BMU) 4, 5, and 6, which are areas which have been delineated for direct cumulative effects analysis. The bear units have been in use for analyzing cumulative impacts to grizzlies since 1982. BMUs were used to determine percent habitat effectiveness, based on minimum level of 70 percent.

Sub-units of BMUs called bear analysis areas (BAA) were used to determine open road densities, based on a maximum level of 0.75 miles per square mile (640 acres).

An even larger area was used to determine the indirect cumulative effects of two mines (Rock Creek and Montanore) operating at the same time. The entire Cabinet-Yaak Recovery Zone (2580 square miles) was the starting point and then the Cabinet Mountain portion of the CYE (35% of CYE) and finally the south half of the Cabinet Mountain portion (22% of CYE) was evaluated for this effect.

The vegetative habitat analysis follows the cumulative effects model (CEM) as outlined in "Cumulative Effects Analysis Process for the Selkirk/Cabinet-Yaak Grizzly Bear Ecosystems" (USFWS 1988). Early and Late habitat units were mapped within the Rock creek drainage and values and acres displayed for all habitat units that were impacted (physically changed or within project influence zone of 1/4 to 1/2 mile or ridge line).

Based on the CEM process? specifically Table 4 pg 12,(USFWS 1988) replacement habitat needs were identified as follows:

Tailings site:

368 acres physically changed

A disturbance coefficient (DC) of 0.0 is assigned. This means that total displacement occurs and none of the area would be available for bear use at any time during the project. A 100% compensation level assigned.

368 x 1 = 368 acres needed

Tailings site influence zone:

Motorized point with 24 hour activity - 1/2 mile influence zone

486 acres (includes only those acres not already disturbed by existing facilities (Road 150, railroad)

A DC of 0.1 is assigned. This means that the ability of the area to support bears is 10% of potential. **A** 90% compensation level assigned.

486 x .9 = 437.4 acres needed

~~Mill site and~~ Facilities (mill, water treatment and mine sites):

41 acres physically changed

A DC of 0.0 is assigned. This means that total displacement occurs and none of the area would be available for bear use at any time during the project. **A** 100% compensation level assigned.

41 x 1 = 41 acres needed

SUMMARY

FEATURE	*ACRES*
Tailings Site	368.0
Tailings Site Influence Zone	437.4
Mill Site Acres	41.0
Mill Site Influence Zone	207.0
Transportation Facilities	64.0
Transportation Facilities Influence Zone	37.8
Exploration Adit	10.0
Exploration Adit Influence Zone	43.4
Existing Transportation Facilities Influence Zone	1131.2
Ventilation Adit	0.0
Ventilation Adit Influence Zone	10.0
Total Project Replacement Acres	2349.8

REPLACEMENT ACRES (rounded to nearest whole acre) = 2350

Habitat replacement acres must be "IN KIND"

"IN KIND" acres must provide a total of6133.5 early habitat units; and 3783.5 late habitat units. Overall habitat value of 2.11 habitat units per acre (2.61 early HUs ; 1.61 late HUs) is desired.

Acceptable "in kind" replacement acres include:

1. Fee title or:
2. Conservation easement.

   Either method must be, at a minimum, for the life of the mine (35 years) plus a reasonable recovery period following mine reclamation. Bear generations are about **7** years, so a "reasonable" period would be **2** bear generations in order to give bears time to start re-using lands from which they had been displaced.

3. Lands must provide equivalent early and late habitat units as described in the BA seasonal component section.

USFWS et.al. 1988. Cumulative Effects Analysis Process for the Selkirk/Cabinet-Yaak Grizzly Bear Ecosystems 1988. USFWS Boise Field Office. Boise ID. 32 pp.