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To minimize compaction of the topsoil following redistribution, travel on reclaimed areas will not be allowed. Co-Op will exercise care to guard against erosion during and after application of topsoil and will employ wood fiber mulch and tackifiers to ensure the stability of topsoil on the graded slopes. The specific methods to be implemented are defined in Section 9.

The soil stabilization methodology that will be used includes the placement of crushed and heavier material at the toe of road fill slopes, and the random placement of large rocks and boulders on the surface. This procedure will enhance the microclimate as well as make the reclaimed area more aesthetically compatible with the undisturbed surroundings. Erosion control matting will be installed on steep slopes where it is determined that the use is required for the proper establishment of vegetation and erosion control. The detailed revegetation plan to be submitted in the last five year permit renewal prior to reclamation, will include maps showing the areas to receive matting.

8.9 NUTRIENTS AND SOIL AMENDMENTS

Chemical analysis for micronutrients will be conducted by testing soil extracts from the redistributed material as outlined in Table 8.7-1. All necessary fertilization and/or neutralizing compounds will be applied according to the results of the soil sampling and analysis program approved by the division.

old

Topsoil is presently being stored within areas of the permit boundary (Section 8.6). These piles should be considered "long term".

8.7.1.3 Topsoil Protection

The short-term topsoil stockpile will be sprayed with water or temporarily vegetated to retard erosion. The long-term topsoil stockpile will be protected by the following operational steps:

1. A stable surface will be provided in an area outside the influence of active operations.

2. As a stockpile is completed, it will be left in a rough condition to minimize erosion.

3. Stockpiles will be situated out of drainage to prevent water erosion.

4. Storage piles will be vegetated with quick growing, soil-stabilizing plants. Revegetation will involve the immediate seeding and mulching of stockpiles during the next planting season with the seed mixture recommended in Section 9.5, in compliance with the requirements of the appropriate land management agency.

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Table 8.7-1 Analytical Parameters for Baseline Soils Data (cont)

Test to be Performed	Reported As	Suggested Methods[1]
Soluble Potassium, Magnesium, Calcium & Sodium	meq/l	ASA Mono. No. 9, Part 2, (2 ed), 1982. Method 10-3.4. pages 173-174.
Sodium Adsorption Ratio[2]	SAR calculated from soluble Ca, Mg & Na (meq/l)	$\frac{[Na^+]}{([Ca^{2+} + Mg^{2+}]/2)^{0.5}}$
Total N	%	ASA Mono. No. 9, Part 2 (2 ed), 1982. Method 31-3, pages 610-616.
Available Phosphorus	mg/Kg	ASA Mono. No. 9, Part 2, (2 ed), 1982. Method 24-5.4, pages 421-422.
Available Water Capacity	in/in	USDA SCS Soil Survey Investigation Report No. 1, Method 4C1, page 24.
Rock Fragments	% Volume	USDA SCS Soil Survey Investigation Report No. 1, Method 3B, page 18.

[1]These are suggested methods, other equivalent methods may be used if described and can be justified prior to sampling.

[2]If samples have a SAR greater than 12 for clay textured soils or greater than 15 for sandy textured soils, then exchangeable sodium percentage should be analyzed.

Note: This table is from Table 1 of the Department's "Guidelines for Management of Topsoil and Overburden for Underground and Surface Coal Mining", April 1988.

old

for the required chemical properties in all horizons (see Appendix A).

8.7.1 Soil Removal, Handling, Storage, and Protection Plans

Prior to the start of all new construction, topsoil will be analyzed as outlined in Table 8.7-1, in accordance with Division recommendations to determine the extent and depth of suitable plant growth medium and will be separately salvaged and stockpiled. Topsoil is stockpiled, consolidated and protected from wind and water erosion and contamination which might lessen its capability to support vegetation. The following subsections deal specifically with the various phases of the topsoil and subsoil handling plan.

8.7.1.1 Topsoil Removal

The depth of topsoil removed previous to 1990 was determined by the amount of A and B horizon material as defined in OSM Regulation 30 CFR 783.22. Existing vegetation was removed and topsoil was collected prior to excavation or other disturbance operations within the affected areas. The topsoil removed in these areas consists of A horizon quality material and B horizon quality material with virtually no distinctive difference. The C horizon material was not removed since it was not sufficiently capable of supporting diverse vegetation due to the excessive rock.

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4.5.2 Differing Post-Mining Land Use Support

The mine site will be returned to wildlife/grazing [rangeland] habitat, which is similar to the pre-mining land use.

4.5.3 Final Surface Configuration

The proposed final surface contour plan is shown on Plate 3-2. The final contours shown are compatible and suitable for post mining use. They will also improve stability and drainage.

4.5.4 Compatibility with Surrounding Land Uses

Throughout the life of the project and especially during abandonment phases, the following assessments will be made:

1. The visual resources will be assessed. The abandonment assessment will concentrate on how effectively final drainage and slope patterns fit into the area's general visual resources. This assessment will be made through the period of liability.

2. The recreational resources will be assessed. This process will include a review of post-mining hunting, camping, hiking and recreational land use. If it is found, during the liability period, that any of these activities have

old

4.5 POST-MINING LAND USE

Table 4-1 Proposed Post-Mining Land Use

Land Use in Relation to Mine Features

Area	Present Ownership	Pre-mining Use	Proposed Post-mining Use	Alternate Use
Mine Site Exploratory Excavations	Private	Wildlife/ Grazing	Wildlife/ Grazing	Picnic Area
Conveyor, Pipeline and Power Line Route	Private	Grazing	Grazing	Wildlife Habitat
Main Access	Private	Service Road	Service Road	Wildlife Habitat

Land Use in Relation to Physical Features

Area	Proposed Post-mining Use	Ability to Support Proposed Post-mining Use
Flatlands	Wildlife/Grazing Habitat/ Timber	Adequate
Canyons	Wildlife/Grazing Habitat	Adequate
Moderate Elevation: North & East Slopes	Wildlife/Grazing Habitat	Adequate
High Elevation: Steep land North & East Slopes	Wildlife Habitat	Adequate
West and East Slopes	Wildlife Habitat	Moderate - Because of Harsh Natural Conditions

METHODOLOGY

old

Phase 1 - Earth Moving

The pad down slopes will be brought back to a reasonable configuration by implementation of a crawler tractor. The actual method will involve smooth contouring of the existing soil and walking the crawler up and down the slope attempting to minimize compaction while at the same time creating small indentations by the grouser on the track. This methodology creates an enhanced micro-climate for the establishment of seed and guarantees sufficient compaction as to assure integrity and stability of embankment and prohibit failure.

Phase 2 - Seeding and Mulching

The entire disturbed area will be hydroseeded during the mid fall season with a Target completion date of 15 October. The seed mix and rate of application for interim reclamation is shown in Table 3G-1. Hydro-seeding and mulching will be carried out in conjunction with the earth work of Phase 1. All hydroseeded or hand seeded areas will be lightly raked to insure adequate soil/seed contact. Recommendations for the hydroseeding and mulching operation are shown in Table 3G-2.

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approved by the department if they are found on site in the future. Co-Op does not feel this regulation is applicable, for the area in question is not to be utilized in a manner which will constitute the stockpiling or storage of coal and/or refuse.

POTENTIAL HAZARDOUS WASTES

The following list includes the products which are used or may be used within the mine permit area, that are capable of producing hazardous wastes;

Diesel Fuel	Gasoline	Coal Oil
Carburetor Cleaners	Engine Degreaser	Windshield Washer Fluid
Lead Acid Batteries	Blasting Products	Solvents (Flash-point < 140°F)
Paints	Thinners	Deicers
Hydraulic Oil		

These products will be consumed in use or recycled to the extent possible to avoid costly disposal and company liability. Any of these or other materials that become potentially hazardous and there containers will be disposed of in the proper manner, at an approved disposal site.

TOXIC MATERIALS & HANDLING

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Any material that is contaminated with coal, as determined by visual observation, will be placed against the highwall and buried beneath a min of 2 ft of fill material during reclamation. Material that is contaminated with oil or grease or any other potentially acid or toxic matter, as determined by visual means, will be placed against the highwall and covered with a min of 4 ft fill, top soiled, and reclaimed. Interim isolation of such material will be by use of berms created by a backhoe or loader.

Since the roof material from the mine has shown a high SAR value, any roof rock that is stored on the surface will be isolated by a berm as long as it is stored on site. During reclamation, this material will be placed against the top of the highwall and covered with a minimum of 4 ft of material, covered with required plant growth medium and revegetated.

Covering Coal and Acid and Toxic Forming materials

The pH, acid-base potential, texture and electrical conductivity of these materials must be included on the date reported.

<u>Co-Op reply</u>. Co-Op submitted a sample to CT&E testing for this data and the results are included attached. Co-Op will commit to removing any and all such material or disposing of them in a manner

old

3.6.4 Backfilling and Grading Plans

The objective of the proposed backfilling, soil stabilizing, compacting, contouring and grading process is to achieve a reclaimed surface which will provide a variety of topographic features and enhance post-mining land use.

The steps to be taken in the backfill, soil stabilization, compaction, contouring and grading problems are described in the following subsections. Stability analysis of highwalls and backfilled areas are discussed in Appendix 3-F.

Backfilling operations, utilizing equipment such as rubber-tired scrappers, bulldozers, backhoes, front-end loaders and dump trucks, will be conducted in the portal and treatment facility areas. Holes or depressions will be filled when the mining operation is concluded. Compaction operations utilizing equipment such as sheeps-foot tampers, will be conducted to stabilize all filled holes and depressions.

In general, the backfilling and grading operation will take place in the following manner:

a. All mining portals will be sealed and backfilled as previously described in Section 3.6.3.1.

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controlling runoff and revegetating the hillsides with vegetation comparable to existing growth.

Backfilling of the subterranean portion of the silos, holes and depressions will be the next reclamation activity, Once the backfilling is completed, the disturbed areas will be graded and recontoured. Topsoil materials will be redistributed as defined in Chapter 8 and then seeded or planted as described in Chapter 9, before the next growing season. A suitably permanent and diverse vegetation cover will be established on all affected areas of land.

The post-mining land uses will be grazing, recreation, wildlife and mineral.

Reclamation Timetable. Land reclamation will take place as soon as possible after surface disturbance. See Section 3.6.8.1. All cut and fill slopes resulting from construction of access roads and coal yards will be stabilized and revegetated at the first seasonal opportunity. Areas occupied by support facilities such as roads, office buildings, shops, coal handling structures and conveyors will not be reclaimed until conclusion of the mining operations. Demolition and removal of structures should commence in March, April 2012. Portal seals and grading should commence in June and be completed by Sept 2012. Drill seeding, hydroseeding and stream enhancement work should be completed by 30 Oct. Monitoring will continue during the liability period for at least 10 yrs. When the

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3.6 RECLAMATION PLAN

Co-Op upon completion of mining on the permit area, will reclaim all disturbed surface areas as diligently and rapidly as possible, to restore the property to a variety of alternative uses. All reclaimed areas will be maintained during the liability period for at least 10 years.

The initial step in the reclamation plan is to seal all large-diameter openings by backfilling these openings with non-combustible material, (earth & small rock) adjacent to the portals. The seals will be designed such that mine drainage, if any, will not enter surface water bodies. For a more detailed description of the dealing of openings, see Section 3.6.3.1, Sealing of mine Openings, Drill Holes, Wells, etc.

The next step in reclamation would be the removal of all surface structures, equipment and road blacktop. Once this has been accomplished, all solid waste generated in the abandonment operation will be collected and disposed of in an approved manner. Additional information concerning this aspect of the reclamation plan is present in Section 3.6.3.2, Removal of Surface Structures and 3.6.4.

Proposed access roads, to the mine portals, will be reclaimed and revegetated. This will accomplish a dual purpose of

olk

employed as necessary. Chemical stabilization will include the addition of neutralizing chemicals to soils shown to be excessively acidic or basic. Nutrients and soil amendments will be added in the amounts indicated by soil testing (Section 8.9) so approved post-mining land use can be sustained.

Biological Soil Stabilization. Returned soils will be stabilized biologically by revegetation of disturbed areas. This stabilization effect will be accomplished by the new vegetative cover, particularly small shrubs and trees. This aspect of soil stabilization will begin as soon as topsoil is redistributed. Section 3.6.5, Revegetation Plan, provides specific detail on the aspect of the reclamation plan.

3.5.5 Protection of Vegetative Resources

Co-Op has maintained a commitment to reclaim the unused disturbed areas to the extent of the cover of the natural vegetation on the mine plan area. Chapter 9, Vegetative resources, provides a preliminary report on the vegetative resources of the area.

3.5.5.1 Projected Impacts of Mining on Vegetative Resources

Since the Bear Canyon Mine is an underground mine, the overall impact on surface vegetation is minor. The effects of surface operations on vegetation from new construction areas, on-site

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will first be removed, then topsoil will be segregated from other materials, removed and stockpiled separately in a stable approved site within the permit area. The stockpile will be protected from erosion, compaction, or contamination and will be stabilized with interim revegetation procedures.

Backfill, Compaction and Grading. Disturbed surface areas will be backfilled, compacted and graded according to the approved time schedule. Wherever possible, backfilling will return the various soil horizons to their original site and make them compatible with surrounding areas. Compaction will help the returned soils remain in place. Grading will restore the contour to as near the original state as possible. Post Mining Topography is shown on Plate 3-2.

Since this mine produces no acid-forming or toxic-forming materials, backfilling required to cover such materials will be limited (Appendix 3-E).

Physical and Chemical Soil Stabilization. Soils will be stabilized by physical and chemical methods before planting. This will include placement of crushed heavy material at the top of road-fill slopes, for example. Other approved and proven methods will be

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b. Water rights could be purchased for springs damaged by Co-Op, or, alternate water shares could be substituted (Appendix 7-C).

c. A well could be drilled at the affected site to provide an alternate supply (since artisan conditions do not exist).

d. Water produced in the mine could be piped to the affected site.

e. Water shares presently owned could be transferred.

Alternative d. may mean treating of poorer quality water and pumping to overcome elevation differences.

In the unlikely event that mining adversely affects a water source, Co-Op will select an alternative after considering all possibilities of each site-specific circumstance. Forest Service approval will be obtained for water effected on Federal Lease U-024316.

3.5.4 Preservation of Soil Resources

Co-Op is prepared to meet the requirements specified by 30 CFR 784.15. Backfilling, soil stabilization, compacting, grading and any other necessary operations will be performed when necessary with the best technology available, as approved by the regulatory agency. Section 3.6, Reclamation Plan, provides a detailed

old

is not kept to a minimum. These topics are discussed in detail in the Wildlife Report, Chapter 10.

3.5.1.2 Control Measures to Mitigate Impacts

Reclamation activities in the permit area will be directed toward minimizing the overall impact of coal mining. This can be accomplished by careful planning of the disturbed areas that must be later reclaimed. Reclamation activities are defined in Section 3.6.

The proposed mine surface operation facility area, will be returned to a wildlife/grazing habitat at the conclusion of the mining operation. The pre-mining and proposed post-mining uses are therefore identical for all areas (Chapter 4).

3.5.2 Protection of Human Values

There are no public parks nor historical sites worthy of preservation in the permit area.

Topsoil is presently being stored within areas of the permit boundary (Section 8.6). These piles should be considered "long term".

8.7.1.3 Topsoil Protection

The short-term topsoil stockpile will be sprayed with water or temporarily vegetated to retard erosion. The long-term topsoil stockpile will be protected by the following operational steps:

1. A stable surface will be provided in an area outside the influence of active operations.

2. As a stockpile is completed, it will be left in a rough condition to minimize erosion.

3. Stockpiles will be situated out of drainages to prevent water erosion.

4. Storage piles will be vegetated with quick growing, soil-stabilizing plants. Revegetation will involve the immediate seeding of stockpiles during the next planting season with the seed mixture recommended in Section 9.5, in compliance with the requirements of the appropriate land management agency.

Salt Lake City, Utah
November 15, 1982

TO WHOM IT MAY CONCERN:

Co-op Mining Co. asked us, as land owners, to describe our intended future use of the property currently being mined by Co-op Mining Co. in Emery County, Utah.

Co-op Mining Co. now occupies the premises pursuant to a written lease agreement, authorizing the removal and sale by Co-op, of coal from the property. Our best current information indicates that there exists sufficient coal reserves on the property to support a mining operation for in excess of fifty years, at the current rate of coal removal. Upon the expiration of the Co-op Mining Co. lease, and assuming sufficient coal reserves remain, we will re-lease the property, either to Co-op or to some other company interested in mining the coal.

Upon the cessation of coal mining activity, assuming we still own the property and no more beneficial use of the land becomes apparent, the land will most likely be used for grazing cattle or other livestock.

Very truly yours,

Ronald Tucker

COP Development Co.

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discussion of the reclamation effort.

3.5.4.1 Projected Impacts of Mining on Soil Resources

Since the Bear Canyon Mine is an underground mine at the site of an old works, the overall impact of mining on soils will be minor, The impacts of surface operations and mining facilities on soil resources consist of coverage of soil by facilities, disturbance of soils during construction activities, erosion created by removing vegetation, reduced forage growth due to nutrient degradation, reduced wildlife capacity and particulate emissions to the air. However, the abandoned mine had large accumulations of debris which has now been cleaned up, which to a large degree constitutes enhancement.

3.5.4.2 Control Measures to Mitigate Impacts

The objectives of the proposed backfilling as soon as operation are concluded in each disturbed area, the removed topsoil will be redistributed on the site in a 6 in. uniform lift. Methods and techniques are detailed in Section 3.6.4.4, Soil Redistribution and Stabilization.

<u>Topsoil Removal and Protection</u>. Before new construction or mining activity that will disturb the surface of undisturbed areas, topsoil will be removed from the effected area. Vegetation

old

2.2.2 Holders of Leasehold Interest in Surface Area and Coal Rights

The names and addresses of holders of record in Leasehold interest are listed below: Coal mining lease by and between Co-Op Mining Co. and Peabody Coal Co., executed 1 December 1975 (Plate 2-1).

T16S, R7E SLBM	Sec. 14 SW 1/4, SE 1/4
	Sec. 23 E1/2, E1/2 W1/2
	Sec. 24 All West of N-S Fault
	Sec. 25 All West of N-S Fault
(Fed. Lease U024316)	Sec. 13 W 1/2 W 1/2
	Sec. 14, E 1/2 NW 1/4, NE 1/4
(Fed. Lease U024318)	Sec. 26 E 1/2 NW 1/4

The right to mine and remove from, and use for purposes incident to mining, including access roads, camp facilities, surface operations, storage of coal, and other activities. Also unrestricted use of all access roads leading to and from property. Lease in binding on the successors to the parties of the lease. Co-Op also holds Federal Lease U024316 (See Appendix 2-F, Plate 2-1).

2.2.3 Purchase of Record Under a Real Estate Contract for Surface Area Coal

See Appendix 2-B Title Insurance Policy and Property Title.

2.2.4 Operator, if Different from Applicant

Same as above.

old

2.2.5 Resident Agent of the Applicant

Nathan Atwood
P. O. Box 1245
Huntington, Utah 84528
(801) 381-5238

2.2.6 Business Designation (Partnership)

Officers and Directors of the Applicant (General Partners)

Earl W. Stoddard
P.O. Box 300
Huntington, Utah 84528

R.L. Brown
3140 South Main
Salt Lake City, Utah 84115

John Gustafson
1815 South 1100 West
Woods Cross, Utah 84087

2.2.7 Current, Pending or Previous Coal Mining Permits in the U.S. Held By Applicant and Principal Shareholder Subsequent to 1970

Act/015/021 Oil, Gas, and Mining Div. [illegible]

Act/015/025 Oil, Gas, and Mining Div. Bear Canyon

2.2.8 Owners of Record of Surface and Sub-surface Areas Contiguous to the Proposed Permit Area

Plate 2-2 shows surface ownership and Plate 2-3 display sub-surface

old

ownership for the permit area and parcels of land contiguous to the permit boundaries. The names and addresses of the owners of record of the mine property are the same as the General Partners (Section 2.2.6).

2.2.9 Mine Name and M.S.H.A. Identification

The name of the mining operation for which this application is submitted is:

Bear Canyon Mine Co-Op Mining Company

The M.S.H.A. Identification Number is: ✳

MSHA #42-00081-0

2.3 COMPLIANCE INFORMATION (R614-301-113)

See Appendix 2-A.

2.4 RIGHT OF ENTRY AND OPERATION INFORMATION (R614-301-114)

The applicant's right to enter the lands and to conduct operations in the permit area is based on the documents listed in Section 2.4.1. It should be noted that the applicant's right is not subject to any pending litigation. Easements are included under Appendix 2-E.

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Plate 2-1 shows the Permit Area, Plate 2-2 shows Surface Ownership, Plate 2-3 shows Sub-Surface Ownership, and Plate 2-4 shows Surface Facilities. The initials COP on the plates stand for COP Development Company. Table 2-1 lists the fee owners of the surface and mineral property rights.

Table 2-1 Property Ownership

	Surface	Coal	Minerals	Grazing	Oil & Gas
A.	COP Development	"	"	"	"
B.	Nevada Power	"	"	"	"
C.	U.S. Forest Service	*	*	"	*

A. C.O.P. Development Co.
3140 South Main Street
Salt Lake City, Utah 84115

B. Nevada Power Company
P. O. Box 230
6226 West Sahara Avenue
Las Vegas, Nevada 89151

A subsidiary of Nevada Electric Investment Co.

C. U.S. Forest Service
599 W. Price River Dr.
Price, Utah 84501

* The Bureau of Land Management is responsible for administration of sub-surface resources in cooperation with the forest service.

AMENDMENT TO
& Reclamation Plan
Division of Oil, Gas & Mining
Tom Munson date 3/27/90

Table 7.1-8 Water Monitoring Matrix 1990 thru 1991

Location	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Upper Bear Creek BC-1		opper.			opper.	field	field	opper.	field	opper. (3)		
Lower Bear Creek BC-2		opper.			opper.	field	field	opper.	field	opper. (3)		
Rt. Fork Bear Cr. BC-3		opper.			opper.	field	field	opper.	field	opper. (3)		
Portal Well SBC-2		opper.			opper.			opper.		opper.		
Creek Well SBC-3		opper.			opper.			opper.		opper.		
Huntington Spring Overflow SBC-4		opper.			opper.			opper.		opper. (3)		
Birch Spring SBC-5					opper.					opper.		
Co-Op Dev Spring SBC-6		opper.			opper.			opper.		opper. (3)		
E. Bleeder #33 W. SBC-7		flow			flow			flow		flow		
E. Bleeder #30 E. SBC-8		flow			flow			flow		flow		
1st N. Bleeder #42 SBC-9		base.			base.			base.		base.		

Notes:
1. See Tables 7.1-7 and 7.2-5 for listing of water quality monitoring parameters.
2. opper. = opperational
   base. = baseline
3. Baseline parameters taken in 1990.

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Table 7.1-9 Water Monitoring Matrix 1990 thru 1995

Location	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Upper Bear Creek BC-1		opper.			opper.	field	field	opper.	field	opper. (3)		
Lower Bear Creek BC-2		opper.			opper.	field	field	opper.	field	opper. (3)		
Rt. Fork Bear Cr. BC-3		opper.			opper.	field	field	opper.	field	opper. (3)		
Portal Well SBC-2		opper.			opper.			opper.		opper.		
Creek Well SBC-3		opper.			opper.			opper.		opper.		
Huntington Spring Overflow SBC-4		opper.			opper.			opper.		opper. (3)		
Birch Spring SBC-5					opper.					opper. (4)		
Co-Op Dev Spring SBC-6		opper.			opper.			opper.		opper. (3)		
E. Bleeder #33 W. SBC-7		opper.			opper.			opper.		opper. (5)		
E. Bleeder #30 E. SBC-8		opper.			opper.			opper.		opper. (5)		

Notes:
1. See Tables 7.1-7 and 7.2-5 for listing of water quality monitoring parameters.
2. opper. = opperational
   base. = baseline
3. Baseline parameters taken in 1990 and 1995.
4. Baseline parameters taken in 1993.
5. Baseline parameters taken in 1995.

old

R614-301-528.330 Disposal of Non-Coal Waste. Co-Op has undertaken a massive clean-up operation wherein large quantities of scrap have already been removed from the permit area. This operation was completed (1 Sept 1983) the balance of the salvageable equipment is being stored in the designated area.

The equipment which is not scrapped out is temporarily stored in the storage yard in Bear Canyon. This site is situated in such a manner to insure that whatever runoff results from the area will pass through designated sediment facilities.

The non-coal waste (other than rock refuse) generated in the operation of the mine is placed in metal dumpsters which are strategically located on the property. A local trash collector is contracted to replace these bins when they are approx 80 pct full,

Appendix 3-E addresses a comprehensive plan to handle toxic or contaminated material in the course of reclamation.

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SPRING AND SEEP INVENTORY

CO-OP BEAR CANYON MINE FEDERAL LEASE

SCOPE

An inventory was conducted on the Co-Op Mine Lease areas during June, 1990. The purpose of the inventory was to establish locations of seeps and springs within the actual permit area as well as a one-half mile periphery area which could feasibly be impacted through future subsidence. The inventory was designed to not only locate, but to establish baseline data relative to both quantitative and qualitative parameters of each site where springs were observed which had greater than 2 gpm. The area in question is defined on Figure 1.

METHODOLOGY

June 18, 1990, an aerial survey reconnaissance of the permit area was conducted by 3 staff members from E.I.S.. The purpose of the reconnaissance was to locate evidence of surface water through actual observation as well as suspect areas of moisture which would be indicated by a lushness of vegetation and/or indicator species such as willow, or cottonwood trees. An aerial survey was beneficial also in establishing a plan to contour ground search the area due to the extreme roughness of the terrain and limited access by any means other than foot.

With the information secured from the aerial survey, the U.S.F.S. was contacted and a search of their files was conducted to locate all existing water rights within the survey area. A copy of the rights are attached as Table 2. The location of all existing water rights were plotted on Figure 1 and correlated against the observation from the aerial survey. These water rights which fell within the area of potential influence were then confirmed with actual ground sightings. The results of the ground observations are recorded on Table 1 with photographs in Appendix #1.

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The final phase was to conduct a ground survey of the entire area of potential influence. The method involved a 100% survey of all areas which could theoretically be impacted through mining activities; then to walk all areas within the area of influence at approximately a 200' interval (where accessible) with particular emphasis on all draws and drainage areas. This was accomplished by utilizing a four man team. Access to the ridge was gained by the road up Mohrland. then across Gentry Mt. to McCadden Hollow, then, a jeep trail down the main ridge separating Bear and Trail Canyons. Three men would be let out along the ridge, then contour search the side hills and canyon bottoms to the lower road where they would be picked up. Due to extreme roughness of the terrain and the time involved in transport, an normal working day was limited to approximately 6 hours. Each man carried with him, 2 sets of sample bottles, a thermometer, Ph and Conductivity meters, and the means to determine flow through time-volume materials. When a spring or seep was observed, its location was plotted on a map. If there was flow, it was measured as to volume, temperature, and Ph and Conductivity. There were no springs within the survey area (that were accessible) with flows in excess of 2 gpm's. The upper region of Bear Canyon was inaccessible and the main flow of Bear Creek originates approximately 300' below the ridge. This area is not accessible by conventional means, however, Bear Creek has been historically sampled by Co-Op Mine over the last 9 years.

CONCLUSIONS AND RESULTS

The area of potential influence in association with underground mining of the lease areas had springs and or seeps. There were a total of 14 seeps and/or springs that were located; none of these had sufficient flow to collect qualitative samples. The flow from 9 of the sampled springs was less then .5 gpm. Only 1 site had in excess of 2 gpm. These are labeled on Figure 1 as BL-8. BL-8 is associated with Water Right # 714 with a flow of 2 gpm. This spring is located at the outer edge of the area of potential influence and is the only source which has a well

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defined outfall and established riparian zone. It is believed to be a permanent year-round source of water. M-4, (USFS # 142) has a flow of .25 gpm at the source but then diminishes to 0 gpm within approximately 200 ft. of channel. The absence of a well defined riparian zone leads to the assumption that this spring is of an intermittent nature and is most likely dry during the fall of the year.

All of the remaining springs and seeps had a very small area of influence with virtually no surface flow beyond 10' to 15' and no defined riparian zones other than that a minor lushness of vegetation in the immediate area of influence. There was no riparian based vegetation but simply a lushness of vegetation which was indigenous to the surrounding area. Table 1 lists each spring and seep with flow.

RECOMMENDATIONS

Only 1 spring has sufficient flow to warrant baseline monitoring. This constitutes the head water of Bear Creek BL-8. Due to the nature and location of this, it would necessitate an experienced rock climber to collect at the source, considering that the creek is sampled with 1300 to 1600 feet of the source, it would seem redundant to re-initiate baseline data in this inaccessible area.

CONCLUSIONS

It is apparent after the survey, that surface water is conspicuously absent over the majority of the proposed lease area. In this light, all effort should be made to maintain the integrity of the existing springs. However, due to the amount of overburden and depth of the coal seam, no adverse impacts appear likely; in fact, the general consequence of the existing mining operation with its associated sediment control structures and ponds has resulted in a positive benefit to Bear Creek in eliminating considerable sediment as the creek transverses the existing permit area.

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Table 1

BL-1	Spring	.3 gpm	
BL-2	Spring	.5 gpm	
BL-3	Seep	No Flow	
BL-3a	Associated seep	No Flow	
BL-4	Spring	.5 gpm	
BL-5	Spring	.5 gpm	
BL-6	Spring	.5 gpm	
BL-7	Spring	.5 gpm	
BL-8	Spring	2+ gpm	Main source
M-1a			
M-1b	Intermittant in main drainage		
M-1c			
M-2	Spring	.5 gpm	
M-3	Spring	.25 gpm	
M-4	Spring	.25 gpm	
T-1	Seep	.1 gpm	puddled

old

Table 2

USFS 712	Channel Area 151
USFS 714	Channel Area 142
USFS 713	Off Area of Influence

old

f. Man-Made Structures. There are no man-made structures above the lease area with the exception of two 4x4 roads. Potential subsidence impacts to the roads would be minimal, since the unlikely formation of fractures or depressions would hardly be noticeable on a 4-wheel drive road.

g. Minerals, Oil, and Gas. There are no known oil and/or gas wells within the lease expansion area.

5.1 Subsidence Monitoring

Before expansion into the Federal Lease area U-023416 the subsidence monitoring plan consisted of 3 monitoring points (SMS-1, SMS-2, and SMS-3) in the Bear Canyon Permit Area, a fourth point SMS-4 in the Trail Canyon Permit Area, and a Control Point CON-5, located outside the mining area. SMS-1, SMS-3, and SMS-4 are common to both the Trail Canyon and Bear Canyon Permits. As noted in this appendix (Appendix 3-C), Lease Addition, p 3C-4, a new control point will be established outside the permit expansion area, and CON-5 will become an additional subsidence monitoring point (to be redesignated SMS-5). In addition to the new control point (CON-6), four additional subsidence points (SMS-7, SMS-8, SMS-9, and SMS-10) are proposed to be added in the Federal Lease expansion area. The location of all existing and proposed points are shown on Plate 3-3.

manner as approved in Section 3.3.9.

Minable Reserves. The reserve calculations have been expanded and are tabulated in Table 3.4-1. The nature, depth and thickness of coal to be mined in the additional fee area are shown on Plates 6-1 thru 6-8. All portions of the approved MRP Bear Canyon Mine, will remain unchanged and applicable to the additional area with the addition of this Appendix. Updated maps have been submitted to show the new permit area.

Renewable Resource Survey and Subsidence. A renewable resource survey was conducted in 1984 and covered the additional fee property as well as adjacent federal leases. There are no man made structures, roads, power lines etc. in the area of the new fee property or adjacent areas of potential impacts, with exception of two 4x4 roads above federal lease ~~U-023416~~ U-024316. Upon approval of the mining in the expansion area, and before mining progresses to within 1500 ft of the subsidence control point designated CON-5, an additional control point will be established outside the area of mining influence, and CON-5 will become an additional subsidence monitoring station. These stations, along with the proposed new control point, are shown on Plate 3-3. Subsidence monitoring will proceed at the same frequency and methods as described under the approved subsidence monitoring section in Chapter 3.

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AREA NEAR PORTAL NO.1

This area lies between the upper lamphouse/mine portal bermed pad and the portal access road, extending from the road junction on the south to just north of the upper office trailer at the beginning of the Cattle Co. Road. The area is approx. 0.28 acres. A silt fence is installed at the north end of the area where runoff flows down hill from the Cattle Co. Road area. Runoff from the area passes through a silt fence near the inlet to culvert C-6U. Runoff volume from this area is calculated to be 0.019 acre ft.

BALL PARK TOPSOIL PILE

The ball park covers 1.2 acres. Straw bale dikes and/or silt fences will be installed on the south east side, in line with the natural flow to treat runoff before it enters Bear creak. Runoff volume from this area is calculated to be 0.082 acre ft.

TOPSOIL STOCKPILE

The main topsoil storage pile covers approx 0.1 acres. The area is encircled by an 18 in. berm and is protected by established vegetation. Runoff volume from this area is calculated to be 0.0068 acre ft.

Note: Runoff volumes are based on the 10 yr 24 hr event of 2.25 in. and runoff CN of 82.

GENERAL

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Upon inspection of the Mine permit area it was found that the areas described below exist in the undisturbed zones and that surface runoff going through these areas does not pass through the sediment pond treatment facilities. In order to provide adequate treatment for these areas, straw bale dikes and/or silt fences will be installed as indicated on Plate 7-1. The sediment control structures will be positioned so that surface runoff passes through them before entering Bear Creak. Treatment facilities will be maintained for each area until approved and determined that adequate revegetation cancels the need for treatment. These areas are designated as "Best Technology Currently Available" or BTCA Areas. Drainage from these areas will be monitored as possible to show compliance with the state and federal limitations.

OUTSLOPE BANK OF UPPER STORAGE PAD.

During construction of the Upper Storage Pad (Plate 7-1) some fill was apparently overcast down the face of the slope below. The area covers approximately 800 sq ft. A silt fence will be installed and maintained at the inlet to culvert C-8U. In 1991, culvert C-8U will be eliminated, and the drainage will go to Sediment pond "A". The runoff volume for this area is calculated to be 0.0013 acre ft.

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the culvert is protected by a trash rack and grouted as shown on the attached typical drawing; water then flows down the flexible culvert to the Coal Processing Pad area.

e. Coal Processing Pad. This pad is also sloped to drain to the culvert; another 8 ft opening was left in the culvert for the surface runoff; water is then conveyed down to the lower (Lump Coal) pad area;

f. Lump Coal Pad. The flexible culvert parallels the conveyor down to the lump coal bin, pass beneath the bin supports, and empties into a catch basin/energy dissipater just south of the bin; runoff then flows south into ditch D-4D and passes through culvert C-2D and into Sediment Pond "A."

Drainage is shown on Plate 2-4. Detailed drawings of the various drainage controls are shown in the attached typical details. Sizing calculations are summarized on the following sheet: "Lower Seam Portal Area - Drainage Sizing Calculations."

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The channel is included in drainage area AD-1 (Plate 7-5). The maximum flow calculated for this channel is shown on Table 7.2-8 as 1.5 cfs (Ditch D-2D). Based on this flow, the new culvert designated C-4D, is sized matching the criteria for culvert C-1D, shown on Table 7.2-9. Calculations for this ditch are shown in Appendix 7-F under Run-off Ditch Sizing. The headwater depth above the top of the proposed culvert inlet is 1 ft more than adequate to carry the expected flow.

The out-slope of the pad is protected by 6 in. M.D. rock along the area where drainage will occur. The only drainage that will reach the toe of the pad is that from the upper pad to the lower; the majority of the drainage above will be conveyed through the culvert. The 6 in. rock is more than adequate, since the approved plan calls for natural 6 in. rip-rap in the post-mining channel that will carry not only the disturbed drainage AD-1, but the undisturbed drainage from AU-3 as well.

The ditch in this area has been measured, and typical section is shown on Plate 7-8 as cross-section D-D. The ditch profile is also shown on this plate as Profile "F". Plate 7-8a is a typical section of the proposed channel restoration in the area of the portal pad and culvert, after their removal and upon final reclamation.

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DRAINAGE CONTROL SYSTEM BEAR CANYON NO. 1 MINE

LOWER SEAM PORTAL AREA

a. Upper Pad. Drainage from the disturbed area on the upper pad from the sub-station to culvert C-OD, will continue to flow into culvert C-OD, as approved; the outlet location of the flexible culvert was moved approx 20 ft to the west of the original location to direct runoff onto the rock ledge above the Lower Seam (Hiawatha) portals; water then flows over the rock ledge to the portal pad below;

b. Portal Pad. The northeast corner of the bin is bermed a min of 30 in. high over to the highwall. Runoff water from the upper pad flows southward around the bin and into a collection box at the edge of the portal pad area; the pad is sloped to flow to the box;

c. Flexible Culvert. The collection box at the portal pad discharges into a 15 in. flexible culvert, the culvert drops onto the next lower pad areas (Conveyor Support Pads);

d. Conveyor Support Pads. This pad area is divided into two sections and is sloped to drain to the flexible culvert; the flexible culvert is opened (or replaced with 1/2 round culvert) for a distance of at least 8 ft to allow surface water to enter the culvert at both sections; the entrance to

Table 7.2-9 Summary of Culvert Sizes

Culvert	Flow (cfs)	Velocity (fps)	Rip-Rap Size	Slope (pct)	Diameter	Required Headwater**
C-1R	10.2	9.5	12 in.	8.0	1 ft 6 in.	2 ft 3 in.
C-2R	Not applicable outside the permit area					
C-3R	Not applicable outside the permit area					
C-1U	8.8	12.3	24 in.+	15.0	2 ft 6 in.	1 ft 6 in.
C-2U	1.5	8.4	9 in.	15.0	1 ft 3 in.	0 ft 9 in.
C-3U	7.9++	5.7	6 in.	5.0	1 ft 0 in.	3 ft 0 in.*
C-4U	6.1++	5.1	6 in.	5.1	0 ft 10 in.	3 ft 0 in.*
C-5U	6.1++	5.0	N/R	4.8	0 ft 10 in.	3 ft 0 in.*
C-6U	0.9	4.4	N/R	3.7	0 ft 10 in.	1 ft 0 in.
C-7U	10.3	9.7	12 in.	8.3	1 ft 0 in.	2 ft 3 in.
C-8U	8.8	13.0	24 in.+	15.0	1 ft 6 in.	2 ft 0 in.
C-9U	1.5	8.0	9 in.	7.3	1 ft 3 in.	0 ft 9 in.
C-10U	0.8	5.7	6 in.	5.0	1 ft 0 in.	0 ft 6 in.
C-1D	1.5	10.9	18 in.	20.0	1 ft 3 in.	0 ft 9 in.
C-2D	4.8	9.6	12 in.	12.0	1 ft 6 in.	1 ft 3 in.
C-3D	1.2	5.2	6 in.	4.2	1 ft 0 in.	0 ft 9 in.
60 in. CMP	231.5	13.8	24 in.	3.4	5 ft 0 in.	8 ft 6 in.

* When capacity of culvert is exceeded flow continues down ditch to next culvert.
** From invert elevation.
*** All culverts and ditches meet and or exceed min requirements.
\+ Replaced with 15 in. flexible culvert.
++ A two ft high check dam of rip-rap is used to develop the headwater necessary for maximum flow through the culvert, excess flow continues down the ditch.
N/R - not required

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Table 7.2-8 Summary of Ditch Sizes

All ditches are triangular "V ditch" with 1:1 side slopes.

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1R	10.2	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-2R	12.1	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-3R	10.4	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-1U	1.5	3.5	N/R	4.0	1 ft 3 in.	0 ft 9 in.
D-2U	1.5	3.9	N/R	5.0	1 ft 3 in.	0 ft 9 in.
D-3U	6.1	5.5	4 in.	5.0	1 ft 9 in.	1 ft 3 in.
D-4U	11.8	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-5U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-6U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-7U	10.3	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-8U	2.3	4.4	N/R	6.25	- down road-	
D-9U	1.8	5.0	4 in.	8.3	1 ft 3 in.	0 ft 9 in.
D-10U	1.5	5.7	6 in.	18.0	1 ft 0 in.	0 ft 6 in.
D-11U	7.6	7.9	9 in.	14.0	1 ft 6 in.	1 ft 0 in.
D-1D	0.8	4.0	N/R	9.0	1 ft 0 in.	0 ft 6 in.
D-2D	1.5	5.5	4 in.	10.0	1 ft 3 in.	0 ft 9 in.
D-3D	1.0	5.2	4 in.	15.0	1 ft 0 in.	0 ft 6 in.
D-4D	4.8	5.3	4 in.	6.25	1 ft 6 in.	1 ft 0 in.
D-5D	7.2	6.2	6 in.	6.4	1 ft 9 in.	0 ft 9 in.
D-6D	1.2	4.4	N/R	6.2	1 ft 3 in.	0 ft 9 in.

* 6 in. freeboard added to required flow depth.
** See Plate 7.1 for location of rip-rap.
N/R - not required

AMENDMENT TO
APPROVED Mining & Reclamation Plan
Approved, Division of Oil, Gas & Mining
by pgl date 2/27/90

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Table 7.2-7 Sediment Ponds, Final Design Criteria

Design Criteria Pond "A"*

Drainages Area	:	14.35 acres
SCS Curve #82		
3-yr Sediment Storage	:	41,444 ft^3
10-yr 24-hr Runoff Storage	:	42,714 ft^3
Total Storage Volume	:	84,158 ft^3
Use Existing Spillway	:	10 ft wide Broad Crested Weir
Rainfall Data Base	:	Hiawatha Data by E. Arlo Richardson

* Co-Op agreed to use these numbers from John Whitehead, hydrologist for DOGM, during a discussion, 27 February 1984.

Design Criteria Pond "B"*

Drainage Area	:	1.82 acres
SCS Curve #82		
3-yr Sediment Storage	:	2,156 ft^3
10-yr 24-hr Runoff Storage	:	8,182 ft^3
Total Storage Volume	:	10,338 ft^3
Use Existing Spillway	:	4 ft Wide Broad Crested Weir
Rainfall Data Base	:	Hiawatha Data by E. Arlo Richardson

* Co-Op agreed to use these numbers presented in a letter from DOGM, in a letter to Wendell Owen, 16 June 1983.

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where rules and gullies develop shall be repaired and revegetated.

In addition, all dams and embankments shall be routinely maintained during the mining operation. Any vegetative growth will be cut where necessary to facilitate inspection and repairs. Ditches and spillways shall be cleaned at least annually. Any combustible materials present on the surface shall be removed and all other appropriate maintenance procedures followed.

Sediment material from the sedimentation ponds will be placed on the coal storage area under the loading conveyors (Plate 2-4).

Quarterly Inspections. Quarterly inspections will be made of both sediment ponds and submitted to DOGM within 90 days.

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limited to low quality environs, but none, as far as is presently known, are rare in the inter-mountain region.

10.3.3.2 Raptors

Two species of endangered raptors may be found in the mine plan area. These are the bald eagle and peregrine falcon. Known raptor nest sites within the permit area are shown in Appendix 10-D according to a survey conducted by the Raptor Biologist from the U.S. Fish and Wildlife Service.

According to the Utah Division of Wildlife Resources report, there are three raptor nest locations within the permit area. As shown in Appendix 10-D, p 10D-12 thru 10D-14, the locations designated 281.80, 281.85 and 281.86 are of an "Unknown Buteo". Site 281.80 was shown to be inactive when checked in 1981 and 87, while sites 281.85 and 281.86 were inactive in 1981, 82, 87 and 88.

10.4 EXPECTED IMPACTS OF MINING OPERATIONS ON FISH AND WILDLIFE

10.4.1 Aquatic Wildlife

The mine is an existing mine and as such should have no additional impact on Bear Creek, which is of little value to the aquatic sources of the area. Natural conditions would be stressful to the aquatic life even if existing mining activities were removed.

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aggregata, Plains Pricklypear Opuntia polyacantha, Cheatgrass Bromus tectorum, and Bluebunch Wheatgrass Agropyron spicatum.

9.3.3.5 Bare Cliffs and Talus

Vegetation is nonexistent or sparse and consists of a few grasses and forbs. Cliffs separate the Grassland vegetation type of the plateau from the more vegetated areas of the canyon bottoms.

9.4 THREATENED AND ENDANGERED SPECIES

No plant species listed as threatened or endangered (U.S. Fish and Wildlife Service, 1982) or proposed for threatened or endangered status (Welsh and Thorne, 1979) was observed on the study area. No plants listed as threatened or endangered are known to occur in the Co-op permit area (Thompson, personal communication, 1983).

9.5 RECLAMATION PLAN

The following procedures are designed to revegetate and control erosion. They should, to a large degree, satisfy the commitments made by Co-Op in their permit while also satisfying DOGM regulations as pertaining to interim reclamation and final reclamation for those areas which will be utilized after mining operations are concluded.

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at the outcrops (and property boundaries), and that the company be prepared to implement mitigation measures as proposed if such resources are negatively impacted.

SUBSIDENCE

Subsidence can normally be expected to occur over areas where second mining has taken place (pillaring). Based on the geologic interruptions within a mine, subsidence becomes very difficult to predict, due to the variable nature of the mining panels. However, Figure 3H-1 will give an estimate of the maximum subsidence that may be expected in mine studied in the Western U.S. Maximum subsidence for an average panel in the Bear Canyon Mine has been estimated from Figure 3H-1, using the following criteria:

Panel Width - 600 ft
Average Depth - 800 ft
Width/Depth Ratio - 0.75
Seam Thickness - 9.0 ft

Based on this criteria and the graph, subsidence could reach a maximum of 5.40 ft directly over a pillared panel. However, since past pillaring has been performed in this general area as much a 40 years ago, and there are no obvious surface expressions of resulting subsidence, it is expected that this figure will be substantially less, if even measurable.

Hydrologic Resources. The hydrologic resources above the mining area consists primarily of a potential recharge zone for groundwater resources (springs)located in the strata below the mining. While it is unlikely that mining activities will have any effect upon the springs, there is some potential for mining to have an effect upon the upper recharge zones. The potential effect of mining on the hydrologic regime, as will as any proposed mitigation measures are discussed in detail in Chapter 7 of the PAP.

MINING METHODS

Mining at the Bear Creek Mine is conducted by the room and pillar method. This method may result in 75 pct - 78 pct extraction within the pillar panels, with an overall extraction of approximately 60 pct for the entire reserve. Longwall mining is not currently a proposed mining method for this mine.

A 200 ft barrier is proposed to be left between the mining and the coal outcrop, and a 100 ft barrier will be left between mining and property boundaries.

It is not proposed to leave any other coal permanently in place for protection of resources above the mine, since the resources that could potentially be affected by subsidence are not localized, but exist above the entire area. It is therefore proposed that subsidence protection measures will be employees only

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occur, effects would likely be minimal, resulting in some fracturing or slight depressions and could result in displacement of vegetation. Mitigation of such a situation could be accomplished by filling of fractures, regrading and replanting such areas.

d. Fish and Wildlife. There are no fish known to exist above the federal lease permit area. The area is heavily utilized by a wide variety of wildlife. Although subsidence is unlikely, should it occur, some loss of riparian area or water resources is possible. Such impacts and mitigation measures would be as described in Appendix 3C and the Gentry Mountain C.H.I.A. (Appendix 7-L).

The stream in McCadden Hollow is of concern; however, the extreme cover in this area makes it very unlikely to be impacted by a room and pillar operation such as that in the Bear Canyon Mine. Mining under such streams is not inconsistent with other mines in the area, often under lighter cover conditions. The stream will be monitored per the plan TDB for flow, to establish any trend of negative impacts.

e. Paleo-Archeological. There are no known sites within this area. (See Appendix 5-A)

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established monitoring program.

These two new sources are added to Plate 7-1, and Plate 3-4, as SBC-7 and SBC-8. The present mine water monitoring point SBC-1 is no longer flowing and will be deleted upon DOGM approval. Base line data is included in Chapter 7, and will be updated annually as the balance of the 2 yr base line date is collected.

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occurrences.

Data collection intervals will be no less than quarterly, as defined in Chapter 7. New significant occurrences, as specified by state requirements, within the present permit area and permit application area will be promptly included in the sampling program. Springs below the mine will continue to be sampled and tested.

An observation well will be drilled when mining reaches the north portion of the permit application area. Piezometric and water quality data will be collected and further sampling incorporated into the established monitoring program, the well will be drilled through the base of the Blackhawk and at least 25 ft into the Starpoint Sandstone to determined the occurrence of ground water within the depths of impact of the mining activities on the ground water regime.

The above program is expected to provide adequate data to determine any affects of the projected mining on the hydrologic regime including affects to present or potential culinary spring located down gradient form the permit expansion area.

A preliminary surface investigation encountered no springs in the permit expansion area. A detailed spring and seep inventory should be conducted however and if significant occurrences are encountered, data collection will be incorporated into the

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3.4.2.2 Outcrop Protection

In most areas, coal outcrops are buried and are not visible from the surface. Outcrops are either covered to some depth with overburden or, in many areas, the coal has been burned for some distance from the surface. Where neither of these situations exist, routine tests of the coal may show that it has been "weathered" or "oxidized" and mining will be stopped within 200 ft of the outcrop.

Barrier pillars to protect main and sub-mine entries have been made large enough (200 ft or greater) to assure protection of the entries for their useful life. When the area serviced is mined out, entry pillars will be recovered on the way out.

3.4.2.3 Protection of Natural Surface Structures & Streams

Co-Op's commitment to maintain a min of 200 ft barrier pillars to outcrops will minimize the possibility of escarpment failure and resulting detrimental impacts to down stream water quality or nesting raptor. No stream channels lie over the minable portion of the permit area. Downstream channels are protected from disturbed area runoff contamination by utilization of sediment ponds. Temporary sediment controls i.e.; silt fences, straw bail dikes etc. will be installed and vegetation will be reestablished as required in the event of impacts by escarpment failure.

the mine discharge permit (Appendix 7-B).

3.4.2 Barrier Pillars

Pillars of coal generally are left underground to protect surface or underground features which must be maintained and protected for the life of the mine (main entries) or permanently (oil or gas wells). The size of some is specified by law; others are designed by the operator to provide the protection needed.

3.4.2.1 Property Boundaries

Area boundaries of individual leases and fee property are shown in Plate 2-3. Protection of boundaries and property adjacent to the permit area is provided by continuous barrier pillars a min of 100 ft wide. This is wide enough to prevent subsidence across the boundary resulting from angle of draw.

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3.4.1.2 Mining Methods

Mining in both the Bear Canyon and Hiawatha Seams is done by continuous miners. The miners discharge into shuttle cars (diesel or electric which carry the coal to the feeder breaker. The feeder breaker discharges the coal onto the belt conveyor where it is taken out of the mine.

The main entries consist of a five-entry system on 80 ft - 100 ft centers to be driven to the property limits. Sub-mains consisting of five entries on 83 ft centers are then driven off the mains and room-and-pillar panels are developed off the sub-mains. Rooms are developed within the panels on 70 ft - 83 ft centers. The pillars are then recovered according to the approved plan. Timber is installed to support the roof and provide for breaker control of caving roof. Retreat mining of this type will provide a recovery of 75 pct - 78 pct within the panels. As the panel retreat is completed, the sub-mains will be pulled upon final retreat of the mine operation. See Figures 3.4-1 and 3.4-2.

As can be seen on Plates 3-4 and 3-4A, the lower seam workings are planned to be columnized with the upper as closely as practicable. The mining plan sequence allows for recovery of the upper seam areas prior to final recovery of the lower seam. This procedure is consistent with accepted engineering practice in multiple seam mining.

Table 7.2-8 Summary of Ditch Sizes (cont)

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1D	0.8	4.0	N/R	9.0	1 ft 0 in.	0 ft 6 in.
D-2D	1.5	5.5	4 in.	10.0	1 ft 3 in.	0 ft 9 in.
D-3D	1.0	5.2	4 in.	15.0	1 ft 0 in.	0 ft 6 in.
D-4D	0.5	3.2	N/R	6.25	1 ft 6 in.	0 ft 5 in.
D-5D	7.2	6.2	6 in.	6.4	1 ft 9 in.	0 ft 9 in.
D-6D	1.2	4.4	N/R	6.25	1 ft 3 in.	0 ft 9 in.
D-7D (upper)	6.4	9.4	12 in.	25.0	1 ft 6 in.	0 ft 10 in.
D-7D (lower)	6.4	5.1	4 in.	5.0	1 ft 6 in.	1 ft 2 in.

- All ditches are triangular "V ditch" with 1:1 side slopes.
* 6 in. freeboard added to required flow depth.
** See Plate 7.1 for location of rip-rap.
N/R - not required

Notes for D-7D Calculations

Land Slope	-	31.6 pct
Runoff Curve No.	-	82
Channel Length	-	1804 ft
Time of Conc.	-	0.1417 hrs
Watershed Area	-	7.68 ac
10 yr - 24 hr Event	-	2.25 in.
Peak Flow	-	6.43 cfs

35 %	Max Slope	-	25 pct	~~Max~~ Min Slope	-	5 pct
.77	Flow Depth	-	0.82 ft	Flow Depth	-	1.11 ft
10.64	Velocity	-	9.37 fps	Velocity	-	5.14 fps
	Rip-Rap D_{50}	-	12 in.	Rip-Rap D_{50}	-	4 in.

Table 7.2-8 Summary of Ditch Sizes

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1R	10.2	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-2R	12.1	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-3R	10.4	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-1U	1.5	3.5	N/R	4.0	1 ft 3 in.	0 ft 9 in.
D-2U	1.5	3.9	N/R	5.0	1 ft 3 in.	0 ft 9 in.
D-3U	6.1	5.5	4 in.	5.0	1 ft 9 in.	1 ft 3 in.
D-4U	11.8	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-5U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-6U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-7U	10.3	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-8U	2.3	4.4	N/R	6.25	- down road-	
D-9U	1.8	5.0	4 in.	8.3	1 ft 3 in.	0 ft 9 in.
D-10U		-	Replaced with D-7D			
D-11U	7.6	7.9	9 in.	14.0	1 ft 6 in.	1 ft 0 in.
D-12U	4.5	4.7	N/R	5.0	1 ft 6 in.	1 ft 3 in.

- Table continued on following page.

Table 7.2-8 Summary of Ditch Sizes

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1R	10.2	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-2R	12.1	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-3R	10.4	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-1U	1.5	3.5	N/R	4.0	1 ft 3 in.	0 ft 9 in.
D-2U	1.5	3.9	N/R	5.0	1 ft 3 in.	0 ft 9 in.
D-3U	6.1	5.5	4 in.	5.0	1 ft 9 in.	1 ft 3 in.
D-4U	11.8	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-5U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-6U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-7U	10.3	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-8U	2.3	4.4	N/R	6.25	- down road-	
D-9U	1.8	5.0	4 in.	8.3	1 ft 3 in.	0 ft 9 in.
D-10U		-	Replaced with D-7D			
D-11U	7.6	7.9	9 in.	14.0	1 ft 6 in.	1 ft 0 in.
D-12U	4.5	4.7	N/R	5.0	1 ft 6 in.	1 ft 3 in.

- Table continued on following page.

Table 7.2-8 Summary of Ditch Sizes (cont)

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1D	0.8	4.0	N/R	9.0	1 ft 0 in.	0 ft 6 in.
D-2D	1.5	5.5	4 in.	10.0	1 ft 3 in.	0 ft 9 in.
D-3D	1.0	5.2	4 in.	15.0	1 ft 0 in.	0 ft 6 in.
D-4D	0.5	3.2	N/R	6.25	1 ft 6 in.	0 ft 5 in.
D-5D	7.2	6.2	6 in.	6.4	1 ft 9 in.	0 ft 9 in.
D-6D	1.2	4.4	N/R	6.25	1 ft 3 in.	0 ft 9 in.
D-7D (upper)	6.4	9.4	12 in.	25.0	1 ft 6 in.	0 ft 10 in.
D-7D (lower)	6.4	5.1	4 in.	5.0	1 ft 6 in.	1 ft 2 in.

\- All ditches are triangular "V ditch" with 1:1 side slopes.
* 6 in. freeboard added to required flow depth.
** See Plate 7.1 for location of rip-rap.
N/R - not required

Notes for D-7D Calculations

Land Slope	-	31.6 pct
Runoff Curve No.	-	82
Channel Length	-	1804 ft
Time of Conc.	-	0.1417 hrs
Watershed Area	-	7.68 ac
10 yr - 24 hr Event	-	2.25 in.
Peak Flow	-	6.43 cfs

Max Slope	-	25 pct	Max Slope	-	5 pct
Flow Depth	-	0.82 ft	Flow Depth	-	1.11 ft
Velocity	-	9.37 fps	Velocity	-	5.14 fps
Rip-Rap D_{50}	-	12 in.	Rip-Rap D_{50}	-	4 in.

Table 7.2-8 Summary of Ditch Sizes

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1R	10.2	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-2R	12.1	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-3R	10.4	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-1U	1.5	3.5	N/R	4.0	1 ft 3 in.	0 ft 9 in.
D-2U	1.5	3.9	N/R	5.0	1 ft 3 in.	0 ft 9 in.
D-3U	6.1	5.5	4 in.	5.0	1 ft 9 in.	1 ft 3 in.
D-4U	11.8	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-5U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-6U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-7U	10.3	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-8U	2.3	4.4	N/R	6.25	- down road-	
D-9U	1.8	5.0	4 in.	8.3	1 ft 3 in.	0 ft 9 in.
D-10U		-	Replaced with D-7D			
D-11U	7.6	7.9	9 in.	14.0	1 ft 6 in.	1 ft 0 in.
D-12U	4.5	4.7	N/R	5.0	1 ft 6 in.	1 ft 3 in.

- Table continued on following page.

Table 7.2-8 Summary of Ditch Sizes (cont)

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1D	0.8	4.0	N/R	9.0	1 ft 0 in.	0 ft 6 in.
D-2D	1.5	5.5	4 in.	10.0	1 ft 3 in.	0 ft 9 in.
D-3D	1.0	5.2	4 in.	15.0	1 ft 0 in.	0 ft 6 in.
D-4D	0.5	3.2	N/R	6.25	1 ft 6 in.	0 ft 5 in.
D-5D	7.2	6.2	6 in.	6.4	1 ft 9 in.	0 ft 9 in.
D-6D	1.2	4.4	N/R	6.25	1 ft 3 in.	0 ft 9 in.
D-7D (upper)	6.4	9.4	12 in.	25.0	1 ft 6 in.	0 ft 10 in.
D-7D (lower)	6.4	5.1	4 in.	5.0	1 ft 6 in.	1 ft 2 in.

\- All ditches are triangular "V ditch" with 1:1 side slopes.
* 6 in. freeboard added to required flow depth.
** See Plate 7.1 for location of rip-rap.
N/R - not required

Notes for D-7D Calculations

Land Slope	-	31.6 pct
Runoff Curve No.	-	82
Channel Length	-	1804 ft
Time of Conc.	-	0.1417 hrs
Watershed Area	-	7.68 ac
10 yr - 24 hr Event	-	2.25 in.
Peak Flow	-	6.43 cfs

Max Slope	-	25 pct	Max Slope	-	5 pct
Flow Depth	-	0.82 ft	Flow Depth	-	1.11 ft
Velocity	-	9.37 fps	Velocity	-	5.14 fps
Rip-Rap D_{50}	-	12 in.	Rip-Rap D_{50}	-	4 in.

Table 7.2-8 Summary of Ditch Sizes

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1R	10.2	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-2R	12.1	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-3R	10.4	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-1U	1.5	3.5	N/R	4.0	1 ft 3 in.	0 ft 9 in.
D-2U	1.5	3.9	N/R	5.0	1 ft 3 in.	0 ft 9 in.
D-3U	6.1	5.5	4 in.	5.0	1 ft 9 in.	1 ft 3 in.
D-4U	11.8	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-5U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-6U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-7U	10.3	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-8U	2.3	4.4	N/R	6.25	- down road-	
D-9U	1.8	5.0	4 in.	8.3	1 ft 3 in.	0 ft 9 in.
D-10U		-	Replaced with D-7D			
D-11U	7.6	7.9	9 in.	14.0	1 ft 6 in.	1 ft 0 in.
D-12U	4.5	4.7	N/R	5.0	1 ft 6 in.	1 ft 3 in.

- Table continued on following page.

Table 7.2-8 Summary of Ditch Sizes (cont)

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1D	0.8	4.0	N/R	9.0	1 ft 0 in.	0 ft 6 in.
D-2D	1.5	5.5	4 in.	10.0	1 ft 3 in.	0 ft 9 in.
D-3D	1.0	5.2	4 in.	15.0	1 ft 0 in.	0 ft 6 in.
D-4D	0.5	3.2	N/R	6.25	1 ft 6 in.	0 ft 5 in.
D-5D	7.2	6.2	6 in.	6.4	1 ft 9 in.	0 ft 9 in.
D-6D	1.2	4.4	N/R	6.25	1 ft 3 in.	0 ft 9 in.
D-7D (upper)	6.4	9.4	12 in.	25.0	1 ft 6 in.	0 ft 10 in.
D-7D (lower)	6.4	5.1	4 in.	5.0	1 ft 6 in.	1 ft 2 in.

\- All ditches are triangular "V ditch" with 1:1 side slopes.
* 6 in. freeboard added to required flow depth.
** See Plate 7.1 for location of rip-rap.
N/R - not required

Notes for D-7D Calculations

Land Slope	-	31.6 pct
Runoff Curve No.	-	82
Channel Length	-	1804 ft
Time of Conc.	-	0.1417 hrs
Watershed Area	-	7.68 ac
10 yr - 24 hr Event	-	2.25 in.
Peak Flow	-	6.43 cfs

Max Slope	-	25 pct	Max Slope	-	5 pct
Flow Depth	-	0.82 ft	Flow Depth	-	1.11 ft
Velocity	-	9.37 fps	Velocity	-	5.14 fps
Rip-Rap D_{50}	-	12 in.	Rip-Rap D_{50}	-	4 in.

Table 7.2-7 Sediment Ponds, Final Design Criteria

Design Criteria Pond "A"*

Drainage Area	:	14.35 acres**
SCS Curve #82		
3-yr Sediment Storage	:	41,444 ft^3
10-yr 24-hr Runoff Storage	:	42,714 ft^3
Total Storage Volume	:	84,158 ft^3
Use Existing Spillway	:	10 ft wide Broad Crested Weir
Rainfall Data Base	:	Hiawatha Data by E. Arlo Richardson

* Co-Op agreed to use these numbers from John Whitehead, hydrologist for DOGM, during a discussion, 27 February 1984.
** See supplement on next page, p 7-62A.

Design Criteria Pond "B"*

Drainage Area	:	1.82 acres**
SCS Curve #82		
3-yr Sediment Storage	:	2,156 ft^3
10-yr 24-hr Runoff Storage	:	8,182 ft^3
Total Storage Volume	:	10,338 ft^3
Use Existing Spillway	:	4 ft Wide Broad Crested Weir
Rainfall Data Base	:	Hiawatha Data by E. Arlo Richardson

* Co-Op agreed to use these numbers presented in a letter from DOGM, in a letter to Wendell Owen, 16 June 1983.
** See supplement on next page, p 7-62A.

Supplement to Table 7.2-7
Additional Notes on Sediment Ponds and Drainage Areas

Drainage Areas. With the removal of culvert C-9U and the conversion of ditch D-10U to the disturbed ditch D-7D, an additional 5 acres of undisturbed drainage will go into sed pond "A". This area is designated AU-2a on Plate 7-5. All other drainage areas flowing to the pond are also shown on Plate 7-5, and each of these areas were re-planimetered to determine actual runoff to the pond. The results of the area calculations are summarized below:

Area	Acreage	Runoff CN	Runoff Volume
AU-2a	5.000	73	0.121 ac ft
AU-1	3.614	82	0.247 ac ft
AU-2	4.628	82	0.316 ac ft
AU-3	5.936	82	0.406 ac ft
Total (Pond "A")	14.178		1.090 ac ft

3 yr Sediment Volume = 14.178 x 0.0066 ac ft/ac = 0.940 ac ft

Total required volume for Pond "A" = 2.030 ac ft

Area "B" was also re-planimetered from Plate 7-5. Following are the results for this area and Pond "B":

Area	Acreage	Runoff CN	Runoff Volume
B	1.895	82	0.130 ac ft

3 yr Sediment Volume = 14.178 x 0.0066 ac ft/ac = 0.940 ac ft

Total required volume for Pond "A" = 2.030 ac ft

Based on the above numbers, the total disturbed area for Bear Canyon Mine site is 16.073 acres.

Table 7.2-8 Summary of Ditch Sizes

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1R	10.2	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-2R	12.1	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-3R	10.4	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-1U	1.5	3.5	N/R	4.0	1 ft 3 in.	0 ft 9 in.
D-2U	1.5	3.9	N/R	5.0	1 ft 3 in.	0 ft 9 in.
D-3U	6.1	5.5	4 in.	5.0	1 ft 9 in.	1 ft 3 in.
D-4U	11.8	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-5U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-6U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-7U	10.3	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-8U	2.3	4.4	N/R	6.25	- down road-	
D-9U	1.8	5.0	4 in.	8.3	1 ft 3 in.	0 ft 9 in.
D-10U		-	Replaced with D-7D			
D-11U	7.6	7.9	9 in.	14.0	1 ft 6 in.	1 ft 0 in.
D-12U	4.5	4.7	N/R	5.0	1 ft 6 in.	1 ft 3 in.

- Table continued on following page.

Table 7.2-8 Summary of Ditch Sizes (cont)

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1D	0.8	4.0	N/R	9.0	1 ft 0 in.	0 ft 6 in.
D-2D	1.5	5.5	4 in.	10.0	1 ft 3 in.	0 ft 9 in.
D-3D	1.0	5.2	4 in.	15.0	1 ft 0 in.	0 ft 6 in.
D-4D	0.5	3.2	N/R	6.25	1 ft 6 in.	0 ft 5 in.
D-5D	7.2	6.2	6 in.	6.4	1 ft 9 in.	0 ft 9 in.
D-6D	1.2	4.4	N/R	6.25	1 ft 3 in.	0 ft 9 in.
D-7D (upper)	6.4	9.4	12 in.	25.0	1 ft 6 in.	0 ft 10 in.
D-7D (lower)	6.4	5.1	4 in.	5.0	1 ft 6 in.	1 ft 2 in.

\- All ditches are triangular "V ditch" with 1:1 side slopes.
* 6 in. freeboard added to required flow depth.
** See Plate 7.1 for location of rip-rap.
N/R - not required

Notes for D-7D Calculations

Land Slope	-	31.6 pct
Runoff Curve No.	-	82
Channel Length	-	1804 ft
Time of Conc.	-	0.1417 hrs
Watershed Area	-	7.68 ac
10 yr - 24 hr Event	-	2.25 in.
Peak Flow	-	6.43 cfs

Max Slope	-	25 pct	Max Slope	-	5 pct
Flow Depth	-	0.82 ft	Flow Depth	-	1.11 ft
Velocity	-	9.37 fps	Velocity	-	5.14 fps
Rip-Rap D_{50}	-	12 in.	Rip-Rap D_{50}	-	4 in.

Table 7.2-9 Summary of Culvert Sizes

Culvert	Flow (cfs)	Velocity (fps)	Rip-Rap Size	Slope (pct)	Diameter	Required Headwater**
C-1R	10.2	9.5	12 in.	8.0	1 ft 6 in.	2 ft 3 in.
C-2R	Not applicable outside the permit area					
C-3R	Not applicable outside the permit area					
C-1U	8.8	12.3	24 in.+	15.0	2 ft 6 in.	1 ft 6 in.
C-2U	1.5	8.4	9 in.	15.0	1 ft 3 in.	0 ft 9 in.
C-3U	7.9++	5.7	6 in.	5.0	1 ft 0 in.	3 ft 0 in.*
C-4U	6.1++	5.1	6 in.	5.1	0 ft 10 in.	3 ft 0 in.*
C-5U	6.1++	5.0	N/R	4.8	0 ft 10 in.	3 ft 0 in.*
C-6U	0.9	4.4	N/R	3.7	0 ft 10 in.	1 ft 0 in.
C-7U	10.3	9.7	12 in.	8.3	1 ft 0 in.	2 ft 3 in.
C-8U	8.8	13.0	24 in.+	15.0	1 ft 6 in.	2 ft 0 in.
C-10U	0.8	5.7	6 in.	5.0	1 ft 0 in.	0 ft 6 in.
C-1D	1.5	10.9	18 in.	20.0	1 ft 3 in.	0 ft 9 in.
C-2D	0.5	9.6	12 in.	12.0	1 ft 6 in.	1 ft 3 in.
C-3D	1.2	5.2	6 in.	4.2	1 ft 6 in.	0 ft 9 in.
C-4D	0.5	9.6	12 in.	8.0	1 ft 6 in.	0 ft 3 in.
C-5D	0.2	3.5	N/R	6.5	1 ft 0 in.	0 ft 3 in.
60 in. CMP	231.5	13.8	24 in.	3.4	5 ft 0 in.	8 ft 6 in.

* When capacity of culvert is exceeded flow continues down ditch to next culvert.

** From invert elevation.

*** All culverts and ditches meet and or exceed min requirements.

\+ Replaced with 15 in. flexible culvert.

++ A two ft high check dam of rip-rap is used to develop the headwater necessary for maximum flow through the culvert, excess flow continues down the ditch.

N/R - not required

The channel is included in drainage area AD-1 (Plate 7-5). The maximum flow calculated for this channel is shown on Table 7.2-8 as 1.5 cfs (Ditch D-2D). Based on this flow, the new culvert designated C-1D, is sized matching the criteria for existing culvert C-1D, shown on Table 7.2-9. Calculations for this ditch are shown in Appendix 7-F under Run-off Ditch Sizing. The headwater depth above the top of the proposed culvert inlet is 1 ft more than adequate to carry the expected flow.

The out-slope of the pad is protected by 6 in. M.D. rock along the area where drainage will occur. The only drainage that will reach the toe of the pad is that from the upper pad to the lower; the majority of the drainage above will be conveyed through the culvert. The 6 in. rock is more than adequate, since the approved plan calls for natural 6 in. rip-rap in the post-mining channel that will carry not only the disturbed drainage AD-1, but the undisturbed drainage from AU-3 as well.

The ditch in this area has been measured, and typical section is shown on Plate 7-8 as cross-section D-D. The ditch profile is also shown on this plate as Profile "F". Plate 7-8a is a typical section of the proposed channel restoration in the area of the portal pad and culvert, after their removal and upon final reclamation.

DRAINAGE CONTROL SYSTEM BEAR CANYON NO. 1 MINE

LOWER SEAM PORTAL AREA

a. Upper Pad. Drainage from the disturbed area on the upper pad from the sub-station to culvert C-1D, will continue to flow into culvert C-1D, as approved; the outlet location of the flexible culvert was moved approx 20 ft to the west of the original location to direct runoff onto the rock ledge above the Lower Seam (Hiawatha) portals; water then flows over the rock ledge to the portal pad below;

b. Portal Pad. The northeast corner of the bin is bermed a min of 30 in. high over to the highwall. Runoff water from the upper pad flows southward around the bin and into a collection box at the edge of the portal pad area; the pad is sloped to flow to the box;

c. Flexible Culvert. The collection box at the portal pad discharges into a 15 in. flexible culvert, the culvert drops onto the next lower pad areas (Conveyor Support Pads);

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the culvert is protected by a trash rack and grouted as shown on the attached typical drawing; water then flows down the flexible culvert to the Coal Processing Pad area.

e. Coal Processing Pad. This pad is also sloped to drain to the culvert; another 8 ft opening was left in the culvert for the surface runoff; water is then conveyed down to the lower (Lump Coal) pad area;

f. Lump Coal Pad. The flexible culvert parallels the conveyor down to the lump coal bin, pass beneath the bin supports, and empties into a catch basin/energy dissipater just south of the bin; runoff then flows south into ditch D-7D and passes into Sediment Pond "A."

Drainage is shown on Plate 7-1. Detailed drawings of the various drainage controls are shown in the attached typical details. Sizing calculations are summarized on the following sheet: "Lower Seam Portal Area - Drainage Sizing Calculations."

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This area lies between the upper lamphouse/mine portal bermed pad and the portal access road, extending from the road junction on the south to just north of the upper office trailer at the beginning of the Cattle Co. Road. The area is approx. 0.28 acres. A silt fence is installed at the north end of the area where runoff flows down hill from the Cattle Co. Road area. Runoff from the area passes through a silt fence near the inlet to culvert C-6U. Runoff volume from this area is calculated to be 0.019 acre ft.

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The ball park covers 1.2 acres. Straw bale dikes and/or silt fences will be installed on the south east side, in line with the natural flow to treat runoff before it enters Bear creak. Runoff volume from this area is calculated to be 0.082 acre ft.

TOPSOIL STOCKPILE

The main topsoil storage pile covers approx 0.1 acres. The area is encircled by an 18 in. berm and is protected by established vegetation. Runoff volume from this area is calculated to be 0.0068 acre ft.

Note: Runoff volumes are based on the 10 yr 24 hr event of 2.25 in. and runoff CN of 82.

Table 7.2-7 Sediment Ponds, Final Design Criteria

Design Criteria Pond "A"*

Drainage Area	:	14.35 acres**
SCS Curve #82		
3-yr Sediment Storage	:	41,444 ft^3
10-yr 24-hr Runoff Storage	:	42,714 ft^3
Total Storage Volume	:	84,158 ft^3
Use Existing Spillway	:	10 ft wide Broad Crested Weir
Rainfall Data Base	:	Hiawatha Data by E. Arlo Richardson

* Co-Op agreed to use these numbers from John Whitehead, hydrologist for DOGM, during a discussion, 27 February 1984.
** See supplement on next page, p 7-62A.

Design Criteria Pond "B"*

Drainage Area	:	1.82 acres**
SCS Curve #82		
3-yr Sediment Storage	:	2,156 ft^3
10-yr 24-hr Runoff Storage	:	8,182 ft^3
Total Storage Volume	:	10,338 ft^3
Use Existing Spillway	:	4 ft Wide Broad Crested Weir
Rainfall Data Base	:	Hiawatha Data by E. Arlo Richardson

* Co-Op agreed to use these numbers presented in a letter from DOGM, in a letter to Wendell Owen, 16 June 1983.
** See supplement on next page, p 7-62A.

Supplement to Table 7.2-7
Additional Notes on Sediment Ponds and Drainage Areas

Drainage Areas. With the removal of culvert C-9U and the conversion of ditch D-10U to the disturbed ditch D-7D, an additional 5 acres of undisturbed drainage will go into sed pond "A". This area is designated AU-2a on Plate 7-5. All other drainage areas flowing to the pond are also shown on Plate 7-5, and each of these areas were re-planimetered to determine actual runoff to the pond. The results of the area calculations are summarized below:

Area	Acreage	Runoff CN	Runoff Volume
AU-2a	5.000	73	0.121 ac ft
AU-1	3.614	82	0.247 ac ft
AU-2	4.628	82	0.316 ac ft
AU-3	5.936	82	0.406 ac ft
Total (Pond "A")	14.178		1.090 ac ft

3 yr Sediment Volume = 14.178 x 0.0066 ac ft/ac = 0.940 ac ft

Total required volume for Pond "A" = 2.030 ac ft

Area "B" was also re-planimetered from Plate 7-5. Following are the results for this area and Pond "B":

Area	Acreage	Runoff CN	Runoff Volume
B	1.895	82	0.130 ac ft

3 yr Sediment Volume = 14.178 x 0.0066 ac ft/ac = 0.940 ac ft

Total required volume for Pond "A" = 2.030 ac ft

Based on the above numbers, the total disturbed area for Bear Canyon Mine site is 16.073 acres.

Sediment Pond "A". This pond was cleaned and resurveyed on 12 Oct 1990. The existing pond volume was found to be 2.04 acre ft at design overflow, as shown on Plate 7-2A. This indicates that the pond is presently large enough to absorb the additional runoff from the removal of culvert C-9U, as proposed.

Sediment Pond "A"
Stage - Volume Calculations

Elev	Area ft^2	Depth ft	Volume ac ft	Remarks
90	3,740			bottom
		1	0.111	
91	5,960			
		1	0.156	
92	7,600			
		2	0.392	
94	9,480			
		0.9	0.206	
94.9	10,440			decant
		1.1	0.277	
96	11,480			
		1.9	0.543	
97.9	13,440			
		1.1	0.350	
99	14,280			Max Overflow depth
		TOTAL	2.035 ac ft	

Note: All information taken from Plate 7-2A

Additional Protection 1990

As additional, interim protection, a second silt fence will be installed 15 to 25 ft above the first at the inlet to culvert C-8U. This will provide additional protection from coal fines until the culvert is removed in 1991, and the drainage redirected to the sediment pond.

Culvert C-9U Removal 1990

In the fall of 1990 (late Oct - early Nov) culvert C-9U will be removed, and drainage from ditch D-10U will be re-directed into sediment pond "A" via existing ditch D-5D. Ditch D-10U will be cleaned and enlarged as necessary and extended north to intercept ditch D-4D. Ditch D-10U will be re-designated ditch D-7D.

An additional 5 acres of undisturbed drainage will also be intercepted by ditch D-7D, which will flow to pond "A". The drainage is shown on Plate 7-5.

The pond sizing justification is shown in "Additional Notes on Sediment Ponds and Drainage Areas", supplement to Table 7.2-7. Changes in ditches and culverts are shown on Tables 7.2-8 and 7.2-9 respectively. All drainage changes have been updated on Plate 7-1.

Table 7.2-8 Summary of Ditch Sizes

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1R	10.2	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-2R	12.1	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-3R	10.4	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-1U	1.5	3.5	N/R	4.0	1 ft 3 in.	0 ft 9 in.
D-2U	1.5	3.9	N/R	5.0	1 ft 3 in.	0 ft 9 in.
D-3U	6.1	5.5	4 in.	5.0	1 ft 9 in.	1 ft 3 in.
D-4U	11.8	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-5U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-6U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-7U	10.3	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-8U	2.3	4.4	N/R	6.25	- down road-	
D-9U	1.8	5.0	4 in.	8.3	1 ft 3 in.	0 ft 9 in.
D-10U		-	Replaced with D-7D			
D-11U	7.6	7.9	9 in.	14.0	1 ft 6 in.	1 ft 0 in.
D-12U	4.5	4.7	N/R	5.0	1 ft 6 in.	1 ft 3 in.

- Table continued on following page.

Table 7.2-8 Summary of Ditch Sizes (cont)

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1D	0.8	4.0	N/R	9.0	1 ft 0 in.	0 ft 6 in.
D-2D	1.5	5.5	4 in.	10.0	1 ft 3 in.	0 ft 9 in.
D-3D	1.0	5.2	4 in.	15.0	1 ft 0 in.	0 ft 6 in.
D-4D	0.5	3.2	N/R	6.25	1 ft 6 in.	0 ft 5 in.
D-5D	7.2	6.2	6 in.	6.4	1 ft 9 in.	0 ft 9 in.
D-6D	1.2	4.4	N/R	6.25	1 ft 3 in.	0 ft 9 in.
D-7D (upper)	6.4	9.4	12 in.	25.0	1 ft 6 in.	0 ft 10 in.
D-7D (lower)	6.4	5.1	4 in.	5.0	1 ft 6 in.	1 ft 2 in.

\- All ditches are triangular "V ditch" with 1:1 side slopes.
* 6 in. freeboard added to required flow depth.
** See Plate 7.1 for location of rip-rap.
N/R - not required

Notes for D-7D Calculations

Land Slope	-	31.6 pct
Runoff Curve No.	-	82
Channel Length	-	1804 ft
Time of Conc.	-	0.1417 hrs
Watershed Area	-	7.68 ac
10 yr - 24 hr Event	-	2.25 in.
Peak Flow	-	6.43 cfs

Max Slope	-	25 pct	Max Slope	-	5 pct
Flow Depth	-	0.82 ft	Flow Depth	-	1.11 ft
Velocity	-	9.37 fps	Velocity	-	5.14 fps
Rip-Rap D_{50}	-	12 in.	Rip-Rap D_{50}	-	4 in.

Table 7.2-9 Summary of Culvert Sizes

Culvert	Flow (cfs)	Velocity (fps)	Rip-Rap Size	Slope (pct)	Diameter	Required Headwater**
C-1R	10.2	9.5	12 in.	8.0	1 ft 6 in.	2 ft 3 in.
C-2R	Not applicable outside the permit area					
C-3R	Not applicable outside the permit area					
C-1U	8.8	12.3	24 in.+	15.0	2 ft 6 in.	1 ft 6 in.
C-2U	1.5	8.4	9 in.	15.0	1 ft 3 in.	0 ft 9 in.
C-3U	7.9++	5.7	6 in.	5.0	1 ft 0 in.	3 ft 0 in.*
C-4U	6.1++	5.1	6 in.	5.1	0 ft 10 in.	3 ft 0 in.*
C-5U	6.1++	5.0	N/R	4.8	0 ft 10 in.	3 ft 0 in.*
C-6U	0.9	4.4	N/R	3.7	0 ft 10 in.	1 ft 0 in.
C-7U	10.3	9.7	12 in.	8.3	1 ft 0 in.	2 ft 3 in.
C-8U	8.8	13.0	24 in.+	15.0	1 ft 6 in.	2 ft 0 in.
C-10U	0.8	5.7	6 in.	5.0	1 ft 0 in.	0 ft 6 in.
C-1D	1.5	10.9	18 in.	20.0	1 ft 3 in.	0 ft 9 in.
C-2D	0.5	9.6	12 in.	12.0	1 ft 6 in.	1 ft 3 in.
C-3D	1.2	5.2	6 in.	4.2	1 ft 6 in.	0 ft 9 in.
C-4D	0.5	9.6	12 in.	8.0	1 ft 6 in.	0 ft 3 in.
C-5D	0.2	3.5	N/R	6.5	1 ft 0 in.	0 ft 3 in.
60 in. CMP	231.5	13.8	24 in.	3.4	5 ft 0 in.	8 ft 6 in.

* When capacity of culvert is exceeded flow continues down ditch to next culvert.
** From invert elevation.
*** All culverts and ditches meet and or exceed min requirements.
\+ Replaced with 15 in. flexible culvert.
++ A two ft high check dam of rip-rap is used to develop the headwater necessary for maximum flow through the culvert, excess flow continues down the ditch.
N/R - not required

The channel is included in drainage area AD-1 (Plate 7-5). The maximum flow calculated for this channel is shown on Table 7.2-8 as 1.5 cfs (Ditch D-2D). Based on this flow, the new culvert designated C-1D, is sized matching the criteria for existing culvert C-1D, shown on Table 7.2-9. Calculations for this ditch are shown in Appendix 7-F under Run-off Ditch Sizing. The headwater depth above the top of the proposed culvert inlet is 1 ft more than adequate to carry the expected flow.

The out-slope of the pad is protected by 6 in. M.D. rock along the area where drainage will occur. The only drainage that will reach the toe of the pad is that from the upper pad to the lower; the majority of the drainage above will be conveyed through the culvert. The 6 in. rock is more than adequate, since the approved plan calls for natural 6 in. rip-rap in the post-mining channel that will carry not only the disturbed drainage AD-1, but the undisturbed drainage from AU-3 as well.

The ditch in this area has been measured, and typical section is shown on Plate 7-8 as cross-section D-D. The ditch profile is also shown on this plate as Profile "F". Plate 7-8a is a typical section of the proposed channel restoration in the area of the portal pad and culvert, after their removal and upon final reclamation.

DRAINAGE CONTROL SYSTEM BEAR CANYON NO. 1 MINE

LOWER SEAM PORTAL AREA

a. Upper Pad. Drainage from the disturbed area on the upper pad from the sub-station to culvert C-1D, will continue to flow into culvert C-1D, as approved; the outlet location of the flexible culvert was moved approx 20 ft to the west of the original location to direct runoff onto the rock ledge above the Lower Seam (Hiawatha) portals; water then flows over the rock ledge to the portal pad below;

b. Portal Pad. The northeast corner of the bin is bermed a min of 30 in. high over to the highwall. Runoff water from the upper pad flows southward around the bin and into a collection box at the edge of the portal pad area; the pad is sloped to flow to the box;

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e. Coal Processing Pad. This pad is also sloped to drain to the culvert; another 8 ft opening was left in the culvert for the surface runoff; water is then conveyed down to the lower (Lump Coal) pad area;

f. Lump Coal Pad. The flexible culvert parallels the conveyor down to the lump coal bin, pass beneath the bin supports, and empties into a catch basin/energy dissipater just south of the bin; runoff then flows south into ditch D-7D and passes into Sediment Pond "A."

Drainage is shown on Plate 7-1. Detailed drawings of the various drainage controls are shown in the attached typical details. Sizing calculations are summarized on the following sheet: "Lower Seam Portal Area - Drainage Sizing Calculations."

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Total Storage Volume	:	84,158 ft^3
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** See supplement on next page, p 7-62A.

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Drainage Area	:	1.82 acres**
SCS Curve #82		
3-yr Sediment Storage	:	2,156 ft^3
10-yr 24-hr Runoff Storage	:	8,182 ft^3
Total Storage Volume	:	10,338 ft^3
Use Existing Spillway	:	4 ft Wide Broad Crested Weir
Rainfall Data Base	:	Hiawatha Data by E. Arlo Richardson

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Total (Pond "A")	14.178		1.090 ac ft

3 yr Sediment Volume = 14.178 x 0.0066 ac ft/ac = 0.940 ac ft

Total required volume for Pond "A" = 2.030 ac ft

Area "B" was also re-planimetered from Plate 7-5. Following are the results for this area and Pond "B":

Area	Acreage	Runoff CN	Runoff Volume
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Total required volume for Pond "A" = 2.030 ac ft

Based on the above numbers, the total disturbed area for Bear Canyon Mine site is 16.073 acres.

Sediment Pond "A". This pond was cleaned and resurveyed on 12 Oct 1990. The existing pond volume was found to be 2.04 acre ft at design overflow, as shown on Plate 7-2A. This indicates that the pond is presently large enough to absorb the additional runoff from the removal of culvert C-9U, as proposed.

Sediment Pond "A"
Stage - Volume Calculations

Elev	Area ft^2	Depth ft	Volume ac ft	Remarks
90	3,740			bottom
		1	0.111	
91	5,960			
		1	0.156	
92	7,600			
		2	0.392	
94	9,480			
		0.9	0.206	
94.9	10,440			decant
		1.1	0.277	
96	11,480			
		1.9	0.543	
97.9	13,440			
		1.1	0.350	
99	14,280			Max Overflow depth
		TOTAL	2.035 ac ft	

Note: All information taken from Plate 7-2A

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- Table continued on following page.

Table 7.2-8 Summary of Ditch Sizes (cont)

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1D	0.8	4.0	N/R	9.0	1 ft 0 in.	0 ft 6 in.
D-2D	1.5	5.5	4 in.	10.0	1 ft 3 in.	0 ft 9 in.
D-3D	1.0	5.2	4 in.	15.0	1 ft 0 in.	0 ft 6 in.
D-4D	0.5	3.2	N/R	6.25	1 ft 6 in.	0 ft 5 in.
D-5D	7.2	6.2	6 in.	6.4	1 ft 9 in.	0 ft 9 in.
D-6D	1.2	4.4	N/R	6.25	1 ft 3 in.	0 ft 9 in.
D-7D (upper)	6.4	9.4	12 in.	25.0	1 ft 6 in.	0 ft 10 in.
D-7D (lower)	6.4	5.1	4 in.	5.0	1 ft 6 in.	1 ft 2 in.

- All ditches are triangular "V ditch" with 1:1 side slopes.
* 6 in. freeboard added to required flow depth.
** See Plate 7.1 for location of rip-rap.
N/R - not required

Notes for D-7D Calculations

Land Slope	-	31.6 pct
Runoff Curve No.	-	82
Channel Length	-	1804 ft
Time of Conc.	-	0.1417 hrs
Watershed Area	-	7.68 ac
10 yr - 24 hr Event	-	2.25 in.
Peak Flow	-	6.43 cfs

Max Slope	-	25 pct	Max Slope	-	5 pct
Flow Depth	-	0.82 ft	Flow Depth	-	1.11 ft
Velocity	-	9.37 fps	Velocity	-	5.14 fps
Rip-Rap D_{50}	-	12 in.	Rip-Rap D_{50}	-	4 in.

Table 7.2-9 Summary of Culvert Sizes

Culvert	Flow (cfs)	Velocity (fps)	Rip-Rap Size	Slope (pct)	Diameter	Required Headwater**
C-1R	10.2	9.5	12 in.	8.0	1 ft 6 in.	2 ft 3 in.
C-2R	Not applicable outside the permit area					
C-3R	Not applicable outside the permit area					
C-1U	8.8	12.3	24 in.+	15.0	2 ft 6 in.	1 ft 6 in.
C-2U	1.5	8.4	9 in.	15.0	1 ft 3 in.	0 ft 9 in.
C-3U	7.9++	5.7	6 in.	5.0	1 ft 0 in.	3 ft 0 in.*
C-4U	6.1++	5.1	6 in.	5.1	0 ft 10 in.	3 ft 0 in.*
C-5U	6.1++	5.0	N/R	4.8	0 ft 10 in.	3 ft 0 in.*
C-6U	0.9	4.4	N/R	3.7	0 ft 10 in.	1 ft 0 in.
C-7U	10.3	9.7	12 in.	8.3	1 ft 0 in.	2 ft 3 in.
C-8U	8.8	13.0	24 in.+	15.0	1 ft 6 in.	2 ft 0 in.
C-10U	0.8	5.7	6 in.	5.0	1 ft 0 in.	0 ft 6 in.
C-1D	1.5	10.9	18 in.	20.0	1 ft 3 in.	0 ft 9 in.
C-2D	0.5	9.6	12 in.	12.0	1 ft 6 in.	1 ft 3 in.
C-3D	1.2	5.2	6 in.	4.2	1 ft 6 in.	0 ft 9 in.
C-4D	0.5	9.6	12 in.	8.0	1 ft 6 in.	0 ft 3 in.
C-5D	0.2	3.5	N/R	6.5	1 ft 0 in.	0 ft 3 in.
60 in. CMP	231.5	13.8	24 in.	3.4	5 ft 0 in.	8 ft 6 in.

* When capacity of culvert is exceeded flow continues down ditch to next culvert.
** From invert elevation.
*** All culverts and ditches meet and or exceed min requirements.
\+ Replaced with 15 in. flexible culvert.
++ A two ft high check dam of rip-rap is used to develop the headwater necessary for maximum flow through the culvert, excess flow continues down the ditch.
N/R - not required

The channel is included in drainage area AD-1 (Plate 7-5). The maximum flow calculated for this channel is shown on Table 7.2-8 as 1.5 cfs (Ditch D-2D). Based on this flow, the new culvert designated C-1D, is sized matching the criteria for existing culvert C-1D, shown on Table 7.2-9. Calculations for this ditch are shown in Appendix 7-F under Run-off Ditch Sizing. The headwater depth above the top of the proposed culvert inlet is 1 ft more than adequate to carry the expected flow.

The out-slope of the pad is protected by 6 in. M.D. rock along the area where drainage will occur. The only drainage that will reach the toe of the pad is that from the upper pad to the lower; the majority of the drainage above will be conveyed through the culvert. The 6 in. rock is more than adequate, since the approved plan calls for natural 6 in. rip-rap in the post-mining channel that will carry not only the disturbed drainage AD-1, but the undisturbed drainage from AU-3 as well.

The ditch in this area has been measured, and typical section is shown on Plate 7-8 as cross-section D-D. The ditch profile is also shown on this plate as Profile "F". Plate 7-8a is a typical section of the proposed channel restoration in the area of the portal pad and culvert, after their removal and upon final reclamation.

DRAINAGE CONTROL SYSTEM BEAR CANYON NO. 1 MINE

LOWER SEAM PORTAL AREA

a. Upper Pad. Drainage from the disturbed area on the upper pad from the sub-station to culvert C-1D, will continue to flow into culvert C-1D, as approved; the outlet location of the flexible culvert was moved approx 20 ft to the west of the original location to direct runoff onto the rock ledge above the Lower Seam (Hiawatha) portals; water then flows over the rock ledge to the portal pad below;

b. Portal Pad. The northeast corner of the bin is bermed a min of 30 in. high over to the highwall. Runoff water from the upper pad flows southward around the bin and into a collection box at the edge of the portal pad area; the pad is sloped to flow to the box;

c. Flexible Culvert. The collection box at the portal pad discharges into a 15 in. flexible culvert, the culvert drops onto the next lower pad areas (Conveyor Support Pads);

d. Conveyor Support Pads. This pad area is divided into two sections and is sloped to drain to the flexible culvert; the flexible culvert is opened (or replaced with 1/2 round culvert) for a distance of at least 8 ft to allow surface water to enter the culvert at both sections; the entrance to

the culvert is protected by a trash rack and grouted as shown on the attached typical drawing; water then flows down the flexible culvert to the Coal Processing Pad area.

e. Coal Processing Pad. This pad is also sloped to drain to the culvert; another 8 ft opening was left in the culvert for the surface runoff; water is then conveyed down to the lower (Lump Coal) pad area;

f. Lump Coal Pad. The flexible culvert parallels the conveyor down to the lump coal bin, pass beneath the bin supports, and empties into a catch basin/energy dissipater just south of the bin; runoff then flows south into ditch D-7D and passes into Sediment Pond "A."

Drainage is shown on Plate 7-1. Detailed drawings of the various drainage controls are shown in the attached typical details. Sizing calculations are summarized on the following sheet: "Lower Seam Portal Area - Drainage Sizing Calculations."

GENERAL

Upon inspection of the Mine permit area it was found that the areas described below exist in the undisturbed zones and that surface runoff going through these areas does not pass through the sediment pond treatment facilities. In order to provide adequate treatment for these areas, straw bale dikes and/or silt fences will be installed as indicated on Plate 7-1. The sediment control structures will be positioned so that surface runoff passes through them before entering Bear Creak. Treatment facilities will be maintained for each area until approved and determined that adequate revegetation cancels the need for treatment. These areas are designated as "Best Technology Currently Available" or BTCA Areas. Drainage from these areas will be monitored as possible to show compliance with the state and federal limitations.

OUTSLOPE BANK OF UPPER STORAGE PAD.

During construction of the Upper Storage Pad (Plate 7-1) some fill was apparently overcast down the face of the slope below. The area covers approximately 800 sq ft. A silt fence will be installed and maintained at the inlet to culvert C-8U. In 1991, culvert C-8U will be eliminated, and the drainage will go to Sediment pond "A". The runoff volume for this area is calculated to be 0.0013 acre ft.

AREA NEAR PORTAL NO.1

This area lies between the upper lamphouse/mine portal bermed pad and the portal access road, extending from the road junction on the south to just north of the upper office trailer at the beginning of the Cattle Co. Road. The area is approx. 0.28 acres. A silt fence is installed at the north end of the area where runoff flows down hill from the Cattle Co. Road area. Runoff from the area passes through a silt fence near the inlet to culvert C-6U. Runoff volume from this area is calculated to be 0.019 acre ft.

BALL PARK TOPSOIL PILE

The ball park covers 1.2 acres. Straw bale dikes and/or silt fences will be installed on the south east side, in line with the natural flow to treat runoff before it enters Bear creak. Runoff volume from this area is calculated to be 0.082 acre ft.

TOPSOIL STOCKPILE

The main topsoil storage pile covers approx 0.1 acres. The area is encircled by an 18 in. berm and is protected by established vegetation. Runoff volume from this area is calculated to be 0.0068 acre ft.

Note: Runoff volumes are based on the 10 yr 24 hr event of 2.25 in. and runoff CN of 82.

Table 7.2-7 Sediment Ponds, Final Design Criteria

Design Criteria Pond "A"*

Drainage Area	:	14.35 acres**
SCS Curve #82		
3-yr Sediment Storage	:	41,444 ft^3
10-yr 24-hr Runoff Storage	:	42,714 ft^3
Total Storage Volume	:	84,158 ft^3
Use Existing Spillway	:	10 ft wide Broad Crested Weir
Rainfall Data Base	:	Hiawatha Data by E. Arlo Richardson

* Co-Op agreed to use these numbers from John Whitehead, hydrologist for DOGM, during a discussion, 27 February 1984.
** See supplement on next page, p 7-62A.

Design Criteria Pond "B"*

Drainage Area	:	1.82 acres**
SCS Curve #82		
3-yr Sediment Storage	:	2,156 ft^3
10-yr 24-hr Runoff Storage	:	8,182 ft^3
Total Storage Volume	:	10,338 ft^3
Use Existing Spillway	:	4 ft Wide Broad Crested Weir
Rainfall Data Base	:	Hiawatha Data by E. Arlo Richardson

* Co-Op agreed to use these numbers presented in a letter from DOGM, in a letter to Wendell Owen, 16 June 1983.
** See supplement on next page, p 7-62A.

Supplement to Table 7.2-7
Additional Notes on Sediment Ponds and Drainage Areas

Drainage Areas. With the removal of culvert C-9U and the conversion of ditch D-10U to the disturbed ditch D-7D, an additional 5 acres of undisturbed drainage will go into sed pond "A". This area is designated AU-2a on Plate 7-5. All other drainage areas flowing to the pond are also shown on Plate 7-5, and each of these areas were re-planimetered to determine actual runoff to the pond. The results of the area calculations are summarized below:

Area	Acreage	Runoff CN	Runoff Volume
AU-2a	5.000	73	0.121 ac ft
AU-1	3.614	82	0.247 ac ft
AU-2	4.628	82	0.316 ac ft
AU-3	5.936	82	0.406 ac ft
Total (Pond "A")	14.178		1.090 ac ft

3 yr Sediment Volume = 14.178 x 0.0066 ac ft/ac = 0.940 ac ft

Total required volume for Pond "A" = 2.030 ac ft

Area "B" was also re-planimetered from Plate 7-5. Following are the results for this area and Pond "B":

Area	Acreage	Runoff CN	Runoff Volume
B	1.895	82	0.130 ac ft

3 yr Sediment Volume = 14.178 x 0.0066 ac ft/ac = 0.940 ac ft

Total required volume for Pond "A" = 2.030 ac ft

Based on the above numbers, the total disturbed area for Bear Canyon Mine site is 16.073 acres.

Sediment Pond "A". This pond was cleaned and resurveyed on 12 Oct 1990. The existing pond volume was found to be 2.04 acre ft at design overflow, as shown on Plate 7-2A. This indicates that the pond is presently large enough to absorb the additional runoff from the removal of culvert C-9U, as proposed.

Sediment Pond "A"
Stage - Volume Calculations

Elev	Area ft^2	Depth ft	Volume ac ft	Remarks
90	3,740			bottom
		1	0.111	
91	5,960			
		1	0.156	
92	7,600			
		2	0.392	
94	9,480			
		0.9	0.206	
94.9	10,440			decant
		1.1	0.277	
96	11,480			
		1.9	0.543	
97.9	13,440			
		1.1	0.350	
99	14,280			Max Overflow depth
		TOTAL	2.035 ac ft	

Note: All information taken from Plate 7-2A

Additional Protection 1990

As additional, interim protection, a second silt fence will be installed 15 to 25 ft above the first at the inlet to culvert C-8U. This will provide additional protection from coal fines until the culvert is removed in 1991, and the drainage redirected to the sediment pond.

Culvert C-9U Removal 1990

In the fall of 1990 (late Oct - early Nov) culvert C-9U will be removed, and drainage from ditch D-10U will be re-directed into sediment pond "A" via existing ditch D-5D. Ditch D-10U will be cleaned and enlarged as necessary and extended north to intercept ditch D-4D. Ditch D-10U will be re-designated ditch D-7D.

An additional 5 acres of undisturbed drainage will also be intercepted by ditch D-7D, which will flow to pond "A". The drainage is shown on Plate 7-5.

The pond sizing justification is shown in "Additional Notes on Sediment Ponds and Drainage Areas", supplement to Table 7.2-7. Changes in ditches and culverts are shown on Tables 7.2-8 and 7.2-9 respectively. All drainage changes have been updated on Plate 7-1.

Table 7.2-8 Summary of Ditch Sizes

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1R	10.2	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-2R	12.1	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-3R	10.4	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-1U	1.5	3.5	N/R	4.0	1 ft 3 in.	0 ft 9 in.
D-2U	1.5	3.9	N/R	5.0	1 ft 3 in.	0 ft 9 in.
D-3U	6.1	5.5	4 in.	5.0	1 ft 9 in.	1 ft 3 in.
D-4U	11.8	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-5U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-6U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-7U	10.3	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-8U	2.3	4.4	N/R	6.25	- down road-	
D-9U	1.8	5.0	4 in.	8.3	1 ft 3 in.	0 ft 9 in.
D-10U		-	Replaced with D-7D			
D-11U	7.6	7.9	9 in.	14.0	1 ft 6 in.	1 ft 0 in.
D-12U	4.5	4.7	N/R	5.0	1 ft 6 in.	1 ft 3 in.

- Table continued on following page.

Table 7.2-8 Summary of Ditch Sizes (cont)

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1D	0.8	4.0	N/R	9.0	1 ft 0 in.	0 ft 6 in.
D-2D	1.5	5.5	4 in.	10.0	1 ft 3 in.	0 ft 9 in.
D-3D	1.0	5.2	4 in.	15.0	1 ft 0 in.	0 ft 6 in.
D-4D	0.5	3.2	N/R	6.25	1 ft 6 in.	0 ft 5 in.
D-5D	7.2	6.2	6 in.	6.4	1 ft 9 in.	0 ft 9 in.
D-6D	1.2	4.4	N/R	6.25	1 ft 3 in.	0 ft 9 in.
D-7D (upper)	6.4	9.4	12 in.	25.0	1 ft 6 in.	0 ft 10 in.
D-7D (lower)	6.4	5.1	4 in.	5.0	1 ft 6 in.	1 ft 2 in.

- All ditches are triangular "V ditch" with 1:1 side slopes.
* 6 in. freeboard added to required flow depth.
** See Plate 7.1 for location of rip-rap.
N/R - not required

Notes for D-7D Calculations

Land Slope	-	31.6 pct
Runoff Curve No.	-	82
Channel Length	-	1804 ft
Time of Conc.	-	0.1417 hrs
Watershed Area	-	7.68 ac
10 yr - 24 hr Event	-	2.25 in.
Peak Flow	-	6.43 cfs

Max Slope	-	25 pct	Max Slope	-	5 pct
Flow Depth	-	0.82 ft	Flow Depth	-	1.11 ft
Velocity	-	9.37 fps	Velocity	-	5.14 fps
Rip-Rap D_{50}	-	12 in.	Rip-Rap D_{50}	-	4 in.

Table 7.2-9 Summary of Culvert Sizes

Culvert	Flow (cfs)	Velocity (fps)	Rip-Rap Size	Slope (pct)	Diameter	Required Headwater**
C-1R	10.2	9.5	12 in.	8.0	1 ft 6 in.	2 ft 3 in.
C-2R	Not applicable outside the permit area					
C-3R	Not applicable outside the permit area					
C-1U	8.8	12.3	24 in.+	15.0	2 ft 6 in.	1 ft 6 in.
C-2U	1.5	8.4	9 in.	15.0	1 ft 3 in.	0 ft 9 in.
C-3U	7.9++	5.7	6 in.	5.0	1 ft 0 in.	3 ft 0 in.*
C-4U	6.1++	5.1	6 in.	5.1	0 ft 10 in.	3 ft 0 in.*
C-5U	6.1++	5.0	N/R	4.8	0 ft 10 in.	3 ft 0 in.*
C-6U	0.9	4.4	N/R	3.7	0 ft 10 in.	1 ft 0 in.
C-7U	10.3	9.7	12 in.	8.3	1 ft 0 in.	2 ft 3 in.
C-8U	8.8	13.0	24 in.+	15.0	1 ft 6 in.	2 ft 0 in.
C-10U	0.8	5.7	6 in.	5.0	1 ft 0 in.	0 ft 6 in.
C-1D	1.5	10.9	18 in.	20.0	1 ft 3 in.	0 ft 9 in.
C-2D	0.5	9.6	12 in.	12.0	1 ft 6 in.	1 ft 3 in.
C-3D	1.2	5.2	6 in.	4.2	1 ft 6 in.	0 ft 9 in.
C-4D	0.5	9.6	12 in.	8.0	1 ft 6 in.	0 ft 3 in.
C-5D	0.2	3.5	N/R	6.5	1 ft 0 in.	0 ft 3 in.
60 in. CMP	231.5	13.8	24 in.	3.4	5 ft 0 in.	8 ft 6 in.

* When capacity of culvert is exceeded flow continues down ditch to next culvert.
** From invert elevation.
*** All culverts and ditches meet and or exceed min requirements.
\+ Replaced with 15 in. flexible culvert.
++ A two ft high check dam of rip-rap is used to develop the headwater necessary for maximum flow through the culvert, excess flow continues down the ditch.
N/R - not required

The channel is included in drainage area AD-1 (Plate 7-5). The maximum flow calculated for this channel is shown on Table 7.2-8 as 1.5 cfs (Ditch D-2D). Based on this flow, the new culvert designated C-1D, is sized matching the criteria for existing culvert C-1D, shown on Table 7.2-9. Calculations for this ditch are shown in Appendix 7-F under Run-off Ditch Sizing. The headwater depth above the top of the proposed culvert inlet is 1 ft more than adequate to carry the expected flow.

The out-slope of the pad is protected by 6 in. M.D. rock along the area where drainage will occur. The only drainage that will reach the toe of the pad is that from the upper pad to the lower; the majority of the drainage above will be conveyed through the culvert. The 6 in. rock is more than adequate, since the approved plan calls for natural 6 in. rip-rap in the post-mining channel that will carry not only the disturbed drainage AD-1, but the undisturbed drainage from AU-3 as well.

The ditch in this area has been measured, and typical section is shown on Plate 7-8 as cross-section D-D. The ditch profile is also shown on this plate as Profile "F". Plate 7-8a is a typical section of the proposed channel restoration in the area of the portal pad and culvert, after their removal and upon final reclamation.

DRAINAGE CONTROL SYSTEM BEAR CANYON NO. 1 MINE

LOWER SEAM PORTAL AREA

a. Upper Pad. Drainage from the disturbed area on the upper pad from the sub-station to culvert C-1D, will continue to flow into culvert C-1D, as approved; the outlet location of the flexible culvert was moved approx 20 ft to the west of the original location to direct runoff onto the rock ledge above the Lower Seam (Hiawatha) portals; water then flows over the rock ledge to the portal pad below;

b. Portal Pad. The northeast corner of the bin is bermed a min of 30 in. high over to the highwall. Runoff water from the upper pad flows southward around the bin and into a collection box at the edge of the portal pad area; the pad is sloped to flow to the box;

c. Flexible Culvert. The collection box at the portal pad discharges into a 15 in. flexible culvert, the culvert drops onto the next lower pad areas (Conveyor Support Pads);

d. Conveyor Support Pads. This pad area is divided into two sections and is sloped to drain to the flexible culvert; the flexible culvert is opened (or replaced with 1/2 round culvert) for a distance of at least 8 ft to allow surface water to enter the culvert at both sections; the entrance to

the culvert is protected by a trash rack and grouted as shown on the attached typical drawing; water then flows down the flexible culvert to the Coal Processing Pad area.

e. Coal Processing Pad. This pad is also sloped to drain to the culvert; another 8 ft opening was left in the culvert for the surface runoff; water is then conveyed down to the lower (Lump Coal) pad area;

f. Lump Coal Pad. The flexible culvert parallels the conveyor down to the lump coal bin, pass beneath the bin supports, and empties into a catch basin/energy dissipater just south of the bin; runoff then flows south into ditch D-7D and passes into Sediment Pond "A."

Drainage is shown on Plate 7-1. Detailed drawings of the various drainage controls are shown in the attached typical details. Sizing calculations are summarized on the following sheet: "Lower Seam Portal Area - Drainage Sizing Calculations."

GENERAL

Upon inspection of the Mine permit area it was found that the areas described below exist in the undisturbed zones and that surface runoff going through these areas does not pass through the sediment pond treatment facilities. In order to provide adequate treatment for these areas, straw bale dikes and/or silt fences will be installed as indicated on Plate 7-1. The sediment control structures will be positioned so that surface runoff passes through them before entering Bear Creak. Treatment facilities will be maintained for each area until approved and determined that adequate revegetation cancels the need for treatment. These areas are designated as "Best Technology Currently Available" or BTCA Areas. Drainage from these areas will be monitored as possible to show compliance with the state and federal limitations.

OUTSLOPE BANK OF UPPER STORAGE PAD.

During construction of the Upper Storage Pad (Plate 7-1) some fill was apparently overcast down the face of the slope below. The area covers approximately 800 sq ft. A silt fence will be installed and maintained at the inlet to culvert C-8U. In 1991, culvert C-8U will be eliminated, and the drainage will go to Sediment pond "A". The runoff volume for this area is calculated to be 0.0013 acre ft.

AREA NEAR PORTAL NO.1

This area lies between the upper lamphouse/mine portal bermed pad and the portal access road, extending from the road junction on the south to just north of the upper office trailer at the beginning of the Cattle Co. Road. The area is approx. 0.28 acres. A silt fence is installed at the north end of the area where runoff flows down hill from the Cattle Co. Road area. Runoff from the area passes through a silt fence near the inlet to culvert C-6U. Runoff volume from this area is calculated to be 0.019 acre ft.

BALL PARK TOPSOIL PILE

The ball park covers 1.2 acres. Straw bale dikes and/or silt fences will be installed on the south east side, in line with the natural flow to treat runoff before it enters Bear creak. Runoff volume from this area is calculated to be 0.082 acre ft.

TOPSOIL STOCKPILE

The main topsoil storage pile covers approx 0.1 acres. The area is encircled by an 18 in. berm and is protected by established vegetation. Runoff volume from this area is calculated to be 0.0068 acre ft.

Note: Runoff volumes are based on the 10 yr 24 hr event of 2.25 in. and runoff CN of 82.

Table 7.2-7 Sediment Ponds, Final Design Criteria

Design Criteria Pond "A"*

Drainage Area	:	14.35 acres**
SCS Curve #82		
3-yr Sediment Storage	:	41,444 ft^3
10-yr 24-hr Runoff Storage	:	42,714 ft^3
Total Storage Volume	:	84,158 ft^3
Use Existing Spillway	:	10 ft wide Broad Crested Weir
Rainfall Data Base	:	Hiawatha Data by E. Arlo Richardson

* Co-Op agreed to use these numbers from John Whitehead, hydrologist for DOGM, during a discussion, 27 February 1984.
** See supplement on next page, p 7-62A.

Design Criteria Pond "B"*

Drainage Area	:	1.82 acres**
SCS Curve #82		
3-yr Sediment Storage	:	2,156 ft^3
10-yr 24-hr Runoff Storage	:	8,182 ft^3
Total Storage Volume	:	10,338 ft^3
Use Existing Spillway	:	4 ft Wide Broad Crested Weir
Rainfall Data Base	:	Hiawatha Data by E. Arlo Richardson

* Co-Op agreed to use these numbers presented in a letter from DOGM, in a letter to Wendell Owen, 16 June 1983.
** See supplement on next page, p 7-62A.

Supplement to Table 7.2-7
Additional Notes on Sediment Ponds and Drainage Areas

Drainage Areas. With the removal of culvert C-9U and the conversion of ditch D-10U to the disturbed ditch D-7D, an additional 5 acres of undisturbed drainage will go into sed pond "A". This area is designated AU-2a on Plate 7-5. All other drainage areas flowing to the pond are also shown on Plate 7-5, and each of these areas were re-planimetered to determine actual runoff to the pond. The results of the area calculations are summarized below:

Area	Acreage	Runoff CN	Runoff Volume
AU-2a	5.000	73	0.121 ac ft
AU-1	3.614	82	0.247 ac ft
AU-2	4.628	82	0.316 ac ft
AU-3	5.936	82	0.406 ac ft
Total (Pond "A")	14.178		1.090 ac ft

3 yr Sediment Volume = 14.178 x 0.0066 ac ft/ac = 0.940 ac ft

Total required volume for Pond "A" = 2.030 ac ft

Area "B" was also re-planimetered from Plate 7-5. Following are the results for this area and Pond "B":

Area	Acreage	Runoff CN	Runoff Volume
B	1.895	82	0.130 ac ft

3 yr Sediment Volume = 14.178 x 0.0066 ac ft/ac = 0.940 ac ft

Total required volume for Pond "A" = 2.030 ac ft

Based on the above numbers, the total disturbed area for Bear Canyon Mine site is 16.073 acres.

Sediment Pond "A". This pond was cleaned and resurveyed on 12 Oct 1990. The existing pond volume was found to be 2.04 acre ft at design overflow, as shown on Plate 7-2A. This indicates that the pond is presently large enough to absorb the additional runoff from the removal of culvert C-9U, as proposed.

Sediment Pond "A"
Stage - Volume Calculations

Elev	Area ft^2	Depth ft	Volume ac ft	Remarks
90	3,740			bottom
		1	0.111	
91	5,960			
		1	0.156	
92	7,600			
		2	0.392	
94	9,480			
		0.9	0.206	
94.9	10,440			decant
		1.1	0.277	
96	11,480			
		1.9	0.543	
97.9	13,440			
		1.1	0.350	
99	14,280			Max Overflow depth
		TOTAL	2.035 ac ft	

Note: All information taken from Plate 7-2A

Additional Protection 1990

As additional, interim protection, a second silt fence will be installed 15 to 25 ft above the first at the inlet to culvert C-8U. This will provide additional protection from coal fines until the culvert is removed in 1991, and the drainage redirected to the sediment pond.

Culvert C-9U Removal 1990

In the fall of 1990 (late Oct - early Nov) culvert C-9U will be removed, and drainage from ditch D-10U will be re-directed into sediment pond "A" via existing ditch D-5D. Ditch D-10U will be cleaned and enlarged as necessary and extended north to intercept ditch D-4D. Ditch D-10U will be re-designated ditch D-7D.

An additional 5 acres of undisturbed drainage will also be intercepted by ditch D-7D, which will flow to pond "A". The drainage is shown on Plate 7-5.

The pond sizing justification is shown in "Additional Notes on Sediment Ponds and Drainage Areas", supplement to Table 7.2-7. Changes in ditches and culverts are shown on Tables 7.2-8 and 7.2-9 respectively. All drainage changes have been updated on Plate 7-1.

Table 7.2-8 Summary of Ditch Sizes

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1R	10.2	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-2R	12.1	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-3R	10.4	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-1U	1.5	3.5	N/R	4.0	1 ft 3 in.	0 ft 9 in.
D-2U	1.5	3.9	N/R	5.0	1 ft 3 in.	0 ft 9 in.
D-3U	6.1	5.5	4 in.	5.0	1 ft 9 in.	1 ft 3 in.
D-4U	11.8	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-5U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-6U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-7U	10.3	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-8U	2.3	4.4	N/R	6.25	- down road-	
D-9U	1.8	5.0	4 in.	8.3	1 ft 3 in.	0 ft 9 in.
D-10U		-	Replaced with D-7D			
D-11U	7.6	7.9	9 in.	14.0	1 ft 6 in.	1 ft 0 in.
D-12U	4.5	4.7	N/R	5.0	1 ft 6 in.	1 ft 3 in.

- Table continued on following page.

Table 7.2-8 Summary of Ditch Sizes (cont)

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1D	0.8	4.0	N/R	9.0	1 ft 0 in.	0 ft 6 in.
D-2D	1.5	5.5	4 in.	10.0	1 ft 3 in.	0 ft 9 in.
D-3D	1.0	5.2	4 in.	15.0	1 ft 0 in.	0 ft 6 in.
D-4D	0.5	3.2	N/R	6.25	1 ft 6 in.	0 ft 5 in.
D-5D	7.2	6.2	6 in.	6.4	1 ft 9 in.	0 ft 9 in.
D-6D	1.2	4.4	N/R	6.25	1 ft 3 in.	0 ft 9 in.
D-7D (upper)	6.4	9.4	12 in.	25.0	1 ft 6 in.	0 ft 10 in.
D-7D (lower)	6.4	5.1	4 in.	5.0	1 ft 6 in.	1 ft 2 in.

\- All ditches are triangular "V ditch" with 1:1 side slopes.
* 6 in. freeboard added to required flow depth.
** See Plate 7.1 for location of rip-rap.
N/R - not required

Notes for D-7D Calculations

Land Slope	-	31.6 pct
Runoff Curve No.	-	82
Channel Length	-	1804 ft
Time of Conc.	-	0.1417 hrs
Watershed Area	-	7.68 ac
10 yr - 24 hr Event	-	2.25 in.
Peak Flow	-	6.43 cfs

Max Slope	-	25 pct	Max Slope	-	5 pct
Flow Depth	-	0.82 ft	Flow Depth	-	1.11 ft
Velocity	-	9.37 fps	Velocity	-	5.14 fps
Rip-Rap D_{50}	-	12 in.	Rip-Rap D_{50}	-	4 in.

Table 7.2-9 Summary of Culvert Sizes

Culvert	Flow (cfs)	Velocity (fps)	Rip-Rap Size	Slope (pct)	Diameter	Required Headwater**
C-1R	10.2	9.5	12 in.	8.0	1 ft 6 in.	2 ft 3 in.
C-2R	Not applicable outside the permit area					
C-3R	Not applicable outside the permit area					
C-1U	8.8	12.3	24 in.+	15.0	2 ft 6 in.	1 ft 6 in.
C-2U	1.5	8.4	9 in.	15.0	1 ft 3 in.	0 ft 9 in.
C-3U	7.9++	5.7	6 in.	5.0	1 ft 0 in.	3 ft 0 in.*
C-4U	6.1++	5.1	6 in.	5.1	0 ft 10 in.	3 ft 0 in.*
C-5U	6.1++	5.0	N/R	4.8	0 ft 10 in.	3 ft 0 in.*
C-6U	0.9	4.4	N/R	3.7	0 ft 10 in.	1 ft 0 in.
C-7U	10.3	9.7	12 in.	8.3	1 ft 0 in.	2 ft 3 in.
C-8U	8.8	13.0	24 in.+	15.0	1 ft 6 in.	2 ft 0 in.
C-10U	0.8	5.7	6 in.	5.0	1 ft 0 in.	0 ft 6 in.
C-1D	1.5	10.9	18 in.	20.0	1 ft 3 in.	0 ft 9 in.
C-2D	0.5	9.6	12 in.	12.0	1 ft 6 in.	1 ft 3 in.
C-3D	1.2	5.2	6 in.	4.2	1 ft 6 in.	0 ft 9 in.
C-4D	0.5	9.6	12 in.	8.0	1 ft 6 in.	0 ft 3 in.
C-5D	0.2	3.5	N/R	6.5	1 ft 0 in.	0 ft 3 in.
60 in. CMP	231.5	13.8	24 in.	3.4	5 ft 0 in.	8 ft 6 in.

* When capacity of culvert is exceeded flow continues down ditch to next culvert.
** From invert elevation.
*** All culverts and ditches meet and or exceed min requirements.
\+ Replaced with 15 in. flexible culvert.
++ A two ft high check dam of rip-rap is used to develop the headwater necessary for maximum flow through the culvert, excess flow continues down the ditch.
N/R - not required

The channel is included in drainage area AD-1 (Plate 7-5). The maximum flow calculated for this channel is shown on Table 7.2-8 as 1.5 cfs (Ditch D-2D). Based on this flow, the new culvert designated C-1D, is sized matching the criteria for existing culvert C-1D, shown on Table 7.2-9. Calculations for this ditch are shown in Appendix 7-F under Run-off Ditch Sizing. The headwater depth above the top of the proposed culvert inlet is 1 ft more than adequate to carry the expected flow.

The out-slope of the pad is protected by 6 in. M.D. rock along the area where drainage will occur. The only drainage that will reach the toe of the pad is that from the upper pad to the lower; the majority of the drainage above will be conveyed through the culvert. The 6 in. rock is more than adequate, since the approved plan calls for natural 6 in. rip-rap in the post-mining channel that will carry not only the disturbed drainage AD-1, but the undisturbed drainage from AU-3 as well.

The ditch in this area has been measured, and typical section is shown on Plate 7-8 as cross-section D-D. The ditch profile is also shown on this plate as Profile "F". Plate 7-8a is a typical section of the proposed channel restoration in the area of the portal pad and culvert, after their removal and upon final reclamation.

DRAINAGE CONTROL SYSTEM BEAR CANYON NO. 1 MINE

LOWER SEAM PORTAL AREA

a. Upper Pad. Drainage from the disturbed area on the upper pad from the sub-station to culvert C-1D, will continue to flow into culvert C-1D, as approved; the outlet location of the flexible culvert was moved approx 20 ft to the west of the original location to direct runoff onto the rock ledge above the Lower Seam (Hiawatha) portals; water then flows over the rock ledge to the portal pad below;

b. Portal Pad. The northeast corner of the bin is bermed a min of 30 in. high over to the highwall. Runoff water from the upper pad flows southward around the bin and into a collection box at the edge of the portal pad area; the pad is sloped to flow to the box;

c. Flexible Culvert. The collection box at the portal pad discharges into a 15 in. flexible culvert, the culvert drops onto the next lower pad areas (Conveyor Support Pads);

d. Conveyor Support Pads. This pad area is divided into two sections and is sloped to drain to the flexible culvert; the flexible culvert is opened (or replaced with 1/2 round culvert) for a distance of at least 8 ft to allow surface water to enter the culvert at both sections; the entrance to

the culvert is protected by a trash rack and grouted as shown on the attached typical drawing; water then flows down the flexible culvert to the Coal Processing Pad area.

e. Coal Processing Pad. This pad is also sloped to drain to the culvert; another 8 ft opening was left in the culvert for the surface runoff; water is then conveyed down to the lower (Lump Coal) pad area;

f. Lump Coal Pad. The flexible culvert parallels the conveyor down to the lump coal bin, pass beneath the bin supports, and empties into a catch basin/energy dissipater just south of the bin; runoff then flows south into ditch D-7D and passes into Sediment Pond "A."

Drainage is shown on Plate 7-1. Detailed drawings of the various drainage controls are shown in the attached typical details. Sizing calculations are summarized on the following sheet: "Lower Seam Portal Area - Drainage Sizing Calculations."

GENERAL

Upon inspection of the Mine permit area it was found that the areas described below exist in the undisturbed zones and that surface runoff going through these areas does not pass through the sediment pond treatment facilities. In order to provide adequate treatment for these areas, straw bale dikes and/or silt fences will be installed as indicated on Plate 7-1. The sediment control structures will be positioned so that surface runoff passes through them before entering Bear Creak. Treatment facilities will be maintained for each area until approved and determined that adequate revegetation cancels the need for treatment. These areas are designated as "Best Technology Currently Available" or BTCA Areas. Drainage from these areas will be monitored as possible to show compliance with the state and federal limitations.

OUTSLOPE BANK OF UPPER STORAGE PAD.

During construction of the Upper Storage Pad (Plate 7-1) some fill was apparently overcast down the face of the slope below. The area covers approximately 800 sq ft. A silt fence will be installed and maintained at the inlet to culvert C-8U. In 1991, culvert C-8U will be eliminated, and the drainage will go to Sediment pond "A". The runoff volume for this area is calculated to be 0.0013 acre ft.

AREA NEAR PORTAL NO.1

This area lies between the upper lamphouse/mine portal bermed pad and the portal access road, extending from the road junction on the south to just north of the upper office trailer at the beginning of the Cattle Co. Road. The area is approx. 0.28 acres. A silt fence is installed at the north end of the area where runoff flows down hill from the Cattle Co. Road area. Runoff from the area passes through a silt fence near the inlet to culvert C-6U. Runoff volume from this area is calculated to be 0.019 acre ft.

BALL PARK TOPSOIL PILE

The ball park covers 1.2 acres. Straw bale dikes and/or silt fences will be installed on the south east side, in line with the natural flow to treat runoff before it enters Bear creak. Runoff volume from this area is calculated to be 0.082 acre ft.

TOPSOIL STOCKPILE

The main topsoil storage pile covers approx 0.1 acres. The area is encircled by an 18 in. berm and is protected by established vegetation. Runoff volume from this area is calculated to be 0.0068 acre ft.

Note: Runoff volumes are based on the 10 yr 24 hr event of 2.25 in. and runoff CN of 82.

Table 7.2-7 Sediment Ponds, Final Design Criteria

Design Criteria Pond "A"*

Drainage Area	:	14.35 acres**
SCS Curve #82		
3-yr Sediment Storage	:	41,444 ft^3
10-yr 24-hr Runoff Storage	:	42,714 ft^3
Total Storage Volume	:	84,158 ft^3
Use Existing Spillway	:	10 ft wide Broad Crested Weir
Rainfall Data Base	:	Hiawatha Data by E. Arlo Richardson

* Co-Op agreed to use these numbers from John Whitehead, hydrologist for DOGM, during a discussion, 27 February 1984.
** See supplement on next page, p 7-62A.

Design Criteria Pond "B"*

Drainage Area	:	1.82 acres**
SCS Curve #82		
3-yr Sediment Storage	:	2,156 ft^3
10-yr 24-hr Runoff Storage	:	8,182 ft^3
Total Storage Volume	:	10,338 ft^3
Use Existing Spillway	:	4 ft Wide Broad Crested Weir
Rainfall Data Base	:	Hiawatha Data by E. Arlo Richardson

* Co-Op agreed to use these numbers presented in a letter from DOGM, in a letter to Wendell Owen, 16 June 1983.
** See supplement on next page, p 7-62A.

Supplement to Table 7.2-7
Additional Notes on Sediment Ponds and Drainage Areas

Drainage Areas. With the removal of culvert C-9U and the conversion of ditch D-10U to the disturbed ditch D-7D, an additional 5 acres of undisturbed drainage will go into sed pond "A". This area is designated AU-2a on Plate 7-5. All other drainage areas flowing to the pond are also shown on Plate 7-5, and each of these areas were re-planimetered to determine actual runoff to the pond. The results of the area calculations are summarized below:

Area	Acreage	Runoff CN	Runoff Volume
AU-2a	5.000	73	0.121 ac ft
AU-1	3.614	82	0.247 ac ft
AU-2	4.628	82	0.316 ac ft
AU-3	5.936	82	0.406 ac ft
Total (Pond "A")	14.178		1.090 ac ft

3 yr Sediment Volume = 14.178 x 0.0066 ac ft/ac = 0.940 ac ft

Total required volume for Pond "A" = 2.030 ac ft

Area "B" was also re-planimetered from Plate 7-5. Following are the results for this area and Pond "B":

Area	Acreage	Runoff CN	Runoff Volume
B	1.895	82	0.130 ac ft

3 yr Sediment Volume = 14.178 x 0.0066 ac ft/ac = 0.940 ac ft

Total required volume for Pond "A" = 2.030 ac ft

Based on the above numbers, the total disturbed area for Bear Canyon Mine site is 16.073 acres.

Sediment Pond "A". This pond was cleaned and resurveyed on 12 Oct 1990. The existing pond volume was found to be 2.04 acre ft at design overflow, as shown on Plate 7-2A. This indicates that the pond is presently large enough to absorb the additional runoff from the removal of culvert C-9U, as proposed.

Sediment Pond "A"
Stage - Volume Calculations

Elev	Area ft^2	Depth ft	Volume ac ft	Remarks
90	3,740			bottom
		1	0.111	
91	5,960			
		1	0.156	
92	7,600			
		2	0.392	
94	9,480			
		0.9	0.206	
94.9	10,440			decant
		1.1	0.277	
96	11,480			
		1.9	0.543	
97.9	13,440			
		1.1	0.350	
99	14,280			Max Overflow depth
		TOTAL	2.035 ac ft	

Note: All information taken from Plate 7-2A

Additional Protection 1990

As additional, interim protection, a second silt fence will be installed 15 to 25 ft above the first at the inlet to culvert C-8U. This will provide additional protection from coal fines until the culvert is removed in 1991, and the drainage redirected to the sediment pond.

Culvert C-9U Removal 1990

In the fall of 1990 (late Oct - early Nov) culvert C-9U will be removed, and drainage from ditch D-10U will be re-directed into sediment pond "A" via existing ditch D-5D. Ditch D-10U will be cleaned and enlarged as necessary and extended north to intercept ditch D-4D. Ditch D-10U will be re-designated ditch D-7D.

An additional 5 acres of undisturbed drainage will also be intercepted by ditch D-7D, which will flow to pond "A". The drainage is shown on Plate 7-5.

The pond sizing justification is shown in "Additional Notes on Sediment Ponds and Drainage Areas", supplement to Table 7.2-7. Changes in ditches and culverts are shown on Tables 7.2-8 and 7.2-9 respectively. All drainage changes have been updated on Plate 7-1.

Table 7.2-8 Summary of Ditch Sizes

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1R	10.2	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-2R	12.1	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-3R	10.4	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-1U	1.5	3.5	N/R	4.0	1 ft 3 in.	0 ft 9 in.
D-2U	1.5	3.9	N/R	5.0	1 ft 3 in.	0 ft 9 in.
D-3U	6.1	5.5	4 in.	5.0	1 ft 9 in.	1 ft 3 in.
D-4U	11.8	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-5U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-6U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-7U	10.3	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-8U	2.3	4.4	N/R	6.25	- down road-	
D-9U	1.8	5.0	4 in.	8.3	1 ft 3 in.	0 ft 9 in.
D-10U		-	Replaced with D-7D			
D-11U	7.6	7.9	9 in.	14.0	1 ft 6 in.	1 ft 0 in.
D-12U	4.5	4.7	N/R	5.0	1 ft 6 in.	1 ft 3 in.

- Table continued on following page.

Table 7.2-8 Summary of Ditch Sizes (cont)

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1D	0.8	4.0	N/R	9.0	1 ft 0 in.	0 ft 6 in.
D-2D	1.5	5.5	4 in.	10.0	1 ft 3 in.	0 ft 9 in.
D-3D	1.0	5.2	4 in.	15.0	1 ft 0 in.	0 ft 6 in.
D-4D	0.5	3.2	N/R	6.25	1 ft 6 in.	0 ft 5 in.
D-5D	7.2	6.2	6 in.	6.4	1 ft 9 in.	0 ft 9 in.
D-6D	1.2	4.4	N/R	6.25	1 ft 3 in.	0 ft 9 in.
D-7D (upper)	6.4	9.4	12 in.	25.0	1 ft 6 in.	0 ft 10 in.
D-7D (lower)	6.4	5.1	4 in.	5.0	1 ft 6 in.	1 ft 2 in.

\- All ditches are triangular "V ditch" with 1:1 side slopes.
* 6 in. freeboard added to required flow depth.
** See Plate 7.1 for location of rip-rap.
N/R - not required

Notes for D-7D Calculations

Land Slope	-	31.6 pct
Runoff Curve No.	-	82
Channel Length	-	1804 ft
Time of Conc.	-	0.1417 hrs
Watershed Area	-	7.68 ac
10 yr - 24 hr Event	-	2.25 in.
Peak Flow	-	6.43 cfs

Max Slope	-	25 pct	Max Slope	-	5 pct
Flow Depth	-	0.82 ft	Flow Depth	-	1.11 ft
Velocity	-	9.37 fps	Velocity	-	5.14 fps
Rip-Rap D_{50}	-	12 in.	Rip-Rap D_{50}	-	4 in.

Table 7.2-9 Summary of Culvert Sizes

Culvert	Flow (cfs)	Velocity (fps)	Rip-Rap Size	Slope (pct)	Diameter	Required Headwater**
C-1R	10.2	9.5	12 in.	8.0	1 ft 6 in.	2 ft 3 in.
C-2R	Not applicable outside the permit area					
C-3R	Not applicable outside the permit area					
C-1U	8.8	12.3	24 in.+	15.0	2 ft 6 in.	1 ft 6 in.
C-2U	1.5	8.4	9 in.	15.0	1 ft 3 in.	0 ft 9 in.
C-3U	7.9++	5.7	6 in.	5.0	1 ft 0 in.	3 ft 0 in.*
C-4U	6.1++	5.1	6 in.	5.1	0 ft 10 in.	3 ft 0 in.*
C-5U	6.1++	5.0	N/R	4.8	0 ft 10 in.	3 ft 0 in.*
C-6U	0.9	4.4	N/R	3.7	0 ft 10 in.	1 ft 0 in.
C-7U	10.3	9.7	12 in.	8.3	1 ft 0 in.	2 ft 3 in.
C-8U	8.8	13.0	24 in.+	15.0	1 ft 6 in.	2 ft 0 in.
C-10U	0.8	5.7	6 in.	5.0	1 ft 0 in.	0 ft 6 in.
C-1D	1.5	10.9	18 in.	20.0	1 ft 3 in.	0 ft 9 in.
C-2D	0.5	9.6	12 in.	12.0	1 ft 6 in.	1 ft 3 in.
C-3D	1.2	5.2	6 in.	4.2	1 ft 6 in.	0 ft 9 in.
C-4D	0.5	9.6	12 in.	8.0	1 ft 6 in.	0 ft 3 in.
C-5D	0.2	3.5	N/R	6.5	1 ft 0 in.	0 ft 3 in.
60 in. CMP	231.5	13.8	24 in.	3.4	5 ft 0 in.	8 ft 6 in.

* When capacity of culvert is exceeded flow continues down ditch to next culvert.
** From invert elevation.
*** All culverts and ditches meet and or exceed min requirements.
\+ Replaced with 15 in. flexible culvert.
++ A two ft high check dam of rip-rap is used to develop the headwater necessary for maximum flow through the culvert, excess flow continues down the ditch.
N/R - not required

The channel is included in drainage area AD-1 (Plate 7-5). The maximum flow calculated for this channel is shown on Table 7.2-8 as 1.5 cfs (Ditch D-2D). Based on this flow, the new culvert designated C-1D, is sized matching the criteria for existing culvert C-1D, shown on Table 7.2-9. Calculations for this ditch are shown in Appendix 7-F under Run-off Ditch Sizing. The headwater depth above the top of the proposed culvert inlet is 1 ft more than adequate to carry the expected flow.

The out-slope of the pad is protected by 6 in. M.D. rock along the area where drainage will occur. The only drainage that will reach the toe of the pad is that from the upper pad to the lower; the majority of the drainage above will be conveyed through the culvert. The 6 in. rock is more than adequate, since the approved plan calls for natural 6 in. rip-rap in the post-mining channel that will carry not only the disturbed drainage AD-1, but the undisturbed drainage from AU-3 as well.

The ditch in this area has been measured, and typical section is shown on Plate 7-8 as cross-section D-D. The ditch profile is also shown on this plate as Profile "F". Plate 7-8a is a typical section of the proposed channel restoration in the area of the portal pad and culvert, after their removal and upon final reclamation.

DRAINAGE CONTROL SYSTEM BEAR CANYON NO. 1 MINE

LOWER SEAM PORTAL AREA

a. Upper Pad. Drainage from the disturbed area on the upper pad from the sub-station to culvert C-1D, will continue to flow into culvert C-1D, as approved; the outlet location of the flexible culvert was moved approx 20 ft to the west of the original location to direct runoff onto the rock ledge above the Lower Seam (Hiawatha) portals; water then flows over the rock ledge to the portal pad below;

b. Portal Pad. The northeast corner of the bin is bermed a min of 30 in. high over to the highwall. Runoff water from the upper pad flows southward around the bin and into a collection box at the edge of the portal pad area; the pad is sloped to flow to the box;

c. Flexible Culvert. The collection box at the portal pad discharges into a 15 in. flexible culvert, the culvert drops onto the next lower pad areas (Conveyor Support Pads);

d. Conveyor Support Pads. This pad area is divided into two sections and is sloped to drain to the flexible culvert; the flexible culvert is opened (or replaced with 1/2 round culvert) for a distance of at least 8 ft to allow surface water to enter the culvert at both sections; the entrance to

the culvert is protected by a trash rack and grouted as shown on the attached typical drawing; water then flows down the flexible culvert to the Coal Processing Pad area.

e. Coal Processing Pad. This pad is also sloped to drain to the culvert; another 8 ft opening was left in the culvert for the surface runoff; water is then conveyed down to the lower (Lump Coal) pad area;

f. Lump Coal Pad. The flexible culvert parallels the conveyor down to the lump coal bin, pass beneath the bin supports, and empties into a catch basin/energy dissipater just south of the bin; runoff then flows south into ditch D-7D and passes into Sediment Pond "A."

Drainage is shown on Plate 7-1. Detailed drawings of the various drainage controls are shown in the attached typical details. Sizing calculations are summarized on the following sheet: "Lower Seam Portal Area - Drainage Sizing Calculations."

GENERAL

Upon inspection of the Mine permit area it was found that the areas described below exist in the undisturbed zones and that surface runoff going through these areas does not pass through the sediment pond treatment facilities. In order to provide adequate treatment for these areas, straw bale dikes and/or silt fences will be installed as indicated on Plate 7-1. The sediment control structures will be positioned so that surface runoff passes through them before entering Bear Creak. Treatment facilities will be maintained for each area until approved and determined that adequate revegetation cancels the need for treatment. These areas are designated as "Best Technology Currently Available" or BTCA Areas. Drainage from these areas will be monitored as possible to show compliance with the state and federal limitations.

OUTSLOPE BANK OF UPPER STORAGE PAD.

During construction of the Upper Storage Pad (Plate 7-1) some fill was apparently overcast down the face of the slope below. The area covers approximately 800 sq ft. A silt fence will be installed and maintained at the inlet to culvert C-8U. In 1991, culvert C-8U will be eliminated, and the drainage will go to Sediment pond "A". The runoff volume for this area is calculated to be 0.0013 acre ft.

AREA NEAR PORTAL NO.1

This area lies between the upper lamphouse/mine portal bermed pad and the portal access road, extending from the road junction on the south to just north of the upper office trailer at the beginning of the Cattle Co. Road. The area is approx. 0.28 acres. A silt fence is installed at the north end of the area where runoff flows down hill from the Cattle Co. Road area. Runoff from the area passes through a silt fence near the inlet to culvert C-6U. Runoff volume from this area is calculated to be 0.019 acre ft.

BALL PARK TOPSOIL PILE

The ball park covers 1.2 acres. Straw bale dikes and/or silt fences will be installed on the south east side, in line with the natural flow to treat runoff before it enters Bear creak. Runoff volume from this area is calculated to be 0.082 acre ft.

TOPSOIL STOCKPILE

The main topsoil storage pile covers approx 0.1 acres. The area is encircled by an 18 in. berm and is protected by established vegetation. Runoff volume from this area is calculated to be 0.0068 acre ft.

Note: Runoff volumes are based on the 10 yr 24 hr event of 2.25 in. and runoff CN of 82.

Table 7.2-7 Sediment Ponds, Final Design Criteria

Design Criteria Pond "A"*

Drainage Area	:	14.35 acres**
SCS Curve #82		
3-yr Sediment Storage	:	41,444 ft^3
10-yr 24-hr Runoff Storage	:	42,714 ft^3
Total Storage Volume	:	84,158 ft^3
Use Existing Spillway	:	10 ft wide Broad Crested Weir
Rainfall Data Base	:	Hiawatha Data by E. Arlo Richardson

* Co-Op agreed to use these numbers from John Whitehead, hydrologist for DOGM, during a discussion, 27 February 1984.
** See supplement on next page, p 7-62A.

Design Criteria Pond "B"*

Drainage Area	:	1.82 acres**
SCS Curve #82		
3-yr Sediment Storage	:	2,156 ft^3
10-yr 24-hr Runoff Storage	:	8,182 ft^3
Total Storage Volume	:	10,338 ft^3
Use Existing Spillway	:	4 ft Wide Broad Crested Weir
Rainfall Data Base	:	Hiawatha Data by E. Arlo Richardson

* Co-Op agreed to use these numbers presented in a letter from DOGM, in a letter to Wendell Owen, 16 June 1983.
** See supplement on next page, p 7-62A.

Supplement to Table 7.2-7
Additional Notes on Sediment Ponds and Drainage Areas

Drainage Areas. With the removal of culvert C-9U and the conversion of ditch D-10U to the disturbed ditch D-7D, an additional 5 acres of undisturbed drainage will go into sed pond "A". This area is designated AU-2a on Plate 7-5. All other drainage areas flowing to the pond are also shown on Plate 7-5, and each of these areas were re-planimetered to determine actual runoff to the pond. The results of the area calculations are summarized below:

Area	Acreage	Runoff CN	Runoff Volume
AU-2a	5.000	73	0.121 ac ft
AU-1	3.614	82	0.247 ac ft
AU-2	4.628	82	0.316 ac ft
AU-3	5.936	82	0.406 ac ft
Total (Pond "A")	14.178		1.090 ac ft

3 yr Sediment Volume = 14.178 x 0.0066 ac ft/ac = 0.940 ac ft

Total required volume for Pond "A" = 2.030 ac ft

Area "B" was also re-planimetered from Plate 7-5. Following are the results for this area and Pond "B":

Area	Acreage	Runoff CN	Runoff Volume
B	1.895	82	0.130 ac ft

3 yr Sediment Volume = 14.178 x 0.0066 ac ft/ac = 0.940 ac ft

Total required volume for Pond "A" = 2.030 ac ft

Based on the above numbers, the total disturbed area for Bear Canyon Mine site is 16.073 acres.

Sediment Pond "A". This pond was cleaned and resurveyed on 12 Oct 1990. The existing pond volume was found to be 2.04 acre ft at design overflow, as shown on Plate 7-2A. This indicates that the pond is presently large enough to absorb the additional runoff from the removal of culvert C-9U, as proposed.

Sediment Pond "A"
Stage - Volume Calculations

Elev	Area ft^2	Depth ft	Volume ac ft	Remarks
90	3,740			bottom
		1	0.111	
91	5,960			
		1	0.156	
92	7,600			
		2	0.392	
94	9,480			
		0.9	0.206	
94.9	10,440			decant
		1.1	0.277	
96	11,480			
		1.9	0.543	
97.9	13,440			
		1.1	0.350	
99	14,280			Max Overflow depth
		TOTAL	2.035 ac ft	

Note: All information taken from Plate 7-2A

Additional Protection 1990

As additional, interim protection, a second silt fence will be installed 15 to 25 ft above the first at the inlet to culvert C-8U. This will provide additional protection from coal fines until the culvert is removed in 1991, and the drainage redirected to the sediment pond.

Culvert C-9U Removal 1990

In the fall of 1990 (late Oct - early Nov) culvert C-9U will be removed, and drainage from ditch D-10U will be re-directed into sediment pond "A" via existing ditch D-5D. Ditch D-10U will be cleaned and enlarged as necessary and extended north to intercept ditch D-4D. Ditch D-10U will be re-designated ditch D-7D.

An additional 5 acres of undisturbed drainage will also be intercepted by ditch D-7D, which will flow to pond "A". The drainage is shown on Plate 7-5.

The pond sizing justification is shown in "Additional Notes on Sediment Ponds and Drainage Areas", supplement to Table 7.2-7. Changes in ditches and culverts are shown on Tables 7.2-8 and 7.2-9 respectively. All drainage changes have been updated on Plate 7-1.

Table 7.2-8 Summary of Ditch Sizes

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1R	10.2	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-2R	12.1	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-3R	10.4	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-1U	1.5	3.5	N/R	4.0	1 ft 3 in.	0 ft 9 in.
D-2U	1.5	3.9	N/R	5.0	1 ft 3 in.	0 ft 9 in.
D-3U	6.1	5.5	4 in.	5.0	1 ft 9 in.	1 ft 3 in.
D-4U	11.8	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-5U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-6U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-7U	10.3	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-8U	2.3	4.4	N/R	6.25	- down road-	
D-9U	1.8	5.0	4 in.	8.3	1 ft 3 in.	0 ft 9 in.
D-10U		-	Replaced with D-7D			
D-11U	7.6	7.9	9 in.	14.0	1 ft 6 in.	1 ft 0 in.
D-12U	4.5	4.7	N/R	5.0	1 ft 6 in.	1 ft 3 in.

- Table continued on following page.

Table 7.2-8 Summary of Ditch Sizes (cont)

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1D	0.8	4.0	N/R	9.0	1 ft 0 in.	0 ft 6 in.
D-2D	1.5	5.5	4 in.	10.0	1 ft 3 in.	0 ft 9 in.
D-3D	1.0	5.2	4 in.	15.0	1 ft 0 in.	0 ft 6 in.
D-4D	0.5	3.2	N/R	6.25	1 ft 6 in.	0 ft 5 in.
D-5D	7.2	6.2	6 in.	6.4	1 ft 9 in.	0 ft 9 in.
D-6D	1.2	4.4	N/R	6.25	1 ft 3 in.	0 ft 9 in.
D-7D (upper)	6.4	9.4	12 in.	25.0	1 ft 6 in.	0 ft 10 in.
D-7D (lower)	6.4	5.1	4 in.	5.0	1 ft 6 in.	1 ft 2 in.

- All ditches are triangular "V ditch" with 1:1 side slopes.
* 6 in. freeboard added to required flow depth.
** See Plate 7.1 for location of rip-rap.
N/R - not required

Notes for D-7D Calculations

Land Slope	-	31.6 pct
Runoff Curve No.	-	82
Channel Length	-	1804 ft
Time of Conc.	-	0.1417 hrs
Watershed Area	-	7.68 ac
10 yr - 24 hr Event	-	2.25 in.
Peak Flow	-	6.43 cfs

Max Slope	-	25 pct	Max Slope	-	5 pct
Flow Depth	-	0.82 ft	Flow Depth	-	1.11 ft
Velocity	-	9.37 fps	Velocity	-	5.14 fps
Rip-Rap D_{50}	-	12 in.	Rip-Rap D_{50}	-	4 in.

Table 7.2-9 Summary of Culvert Sizes

Culvert	Flow (cfs)	Velocity (fps)	Rip-Rap Size	Slope (pct)	Diameter	Required Headwater**
C-1R	10.2	9.5	12 in.	8.0	1 ft 6 in.	2 ft 3 in.
C-2R	Not applicable outside the permit area					
C-3R	Not applicable outside the permit area					
C-1U	8.8	12.3	24 in.+	15.0	2 ft 6 in.	1 ft 6 in.
C-2U	1.5	8.4	9 in.	15.0	1 ft 3 in.	0 ft 9 in.
C-3U	7.9++	5.7	6 in.	5.0	1 ft 0 in.	3 ft 0 in.*
C-4U	6.1++	5.1	6 in.	5.1	0 ft 10 in.	3 ft 0 in.*
C-5U	6.1++	5.0	N/R	4.8	0 ft 10 in.	3 ft 0 in.*
C-6U	0.9	4.4	N/R	3.7	0 ft 10 in.	1 ft 0 in.
C-7U	10.3	9.7	12 in.	8.3	1 ft 0 in.	2 ft 3 in.
C-8U	8.8	13.0	24 in.+	15.0	1 ft 6 in.	2 ft 0 in.
C-10U	0.8	5.7	6 in.	5.0	1 ft 0 in.	0 ft 6 in.
C-1D	1.5	10.9	18 in.	20.0	1 ft 3 in.	0 ft 9 in.
C-2D	0.5	9.6	12 in.	12.0	1 ft 6 in.	1 ft 3 in.
C-3D	1.2	5.2	6 in.	4.2	1 ft 6 in.	0 ft 9 in.
C-4D	0.5	9.6	12 in.	8.0	1 ft 6 in.	0 ft 3 in.
C-5D	0.2	3.5	N/R	6.5	1 ft 0 in.	0 ft 3 in.
60 in. CMP	231.5	13.8	24 in.	3.4	5 ft 0 in.	8 ft 6 in.

* When capacity of culvert is exceeded flow continues down ditch to next culvert.
** From invert elevation.
*** All culverts and ditches meet and or exceed min requirements.
\+ Replaced with 15 in. flexible culvert.
++ A two ft high check dam of rip-rap is used to develop the headwater necessary for maximum flow through the culvert, excess flow continues down the ditch.
N/R - not required

The channel is included in drainage area AD-1 (Plate 7-5). The maximum flow calculated for this channel is shown on Table 7.2-8 as 1.5 cfs (Ditch D-2D). Based on this flow, the new culvert designated C-1D, is sized matching the criteria for existing culvert C-1D, shown on Table 7.2-9. Calculations for this ditch are shown in Appendix 7-F under Run-off Ditch Sizing. The headwater depth above the top of the proposed culvert inlet is 1 ft more than adequate to carry the expected flow.

The out-slope of the pad is protected by 6 in. M.D. rock along the area where drainage will occur. The only drainage that will reach the toe of the pad is that from the upper pad to the lower; the majority of the drainage above will be conveyed through the culvert. The 6 in. rock is more than adequate, since the approved plan calls for natural 6 in. rip-rap in the post-mining channel that will carry not only the disturbed drainage AD-1, but the undisturbed drainage from AU-3 as well.

The ditch in this area has been measured, and typical section is shown on Plate 7-8 as cross-section D-D. The ditch profile is also shown on this plate as Profile "F". Plate 7-8a is a typical section of the proposed channel restoration in the area of the portal pad and culvert, after their removal and upon final reclamation.

DRAINAGE CONTROL SYSTEM BEAR CANYON NO. 1 MINE

LOWER SEAM PORTAL AREA

a. Upper Pad. Drainage from the disturbed area on the upper pad from the sub-station to culvert C-1D, will continue to flow into culvert C-1D, as approved; the outlet location of the flexible culvert was moved approx 20 ft to the west of the original location to direct runoff onto the rock ledge above the Lower Seam (Hiawatha) portals; water then flows over the rock ledge to the portal pad below;

b. Portal Pad. The northeast corner of the bin is bermed a min of 30 in. high over to the highwall. Runoff water from the upper pad flows southward around the bin and into a collection box at the edge of the portal pad area; the pad is sloped to flow to the box;

c. Flexible Culvert. The collection box at the portal pad discharges into a 15 in. flexible culvert, the culvert drops onto the next lower pad areas (Conveyor Support Pads);

d. Conveyor Support Pads. This pad area is divided into two sections and is sloped to drain to the flexible culvert; the flexible culvert is opened (or replaced with 1/2 round culvert) for a distance of at least 8 ft to allow surface water to enter the culvert at both sections; the entrance to

the culvert is protected by a trash rack and grouted as shown on the attached typical drawing; water then flows down the flexible culvert to the Coal Processing Pad area.

e. Coal Processing Pad. This pad is also sloped to drain to the culvert; another 8 ft opening was left in the culvert for the surface runoff; water is then conveyed down to the lower (Lump Coal) pad area;

f. Lump Coal Pad. The flexible culvert parallels the conveyor down to the lump coal bin, pass beneath the bin supports, and empties into a catch basin/energy dissipater just south of the bin; runoff then flows south into ditch D-7D and passes into Sediment Pond "A."

Drainage is shown on Plate 7-1. Detailed drawings of the various drainage controls are shown in the attached typical details. Sizing calculations are summarized on the following sheet: "Lower Seam Portal Area - Drainage Sizing Calculations."

GENERAL

Upon inspection of the Mine permit area it was found that the areas described below exist in the undisturbed zones and that surface runoff going through these areas does not pass through the sediment pond treatment facilities. In order to provide adequate treatment for these areas, straw bale dikes and/or silt fences will be installed as indicated on Plate 7-1. The sediment control structures will be positioned so that surface runoff passes through them before entering Bear Creak. Treatment facilities will be maintained for each area until approved and determined that adequate revegetation cancels the need for treatment. These areas are designated as "Best Technology Currently Available" or BTCA Areas. Drainage from these areas will be monitored as possible to show compliance with the state and federal limitations.

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Total Storage Volume	:	84,158 ft^3
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** See supplement on next page, p 7-62A.

Design Criteria Pond "B"*

Drainage Area	:	1.82 acres**
SCS Curve #82		
3-yr Sediment Storage	:	2,156 ft^3
10-yr 24-hr Runoff Storage	:	8,182 ft^3
Total Storage Volume	:	10,338 ft^3
Use Existing Spillway	:	4 ft Wide Broad Crested Weir
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Total (Pond "A")	14.178		1.090 ac ft

3 yr Sediment Volume = 14.178 x 0.0066 ac ft/ac = 0.940 ac ft

Total required volume for Pond "A" = 2.030 ac ft

Area "B" was also re-planimetered from Plate 7-5. Following are the results for this area and Pond "B":

Area	Acreage	Runoff CN	Runoff Volume
B	1.895	82	0.130 ac ft

3 yr Sediment Volume = 14.178 x 0.0066 ac ft/ac = 0.940 ac ft

Total required volume for Pond "A" = 2.030 ac ft

Based on the above numbers, the total disturbed area for Bear Canyon Mine site is 16.073 acres.

Sediment Pond "A". This pond was cleaned and resurveyed on 12 Oct 1990. The existing pond volume was found to be 2.04 acre ft at design overflow, as shown on Plate 7-2A. This indicates that the pond is presently large enough to absorb the additional runoff from the removal of culvert C-9U, as proposed.

Sediment Pond "A"
Stage - Volume Calculations

Elev	Area ft^2	Depth ft	Volume ac ft	Remarks
90	3,740			bottom
		1	0.111	
91	5,960			
		1	0.156	
92	7,600			
		2	0.392	
94	9,480			
		0.9	0.206	
94.9	10,440			decant
		1.1	0.277	
96	11,480			
		1.9	0.543	
97.9	13,440			
		1.1	0.350	
99	14,280			Max Overflow depth
		TOTAL	2.035 ac ft	

Note: All information taken from Plate 7-2A

Additional Protection 1990

As additional, interim protection, a second silt fence will be installed 15 to 25 ft above the first at the inlet to culvert C-8U. This will provide additional protection from coal fines until the culvert is removed in 1991, and the drainage redirected to the sediment pond.

Culvert C-9U Removal 1990

In the fall of 1990 (late Oct - early Nov) culvert C-9U will be removed, and drainage from ditch D-10U will be re-directed into sediment pond "A" via existing ditch D-5D. Ditch D-10U will be cleaned and enlarged as necessary and extended north to intercept ditch D-4D. Ditch D-10U will be re-designated ditch D-7D.

An additional 5 acres of undisturbed drainage will also be intercepted by ditch D-7D, which will flow to pond "A". The drainage is shown on Plate 7-5.

The pond sizing justification is shown in "Additional Notes on Sediment Ponds and Drainage Areas", supplement to Table 7.2-7. Changes in ditches and culverts are shown on Tables 7.2-8 and 7.2-9 respectively. All drainage changes have been updated on Plate 7-1.

Table 7.2-8 Summary of Ditch Sizes

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1R	10.2	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-2R	12.1	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-3R	10.4	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-1U	1.5	3.5	N/R	4.0	1 ft 3 in.	0 ft 9 in.
D-2U	1.5	3.9	N/R	5.0	1 ft 3 in.	0 ft 9 in.
D-3U	6.1	5.5	4 in.	5.0	1 ft 9 in.	1 ft 3 in.
D-4U	11.8	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-5U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-6U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-7U	10.3	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-8U	2.3	4.4	N/R	6.25	- down road-	
D-9U	1.8	5.0	4 in.	8.3	1 ft 3 in.	0 ft 9 in.
D-10U		-	Replaced with D-7D			
D-11U	7.6	7.9	9 in.	14.0	1 ft 6 in.	1 ft 0 in.
D-12U	4.5	4.7	N/R	5.0	1 ft 6 in.	1 ft 3 in.

- Table continued on following page.

Table 7.2-8 Summary of Ditch Sizes (cont)

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1D	0.8	4.0	N/R	9.0	1 ft 0 in.	0 ft 6 in.
D-2D	1.5	5.5	4 in.	10.0	1 ft 3 in.	0 ft 9 in.
D-3D	1.0	5.2	4 in.	15.0	1 ft 0 in.	0 ft 6 in.
D-4D	0.5	3.2	N/R	6.25	1 ft 6 in.	0 ft 5 in.
D-5D	7.2	6.2	6 in.	6.4	1 ft 9 in.	0 ft 9 in.
D-6D	1.2	4.4	N/R	6.25	1 ft 3 in.	0 ft 9 in.
D-7D (upper)	6.4	9.4	12 in.	25.0	1 ft 6 in.	0 ft 10 in.
D-7D (lower)	6.4	5.1	4 in.	5.0	1 ft 6 in.	1 ft 2 in.

\- All ditches are triangular "V ditch" with 1:1 side slopes.
* 6 in. freeboard added to required flow depth.
** See Plate 7.1 for location of rip-rap.
N/R - not required

Notes for D-7D Calculations

Land Slope	-	31.6 pct
Runoff Curve No.	-	82
Channel Length	-	1804 ft
Time of Conc.	-	0.1417 hrs
Watershed Area	-	7.68 ac
10 yr - 24 hr Event	-	2.25 in.
Peak Flow	-	6.43 cfs

Max Slope	-	25 pct	Max Slope	-	5 pct
Flow Depth	-	0.82 ft	Flow Depth	-	1.11 ft
Velocity	-	9.37 fps	Velocity	-	5.14 fps
Rip-Rap D_{50}	-	12 in.	Rip-Rap D_{50}	-	4 in.

Table 7.2-9 Summary of Culvert Sizes

Culvert	Flow (cfs)	Velocity (fps)	Rip-Rap Size	Slope (pct)	Diameter	Required Headwater**
C-1R	10.2	9.5	12 in.	8.0	1 ft 6 in.	2 ft 3 in.
C-2R	Not applicable outside the permit area					
C-3R	Not applicable outside the permit area					
C-1U	8.8	12.3	24 in.+	15.0	2 ft 6 in.	1 ft 6 in.
C-2U	1.5	8.4	9 in.	15.0	1 ft 3 in.	0 ft 9 in.
C-3U	7.9++	5.7	6 in.	5.0	1 ft 0 in.	3 ft 0 in.*
C-4U	6.1++	5.1	6 in.	5.1	0 ft 10 in.	3 ft 0 in.*
C-5U	6.1++	5.0	N/R	4.8	0 ft 10 in.	3 ft 0 in.*
C-6U	0.9	4.4	N/R	3.7	0 ft 10 in.	1 ft 0 in.
C-7U	10.3	9.7	12 in.	8.3	1 ft 0 in.	2 ft 3 in.
C-8U	8.8	13.0	24 in.+	15.0	1 ft 6 in.	2 ft 0 in.
C-10U	0.8	5.7	6 in.	5.0	1 ft 0 in.	0 ft 6 in.
C-1D	1.5	10.9	18 in.	20.0	1 ft 3 in.	0 ft 9 in.
C-2D	0.5	9.6	12 in.	12.0	1 ft 6 in.	1 ft 3 in.
C-3D	1.2	5.2	6 in.	4.2	1 ft 6 in.	0 ft 9 in.
C-4D	0.5	9.6	12 in.	8.0	1 ft 6 in.	0 ft 3 in.
C-5D	0.2	3.5	N/R	6.5	1 ft 0 in.	0 ft 3 in.
60 in. CMP	231.5	13.8	24 in.	3.4	5 ft 0 in.	8 ft 6 in.

* When capacity of culvert is exceeded flow continues down ditch to next culvert.
** From invert elevation.
*** All culverts and ditches meet and or exceed min requirements.
\+ Replaced with 15 in. flexible culvert.
++ A two ft high check dam of rip-rap is used to develop the headwater necessary for maximum flow through the culvert, excess flow continues down the ditch.
N/R - not required

The channel is included in drainage area AD-1 (Plate 7-5). The maximum flow calculated for this channel is shown on Table 7.2-8 as 1.5 cfs (Ditch D-2D). Based on this flow, the new culvert designated C-1D, is sized matching the criteria for existing culvert C-1D, shown on Table 7.2-9. Calculations for this ditch are shown in Appendix 7-F under Run-off Ditch Sizing. The headwater depth above the top of the proposed culvert inlet is 1 ft more than adequate to carry the expected flow.

The out-slope of the pad is protected by 6 in. M.D. rock along the area where drainage will occur. The only drainage that will reach the toe of the pad is that from the upper pad to the lower; the majority of the drainage above will be conveyed through the culvert. The 6 in. rock is more than adequate, since the approved plan calls for natural 6 in. rip-rap in the post-mining channel that will carry not only the disturbed drainage AD-1, but the undisturbed drainage from AU-3 as well.

The ditch in this area has been measured, and typical section is shown on Plate 7-8 as cross-section D-D. The ditch profile is also shown on this plate as Profile "F". Plate 7-8a is a typical section of the proposed channel restoration in the area of the portal pad and culvert, after their removal and upon final reclamation.

DRAINAGE CONTROL SYSTEM BEAR CANYON NO. 1 MINE

LOWER SEAM PORTAL AREA

a. Upper Pad. Drainage from the disturbed area on the upper pad from the sub-station to culvert C-1D, will continue to flow into culvert C-1D, as approved; the outlet location of the flexible culvert was moved approx 20 ft to the west of the original location to direct runoff onto the rock ledge above the Lower Seam (Hiawatha) portals; water then flows over the rock ledge to the portal pad below;

b. Portal Pad. The northeast corner of the bin is bermed a min of 30 in. high over to the highwall. Runoff water from the upper pad flows southward around the bin and into a collection box at the edge of the portal pad area; the pad is sloped to flow to the box;

c. Flexible Culvert. The collection box at the portal pad discharges into a 15 in. flexible culvert, the culvert drops onto the next lower pad areas (Conveyor Support Pads);

d. Conveyor Support Pads. This pad area is divided into two sections and is sloped to drain to the flexible culvert; the flexible culvert is opened (or replaced with 1/2 round culvert) for a distance of at least 8 ft to allow surface water to enter the culvert at both sections; the entrance to

the culvert is protected by a trash rack and grouted as shown on the attached typical drawing; water then flows down the flexible culvert to the Coal Processing Pad area.

e. Coal Processing Pad. This pad is also sloped to drain to the culvert; another 8 ft opening was left in the culvert for the surface runoff; water is then conveyed down to the lower (Lump Coal) pad area;

f. Lump Coal Pad. The flexible culvert parallels the conveyor down to the lump coal bin, pass beneath the bin supports, and empties into a catch basin/energy dissipater just south of the bin; runoff then flows south into ditch D-7D and passes into Sediment Pond "A."

Drainage is shown on Plate 7-1. Detailed drawings of the various drainage controls are shown in the attached typical details. Sizing calculations are summarized on the following sheet: "Lower Seam Portal Area - Drainage Sizing Calculations."

GENERAL

Upon inspection of the Mine permit area it was found that the areas described below exist in the undisturbed zones and that surface runoff going through these areas does not pass through the sediment pond treatment facilities. In order to provide adequate treatment for these areas, straw bale dikes and/or silt fences will be installed as indicated on Plate 7-1. The sediment control structures will be positioned so that surface runoff passes through them before entering Bear Creak. Treatment facilities will be maintained for each area until approved and determined that adequate revegetation cancels the need for treatment. These areas are designated as "Best Technology Currently Available" or BTCA Areas. Drainage from these areas will be monitored as possible to show compliance with the state and federal limitations.

OUTSLOPE BANK OF UPPER STORAGE PAD.

During construction of the Upper Storage Pad (Plate 7-1) some fill was apparently overcast down the face of the slope below. The area covers approximately 800 sq ft. A silt fence will be installed and maintained at the inlet to culvert C-8U. In 1991, culvert C-8U will be eliminated, and the drainage will go to Sediment pond "A". The runoff volume for this area is calculated to be 0.0013 acre ft.

AREA NEAR PORTAL NO.1

This area lies between the upper lamphouse/mine portal bermed pad and the portal access road, extending from the road junction on the south to just north of the upper office trailer at the beginning of the Cattle Co. Road. The area is approx. 0.28 acres. A silt fence is installed at the north end of the area where runoff flows down hill from the Cattle Co. Road area. Runoff from the area passes through a silt fence near the inlet to culvert C-6U. Runoff volume from this area is calculated to be 0.019 acre ft.

BALL PARK TOPSOIL PILE

The ball park covers 1.2 acres. Straw bale dikes and/or silt fences will be installed on the south east side, in line with the natural flow to treat runoff before it enters Bear creak. Runoff volume from this area is calculated to be 0.082 acre ft.

TOPSOIL STOCKPILE

The main topsoil storage pile covers approx 0.1 acres. The area is encircled by an 18 in. berm and is protected by established vegetation. Runoff volume from this area is calculated to be 0.0068 acre ft.

Note: Runoff volumes are based on the 10 yr 24 hr event of 2.25 in. and runoff CN of 82.

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PROFILE

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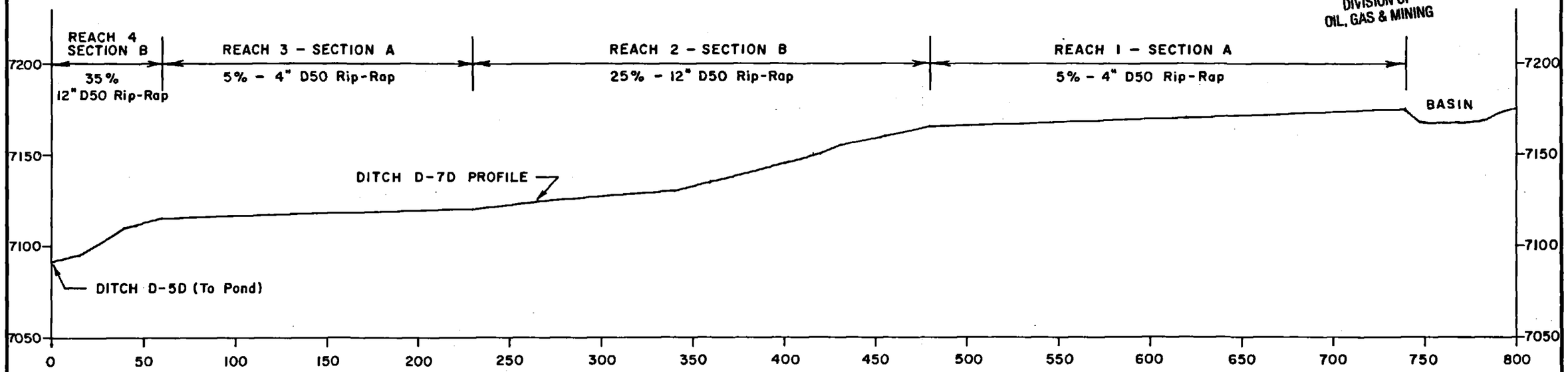

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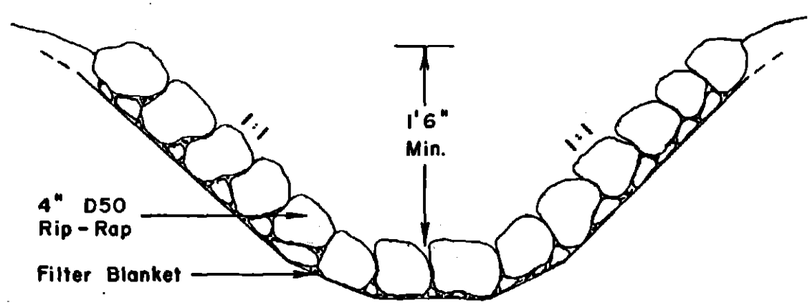

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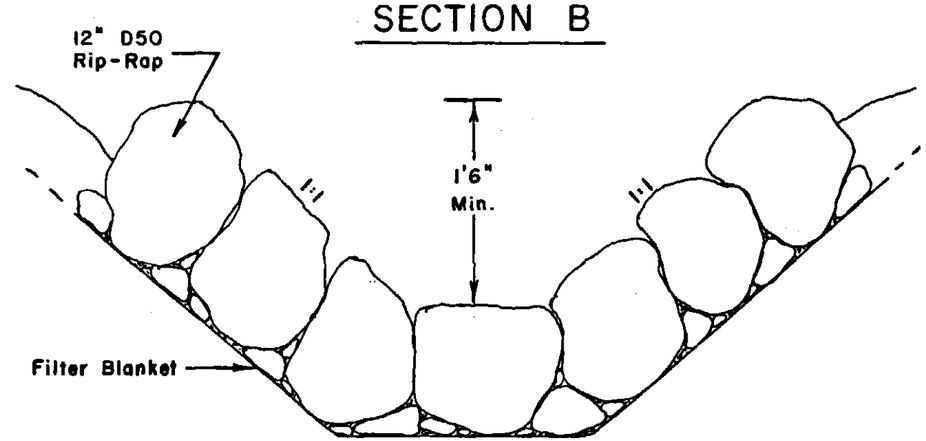

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Shape May Vary.

CO-OP MINING CO.

BEAR CANYON MINE

DITCH D-7D

PLATE 7-1A

PROFILE

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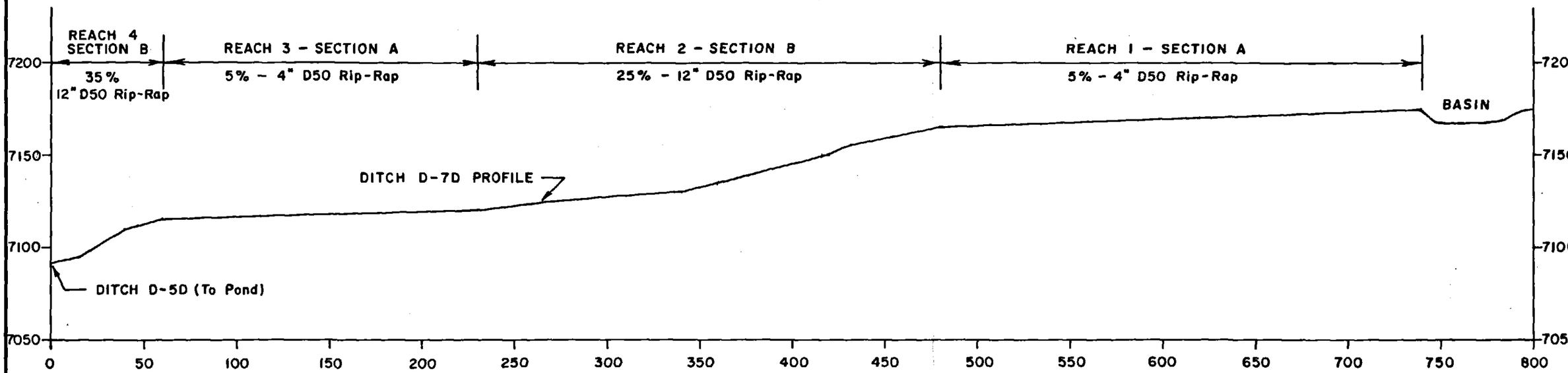

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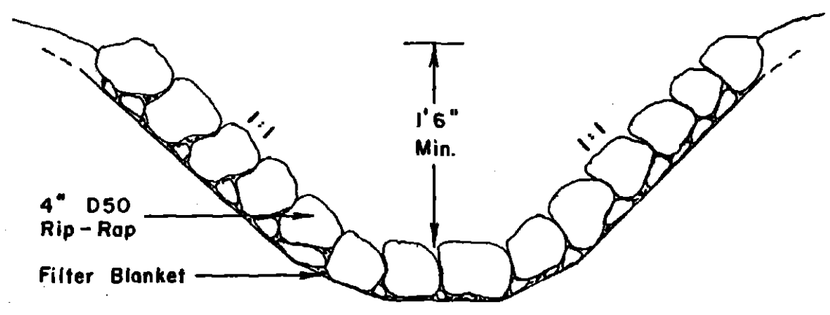

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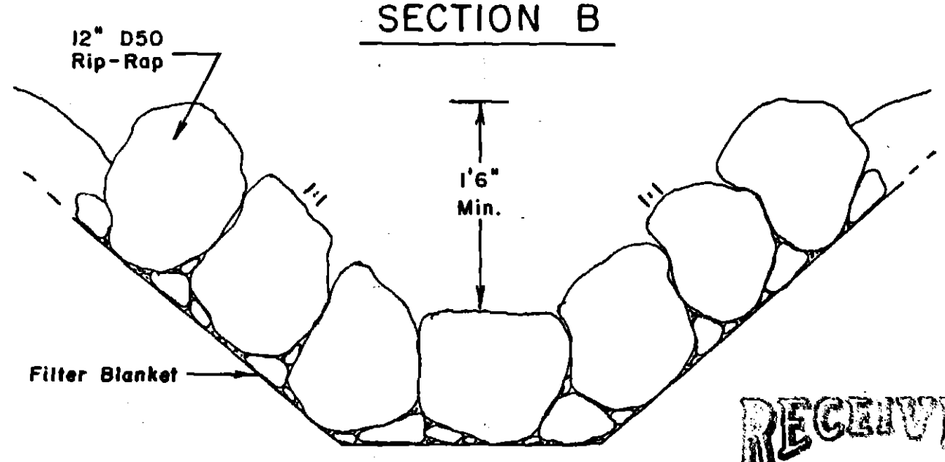

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DITCH D-7D

PLATE 7-1A

PROFILE

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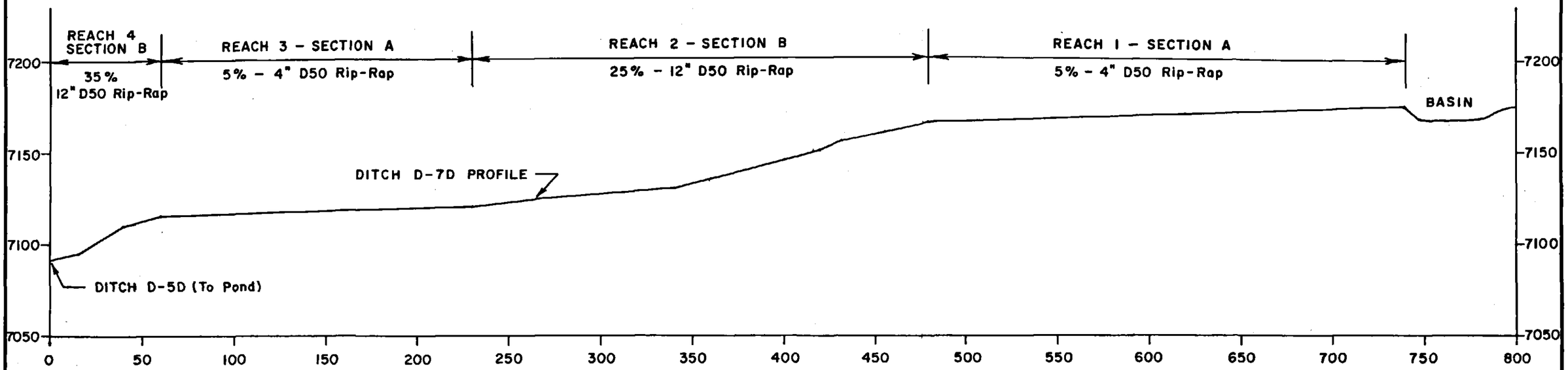

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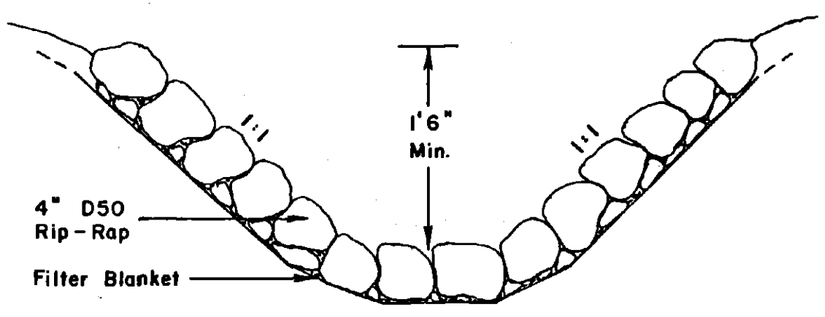

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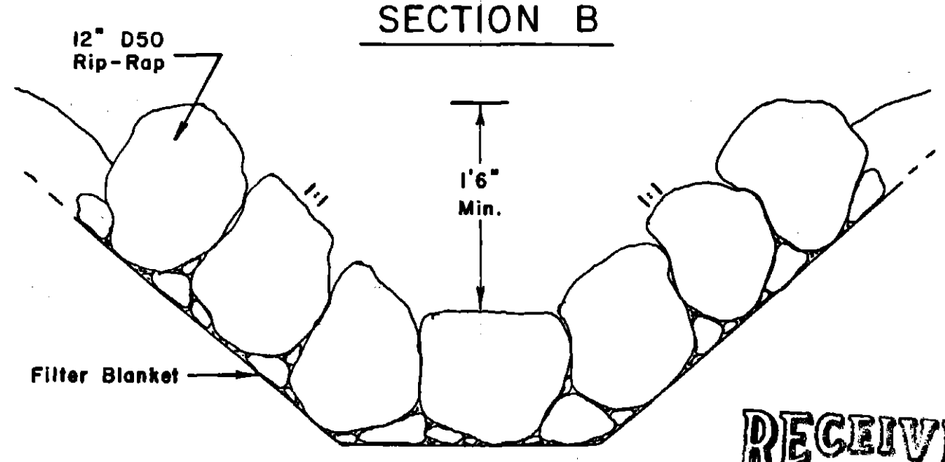

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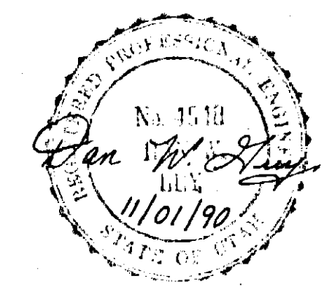

CO-OP MINING CO.

BEAR CANYON MINE

DITCH D-7D

PLATE 7-1A

PROFILE

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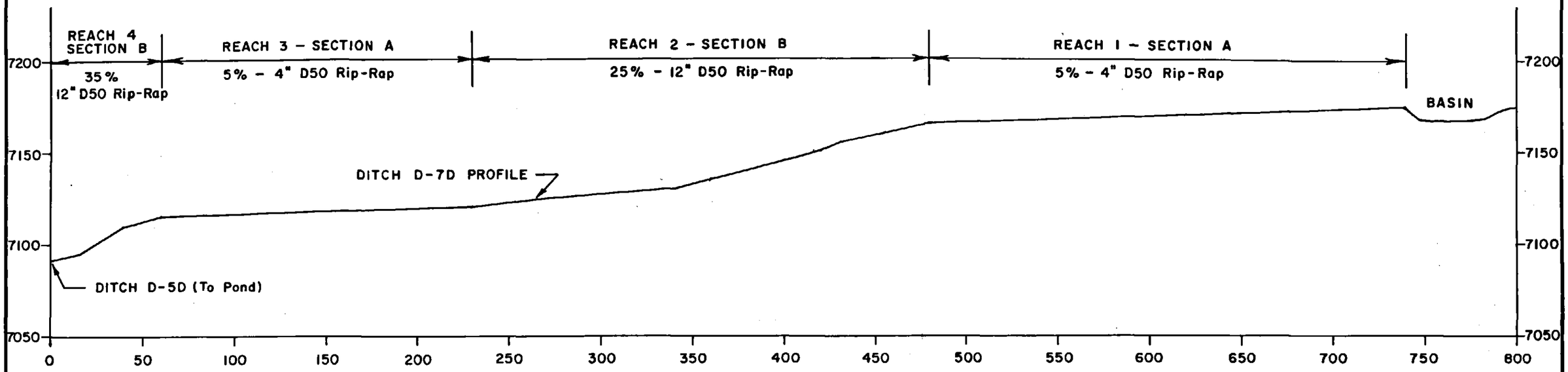

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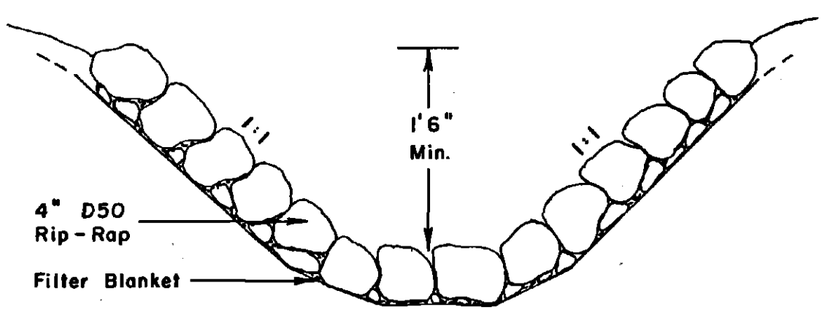

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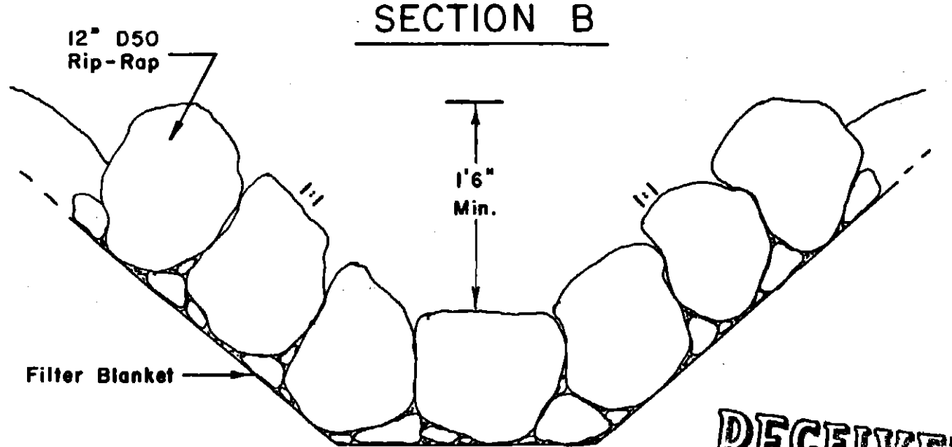

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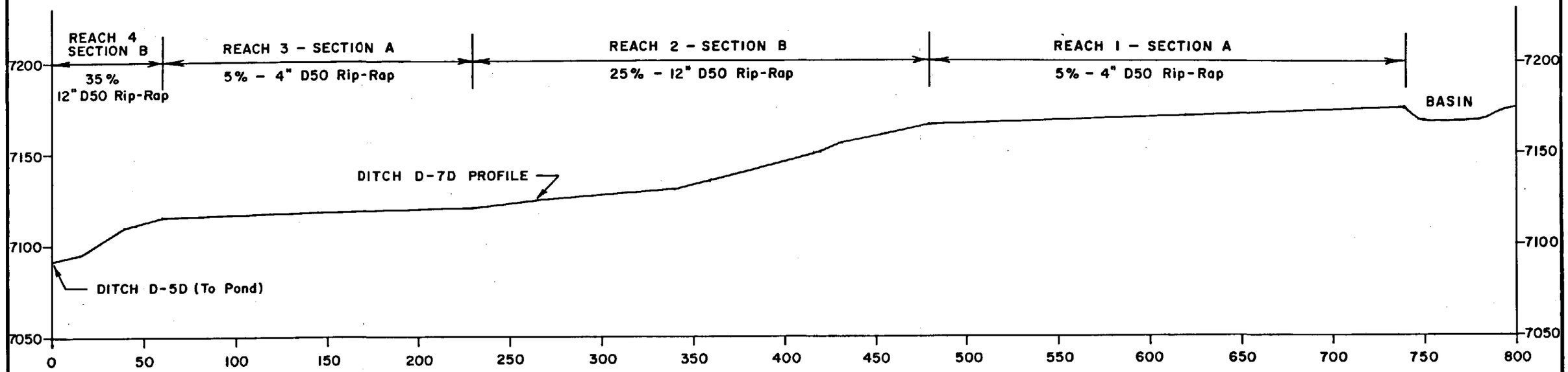
BEAR CANYON MINE

DITCH D-7D

PLATE 7-1A

PROFILE

SCALE : 1" = 50'



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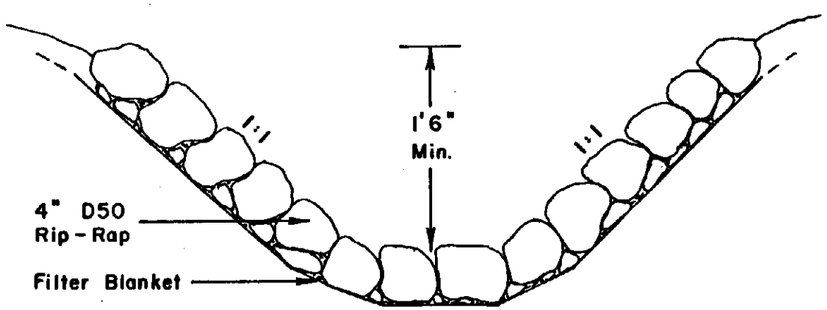

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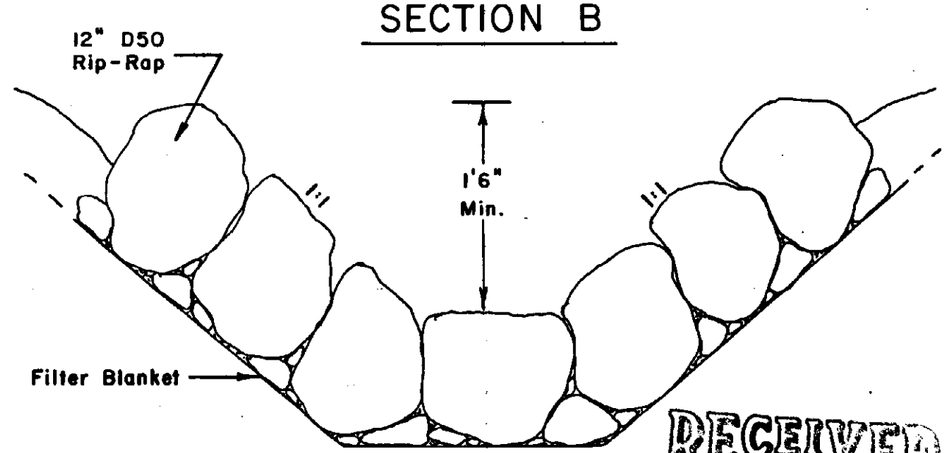

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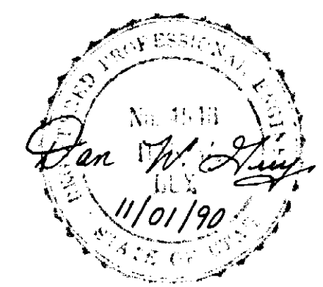

CO-OP MINING CO.

BEAR CANYON MINE

DITCH D-7D

PLATE 7-1A

PROFILE

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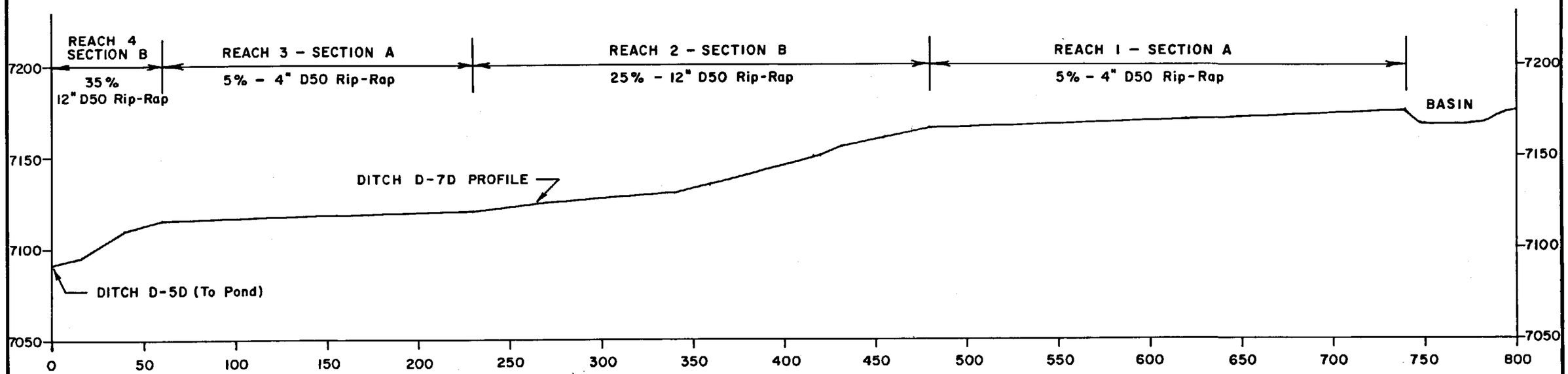

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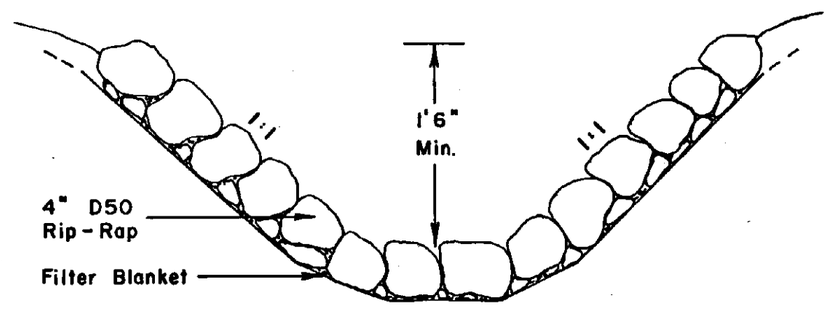

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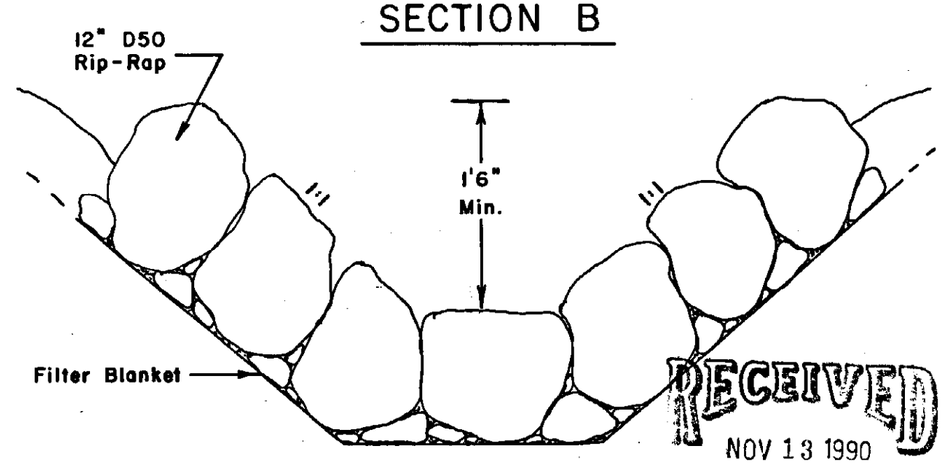

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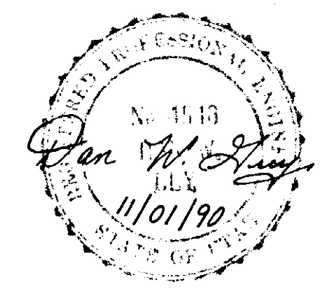
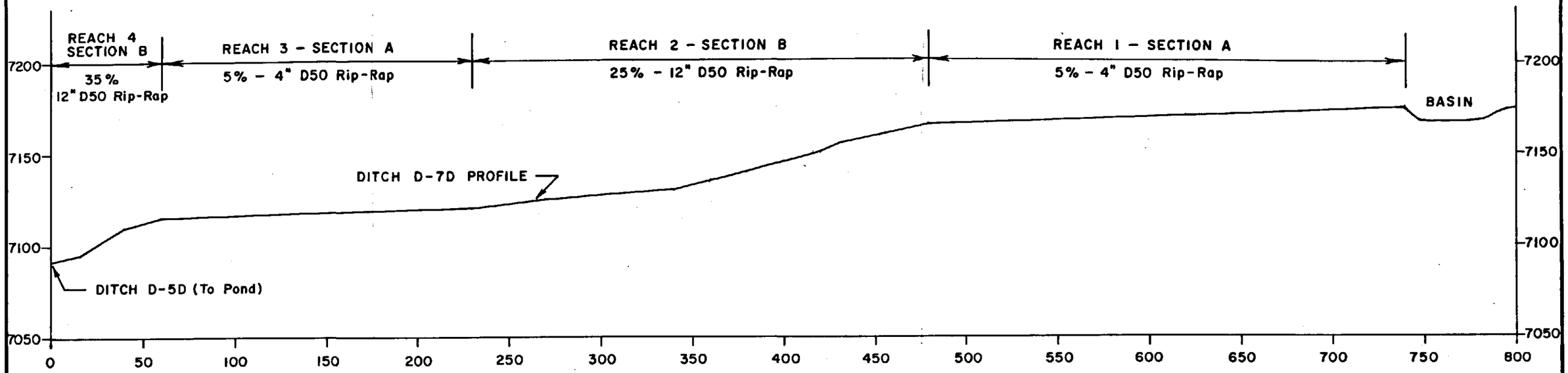


CO-OP MINING CO.
BEAR CANYON MINE
DITCH D-7D
PLATE 7-1A

PROFILE

SCALE : 1" = 50'



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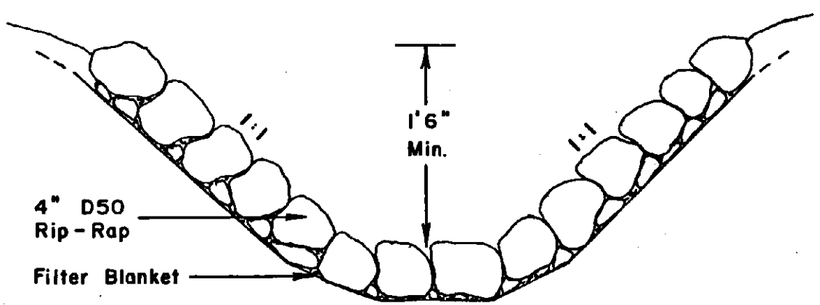

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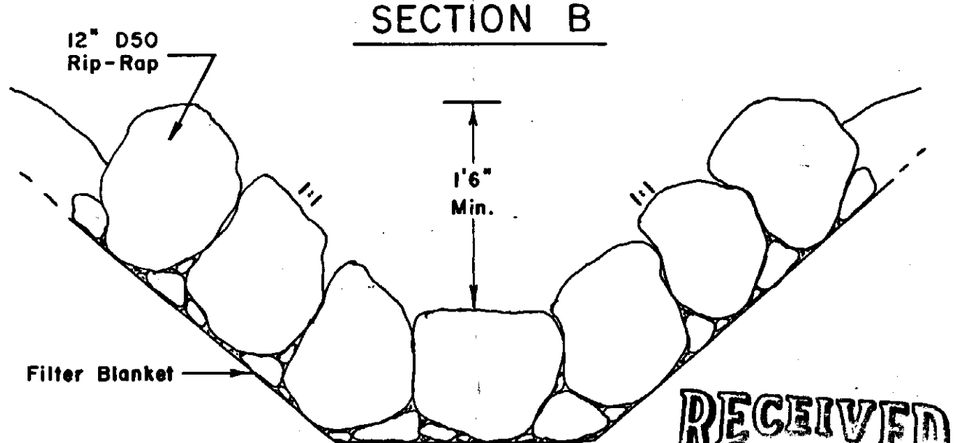

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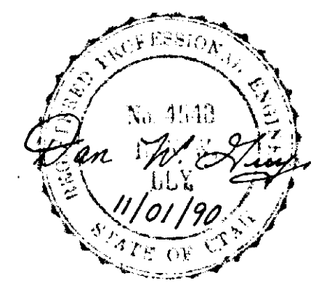

CO-OP MINING CO.

BEAR CANYON MINE

DITCH D-7D

PLATE 7-1A

PROFILE

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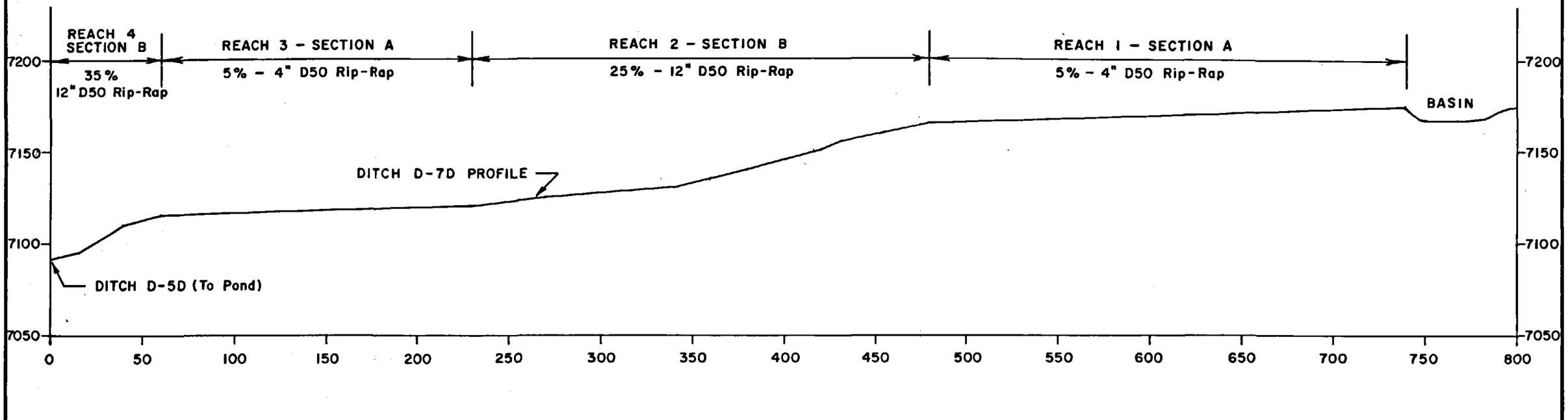

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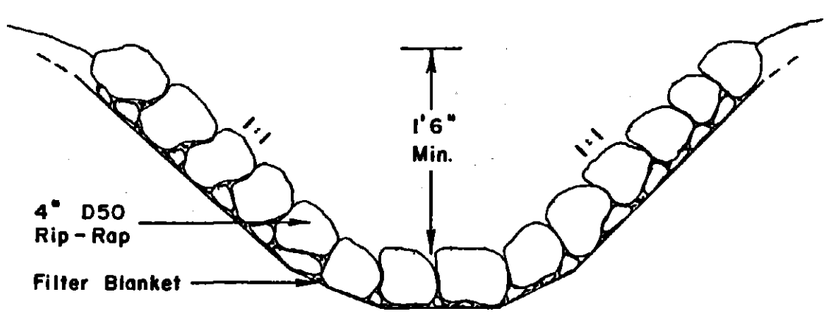

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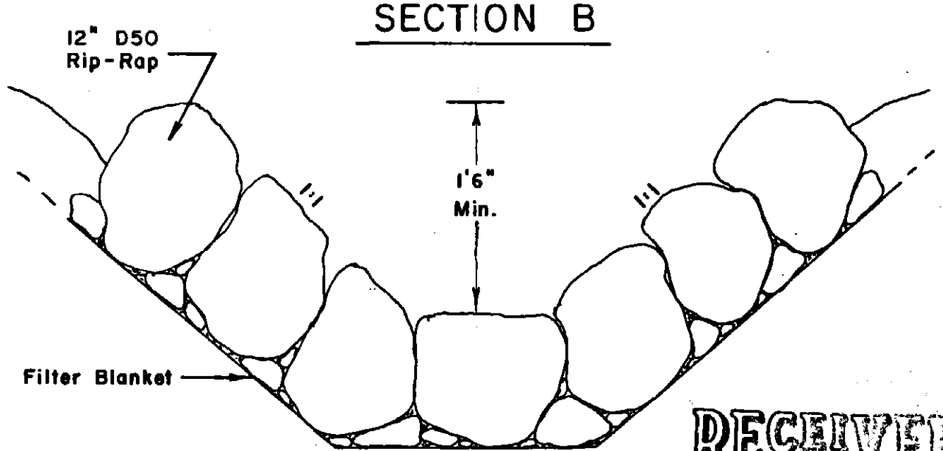

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BEAR CANYON MINE

DITCH D-7D

PLATE 7-1A

PROFILE

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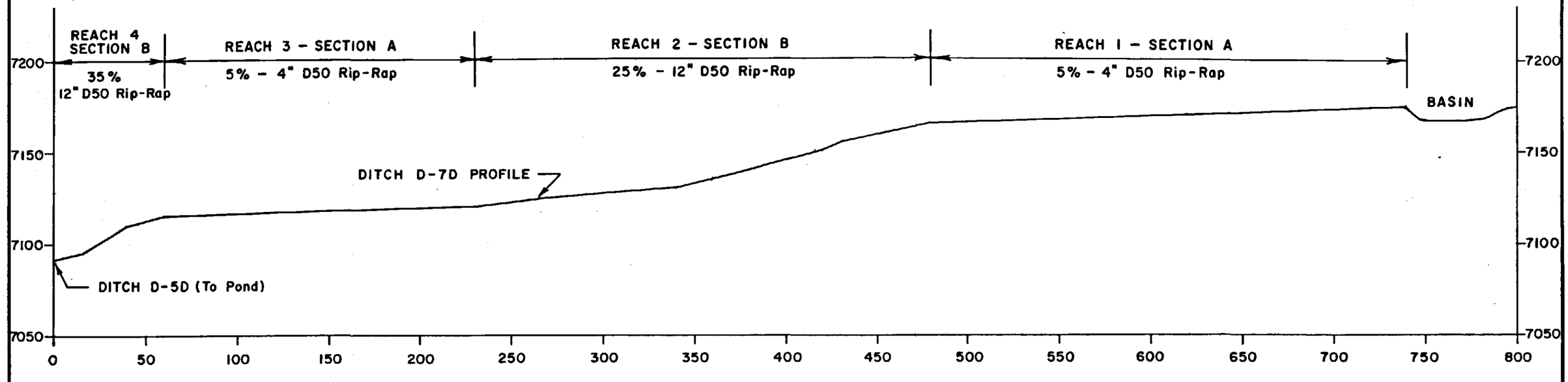

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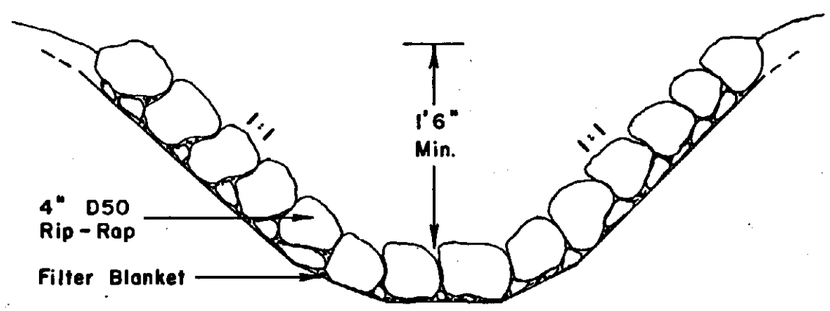

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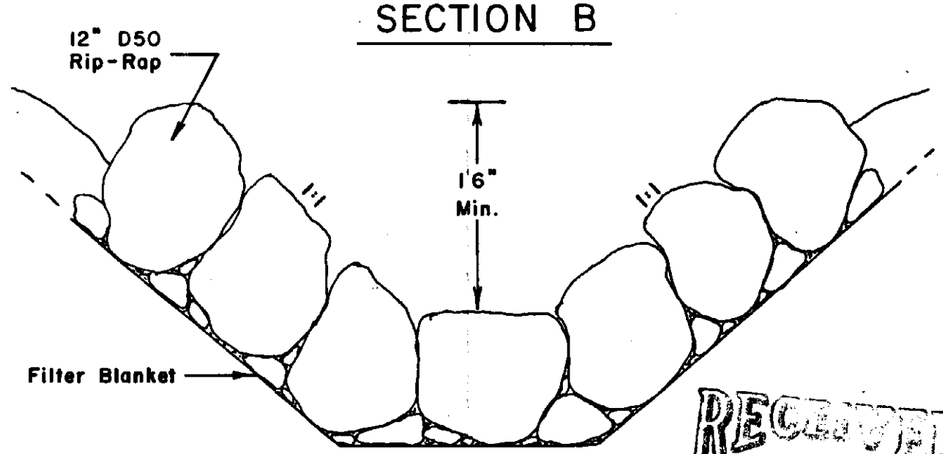

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Shape May Vary.

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DITCH D-7D

PLATE 7-1A

PROFILE

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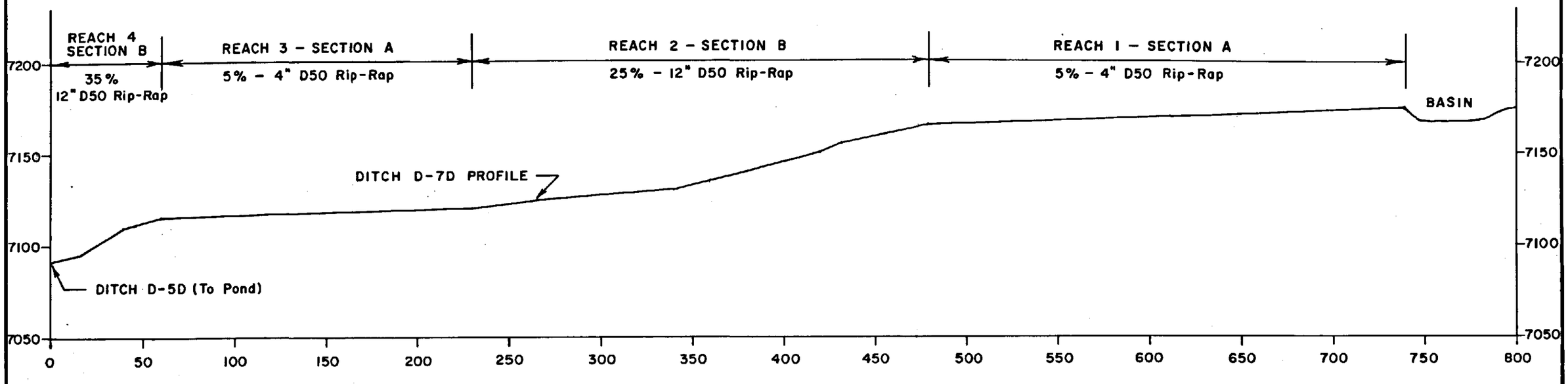

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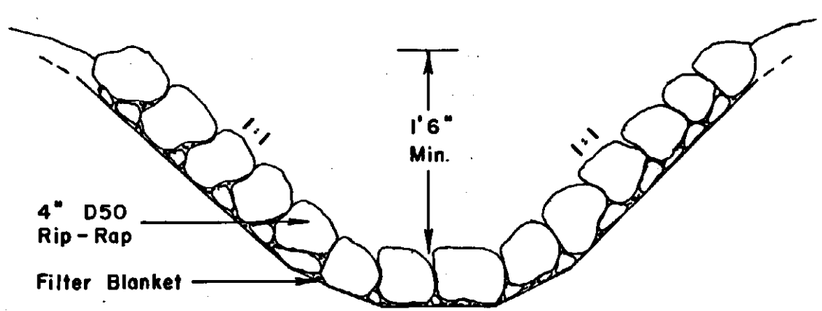

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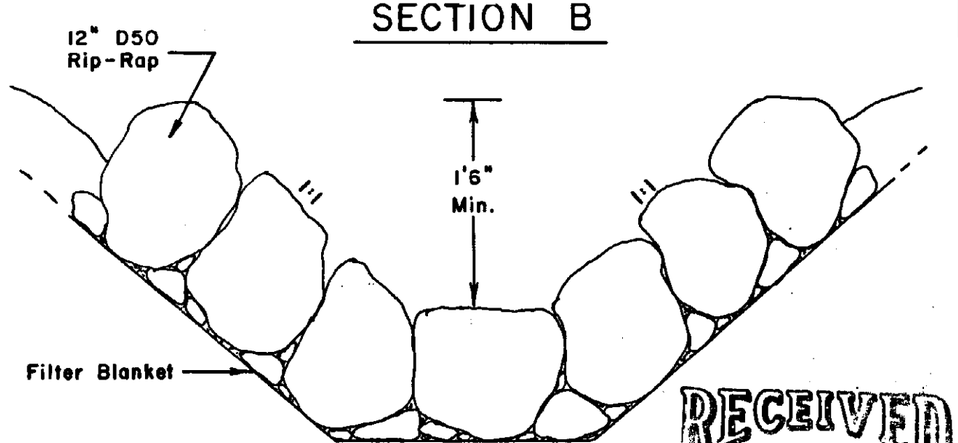

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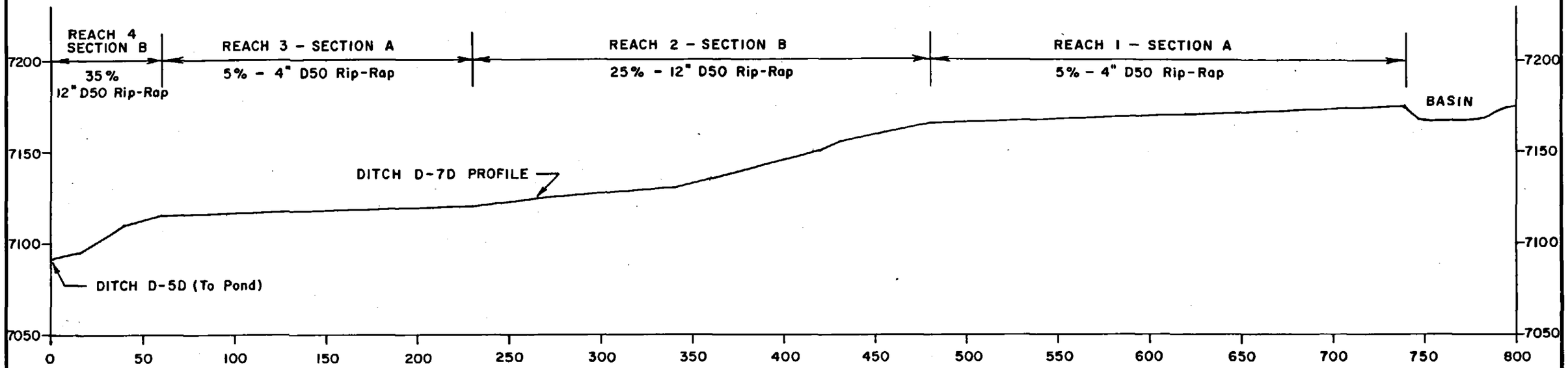
BEAR CANYON MINE

DITCH D-7D

PLATE 7-1A

PROFILE

SCALE : 1" = 50'



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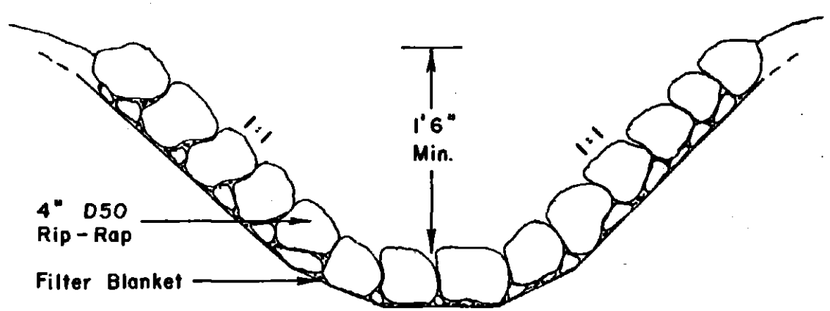

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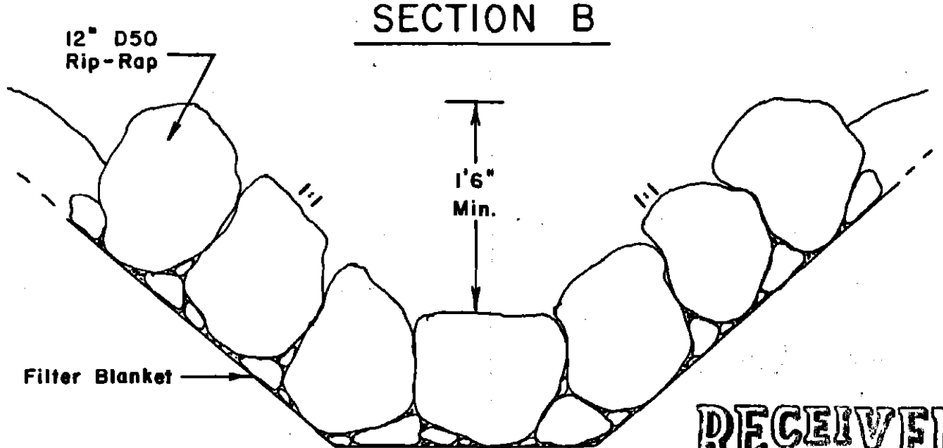

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DITCH D-7D

PLATE 7-1A

PROFILE

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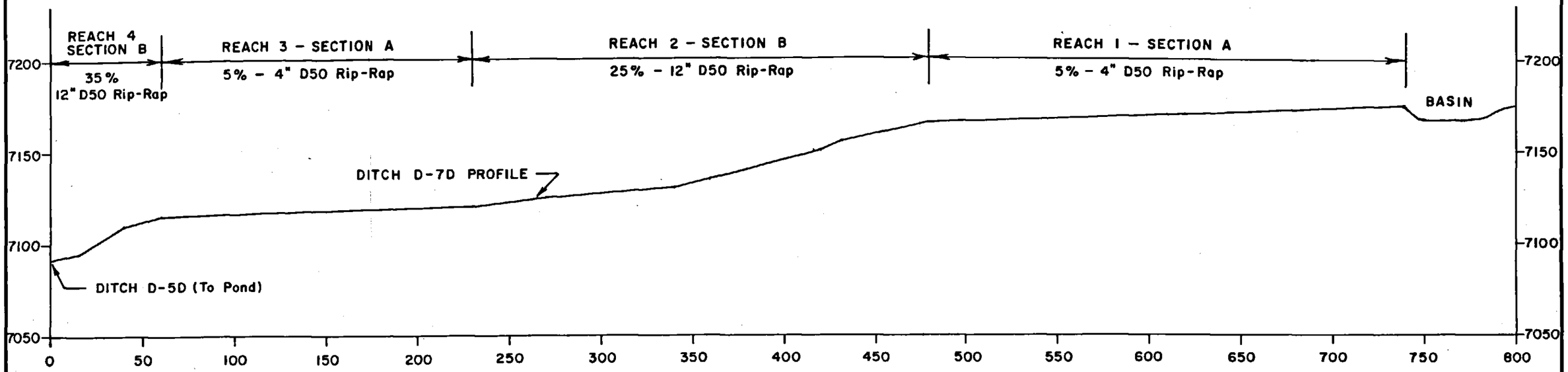
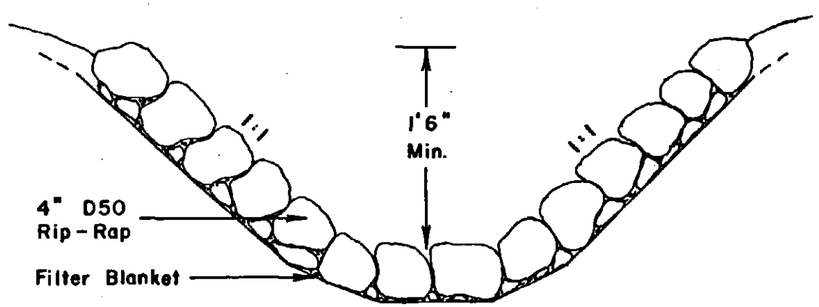


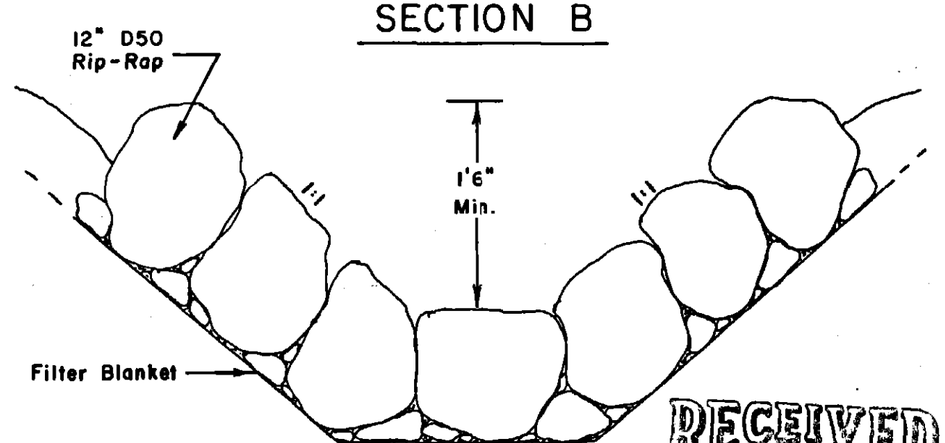
SECTION A



SCALE : 1" = 1'

Shape May Vary.

SECTION B



SCALE : 1" = 1'

Shape May Vary.

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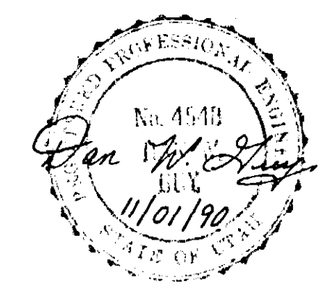


CO-OP MINING CO.

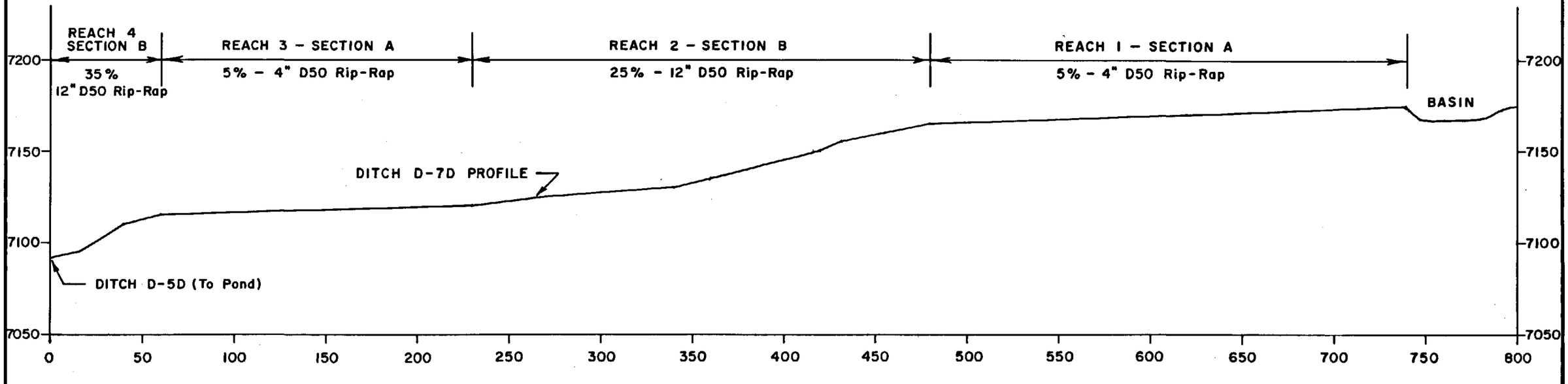
BEAR CANYON MINE

DITCH D-7D

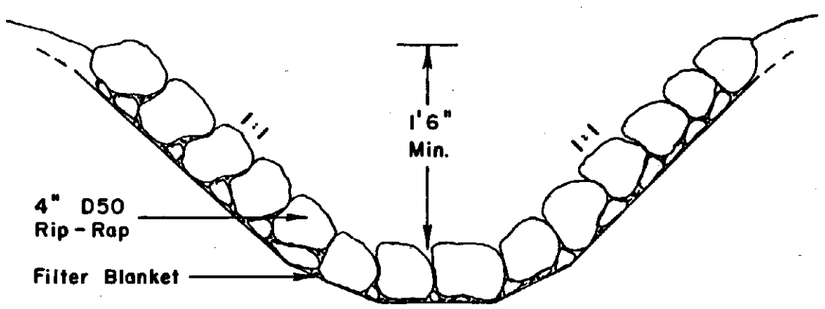
PLATE 7-1A

PROFILE

SCALE : 1" = 50'



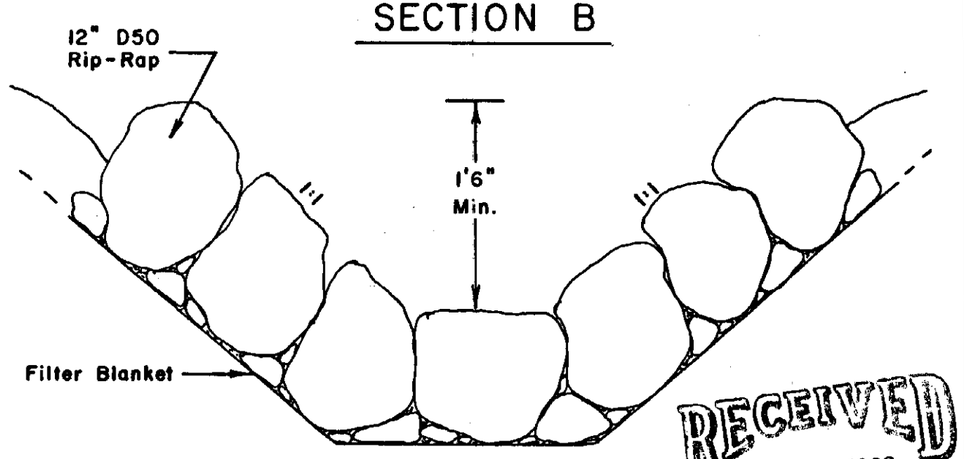
SECTION A



SCALE : 1" = 1'

Shape May Vary.

SECTION B



SCALE : 1" = 1'

Shape May Vary.

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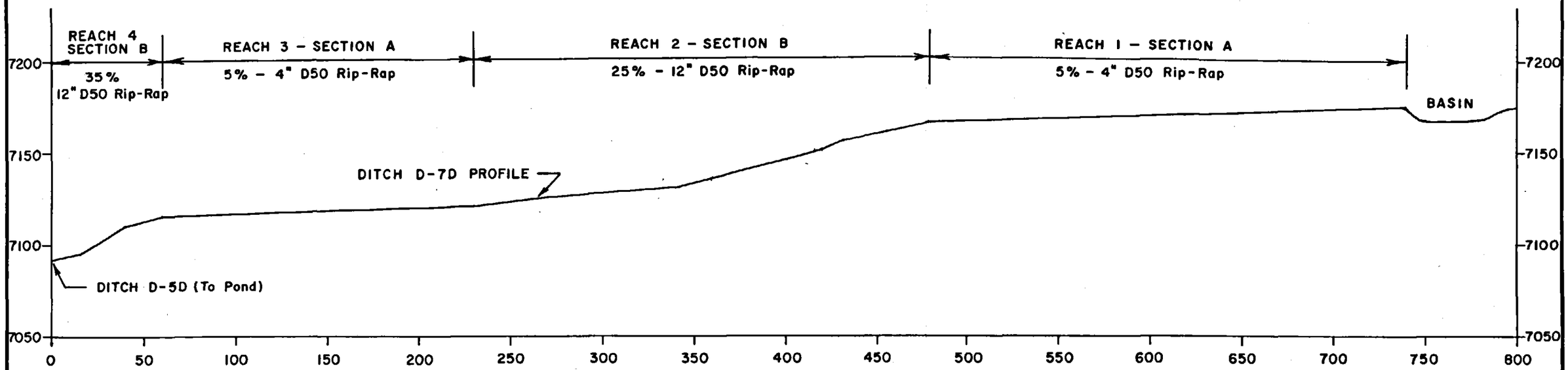
BEAR CANYON MINE

DITCH D-7D

PLATE 7-1A

PROFILE

SCALE : 1" = 50'



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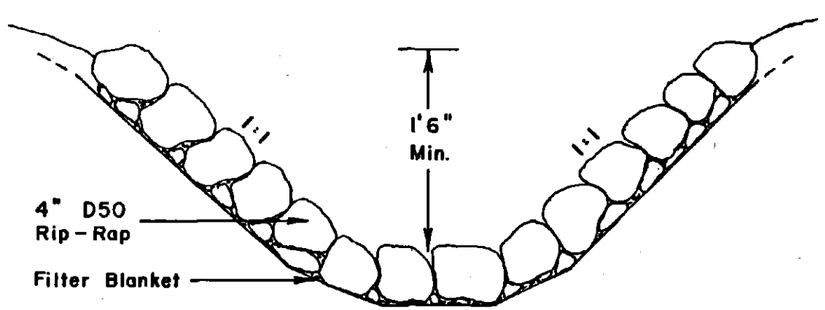
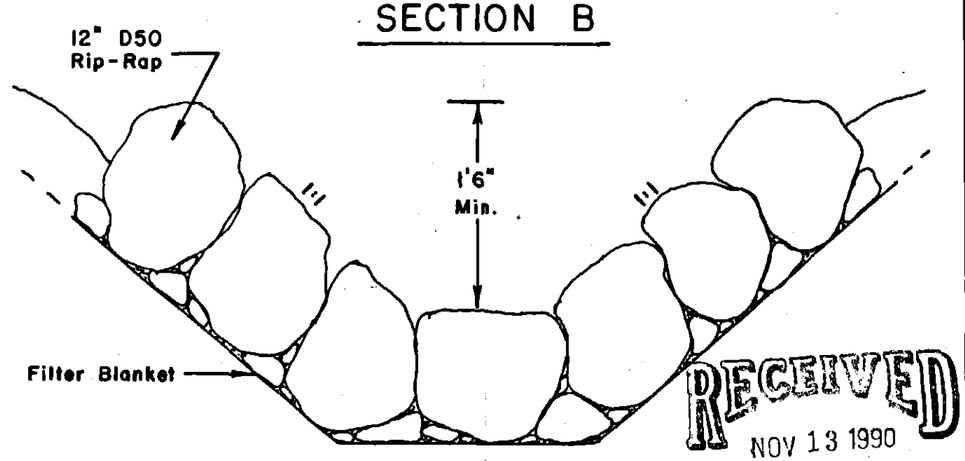


SCALE : 1" = 1'

Shape May Vary.

SECTION B



SCALE : 1" = 1'

Shape May Vary.

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DIVISION OF
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CO-OP MINING CO.

BEAR CANYON MINE

DITCH D-7D

PLATE 7-1A

Table 7.2-7 Sediment Ponds, Final Design Criteria

Design Criteria Pond "A"*

Drainage Area	:	14.35 acres**
SCS Curve #82		
3-yr Sediment Storage	:	41,444 ft^3
10-yr 24-hr Runoff Storage	:	42,714 ft^3
Total Storage Volume	:	84,158 ft^3
Use Existing Spillway	:	10 ft wide Broad Crested Weir
Rainfall Data Base	:	Hiawatha Data by E. Arlo Richardson

* Co-Op agreed to use these numbers from John Whitehead, hydrologist for DOGM, during a discussion, 27 February 1984.
** See supplement on next page, p 7-62A.

Design Criteria Pond "B"*

Drainage Area	:	1.82 acres**
SCS Curve #82		
3-yr Sediment Storage	:	2,156 ft^3
10-yr 24-hr Runoff Storage	:	8,182 ft^3
Total Storage Volume	:	10,338 ft^3
Use Existing Spillway	:	4 ft Wide Broad Crested Weir
Rainfall Data Base	:	Hiawatha Data by E. Arlo Richardson

* Co-Op agreed to use these numbers presented in a letter from DOGM, in a letter to Wendell Owen, 16 June 1983.
** See supplement on next page, p 7-62A.

Supplement to Table 7.2-7
Additional Notes on Sediment Ponds and Drainage Areas

Drainage Areas. With the removal of culvert C-9U and the conversion of ditch D-10U to the disturbed ditch D-7D, an additional 5 acres of undisturbed drainage will go into sed pond "A". This area is designated AU-2a on Plate 7-5. All other drainage areas flowing to the pond are also shown on Plate 7-5, and each of these areas were re-planimetered to determine actual runoff to the pond. The results of the area calculations are summarized below:

Area	Acreage	Runoff CN	Runoff Volume
AU-2a	5.000	73	0.121 ac ft
AU-1	3.614	82	0.247 ac ft
AU-2	4.628	82	0.316 ac ft
AU-3	5.936	82	0.406 ac ft
Total (Pond "A")	14.178		1.090 ac ft

3 yr Sediment Volume = 14.178 x 0.0066 ac ft/ac = 0.940 ac ft

Total required volume for Pond "A" = 2.030 ac ft

Area "B" was also re-planimetered from Plate 7-5. Following are the results for this area and Pond "B":

Area	Acreage	Runoff CN	Runoff Volume
B	1.895	82	0.130 ac ft

3 yr Sediment Volume = 14.178 x 0.0066 ac ft/ac = 0.940 ac ft

Total required volume for Pond "A" = 2.030 ac ft

Based on the above numbers, the total disturbed area for Bear Canyon Mine site is 16.073 acres.

Sediment Pond "A". This pond was cleaned and resurveyed on 12 Oct 1990. The existing pond volume was found to be 2.04 acre ft at design overflow, as shown on Plate 7-2A. This indicates that the pond is presently large enough to absorb the additional runoff from the removal of culvert C-9U, as proposed.

Sediment Pond "A"
Stage - Volume Calculations

Elev	Area ft^2	Depth ft	Volume ac ft	Remarks
90	3,740			bottom
		1	0.111	
91	5,960			
		1	0.156	
92	7,600			
		2	0.392	
94	9,480			
		0.9	0.206	
94.9	10,440			decant
		1.1	0.277	
96	11,480			
		1.9	0.543	
97.9	13,440			
		1.1	0.350	
99	14,280			Max Overflow depth
		TOTAL	2.035 ac ft	

Note: All information taken from Plate 7-2A

Additional Protection 1990

As additional, interim protection, a second silt fence will be installed 15 to 25 ft above the first at the inlet to culvert C-8U. This will provide additional protection from coal fines until the culvert is removed in 1991, and the drainage redirected to the sediment pond.

Culvert C-9U Removal 1990

In the fall of 1990 (late Oct - early Nov) culvert C-9U will be removed, and drainage from ditch D-10U will be re-directed into sediment pond "A" via existing ditch D-5D. Ditch D-10U will be cleaned and enlarged as necessary and extended north to intercept ditch D-4D. Ditch D-10U will be re-designated ditch D-7D.

An additional 5 acres of undisturbed drainage will also be intercepted by ditch D-7D, which will flow to pond "A". The drainage is shown on Plate 7-5.

The pond sizing justification is shown in "Additional Notes on Sediment Ponds and Drainage Areas", supplement to Table 7.2-7. Changes in ditches and culverts are shown on Tables 7.2-8 and 7.2-9 respectively. All drainage changes have been updated on Plate 7-1.

Table 7.2-8 Summary of Ditch Sizes

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1R	10.2	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-2R	12.1	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-3R	10.4	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-1U	1.5	3.5	N/R	4.0	1 ft 3 in.	0 ft 9 in.
D-2U	1.5	3.9	N/R	5.0	1 ft 3 in.	0 ft 9 in.
D-3U	6.1	5.5	4 in.	5.0	1 ft 9 in.	1 ft 3 in.
D-4U	11.8	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-5U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-6U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-7U	10.3	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-8U	2.3	4.4	N/R	6.25	- down road-	
D-9U	1.8	5.0	4 in.	8.3	1 ft 3 in.	0 ft 9 in.
D-10U		-	Replaced with D-7D			
D-11U	7.6	7.9	9 in.	14.0	1 ft 6 in.	1 ft 0 in.
D-12U	4.5	4.7	N/R	5.0	1 ft 6 in.	1 ft 3 in.

- Table continued on following page.

Table 7.2-8 Summary of Ditch Sizes (cont)

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1D	0.8	4.0	N/R	9.0	1 ft 0 in.	0 ft 6 in.
D-2D	1.5	5.5	4 in.	10.0	1 ft 3 in.	0 ft 9 in.
D-3D	1.0	5.2	4 in.	15.0	1 ft 0 in.	0 ft 6 in.
D-4D	0.5	3.2	N/R	6.25	1 ft 6 in.	0 ft 5 in.
D-5D	7.2	6.2	6 in.	6.4	1 ft 9 in.	0 ft 9 in.
D-6D	1.2	4.4	N/R	6.25	1 ft 3 in.	0 ft 9 in.
D-7D (upper)	6.4	9.4	12 in.	25.0	1 ft 6 in.	0 ft 10 in.
D-7D (lower)	6.4	5.1	4 in.	5.0	1 ft 6 in.	1 ft 2 in.

\- All ditches are triangular "V ditch" with 1:1 side slopes.
* 6 in. freeboard added to required flow depth.
** See Plate 7.1 for location of rip-rap.
N/R - not required

Notes for D-7D Calculations

Land Slope	-	31.6 pct
Runoff Curve No.	-	82
Channel Length	-	1804 ft
Time of Conc.	-	0.1417 hrs
Watershed Area	-	7.68 ac
10 yr - 24 hr Event	-	2.25 in.
Peak Flow	-	6.43 cfs

Max Slope	-	25 pct	Max Slope	-	5 pct
Flow Depth	-	0.82 ft	Flow Depth	-	1.11 ft
Velocity	-	9.37 fps	Velocity	-	5.14 fps
Rip-Rap D_{50}	-	12 in.	Rip-Rap D_{50}	-	4 in.

Table 7.2-9 Summary of Culvert Sizes

Culvert	Flow (cfs)	Velocity (fps)	Rip-Rap Size	Slope (pct)	Diameter	Required Headwater**
C-1R	10.2	9.5	12 in.	8.0	1 ft 6 in.	2 ft 3 in.
C-2R	Not applicable outside the permit area					
C-3R	Not applicable outside the permit area					
C-1U	8.8	12.3	24 in.+	15.0	2 ft 6 in.	1 ft 6 in.
C-2U	1.5	8.4	9 in.	15.0	1 ft 3 in.	0 ft 9 in.
C-3U	7.9++	5.7	6 in.	5.0	1 ft 0 in.	3 ft 0 in.*
C-4U	6.1++	5.1	6 in.	5.1	0 ft 10 in.	3 ft 0 in.*
C-5U	6.1++	5.0	N/R	4.8	0 ft 10 in.	3 ft 0 in.*
C-6U	0.9	4.4	N/R	3.7	0 ft 10 in.	1 ft 0 in.
C-7U	10.3	9.7	12 in.	8.3	1 ft 0 in.	2 ft 3 in.
C-8U	8.8	13.0	24 in.+	15.0	1 ft 6 in.	2 ft 0 in.
C-10U	0.8	5.7	6 in.	5.0	1 ft 0 in.	0 ft 6 in.
C-1D	1.5	10.9	18 in.	20.0	1 ft 3 in.	0 ft 9 in.
C-2D	0.5	9.6	12 in.	12.0	1 ft 6 in.	1 ft 3 in.
C-3D	1.2	5.2	6 in.	4.2	1 ft 6 in.	0 ft 9 in.
C-4D	0.5	9.6	12 in.	8.0	1 ft 6 in.	0 ft 3 in.
C-5D	0.2	3.5	N/R	6.5	1 ft 0 in.	0 ft 3 in.
60 in. CMP	231.5	13.8	24 in.	3.4	5 ft 0 in.	8 ft 6 in.

* When capacity of culvert is exceeded flow continues down ditch to next culvert.
** From invert elevation.
*** All culverts and ditches meet and or exceed min requirements.
\+ Replaced with 15 in. flexible culvert.
++ A two ft high check dam of rip-rap is used to develop the headwater necessary for maximum flow through the culvert, excess flow continues down the ditch.
N/R - not required

The channel is included in drainage area AD-1 (Plate 7-5). The maximum flow calculated for this channel is shown on Table 7.2-8 as 1.5 cfs (Ditch D-2D). Based on this flow, the new culvert designated C-1D, is sized matching the criteria for existing culvert C-1D, shown on Table 7.2-9. Calculations for this ditch are shown in Appendix 7-F under Run-off Ditch Sizing. The headwater depth above the top of the proposed culvert inlet is 1 ft more than adequate to carry the expected flow.

The out-slope of the pad is protected by 6 in. M.D. rock along the area where drainage will occur. The only drainage that will reach the toe of the pad is that from the upper pad to the lower; the majority of the drainage above will be conveyed through the culvert. The 6 in. rock is more than adequate, since the approved plan calls for natural 6 in. rip-rap in the post-mining channel that will carry not only the disturbed drainage AD-1, but the undisturbed drainage from AU-3 as well.

The ditch in this area has been measured, and typical section is shown on Plate 7-8 as cross-section D-D. The ditch profile is also shown on this plate as Profile "F". Plate 7-8a is a typical section of the proposed channel restoration in the area of the portal pad and culvert, after their removal and upon final reclamation.

DRAINAGE CONTROL SYSTEM BEAR CANYON NO. 1 MINE

LOWER SEAM PORTAL AREA

a. Upper Pad. Drainage from the disturbed area on the upper pad from the sub-station to culvert C-1D, will continue to flow into culvert C-1D, as approved; the outlet location of the flexible culvert was moved approx 20 ft to the west of the original location to direct runoff onto the rock ledge above the Lower Seam (Hiawatha) portals; water then flows over the rock ledge to the portal pad below;

b. Portal Pad. The northeast corner of the bin is bermed a min of 30 in. high over to the highwall. Runoff water from the upper pad flows southward around the bin and into a collection box at the edge of the portal pad area; the pad is sloped to flow to the box;

c. Flexible Culvert. The collection box at the portal pad discharges into a 15 in. flexible culvert, the culvert drops onto the next lower pad areas (Conveyor Support Pads);

d. Conveyor Support Pads. This pad area is divided into two sections and is sloped to drain to the flexible culvert; the flexible culvert is opened (or replaced with 1/2 round culvert) for a distance of at least 8 ft to allow surface water to enter the culvert at both sections; the entrance to

the culvert is protected by a trash rack and grouted as shown on the attached typical drawing; water then flows down the flexible culvert to the Coal Processing Pad area.

e. Coal Processing Pad. This pad is also sloped to drain to the culvert; another 8 ft opening was left in the culvert for the surface runoff; water is then conveyed down to the lower (Lump Coal) pad area;

f. Lump Coal Pad. The flexible culvert parallels the conveyor down to the lump coal bin, pass beneath the bin supports, and empties into a catch basin/energy dissipater just south of the bin; runoff then flows south into ditch D-7D and passes into Sediment Pond "A."

Drainage is shown on Plate 7-1. Detailed drawings of the various drainage controls are shown in the attached typical details. Sizing calculations are summarized on the following sheet: "Lower Seam Portal Area - Drainage Sizing Calculations."

GENERAL

Upon inspection of the Mine permit area it was found that the areas described below exist in the undisturbed zones and that surface runoff going through these areas does not pass through the sediment pond treatment facilities. In order to provide adequate treatment for these areas, straw bale dikes and/or silt fences will be installed as indicated on Plate 7-1. The sediment control structures will be positioned so that surface runoff passes through them before entering Bear Creak. Treatment facilities will be maintained for each area until approved and determined that adequate revegetation cancels the need for treatment. These areas are designated as "Best Technology Currently Available" or BTCA Areas. Drainage from these areas will be monitored as possible to show compliance with the state and federal limitations.

OUTSLOPE BANK OF UPPER STORAGE PAD.

During construction of the Upper Storage Pad (Plate 7-1) some fill was apparently overcast down the face of the slope below. The area covers approximately 800 sq ft. A silt fence will be installed and maintained at the inlet to culvert C-8U. In 1991, culvert C-8U will be eliminated, and the drainage will go to Sediment pond "A". The runoff volume for this area is calculated to be 0.0013 acre ft.

AREA NEAR PORTAL NO.1

This area lies between the upper lamphouse/mine portal bermed pad and the portal access road, extending from the road junction on the south to just north of the upper office trailer at the beginning of the Cattle Co. Road. The area is approx. 0.28 acres. A silt fence is installed at the north end of the area where runoff flows down hill from the Cattle Co. Road area. Runoff from the area passes through a silt fence near the inlet to culvert C-6U. Runoff volume from this area is calculated to be 0.019 acre ft.

BALL PARK TOPSOIL PILE

The ball park covers 1.2 acres. Straw bale dikes and/or silt fences will be installed on the south east side, in line with the natural flow to treat runoff before it enters Bear creak. Runoff volume from this area is calculated to be 0.082 acre ft.

TOPSOIL STOCKPILE

The main topsoil storage pile covers approx 0.1 acres. The area is encircled by an 18 in. berm and is protected by established vegetation. Runoff volume from this area is calculated to be 0.0068 acre ft.

Note: Runoff volumes are based on the 10 yr 24 hr event of 2.25 in. and runoff CN of 82.

Table 7.2-7 Sediment Ponds, Final Design Criteria

Design Criteria Pond "A"*

Drainage Area	:	14.35 acres**
SCS Curve #82		
3-yr Sediment Storage	:	41,444 ft^3
10-yr 24-hr Runoff Storage	:	42,714 ft^3
Total Storage Volume	:	84,158 ft^3
Use Existing Spillway	:	10 ft wide Broad Crested Weir
Rainfall Data Base	:	Hiawatha Data by E. Arlo Richardson

* Co-Op agreed to use these numbers from John Whitehead, hydrologist for DOGM, during a discussion, 27 February 1984.
** See supplement on next page, p 7-62A.

Design Criteria Pond "B"*

Drainage Area	:	1.82 acres**
SCS Curve #82		
3-yr Sediment Storage	:	2,156 ft^3
10-yr 24-hr Runoff Storage	:	8,182 ft^3
Total Storage Volume	:	10,338 ft^3
Use Existing Spillway	:	4 ft Wide Broad Crested Weir
Rainfall Data Base	:	Hiawatha Data by E. Arlo Richardson

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Supplement to Table 7.2-7
Additional Notes on Sediment Ponds and Drainage Areas

Drainage Areas. With the removal of culvert C-9U and the conversion of ditch D-10U to the disturbed ditch D-7D, an additional 5 acres of undisturbed drainage will go into sed pond "A". This area is designated AU-2a on Plate 7-5. All other drainage areas flowing to the pond are also shown on Plate 7-5, and each of these areas were re-planimetered to determine actual runoff to the pond. The results of the area calculations are summarized below:

Area	Acreage	Runoff CN	Runoff Volume
AU-2a	5.000	73	0.121 ac ft
AU-1	3.614	82	0.247 ac ft
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AU-3	5.936	82	0.406 ac ft
Total (Pond "A")	14.178		1.090 ac ft

3 yr Sediment Volume = 14.178 x 0.0066 ac ft/ac = 0.940 ac ft

Total required volume for Pond "A" = 2.030 ac ft

Area "B" was also re-planimetered from Plate 7-5. Following are the results for this area and Pond "B":

Area	Acreage	Runoff CN	Runoff Volume
B	1.895	82	0.130 ac ft

3 yr Sediment Volume = 14.178 x 0.0066 ac ft/ac = 0.940 ac ft

Total required volume for Pond "A" = 2.030 ac ft

Based on the above numbers, the total disturbed area for Bear Canyon Mine site is 16.073 acres.

Sediment Pond "A". This pond was cleaned and resurveyed on 12 Oct 1990. The existing pond volume was found to be 2.04 acre ft at design overflow, as shown on Plate 7-2A. This indicates that the pond is presently large enough to absorb the additional runoff from the removal of culvert C-9U, as proposed.

Sediment Pond "A"
Stage - Volume Calculations

Elev	Area ft^2	Depth ft	Volume ac ft	Remarks
90	3,740			bottom
		1	0.111	
91	5,960			
		1	0.156	
92	7,600			
		2	0.392	
94	9,480			
		0.9	0.206	
94.9	10,440			decant
		1.1	0.277	
96	11,480			
		1.9	0.543	
97.9	13,440			
		1.1	0.350	
99	14,280			Max Overflow depth
		TOTAL	2.035 ac ft	

Note: All information taken from Plate 7-2A

Additional Protection 1990

As additional, interim protection, a second silt fence will be installed 15 to 25 ft above the first at the inlet to culvert C-8U. This will provide additional protection from coal fines until the culvert is removed in 1991, and the drainage redirected to the sediment pond.

Culvert C-9U Removal 1990

In the fall of 1990 (late Oct - early Nov) culvert C-9U will be removed, and drainage from ditch D-10U will be re-directed into sediment pond "A" via existing ditch D-5D. Ditch D-10U will be cleaned and enlarged as necessary and extended north to intercept ditch D-4D. Ditch D-10U will be re-designated ditch D-7D.

An additional 5 acres of undisturbed drainage will also be intercepted by ditch D-7D, which will flow to pond "A". The drainage is shown on Plate 7-5.

The pond sizing justification is shown in "Additional Notes on Sediment Ponds and Drainage Areas", supplement to Table 7.2-7. Changes in ditches and culverts are shown on Tables 7.2-8 and 7.2-9 respectively. All drainage changes have been updated on Plate 7-1.

Table 7.2-8 Summary of Ditch Sizes

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1R	10.2	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-2R	12.1	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-3R	10.4	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-1U	1.5	3.5	N/R	4.0	1 ft 3 in.	0 ft 9 in.
D-2U	1.5	3.9	N/R	5.0	1 ft 3 in.	0 ft 9 in.
D-3U	6.1	5.5	4 in.	5.0	1 ft 9 in.	1 ft 3 in.
D-4U	11.8	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-5U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-6U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-7U	10.3	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-8U	2.3	4.4	N/R	6.25	- down road-	
D-9U	1.8	5.0	4 in.	8.3	1 ft 3 in.	0 ft 9 in.
D-10U		-	Replaced with D-7D			
D-11U	7.6	7.9	9 in.	14.0	1 ft 6 in.	1 ft 0 in.
D-12U	4.5	4.7	N/R	5.0	1 ft 6 in.	1 ft 3 in.

- Table continued on following page.

Table 7.2-8 Summary of Ditch Sizes (cont)

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1D	0.8	4.0	N/R	9.0	1 ft 0 in.	0 ft 6 in.
D-2D	1.5	5.5	4 in.	10.0	1 ft 3 in.	0 ft 9 in.
D-3D	1.0	5.2	4 in.	15.0	1 ft 0 in.	0 ft 6 in.
D-4D	0.5	3.2	N/R	6.25	1 ft 6 in.	0 ft 5 in.
D-5D	7.2	6.2	6 in.	6.4	1 ft 9 in.	0 ft 9 in.
D-6D	1.2	4.4	N/R	6.25	1 ft 3 in.	0 ft 9 in.
D-7D (upper)	6.4	9.4	12 in.	25.0	1 ft 6 in.	0 ft 10 in.
D-7D (lower)	6.4	5.1	4 in.	5.0	1 ft 6 in.	1 ft 2 in.

\- All ditches are triangular "V ditch" with 1:1 side slopes.
* 6 in. freeboard added to required flow depth.
** See Plate 7.1 for location of rip-rap.
N/R - not required

Notes for D-7D Calculations

Land Slope	-	31.6 pct
Runoff Curve No.	-	82
Channel Length	-	1804 ft
Time of Conc.	-	0.1417 hrs
Watershed Area	-	7.68 ac
10 yr - 24 hr Event	-	2.25 in.
Peak Flow	-	6.43 cfs

Max Slope	-	25 pct	Max Slope	-	5 pct
Flow Depth	-	0.82 ft	Flow Depth	-	1.11 ft
Velocity	-	9.37 fps	Velocity	-	5.14 fps
Rip-Rap D_{50}	-	12 in.	Rip-Rap D_{50}	-	4 in.

Table 7.2-9 Summary of Culvert Sizes

Culvert	Flow (cfs)	Velocity (fps)	Rip-Rap Size	Slope (pct)	Diameter	Required Headwater**
C-1R	10.2	9.5	12 in.	8.0	1 ft 6 in.	2 ft 3 in.
C-2R	Not applicable outside the permit area					
C-3R	Not applicable outside the permit area					
C-1U	8.8	12.3	24 in.+	15.0	2 ft 6 in.	1 ft 6 in.
C-2U	1.5	8.4	9 in.	15.0	1 ft 3 in.	0 ft 9 in.
C-3U	7.9++	5.7	6 in.	5.0	1 ft 0 in.	3 ft 0 in.*
C-4U	6.1++	5.1	6 in.	5.1	0 ft 10 in.	3 ft 0 in.*
C-5U	6.1++	5.0	N/R	4.8	0 ft 10 in.	3 ft 0 in.*
C-6U	0.9	4.4	N/R	3.7	0 ft 10 in.	1 ft 0 in.
C-7U	10.3	9.7	12 in.	8.3	1 ft 0 in.	2 ft 3 in.
C-8U	8.8	13.0	24 in.+	15.0	1 ft 6 in.	2 ft 0 in.
C-10U	0.8	5.7	6 in.	5.0	1 ft 0 in.	0 ft 6 in.
C-1D	1.5	10.9	18 in.	20.0	1 ft 3 in.	0 ft 9 in.
C-2D	0.5	9.6	12 in.	12.0	1 ft 6 in.	1 ft 3 in.
C-3D	1.2	5.2	6 in.	4.2	1 ft 6 in.	0 ft 9 in.
C-4D	0.5	9.6	12 in.	8.0	1 ft 6 in.	0 ft 3 in.
C-5D	0.2	3.5	N/R	6.5	1 ft 0 in.	0 ft 3 in.
60 in. CMP	231.5	13.8	24 in.	3.4	5 ft 0 in.	8 ft 6 in.

* When capacity of culvert is exceeded flow continues down ditch to next culvert.

** From invert elevation.

*** All culverts and ditches meet and or exceed min requirements.

\+ Replaced with 15 in. flexible culvert.

++ A two ft high check dam of rip-rap is used to develop the headwater necessary for maximum flow through the culvert, excess flow continues down the ditch.

N/R - not required

The channel is included in drainage area AD-1 (Plate 7-5). The maximum flow calculated for this channel is shown on Table 7.2-8 as 1.5 cfs (Ditch D-2D). Based on this flow, the new culvert designated C-1D, is sized matching the criteria for existing culvert C-1D, shown on Table 7.2-9. Calculations for this ditch are shown in Appendix 7-F under Run-off Ditch Sizing. The headwater depth above the top of the proposed culvert inlet is 1 ft more than adequate to carry the expected flow.

The out-slope of the pad is protected by 6 in. M.D. rock along the area where drainage will occur. The only drainage that will reach the toe of the pad is that from the upper pad to the lower; the majority of the drainage above will be conveyed through the culvert. The 6 in. rock is more than adequate, since the approved plan calls for natural 6 in. rip-rap in the post-mining channel that will carry not only the disturbed drainage AD-1, but the undisturbed drainage from AU-3 as well.

The ditch in this area has been measured, and typical section is shown on Plate 7-8 as cross-section D-D. The ditch profile is also shown on this plate as Profile "F". Plate 7-8a is a typical section of the proposed channel restoration in the area of the portal pad and culvert, after their removal and upon final reclamation.

DRAINAGE CONTROL SYSTEM BEAR CANYON NO. 1 MINE

LOWER SEAM PORTAL AREA

a. Upper Pad. Drainage from the disturbed area on the upper pad from the sub-station to culvert C-1D, will continue to flow into culvert C-1D, as approved; the outlet location of the flexible culvert was moved approx 20 ft to the west of the original location to direct runoff onto the rock ledge above the Lower Seam (Hiawatha) portals; water then flows over the rock ledge to the portal pad below;

b. Portal Pad. The northeast corner of the bin is bermed a min of 30 in. high over to the highwall. Runoff water from the upper pad flows southward around the bin and into a collection box at the edge of the portal pad area; the pad is sloped to flow to the box;

c. Flexible Culvert. The collection box at the portal pad discharges into a 15 in. flexible culvert, the culvert drops onto the next lower pad areas (Conveyor Support Pads);

d. Conveyor Support Pads. This pad area is divided into two sections and is sloped to drain to the flexible culvert; the flexible culvert is opened (or replaced with 1/2 round culvert) for a distance of at least 8 ft to allow surface water to enter the culvert at both sections; the entrance to

the culvert is protected by a trash rack and grouted as shown on the attached typical drawing; water then flows down the flexible culvert to the Coal Processing Pad area.

e. Coal Processing Pad. This pad is also sloped to drain to the culvert; another 8 ft opening was left in the culvert for the surface runoff; water is then conveyed down to the lower (Lump Coal) pad area;

f. Lump Coal Pad. The flexible culvert parallels the conveyor down to the lump coal bin, pass beneath the bin supports, and empties into a catch basin/energy dissipater just south of the bin; runoff then flows south into ditch D-7D and passes into Sediment Pond "A."

Drainage is shown on Plate 7-1. Detailed drawings of the various drainage controls are shown in the attached typical details. Sizing calculations are summarized on the following sheet: "Lower Seam Portal Area - Drainage Sizing Calculations."

GENERAL

Upon inspection of the Mine permit area it was found that the areas described below exist in the undisturbed zones and that surface runoff going through these areas does not pass through the sediment pond treatment facilities. In order to provide adequate treatment for these areas, straw bale dikes and/or silt fences will be installed as indicated on Plate 7-1. The sediment control structures will be positioned so that surface runoff passes through them before entering Bear Creak. Treatment facilities will be maintained for each area until approved and determined that adequate revegetation cancels the need for treatment. These areas are designated as "Best Technology Currently Available" or BTCA Areas. Drainage from these areas will be monitored as possible to show compliance with the state and federal limitations.

OUTSLOPE BANK OF UPPER STORAGE PAD.

During construction of the Upper Storage Pad (Plate 7-1) some fill was apparently overcast down the face of the slope below. The area covers approximately 800 sq ft. A silt fence will be installed and maintained at the inlet to culvert C-8U. In 1991, culvert C-8U will be eliminated, and the drainage will go to Sediment pond "A". The runoff volume for this area is calculated to be 0.0013 acre ft.

AREA NEAR PORTAL NO.1

This area lies between the upper lamphouse/mine portal bermed pad and the portal access road, extending from the road junction on the south to just north of the upper office trailer at the beginning of the Cattle Co. Road. The area is approx. 0.28 acres. A silt fence is installed at the north end of the area where runoff flows down hill from the Cattle Co. Road area. Runoff from the area passes through a silt fence near the inlet to culvert C-6U. Runoff volume from this area is calculated to be 0.019 acre ft.

BALL PARK TOPSOIL PILE

The ball park covers 1.2 acres. Straw bale dikes and/or silt fences will be installed on the south east side, in line with the natural flow to treat runoff before it enters Bear creak. Runoff volume from this area is calculated to be 0.082 acre ft.

TOPSOIL STOCKPILE

The main topsoil storage pile covers approx 0.1 acres. The area is encircled by an 18 in. berm and is protected by established vegetation. Runoff volume from this area is calculated to be 0.0068 acre ft.

Note: Runoff volumes are based on the 10 yr 24 hr event of 2.25 in. and runoff CN of 82.

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9.5.3.3 Mulching

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The mulch will also be fortified with Tack as previously indicated according to slope. Fertilization and/or neutralizing compounds required according to Section 8.9. will be incorporated in the mulch slurry.

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9.5.1 Phase 1 - Backfilling and Grading

Backfilling and Grading plans are found in Section 3.6.4 of this plan. Roads will be brought back to a reasonable configuration as described in Appendix 3-D.

9.5.2 Phase 2 - Site Preparation

Site stability will be largely accomplished through the grading, compacting and the utilization of a tackifying agent. However, terracing and erosion control matting will be required on all slopes of 2:1 and steeper. See Section 3.6.4. Mapping of each area receiving each control measure will be submitted with the detailed revegetation plan in the last five year permit renewal prior to reclamation.

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Following the seeding effort all broadcast seeded areas with slopes flatter than 2:1 will be hydromulched and fertilized. The rate of application of the wood fiber mulch is:

2,000 to 2,500 lbs/acre on slopes exceeding 3:1 (horiz to vert) slopes

The mulch will also be fortified with Tack as previously indicated according to slope. Fertilization and/or neutralizing compounds required according to Section 8.9. will be incorporated in the mulch slurry.

Slopes 2:1 or steeper will be mulched with erosion control matting. The matting will be applied as per manufacturers specifications.

All drill seeded areas will be mulched with two tons per acre alfalfa, straw or grass hay. The mulch will be certified as weed free by the county agriculture agent. Copies of this certification, along with weight tickets from a certified scale will be submitted to the Division. All straw or hay mulch will be incorporated into the top 6 in. of topsoil or crimped in order to anchor the mulch to the soil surface.

9.5.1 Phase 1 - Backfilling and Grading

Backfilling and Grading plans are found in Section 3.6.4 of this plan. Roads will be brought back to a reasonable configuration as described in Appendix 3-D.

9.5.2 Phase 2 - Site Preparation

Site stability will be largely accomplished through the grading, compacting and the utilization of a tackifying agent. However, terracing and erosion control matting will be required on all slopes of 2:1 and steeper. See Section 3.6.4. Mapping of each area receiving each control measure will be submitted with the detailed revegetation plan in the last five year permit renewal prior to reclamation.

Soil redistribution and stabilization will be completed as defined in Section 8.8 of this plan.

9.5.3 Phase 3 - Seeding and Mulching

The entire area of disturbance will be drilled or broadcast seeded (including hydroseeding) during the first Fall following the complete abandonment and earth work (September through November). Spring seeding was considered too speculative to be implemented based on the variation in Spring moisture regimes.

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erosion and reduction of desirable plant species which will reduce forage production and wildlife capacity.

Vegetated areas adjacent to the disturbed areas are protected from coal fines primarily by utilization of dust controls, such as water sprays on the coal handling facilities and watering of the coal haul roads. One of the major areas, located in the canyon below the Upper Storage Pad, does show past impact from coal fines; however, it is not established that this impact is negative or detrimental to the vegetation. As an added precaution, however, this area is planned to be drained into the sediment pond in 1991, to prevent possible coal fine accumulation from reaching Bear Creek.

New material submitted in text.

Waste dumping or [illegible] undisturbed areas is not permitted. Disturb[illegible] markers delineate the boundaries of disturbance. Employees are trained not to dump or otherwise disturb areas outside those boundaries.

It is not felt that monitoring of these areas by photos is necessary, or even feasible, since long-range photos would give only a very general overview, and close-up photos would be so specific to a small area as to not be representative. In lieu of photo monitoring, it is proposed to visually check the areas on at least a yearly basis, and if it appears that coal fine accumulation or other impacts are occurring from the operation, additional

achieving success will be re-evaluated and revegetated as needed.

3.5.6 Protection of Fish and Wildlife

Wildlife is present in the mine plan permit area. Due to the size of the total disturbance impacts on the various mammal, amphibian and reptile species should be minimal. In addition, Co-Op is committed to mitigating as much as possible the adverse effects of all new construction and maintaining the natural abundance and diversity of the area.

3.5.6.1 Projected Impacts of Mining on Fish and Wildlife

Mammals. The Bear Canyon Mine plan area is inhabited by 84 species of mammals, of which 25 species are considered of high interest and 14 of these are protected by state or federal law (Table 10-1).

Elk that are thought by the Utah Division of Wildlife Resources (UDWR) to be stable and productive use portions of the mine plan area at various times of the year for such necessary activities as wintering and feeding. This use, however, is marginal and not crucial. The minimal disturbance caused by planned surface facilities will have no significant impact on the herd.

Mule deer utilize the whole permit area, taking advantage of

3.6.4.3 Terracing and Erosion Control

Site stability will be largely accomplished through the grading, compacting and the utilization of a tackifying agent. However, on those areas with slopes of more than 2:1, terracing and erosion control matting will be used to enhance erosion control.

Terraces effectively decrease the angle of repose of the slope in question. In accomplishing this you effectively modify the site and change those conditions which preclude vegetation from becoming established. Second, you change the severity of erosion and, in fact, use those surface waters which heretofore were destructive in nature. This is accomplished by creating basins wherein the water has time to soak in and thus can be utilized by vegetation.

By utilizing a small crawler tractor (JD450) terraces can be contoured with the resulting terrace creating a bench effect and spaced at 12 ft intervals down the slope. A terrace of 8 ft, toed toward the hill is thus created. Planting is then instigated at approximately 2 ft distance from the cut fact to minimize the detrimental effect of potential sluffing.

On a small portion of the disturbed area it may be necessary to utilize hand labor to construct small terraces, approximately 18 in. benches on a contour of 4 ft intervals. These terraces are constructed utilizing a "Region 6" hand tool and would only be

In addition to the vegetative stabilization discussed in Section 3.6.5, Revegetation Plan, physical stabilization of the soil is also planned. The specific methods to be implemented are defined in Chapter 8 and 9.

3.6.5 Revegetation Plan

All disturbed areas will be planted and revegetated during the first appropriate season following grading and topsoil redistribution procedures and will include, the addition of remedial soil treatments. A permanent, diverse vegetative cover, using approved seed mixes listed in Chapter 9, Section 9.5, will be established on all reclaimed areas. See Section 9.4 for full reclamation revegetation plan.

The operator will submit a detailed revegetation plan in the last Five-Year Permit Renewal prior to reclamation. The plan will include detailed map(s) of sufficient scale to show exact areas and methods of revegetation (i.e., drill seeding, terraces, netting, etc...) based on the best available technology and final mine site conditions.

Gently sloping and flat areas will be seeded with a drill seeder. Steeper slopes will be seeded with a hydroseeder or by hand. Many shrubs and all trees will be planted by hand setting to ensure a permanent plant cover.

Seedlings will be planted in Apr - May or Sept - Oct depending on availability and sequence of completion, plants will be grouped to provide wildlife cover. Spacing within the group is defined in Chapter 9 and will be correlated to the reference area.

3.6.5.1 Mulching

On all reclaimed areas a wood fiber mulch will be used to enhance moisture retention required for seed germination. Tackifier will be added to the mulch to help it adhere to the soil. A min of 60 lbs tackifier/ton fiber will be applied, with steeper sloping areas requiring more as shown in Section 9.5. Some steeply sloped areas may require erosion control matting. These areas will be noted on the detailed revegetation plan and maps to be submitted in the last Five-Year Permit Renewal prior to reclamation.

3.6.5.2 Irrigation

Since the species used for reclamation are known for their survival characteristics, it is felt that artificial application of additional water will not be required. Should lower than average precipitation or irregularities in distribution of precipitation occur following the initiation of reclamation procedures which temporarily precludes vegetation establishment, a preferred course of action would be to replant problem areas.

Example calculation for percent shrub composition:

$$\text{Chna} \quad \frac{73}{24_{\text{transects}}} = 3.04 \quad \frac{3.04}{*19.13} \times 100 = 15.89 \text{ pct}$$

* 19.13 derived by adding all species averages

9.3.3 Vegetation Types

Table 9-1 lists the vegetation types by total acres and acres of disturbance. Each type listed is described as follows:

Table 9.3-1 Vegetation Types

	Permit Area		Disturbed Area	
Vegetation Type	Acres	Disturbed	Drill Seeded	Hydro Seeded
Conifer	139.06	-0-	-0-	-0-
Grass	62.73	-0-	-0-	-0-
Riparian	7.46	.67	.37	.30
Pinyon-Juniper	654.96	9.64	6.04	3.60
Sagebrush	4.3	-0-	-0-	-0-
Reclaimed	.65	-0-	-0-	.65
Bare	19.30	-0-	-0-	-0-
TOTAL	904.27	10.31	6.41	4.55

10.96

9.5.1 Phase 1 - Backfilling and Grading

Backfilling and Grading plans are found in Section 3.6.4 of this plan. Roads will be brought back to a reasonable configuration as described in Appendix 3-D.

9.5.2 Phase 2 - Site Preparation

Site stability will be largely accomplished through the grading, compacting and the utilization of a tackifying agent. However, terracing and erosion control matting will be required on some of the steeper slopes of more than 2:1. See Section 3.6.4. Mapping of each area receiving each control measure will be submitted with the detailed revegetation plan in the last five year permit renewal prior to reclamation.

Soil redistribution and stabilization will be completed as defined in Section 8.8 of this plan.

9.5.3 Phase 3 - Seeding and Mulching

The entire area of disturbance will be drilled or hydroseeded during the first Fall following the complete abandonment and earth work (September through November). Spring seeding was considered too speculative to be implemented based on the variation in Spring moisture regimes.

9.5.3.1 Drill Seeding

The largest portion of the recontoured site will facilitate drill seeding. The balance of the area would then be hydroseeded (Section 9.5.3.1). In order to lessen compaction, a rangeland drill seeder pulled behind a small crawler tractor will be utilized. The seed mix and rate of application is given in Section 9.5.5.

All drill seeded areas will be mulched with two tons per acre alfalfa, straw or grass hay. The mulch will be certified as weed free by the county agriculture agent. Copies of this certification, along with weight tickets from a certified scale will be submitted to the Division.

9.5.3.2 Hydroseeding

Steep slopes will be seeded with a hydro-seeder or possibly hand seeded. The seed mix and rate of application is given in Section 9.5.5.

All hydroseeded or hand seeded areas, will be lightly raked to insure adequate soil/seed contact. On slopes greater than 2:1, a two step hydroseeding methods will be used. One half of the seed amount will be applied and raked and then the remaining seed will be applied.

After two years the seeding effort will be evaluated and planting will be instigated in the event it appears necessary to bring the density and diversity of woody species up to the confidence levels of the corresponding reference area. The same species will be planted as listed above under shrubs. In addition, the following tree species will be planted:

Species	Number per Acre	Spacing within Clumps*
Pinus edules	18	5 ft
Acer glabrum torr.	18	5 ft
Prunus virginiana	5	25 ft

* Clumps spaces at 30 yd. intervals for wildlife cover

9.5.5.1 Noxious Weeds

The following weeds are officially designated as noxious for the State of Utah, as per the authority vested in the Commissioner of Agriculture under Section 4-17-3, Utah Noxious Weed Act, and will be controlled as directed by the Emery County, Extension Agent if found within the permit area:

Bermudagrass	Cynodon dactylon
Bindweed	Convolvulus spp.
Broadleaved Peppergrass	Lepidium latifolium
Canada Thistle	Cirsium arvense
Dyers Woad	Isatis tinctoria
Johnson Grass	Sorghum halepense
Leafy Spurge	Euohorbia esula
Musk Thistle	Carduus nutans
Quackgrass	Agropyron repens
Russian Knapweed	Centaurea repens
Scotch Thistle	Onopordium acanthium
Whitetop	Cardaria spp.

In combination with the seed, the following rates of tackifier will be utilized:

Table 9.5-2 Suggested Ratios of Tack to Fiber

slope angle (deg)	slope ratio (rise:run)	percent slope	lbs. Tack per ton fiber	ratio tack to fiber
14	1 : 4	25	60(min)*	1 : 30
26	1 : 2	50	80	1 : 25
33	1 : 11/2	66	100	1 : 20
45	1 : 1	100	120	1 : 16
57	11/2 : 1	150	140	1 : 14
64	2 : 1	200	160(min)	1 : 12

* 60 pounds is suggested as a minimum to insure excellent stabilization; however, in many conditions 40 pounds of Tack per acre has given excellent results on a 1:4 or less slope.

(Rates of Tack were developed with respect to velocity and erosive power of water which is proportional to the square root of the slope.) An empirical factor was determined from laboratory and field studies to arrive at the minimum Tack fiber ratio. Thus, 60 pounds of Tack per ton of fiber is about minimum for slopes up to 20 pct and the empirical factor is determined as 60 divided 20 pct = For a 100 pct slope (1:1 or 45 degrees) the ratio of Tack to fiber is calculated as:

(100 pct) (12) = 120 pounds. Tackifier to be used for Hydroseeding and Hydromulching to Serve as Mulch or Soil Binder.

9.5.3.3 Mulching

Following the seeding effort the entire area of disturbance will be hydromulched and fertilized. The rate of application of the wood fiber mulch is:

1,200 to 1,500 lbs/acre	on flat areas or gentle slopes
2,000 to 2,500 lbs/acre	o n slopes exceeding 3:1 (horiz to vert) slopes

The mulch will also be fortified with Tack as previously indicated according to slope. Fertilization and/or neutralizing compounds required according to Section 8.9. will be incorporated in the mulch slurry.

9.5.5 Recommended Seed Mix

All seed obtained will comply with all state and federal seed laws. Copies of certificates for testing and poundage of seed purchased, will be submitted to the division. Any changes in the approved seed mixes will first be cleared with the Division. Costs listed below were gathered from suppliers in Nov. 1990.

It is currently recommended by the State of Utah, Division of Oil, Gas & Mining (DOGM) that riparian areas such as the one in Bear Canyon Mine site not be seeded. It is often impractical to attempt to seed these narrow corridors in conjunction with the surrounding seeded areas. Instead it is recommended that the operator plant woody plant seedlings.

Table 9.5-2 Recommended Seed Mix, Riparian-Creek Bottom

Scientific Name	Common Name	Plants/ac	Cost/ac*
Populus angustifolia	Cottonwood	150	$120
Prunus virginiana	Chokecherry	150	$120
Rosa woodsii	Wood's Rose	500	$400
Sambucus caerulea	Elderberry	100	$ 80
Salix spp.	Willow	2000	$400
	TOTAL	2900	$1120

* Cost of all (except Salix spp.) estimates plant material cost only (labor not included).

Salix should be cut from a source area in close proximity to the mine site and planted in the reclaimed area. The cost of this species is based on estimated labor to accomplish this.

9.6 RECLAMATION VEGETATION MONITORING

All reclaimed areas will be monitored to determine when bond release parameters are achieved. Success standards will be based on the reference area. Qualitative (ocular estimates) monitoring will be completed each year until bond release with the intent of identifying problem areas. Quantitative monitoring will be made during years 2, 3, 5, 9 and 10 until bond releases. Both the final reclaimed area and reference area will be sampled for cover, density (woody plants). Species composition data will be collected and compiled every two years, using cover sampling data. Productivity measurements will be collected during years 9 and 10 of the bond liability period.

The success of the reclamation effort will be evaluated by detailed sampling of cover, woody plant density and production of reference and reclaimed areas. The data from the reclaimed areas and the reference area will be collected during the same growing season. If there is no significant difference in cover woody plant density and production between the reclaimed areas and the reference areas when tested at the 90 pct significance level using a one-tailed t-test, then the areas will be judged to adequately reclaimed relative to cover and production.

Wood plant density standards will be sampled for each reference area as well as the reclaimed areas and the success of

the reclaimed area based on the results from the reference areas (90 pct pre-mining stock level survival at bond release) cover, woody plant density on reclaimed and reference areas will be measured using the same methods employed during the baseline studies. At the time of bond release, trees and shrubs, used to achieve success, will be healthy and at least 80 pct will have been in place for at least eight growing seasons. No trees and shrubs in place for less than two growing seasons will be counted in determining stocking adequacy.

Standard methods, as outlined in Chapter 9, Vegetative Resources, will be applied to determine the degree of success for revegetation attempts. Production will be measured using a Harvest methodology. Shrub density data will be collected, using 1 m x 50 m transects.

One of the greatest challenges of revegetation is to create reclaimed areas which have a large number of desirable species. Species diversity on the reclaimed areas will be encouraged by including a variety of grasses, forbs, and shrubs in seeding and planting mixes.

Species diversity will be judged adequate when the relative cover and pct distribution of biomass for the major life form groups approx that which occurs in the reference areas. That is, if the relative cover by perennial grasses is 50 pct in the

reference areas, then the relative cover by perennial grasses on the reclaimed areas should also be approx 50 pct. This same relationship should also hold true for productivity. If most of the cover and production were being provided by annual forbs on the reclaimed areas and by perennial grasses on the reference areas, then the reclamation would be judged unsuccessful.

The purpose of the above procedures is to demonstrate that based on cover, production, woody plant density, and species diversity, the disturbed areas have been returned to stable plant communities capable of withstanding the intended post-mining land use.

Bear Canyon Reference Area (in Trail Canyon)
Table 9A-3 SHRUB DENSITY RESULTS
(Standard for both pinyon.juniper and riparian vegetation)

/ha = N/24 transects X 200

Shrubs	Number	Pct of Shrub Composition
Artemisia tridentata	16	0.42
Chrysothamnus nauseosus	608	15.89
Ephedra viridis	566	14.79
Eriogonum spp. (corymbosum and bicolor)	2108	55.10
Guaiacum sanctum	350	9.15
*Juniperus osteosperma	16	0.42
*Juniperus scopulorum	8	0.21
Opuntia spp.	8	0.21
*Pinus edulis	75	1.96
*Pinus monophylla	16	0.42
Rosa woodsii	25	0.78
Purshia tridentata	16	0.42
Tamarix pentandra	8	0.21
Total Shrubs/ha	3820	100 pct

All shrubs rooted within the sample area.
*Tree species included due to their shrub-like nature less than 5 ft in height.

TREE DENSITY

A total count of all trees within the reference area was made indicating a density of:

Shrubs	Number	Number Per Acre
Juiperus osteosperma	7	14
Juniperus scopulorum	2	5
Pinus edulis	7	14

10.2 METHODOLOGY

10.2.1 Aquatic Resources

perrenial (class 3A).

All water within the permit area is intermittent (Class 6). Runoff from the permit area flows into the Huntington Creek drainage. This is the only drainage which could potentially be affected by Co-Op's mining activities and the potential impact is expected to be insignificant. Bear Creek may receive some groundwater from the permit area while Huntington Creek eventually receives runoff from the disturbed areas.

The aquatic resource description of Bear Creek consists of a review of available information from previous surveys. Surveys have been conducted of both Bear and Huntington Creek although the potential for impact is considered to be minimal. Water quality determinations have been conducted by certified laboratories to establish baseline data and routine monitoring will continue as outlined in Chapter 7 on all surface and ground water within the permit area.

10.3.2 Wildlife

10.3.2.1 Aquatic Wildlife Habitat and Value Determination

There are no perennial streams that run through the Bear Canyon Mine permit area, all water is ephemeral (Class 6). The ephemeral stream within the permit area is Bear Creek.

Bear Creek is a low-quality aquatic environment of little value to the aquatic resources of the area. A biological community most likely occurs in Bear Creek on an intermittent basis. Being present during a portion of those years when runoff is exceptionally high followed by wetter than usual summer and fall precipitation.

Even if the mine was removed, natural conditions would be stressful to aquatic life. Huntington Creek does receive runoff and/or groundwater from the permit area at some times during the yr, but because of Bear Canyon stream's quality, impact from mining will be minimal. All drainage from disturbed areas is passed through sedimentation ponds before discharge, reducing impact potential further.

10.3.2.2 Terrestrial Wildlife Habitat and Value Determination

Literature and field data were summarized for all terrestrial

eagle observations and the fact that their status is common has resulted in documentation of mostly opportunistic observations of aerie territories.

An active golden eagle nest site is extremely sensitive to disturbance within a one-half kilometer radius. This buffer zone is ranked as being of critical value to maintenance of the eagle population when the bird is actually utilizing the aerie; that period of time is normally between April 15 and June 15. The radius for a buffer zone may need to be increased to one kilometer if a disturbance were to originate from above and within direct line of sight to the eagle aerie.

To date there are no known high-priority concentration areas or critical roost trees for golden eagles on the project area. The mine plan and adjacent areas have been ranked as being of substantial value to golden eagles.

The northern bald eagle is an endangered winter resident (November 15 to March 15) of the local area. Note that no bald eagles are known to nest in Utah, however, historic data documents nesting activity by these birds in the State. There is no known historic evidence of the northern bald eagle nesting on the mine plan or adjacent areas.

The American peregrine falcon (relative abundance is endangered) and the prairie falcon (relative abundance is common) are yearlong residents of the mine plan and adjacent areas. Each of these species utilizes cliff nesting sites. To date there are no known aerie sites for cliff nesting falcons on the project area. However, suitable nesting habitat for the prairie falcon is widespread. Suitable nesting habitat for the American peregrine falcon cannot be found on the mine plan and adjacent areas. Since existence on the area by prairie falcons would not be unlikely, the project area has been ranked as being of substantial value to this cliff nesting falcon. However, the project area only is ranked as being of limited value to peregrine falcons.

For each falcon their aerie site while being utilized and a one-half kilometer radius would be ranked as being of critical value to maintenance of their populations. The falcon's period of use at the aerie site spans the spring and early summer period--prairie falcon, April 15 to June 30; peregrine falcon, March 1 to June 30.

The level of data relative to site specific use of the project area by cliff nesting falcons (not including the kestrel) is unsatisfactory and there could be aeries that have not been identified. Therefore, it is recommended that intensive surveys be initiated on the area for determination of locations for cliff falcon aerie sites.

the period of time when a high interest specie is present.

Haulage of coal between the various mine projects and distribution points should be planned so that impacts to wildlife are lessened; of special concern is haulage of coal through wintering areas for big game. It is recommended that the Company develop coal haulage contracts that require personnel involved with coal haulage to use extreme caution so that accidental collisions between motor vehicles and big game are reduced. Without doubt, a reduction in speed across winter ranges would alleviate this problem during the period between November 1 and May 15 each yr.

At present the most successful and cost effective technique for reducing deer-highway mortality is a system of warning reflectors. This system (manufactured by Streiter Corporation, 2100 Eighteenth Avenue, Rock Island Illinois 61201 and known as "Swareflex") is only of value at night time, but it is during darkness that most deer-highway mortality occurs. Streiter Corporation describes the effect of the reflector system as follow: "The headlights of approaching vehicles strike the wildlife reflectors which are installed on both sides of the road. Unnoticeable to the driver, these reflect red lights into the adjoining terrain and an optical warning fence is produced. Any approaching wildlife is [are] alerted and stops or returns to the safety of the countryside. Immediately after the vehicle has passed, the reflectors become inactive, thereby permitting the animals to cross safely."

Installation of a wildlife warning reflector system, a reduction in speed of coal-haulage trucks and other mine related traffic and increased awareness of wildlife values by mine associated employees should result in a reduction of deer-highway mortality problems. Such a reduction would represent satisfactory mitigation.

In instances where conveyors, slurry lines or any other structure having potential to be a barrier to big game movement is to be developed, passage structures must be provided. Generally speaking overpass and underpass type structures are recommended in order to allow passage of big game to habitats either side of any barrier. These crossings should be placed at the points to be identified from intensive study of big game movements in relation to the mine plan area. Such study would not be required if the structure was adequately elevated to allow uninhabited passage of big game along its entire length.

Underpasses should have a min clearance of three meters maintained across a span of at least five meters. Overpasses should be designed as a circular earthen ramp with the barrier bisecting the ramp into two equal halves as follows:

On either side of the conveyor a half-round ramp with a slope no greater than 3:1 on a five meters wide path placed at an angle 90 degrees to the conveyor and tapering around to a slope of 5:1 at

paths adjacent and parallel to the conveyor. The platform over the conveyor should be concrete or some other material that would not echo when being crossed by big game and should be of character similar to rock or natural earth.

Soils associated with either crossing style should be of the A or B horizons to allow for development of vegetation. Vegetative cover must be established in association with all crossing sites. This will lessen anxiety of individual animals using the site through development of a natural appearing environment.

Mature pinion or juniper trees and an abundance of browse plants need to be placed proximal to crossing points in order to provide a safe travelway. The browse plants will also serve as a permanent attraction for big game to crossing points. Additionally, a mixture of grass and forb seeds should be broadcast over each crossing point to stabilize the soil and enhance the forage situation.

Appropriately sized boulders may need to be placed at crossing sites in order to control off-road vehicles utilized in outdoor recreation.

Industrial developments are encouraged on habitat use areas that are ranked as being of limited value to wildlife. It should be noted, however, that reclamation is ultimately expected on any wildlife use area, regardless of its value to wildlife.

for the required chemical properties in all horizons (see Appendix A).

8.7.1 Soil Removal, Handling, Storage, and Protection Plans

Prior to the start of all new construction, topsoil will be analyzed as outlined in Table 8.7-1, in accordance with Division recommendations to determine the extent and depth of suitable plant growth medium and will be separately salvaged and stockpiled. Topsoil is stockpiled, consolidated and protected from wind and water erosion and contamination which might lessen its capability to support vegetation. The following subsections deal specifically with the various phases of the topsoil and subsoil handling plan.

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Rock Fragments	% Volume	USDA SCS Soil Survey Investigation Report No. 1, Method 3B, page 18.

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8.9 NUTRIENTS AND SOIL AMENDMENTS

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3.5.5 Protection of Vegetative Resources

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3.5.5.1 Projected Impacts of Mining on Vegetative Resources

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Rock Fragments	% Volume	USDA SCS Soil Survey Investigation Report No. 1, Method 3B, page 18.

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Total N	%	ASA Mono. No. 9, Part 2 (2 ed), 1982. Method 31-3, pages 610-616.
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Available Water Capacity	in/in	USDA SCS Soil Survey Investigation Report No. 1, Method 4C1, page 24.
Rock Fragments	% Volume	USDA SCS Soil Survey Investigation Report No. 1, Method 3B, page 18.

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3.6 RECLAMATION PLAN

Co-Op upon completion of mining on the permit area, will reclaim all disturbed surface areas as diligently and rapidly as possible, to restore the property to a variety of alternative uses. All reclaimed areas will be maintained during the liability period for at least 10 years.

The initial step in the reclamation plan is to seal all large-diameter openings by backfilling these openings with non-combustible material, (earth & small rock) adjacent to the portals. The seals will be designed such that mine drainage, if any, will not enter surface water bodies. For a more detailed description of the dealing of openings, see Section 3.6.3.1, Sealing of mine Openings, Drill Holes, Wells, etc.

The next step in reclamation would be the removal of all surface structures, equipment and road blacktop. Once this has been accomplished, all solid waste generated in the abandonment operation will be collected and disposed of in an approved manner. Additional information concerning this aspect of the reclamation plan is present in Section 3.6.3.2, Removal of Surface Structures and 3.6.4.

Proposed access roads, to the mine portals, will be reclaimed and revegetated. This will accomplish a dual purpose of

controlling runoff and revegetating the hillsides with vegetation comparable to existing growth.

Backfilling of the subterranean portion of the silos, holes and depressions will be the next reclamation activity, Once the backfilling is completed, the disturbed areas will be graded and recontoured. Topsoil materials will be redistributed as defined in Chapter 8 and then seeded or planted as described in Chapter 9, before the next growing season. A suitably permanent and diverse vegetation cover will be established on all affected areas of land.

The post-mining land uses will be grazing, recreation, wildlife and mineral.

Reclamation Timetable. Land reclamation will take place as soon as possible after surface disturbance. See Section 3.6.8.1. All cut and fill slopes resulting from construction of access roads and coal yards will be stabilized and revegetated at the first seasonal opportunity. Areas occupied by support facilities such as roads, office buildings, shops, coal handling structures and conveyors will not be reclaimed until conclusion of the mining operations. Demolition and removal of structures should commence in March, April 2012. Portal seals and grading should commence in June and be completed by Sept 2012. Drill seeding, hydroseeding and stream enhancement work should be completed by 30 Oct. Monitoring will continue during the liability period for at least 10 yrs. When the

employed as necessary. Chemical stabilization will include the addition of neutralizing chemicals to soils shown to be excessively acidic or basic. Nutrients and soil amendments will be added in the amounts indicated by soil testing (Section 8.9) so approved post-mining land use can be sustained.

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Table 7.2-7 Sediment Ponds, Final Design Criteria

Design Criteria Pond "A"*

Drainage Area	:	14.35 acres**
SCS Curve #82		
3-yr Sediment Storage	:	41,444 ft^3
10-yr 24-hr Runoff Storage	:	42,714 ft^3
Total Storage Volume	:	84,158 ft^3
Use Existing Spillway	:	10 ft wide Broad Crested Weir
Rainfall Data Base	:	Hiawatha Data by E. Arlo Richardson

* Co-Op agreed to use these numbers from John Whitehead, hydrologist for DOGM, during a discussion, 27 February 1984.
** See supplement on next page, p 7-62A.

Design Criteria Pond "B"*

Drainage Area	:	1.82 acres**
SCS Curve #82		
3-yr Sediment Storage	:	2,156 ft^3
10-yr 24-hr Runoff Storage	:	8,182 ft^3
Total Storage Volume	:	10,338 ft^3
Use Existing Spillway	:	4 ft Wide Broad Crested Weir
Rainfall Data Base	:	Hiawatha Data by E. Arlo Richardson

* Co-Op agreed to use these numbers presented in a letter from DOGM, in a letter to Wendell Owen, 16 June 1983.
** See supplement on next page, p 7-62A.

Supplement to Table 7.2-7
Additional Notes on Sediment Ponds and Drainage Areas

Drainage Areas. With the removal of culvert C-9U and the conversion of ditch D-10U to the disturbed ditch D-7D, an additional 5 acres of undisturbed drainage will go into sed pond "A". This area is designated AU-2a on Plate 7-5. All other drainage areas flowing to the pond are also shown on Plate 7-5, and each of these areas were re-planimetered to determine actual runoff to the pond. The results of the area calculations are summarized below:

Area	Acreage	Runoff CN	Runoff Volume
AU-2a	5.000	73	0.121 ac ft
AU-1	3.614	82	0.247 ac ft
AU-2	4.628	82	0.316 ac ft
AU-3	5.936	82	0.406 ac ft
Total (Pond "A")	14.178		1.090 ac ft

3 yr Sediment Volume = 14.178 x 0.0066 ac ft/ac = 0.940 ac ft

Total required volume for Pond "A" = 2.030 ac ft

Area "B" was also re-planimetered from Plate 7-5. Following are the results for this area and Pond "B":

Area	Acreage	Runoff CN	Runoff Volume
B	1.895	82	0.130 ac ft

3 yr Sediment Volume = 14.178 x 0.0066 ac ft/ac = 0.940 ac ft

Total required volume for Pond "A" = 2.030 ac ft

Based on the above numbers, the total disturbed area for Bear Canyon Mine site is 16.073 acres.

Sediment Pond "A". This pond was cleaned and resurveyed on 12 Oct 1990. The existing pond volume was found to be 2.04 acre ft at design overflow, as shown on Plate 7-2A. This indicates that the pond is presently large enough to absorb the additional runoff from the removal of culvert C-9U, as proposed.

Sediment Pond "A"
Stage - Volume Calculations

Elev	Area ft^2	Depth ft	Volume ac ft	Remarks
90	3,740			bottom
		1	0.111	
91	5,960			
		1	0.156	
92	7,600			
		2	0.392	
94	9,480			
		0.9	0.206	
94.9	10,440			decant
		1.1	0.277	
96	11,480			
		1.9	0.543	
97.9	13,440			
		1.1	0.350	
99	14,280			Max Overflow depth
		TOTAL	2.035 ac ft	

Note: All information taken from Plate 7-2A

Additional Protection 1990

As additional, interim protection, a second silt fence will be installed 15 to 25 ft above the first at the inlet to culvert C-8U. This will provide additional protection from coal fines until the culvert is removed in 1991, and the drainage redirected to the sediment pond.

Culvert C-9U Removal 1990

In the fall of 1990 (late Oct - early Nov) culvert C-9U will be removed, and drainage from ditch D-10U will be re-directed into sediment pond "A" via existing ditch D-5D. Ditch D-10U will be cleaned and enlarged as necessary and extended north to intercept ditch D-4D. Ditch D-10U will be re-designated ditch D-7D.

An additional 5 acres of undisturbed drainage will also be intercepted by ditch D-7D, which will flow to pond "A". The drainage is shown on Plate 7-5.

The pond sizing justification is shown in "Additional Notes on Sediment Ponds and Drainage Areas", supplement to Table 7.2-7. Changes in ditches and culverts are shown on Tables 7.2-8 and 7.2-9 respectively. All drainage changes have been updated on Plate 7-1.

Table 7.2-8 Summary of Ditch Sizes

All ditches are triangular "V ditch" with 1:1 side slopes.

Ditch	Flow (cfs)	Velocity (fps)	Rip-Rap Size**	Slope (pct)	Depth of Ditch	Depth of Water
D-1R	10.2	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-2R	12.1	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-3R	10.4	6.8	6 in.	6.0	2 ft 0 in.	1 ft 6 in.
D-1U	1.5	3.5	N/R	4.0	1 ft 3 in.	0 ft 9 in.
D-2U	1.5	3.9	N/R	5.0	1 ft 3 in.	0 ft 9 in.
D-3U	6.1	5.5	4 in.	5.0	1 ft 9 in.	1 ft 3 in.
D-4U	11.8	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-5U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-6U	0.9	3.5	N/R	7.0	1 ft 0 in.	0 ft 6 in.
D-7U	10.3	6.6	6 in.	5.0	2 ft 0 in.	1 ft 6 in.
D-8U	2.3	4.4	N/R	6.25	- down road-	
D-9U	1.8	5.0	4 in.	8.3	1 ft 3 in.	0 ft 9 in.
D-11U	7.6	7.9	9 in.	14.0	1 ft 6 in.	1 ft 0 in.
D-12U	4.5	4.7	N/R	5.0	1 ft 6 in.	1 ft 3 in.
D-1D	0.8	4.0	N/R	9.0	1 ft 0 in.	0 ft 6 in.
D-2D	1.5	5.5	4 in.	10.0	1 ft 3 in.	0 ft 9 in.
D-3D	1.0	5.2	4 in.	15.0	1 ft 0 in.	0 ft 6 in.
D-4D	0.5	3.2	N/R	6.25	1 ft 6 in.	0 ft 5 in.
D-5D	7.2	6.2	6 in.	6.4	1 ft 9 in.	0 ft 9 in.
D-6D	1.2	4.4	N/R	6.25	1 ft 3 in.	0 ft 9 in.
D-7D	5.8	5.7	6 in.	18.0	1 ft 6 in.	1 ft 1 in.

* 6 in. freeboard added to required flow depth.
** See Plate 7.1 for location of rip-rap.
N/R - not required

Table 7.2-9 Summary of Culvert Sizes

Culvert	Flow (cfs)	Velocity (fps)	Rip-Rap Size	Slope (pct)	Diameter	Required Headwater**
C-1R	10.2	9.5	12 in.	8.0	1 ft 6 in.	2 ft 3 in.
C-2R	Not applicable outside the permit area					
C-3R	Not applicable outside the permit area					
C-1U	8.8	12.3	24 in.+	15.0	2 ft 6 in.	1 ft 6 in.
C-2U	1.5	8.4	9 in.	15.0	1 ft 3 in.	0 ft 9 in.
C-3U	7.9++	5.7	6 in.	5.0	1 ft 0 in.	3 ft 0 in.*
C-4U	6.1++	5.1	6 in.	5.1	0 ft 10 in.	3 ft 0 in.*
C-5U	6.1++	5.0	N/R	4.8	0 ft 10 in.	3 ft 0 in.*
C-6U	0.9	4.4	N/R	3.7	0 ft 10 in.	1 ft 0 in.
C-7U	10.3	9.7	12 in.	8.3	1 ft 0 in.	2 ft 3 in.
C-8U	8.8	13.0	24 in.+	15.0	1 ft 6 in.	2 ft 0 in.
C-10U	0.8	5.7	6 in.	5.0	1 ft 0 in.	0 ft 6 in.
C-1D	1.5	10.9	18 in.	20.0	1 ft 3 in.	0 ft 9 in.
C-2D	0.5	9.6	12 in.	12.0	1 ft 6 in.	1 ft 3 in.
C-3D	1.2	5.2	6 in.	4.2	1 ft 6 in.	0 ft 9 in.
C-4D	0.5	9.6	12 in.	8.0	1 ft 6 in.	0 ft 3 in.
C-5D	0.2	3.5	N/R	6.5	1 ft 0 in.	0 ft 3 in.
60 in. CMP	231.5	13.8	24 in.	3.4	5 ft 0 in.	8 ft 6 in.

* When capacity of culvert is exceeded flow continues down ditch to next culvert.

** From invert elevation.

*** All culverts and ditches meet and or exceed min requirements.

\+ Replaced with 15 in. flexible culvert.

++ A two ft high check dam of rip-rap is used to develop the headwater necessary for maximum flow through the culvert, excess flow continues down the ditch.

N/R - not required

The channel is included in drainage area AD-1 (Plate 7-5). The maximum flow calculated for this channel is shown on Table 7.2-8 as 1.5 cfs (Ditch D-2D). Based on this flow, the new culvert designated C-1D, is sized matching the criteria for existing culvert C-1D, shown on Table 7.2-9. Calculations for this ditch are shown in Appendix 7-F under Run-off Ditch Sizing. The headwater depth above the top of the proposed culvert inlet is 1 ft more than adequate to carry the expected flow.

The out-slope of the pad is protected by 6 in. M.D. rock along the area where drainage will occur. The only drainage that will reach the toe of the pad is that from the upper pad to the lower; the majority of the drainage above will be conveyed through the culvert. The 6 in. rock is more than adequate, since the approved plan calls for natural 6 in. rip-rap in the post-mining channel that will carry not only the disturbed drainage AD-1, but the undisturbed drainage from AU-3 as well.

The ditch in this area has been measured, and typical section is shown on Plate 7-8 as cross-section D-D. The ditch profile is also shown on this plate as Profile "F". Plate 7-8a is a typical section of the proposed channel restoration in the area of the portal pad and culvert, after their removal and upon final reclamation.

DRAINAGE CONTROL SYSTEM BEAR CANYON NO. 1 MINE

LOWER SEAM PORTAL AREA

a. Upper Pad. Drainage from the disturbed area on the upper pad from the sub-station to culvert C-1D, will continue to flow into culvert C-1D, as approved; the outlet location of the flexible culvert was moved approx 20 ft to the west of the original location to direct runoff onto the rock ledge above the Lower Seam (Hiawatha) portals; water then flows over the rock ledge to the portal pad below;

b. Portal Pad. The northeast corner of the bin is bermed a min of 30 in. high over to the highwall. Runoff water from the upper pad flows southward around the bin and into a collection box at the edge of the portal pad area; the pad is sloped to flow to the box;

c. Flexible Culvert. The collection box at the portal pad discharges into a 15 in. flexible culvert, the culvert drops onto the next lower pad areas (Conveyor Support Pads);

d. Conveyor Support Pads. This pad area is divided into two sections and is sloped to drain to the flexible culvert; the flexible culvert is opened (or replaced with 1/2 round culvert) for a distance of at least 8 ft to allow surface water to enter the culvert at both sections; the entrance to

the culvert is protected by a trash rack and grouted as shown on the attached typical drawing; water then flows down the flexible culvert to the Coal Processing Pad area.

e. Coal Processing Pad. This pad is also sloped to drain to the culvert; another 8 ft opening was left in the culvert for the surface runoff; water is then conveyed down to the lower (Lump Coal) pad area;

f. Lump Coal Pad. The flexible culvert parallels the conveyor down to the lump coal bin, pass beneath the bin supports, and empties into a catch basin/energy dissipater just south of the bin; runoff then flows south into ditch D-7D and passes into Sediment Pond "A."

Drainage is shown on Plate 7-1. Detailed drawings of the various drainage controls are shown in the attached typical details. Sizing calculations are summarized on the following sheet: "Lower Seam Portal Area - Drainage Sizing Calculations."

GENERAL

Upon inspection of the Mine permit area it was found that the areas described below exist in the undisturbed zones and that surface runoff going through these areas does not pass through the sediment pond treatment facilities. In order to provide adequate treatment for these areas, straw bale dikes and/or silt fences will be installed as indicated on Plate 7-1. The sediment control structures will be positioned so that surface runoff passes through them before entering Bear Creak. Treatment facilities will be maintained for each area until approved and determined that adequate revegetation cancels the need for treatment. These areas are designated as "Best Technology Currently Available" or BTCA Areas. Drainage from these areas will be monitored as possible to show compliance with the state and federal limitations.

OUTSLOPE BANK OF UPPER STORAGE PAD.

During construction of the Upper Storage Pad (Plate 7-1) some fill was apparently overcast down the face of the slope below. The area covers approximately 800 sq ft. A silt fence will be installed and maintained at the inlet to culvert C-8U. In 1991, culvert C-8U will be eliminated, and the drainage will go to Sediment pond "A". The runoff volume for this area is calculated to be 0.0013 acre ft.

AREA NEAR PORTAL NO.1

This area lies between the upper lamphouse/mine portal bermed pad and the portal access road, extending from the road junction on the south to just north of the upper office trailer at the beginning of the Cattle Co. Road. The area is approx. 0.28 acres. A silt fence is installed at the north end of the area where runoff flows down hill from the Cattle Co. Road area. Runoff from the area passes through a silt fence near the inlet to culvert C-6U. Runoff volume from this area is calculated to be 0.019 acre ft.

BALL PARK TOPSOIL PILE

The ball park covers 1.2 acres. Straw bale dikes and/or silt fences will be installed on the south east side, in line with the natural flow to treat runoff before it enters Bear creak. Runoff volume from this area is calculated to be 0.082 acre ft.

TOPSOIL STOCKPILE

The main topsoil storage pile covers approx 0.1 acres. The area is encircled by an 18 in. berm and is protected by established vegetation. Runoff volume from this area is calculated to be 0.0068 acre ft.

Note: Runoff volumes are based on the 10 yr 24 hr event of 2.25 in. and runoff CN of 82.

Topsoil is presently being stored within areas of the permit boundary (Section 8.6). These piles should be considered "long term".

8.7.1.3 Topsoil Protection

The short-term topsoil stockpile will be sprayed with water or temporarily vegetated to retard erosion. The long-term topsoil stockpile will be protected by the following operational steps:

1. A stable surface will be provided in an area outside the influence of active operations.

2. As a stockpile is completed, it will be left in a rough condition to minimize erosion.

3. Stockpiles will be situated out of drainage to prevent water erosion. A berm will be constructed around the stockpiles.

4. Storage piles will be vegetated with quick growing, soil-stabilizing plants. Revegetation will involve the immediate seeding and mulching of stockpiles during the next planting season with the seed mixture recommended in Section 9.5, in compliance with the requirements of the appropriate land management agency.

2.2.5 Resident Agent of the Applicant

Nathan Atwood
P. O. Box 1245
Huntington, Utah 84528
(801) 381-5238

2.2.6 Business Designation (Partnership)

Officers and Directors of the Applicant (General Partners)

Earl W. Stoddard
P.O. Box 300
Huntington, Utah 84528

R.L. Brown
3140 South Main
Salt Lake City, Utah 84115

John Gustafson
1815 South 1100 West
Woods Cross, Utah 84087

2.2.7 Current, Pending or Previous Coal Mining Permits in the U.S. Held By Applicant and Principal Shareholder Subsequent to 1970

Act/015/021 Utah Division of Oil Gas and Mining
Act/015/025 Utah Division of Oil Gas and Mining

2.2.8 Owners of Record of Surface and Sub-surface Areas Contiguous to the Proposed Permit Area

Plate 2-2 shows surface ownership and Plate 2-3 display sub-surface ownership for the permit area and parcels of land contiguous to the permit boundaries.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

COAL LEASE READJUSTMENT

Serial Number U-024316

Lease Date May 1, 1958

Part I. LEASE RIGHTS GRANTED

This lease, entered into by and between the United States of America, hereinafter called the lessor, through the Bureau of Land Management, and

C. O. P. Coal Development Company
53 West Angelo Avenue
Salt Lake City, UT 84115

hereinafter called lessee, is readjusted, effective May 1, 1988, for a period of 10 years and for so long thereafter as coal is produced in commercial quantities from the leased lands, subject to readjustment of lease terms at the end of each 10 year lease period.

Sec. 1. This lease readjustment is subject to the terms and provisions of the:

|XX| Mineral Lands Leasing Act of 1920, Act of February 25, 1920, as amended, 41 Stat. 437, 30 U.S.C. 181-287, hereinafter referred to as the Act;

|___| Mineral Leasing Act for Acquired Lands, Act of August 7, 1947, 61 Stat. 913, 30 U.S.C. 351-359;

and to the regulations and formal orders of the Secretary of the Interior which are now or hereafter in force, when not inconsistent with the express and specific provisions herein.

Sec. 2. Lessor, in consideration of any rents and royalties to be paid, and the conditions and covenants to be observed as herein set forth, hereby grants to lessee the exclusive right and privilege to drill for, mine, extract, remove or otherwise process and dispose of the coal deposits in, upon, or under the following described lands:

T. 16 S., R. 7 E., SLM, Utah, Emery County
Sec. 10, N½, N½S½, SE¼SW¼, S½SE¼;
Sec. 11, all;
Sec. 12, W½W½;
Sec. 13, W½W½;
Sec. 14, NE¼, E½NW¼.

containing 1,800.00 acres, more or less, together with the right to construct such works, buildings, plants, structures, equipment and appliances and the right to use such on-lease rights-of-way which may be necessary and convenient in the exercise of the rights and privileges granted, subject to the conditions herein provided.

PART II. TERMS AND CONDITIONS

Sec. 1.(a) RENTAL RATE - Lessee shall pay lessor rental annually and in advance for each acre or fraction thereof during the continuance of the lease at the rate of $3.00 for each lease year.

(b) RENTAL CREDITS - Rental shall not be credited against either production or advance royalties for any year.

Sec. 2.(a) PRODUCTION ROYALTIES - The royalty shall be 12½ percent of the value of coal produced by strip or auger mining methods and 8 percent of the value of coal produced by underground mining methods. Royalties are due to lessor the final day of the months succeeding the calendar month in which the royalty obligation accrues.

(b) ADVANCE ROYALTIES - Upon request by the lessee, the authorized officer may accept for a total of not more than 10 years, the payment of advance royalties in lieu of continued operation, consistent with the regulations. The advance royalty shall be based on a percent of the value of a minimum number of tons determined in the manner established by the advance royalty regulations in effect at the time the lessee requests approval to pay advance royalties in lieu of continued operation.

Sec. 3. BONDS - Lessee shall maintain in the proper office a lease bond in the amount of $5,000. The authorized officer may require an adjustment in the amount of the bond to reflect changed conditions.

Sec. 4. DILIGENCE - This lease is subject to the conditions of diligent development and continued operation, except that these conditions are excused when operations under the lease are interrupted by strikes, the elements, or casualties not attributable to the lessee. The lessor, in the public interest, may suspend the condition of continued operation upon payment of advance royalties in accordance with the regulations in existence at the time of the suspension. Lessee's failure to produce coal in commercial quantities at the end of 10 years shall terminate the lease. If not submitted already, lessee shall submit an operation and reclamation plan pursuant to Section 7 of the Act not later than 3 years after the effective date of this lease readjustment.

The lessor reserves the power to assent to or order the suspension of the terms and conditions of this lease in accordance with, inter alia, Section 39 of the Mineral Leasing Act, 30 U.S.C. 209.

Sec. 5. LOGICAL MINING UNIT (LMU) - Either upon approval by the lessor of the lessee's application or at the direction of the lessor, this lease shall become a LMU or part of a LMU, subject to the provisions set forth in the regulations.

The stipulations established in a LMU approval in effect at the time of LMU approval will supersede the relevant inconsistent terms of this lease so long as the lease remains committed to the LMU. If the LMU of which this lease is a part is dissolved, the lease shall then be subject to the lease terms which would have been applied if the lease had not been included in an LMU.

Sec. 6. DOCUMENTS, EVIDENCE AND INSPECTION - At such times and in such form as lessor may prescribe, lessee shall furnish detailed statements showing the amounts and quality of all products removed and sold from the lease, the proceeds therefrom, and the amount used for production purposes or unavoidably lost.

Lessee shall keep open at all times for the inspection of any duly authorized officer of lessor, the leased premises and all surface and underground improvements, works, machinery, ore stockpiles, equipment, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or under the leased lands.

Lessee shall allow lessor access to and copying of documents reasonably necessary to verify lessee compliance with terms and conditions of the lease.

While this lease remains in effect, information obtained under this section shall be closed to inspection by the public in accordance with the Freedom of Information Act (5 U.S.C. 552).

Sec. 7. DAMAGES TO PROPERTY AND CONDUCT OF OPERATIONS - Lessee shall comply at its own expense with all reasonable orders of the Secretary, respecting diligent operations, prevention of waste, and protection of other resources.

Lessee shall not conduct exploration operations, other than casual use, without an approved exploration plan. All exploration plans prior to the commencement of mining operations within an approved mining permit area shall be submitted to the authorized officer.

Lessee shall carry on all operations in accordance with approved methods and practices as provided in the operating regulations, having due regard for the prevention of injury to life, health, or property, and prevention of waste, damage or degradation to any land, air, water, cultural, biological, visual, and other resources, including mineral deposits and formations of mineral deposits not leased hereunder, and to other land uses or users. Lessee shall take measures deemed necessary by lessor to accomplish the intent of this lease term. Such measures may include, but not limited to, modification to proposed siting or design of facilities, timing of operations, and specification of interim and final reclamation procedures. Lessor reserves to itself the right to lease, sell, or otherwise dispose of the surface or other mineral deposits in the lands and the right to continue existing uses and to authorize future uses upon or in the leased lands, including issuing leases for mineral deposits, not covered hereunder and approving easements or rights-of-way. Lessor shall condition such uses to prevent unnecessary or unreasonable interference with rights of lessee as may be consistent with concepts of multiple use and multiple mineral development.

Sec. 8. PROTECTION OF DIVERSE INTERESTS, AND EQUAL OPPORTUNITY - Lessee shall: pay when due all taxes legally assessed and levied under the laws of the State or the United States; accord all employees complete freedom of purchase; pay all wages at least twice each month in lawful money of the United States; maintain a safe working environment in accordance with standard industry practices; restrict the workday to not more than 8 hours in any one day for underground workers, except in emergencies; and take measures necessary to protect the health and safety of the public. No person under the age of 16 years shall be employed in any mine below the surface. To the extent that laws of the State in which the lands are situated are more restrictive than the provisions in this paragraph, then the State laws apply.

Lessee will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and the rules, regulations, and relevant orders of the Secretary of Labor.

Neither lessee nor lessee's subcontractors shall maintain segregated facilities.

Sec. 9.(a) TRANSFERS

|X| This lease may be transferred in whole or in part to any person, association, or corporation qualified to hold such lease interest.

|__| This lease may be transferred in whole or in part to another public body, or to a person who will mine the coal on behalf of, and for the use of, the public body or to a person who for the limited purpose of creating a security interest in favor of a lender agrees to be obligated to mine the coal on behalf of the public body.

|__| This lease may only be transferred in whole or in part to another small business qualified under 13 CFR 121.

Transfers of record title, working or royalty interest must be approved in accordance with the regulations.

(b) RELINQUISHMENT - The lessee may relinquish in writing at any time all rights under this lease or any portion thereof as provided in the regulations. Upon lessor's acceptance of the relinquishment, lessee shall be relieved of all future obligations under the lease or the relinquished portion thereof, whichever is applicable.

Sec. 10. DELIVERY OF PREMISES, REMOVAL OF MACHINERY, EQUIPMENT, ETC. - At such time as all portions of this lease are returned to lessor, lessee shall deliver up to lessor the land leased, underground timbering, and such other supports and structures necessary for the preservation of the mine workings on the leased premises or deposits and place all workings in condition for suspension or abandonment. Within 180 days thereof, lessee shall remove from the premises all other structures, machinery, equipment, tools, and materials that it elects to or as required by the authorized officer. Any such structures, machinery, equipment, tools, and materials remaining on the leased lands beyond 180 days, or approved extension thereof, shall become the property of the lessor, but lessee shall either remove any or all such property or shall continue to be liable for the cost of removal and disposal in the amount actually incurred by the lessor. If the surface is owned by third parties, lessor shall waive the requirement for removal, provided the third parties do not object to such waiver. Lessee shall, prior to the termination of bond liability or at any other time when required and in accordance with all applicable laws and regulations, reclaim all lands the surface of which has been disturbed, dispose of all debris or solid waste, repair the offsite and onsite damage caused by lessee's activity or activities incidental thereto, and reclaim access roads or trails.

Sec. 11. PROCEEDINGS IN CASE OF DEFAULT - If lessee fails to comply with applicable laws, existing regulations, or the terms, conditions and stipulations of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease shall be subject to cancellation by the lessor only by judicial proceedings. This provision shall not be construed to prevent the exercise by lessor of any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver shall not prevent later

cancellation for the same default occurring at any other time.

Sec. 12. HEIRS AND SUCCESSORS - IN-INTEREST - Each obligation of this lease shall extend to and be binding upon, and every benefit hereof shall inure to, the heirs, executors, administrators, successors, or assigns of the respective parties hereto.

Sec. 13. INDEMNIFICATION - Lessee shall indemnify and hold harmless the United States from any and all claims arising out of the lessee's activities and operations under this lease.

Sec. 14. SPECIAL STATUTES - This lease is subject to the Federal Water Pollution Control Act (33 U.S.C. 1151 - 1175); the Clean Air Act (42 U.S.C. 1857 et seq.), and to all other applicable laws pertaining to exploration activities, mining operations and reclamation, including the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201 et seq.)

Sec. 15. SPECIAL STIPULATIONS -

1. The Regulatory Authority shall mean the State Regulatory Authority pursuant to a cooperative agreement approved under 30 CFR Part 745 or in the absence of a cooperative agreement, Office of Surface Mining. The authorized officer shall mean the State Director, Bureau of Land Management. The authorized officer of the Surface Management Agency shall mean the Forest Supervisor, Forest Service. Surface Management Agency for private surface is the Bureau of Land Management. For adjoining private lands with Federal minerals and which primarily involve National Forest Service issues, the Forest Service will have the lead for environmental analysis and, when necessary, documentation in an environmental assessment or environmental impact statement.

2. The authorized officers, of the Bureau of Land Management, Office of Surface Mining (Regulatory Authority), and the Surface Management Agency (Forest Service) respectively, shall coordinate, as practical, regulation of mining operations and associated activities on the lease area.

3. In accordance with Sec. 523(b) of the "Surface Mining Control and Reclamation Act of 1977," surface mining and reclamation operations conducted on this lease are to conform with the requirements of this Act and are subject to compliance with Office of Surface Mining Regulations, or as applicable, a Utah program equivalent approved under cooperative agreement in accordance with Sec. 523(c). The United States Government does not warrant that the entire tract will be susceptible to mining.

4. Federal Regulations 43 CFR 3400 pertaining to Coal Management make provisions for the Surface Management Agency, the surface of which is under the jurisdiction of any Federal agency other than the Department of Interior, to consent to leasing and to prescribe conditions to insure the use and protection of the lands. All or part of this lease contain lands the surface of which are managed by the United States Department of Agriculture, Forest Service Manti-LaSal National Forest.

The following stipulations pertain to the lessee responsibility for mining operations on the lease area and on adjacent areas as may be specifically designated on National Forest System lands.

5. Before undertaking activities that may disturb the surface of previously undisturbed leased lands, the lessee may be required to conduct a cultural resource inventory and a paleontological appraisal of the areas to be disturbed. These studies shall be conducted by qualified professional cultural resource specialists or qualified paleontologists, as appropriate, and a report prepared itemizing the findings. A plan will then be submitted making recommendations for the protection of, or measures to be taken to mitigate impacts for identified cultural or paleontological resources.

If cultural resources or paleontological remains (fossils) of significant scientific interest are discovered during operations under this lease, the lessee prior to disturbance shall, immediately bring them to the attention of the appropriate authorities. Paleontological remains of significant scientific interest do not include leaves, ferns, or dinosaur tracks commonly encountered during underground mining operations.

The cost of conducting the inventory, preparing reports,and carrying out mitigating measures shall be borne by the lessee.

6. If there is reason to believe that threatened or endangered (T&E) species of plants or animals, or migratory bird species of high Federal interest occur in the area the lessee shall be required to conduct an intensive field inventory of the area to be disturbed and/or impacted. The inventory shall be conducted by a qualified specialist and a report of findings will be prepared. A plan will be prepared making recommendations for the protection of these species or action necessary to mitigate the disturbance.

The cost of conducting the inventory, preparing reports, and carrying out mitigating measures shall be borne by the lessee.

7. The lessee shall be required to perform a study to secure adequate baseline data to quantify the existing surface resources on and adjacent to the lease area. Existing data may be used if such data is adequate for the intended purposes. The study shall be adequate to locate, quantify, and demonstrate the inter-relationship of the geology, topography, surface hydrology, vegetation, and wildlife. Baseline data will be established so that future programs of observation can be incorporated at regular intervals for comparison.

8. Powerlines used in conjunction with the mining of coal from this lease shall be constructed so as to provide adequate protection for raptors and other large birds. When feasible, powerlines will be located at least 100 yards from public roads.

9. The limited area available for mine facilities at the coal outcrop, steep topography, adverse winter weather, and physical limitations on the size and design of the access road, are factors which will determine the ultimate size of the surface area utilized for the mine. A site specific environmental analysis will be prepared for each new mine site development and for major modifications to existing developments to examine alternatives and mitigate conflicts.

10. The lessee shall be required to establish a monitoring system to locate, measure, and quantify the progressive and final effects of underground mining activities on the topographic surface, underground and surface hydrology and vegetation. The monitoring system shall utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a number of points over the lease area. The monitoring shall incorporate and be an extension of the baseline data.

11. The lessee shall provide for the suppression and control of fugitive dust on haul roads and at coal handling and storage facilities. On Forest Development Roads (FDR), lessees may perform their share of road maintenance by a commensurate share agreement if a significant degree of traffic is generated that is not related to their activities.

12. Except at specifically approved locations, underground mining operations shall be conducted in such a manner so as to prevent surface subsidence that would: (1) cause the creation of hazardous conditions such as potential escarpment failure and landslides, (2) cause damage to existing surface structures, and (3) damage or alter the flow of perennial streams. The lessee shall provide specific measures for the protection of escarpments, and determine corrective measures to assure that hazardous conditions are not created.

13. In order to avoid surface disturbance on steep canyon slopes and to preclude the need for surface access, all surface breakouts for ventilation tunnels shall be constructed from inside the mine, except at specifically approved locations.

14. The coal contained within, and authorized for mining under this lease, shall be extracted only by underground mining methods.

15. Existing Forest Service owned or permitted surface improvements will need to be protected, restored, or replaced to provide for the continuance of current land uses.

16. In order to protect big game wintering areas, elk calving and deer fawning areas, sagegrouse strutting areas, and other critical wildlife habitat and/or activities, specific surface uses outside the mine development area may be curtailed during specific periods of the year.

17. Support facilities, structures, equipment, and similar developments will be removed from the lease area within 2 years after the final termination of use of such facilities. This provision shall apply unless the requirement of Section 10 of the lease form is applicable. Disturbed areas and those areas previously occupied by such facilities will be stabilized and rehabilitated, drainages reestablished, and the areas returned to a premining land use.

18. The lessee at the conclusion of the mining operations, or at other times as surface disturbance related to mining may occur, will replace all damaged, disturbed, or displaced corner monuments (section corners, quarter corners, etc.)

their accessories and appendages (witness trees, bearing trees, etc.), or restore them to their original condition and location, or at other locations that meet the requirements of the rectangular surveying system. This work shall be conducted at the expense of the lessee, by a professional land surveyor registered in the State of Utah and to the standards and guidelines found in the manual of surveying instruction, U.S. Department of Interior.

19. The lessee at his expense will be responsible to replace any surface water identified for protection, that may be lost or adversely affected by mining operations, with water from an alternate source in sufficient quantity and quality to maintain existing riparian habitat, fishery habitat, livestock and wildlife use, or other land uses.

20. The lessee must comply with all the rules and regulations of the Secretary of Agriculture set forth at Title 36, Chapter II, of the Code of Federal Regulations governing the use and management of the National Forest System (NFS) when not inconsistent with the rights granted by the Secretary of the Interior in the lease. The Secretary of Agriculture's rules and regulations must be complied with for (1) all use and occupancy of the NFS prior to approval of a permit/operation plan by the Secretary of Interior, (2) uses of all existing improvements, such as Forest Development Roads, within and outside the area licensed, permitted or leased by the Secretary of Interior, and (3) use and occupancy of the NFS not authorized by a permit/operation plan approved by the Secretary of the Interior.

All matters related to this stipulation are to be addressed to:

Forest Supervisor
Manti-LaSal National Forest
599 West Price River Drive
Price, Utah 84501

Telephone No.: 801-637-2817

who is the authorized representative of the Secretary of Agriculture.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

COAL LEASE READJUSTMENT

Serial Number U-024318

Lease Date May 1, 1958

Part I. LEASE RIGHTS GRANTED

This lease, entered into by and between the United States of America, hereinafter called the lessor, through the Bureau of Land Management, and

C. O. P. Coal Development Company
53 West Angelo Avenue
Salt Lake City, UT 84115

hereinafter called lessee, is readjusted, effective May 1, 1988, for a period of 10 years and for so long thereafter as coal is produced in commercial quantities from the leased lands, subject to readjustment of lease terms at the end of each 10 year lease period.

Sec. 1. This lease readjustment is subject to the terms and provisions of the:

|XX| Mineral Lands Leasing Act of 1920, Act of February 25, 1920, as amended, 41 Stat. 437, 30 U.S.C. 181-287, hereinafter referred to as the Act;

|___| Mineral Leasing Act for Acquired Lands, Act of August 7, 1947, 61 Stat. 913, 30 U.S.C. 351-359;

and to the regulations and formal orders of the Secretary of the Interior which are now or hereafter in force, when not inconsistent with the express and specific provisions herein.

Sec. 2. Lessor, in consideration of any rents and royalties to be paid, and the conditions and covenants to be observed as herein set forth, hereby grants to lessee the exclusive right and privilege to drill for, mine, extract, remove or otherwise process and dispose of the coal deposits in, upon, or under the following described lands:

T. 16 S., R. 7 E., SLM, Utah, Emery County
Sec., 26, E½NW¼.

containing 80.00 acres, more or less, together with the right to construct such works, buildings, plants, structures, equipment and appliances and the right to use such on-lease rights-of-way which may be necessary and convenient in the exercise of the rights and privileges granted, subject to the conditions herein provided.

PART II. TERMS AND CONDITIONS

Sec. 1.(a) RENTAL RATE - Lessee shall pay lessor rental annually and in advance for each acre or fraction thereof during the continuance of the lease at the rate of $3.00 for each lease year.

(b) RENTAL CREDITS - Rental shall not be credited against either production or advance royalties for any year.

Sec. 2.(a) PRODUCTION ROYALTIES - The royalty shall be 12½ percent of the value of coal produced by strip or auger mining methods and 8 percent of the value of coal produced by underground mining methods. Royalties are due to lessor the final day of the months succeeding the calendar month in which the royalty obligation accrues.

(b) ADVANCE ROYALTIES - Upon request by the lessee, the authorized officer may accept for a total of not more than 10 years, the payment of advance royalties in lieu of continued operation, consistent with the regulations. The advance royalty shall be based on a percent of the value of a minimum number of tons determined in the manner established by the advance royalty regulations in effect at the time the lessee requests approval to pay advance royalties in lieu of continued operation.

Sec. 3. BONDS - Lessee shall maintain in the proper office a lease bond in the amount of $5,000. The authorized officer may require an adjustment in the amount of the bond to reflect changed conditions.

Sec. 4. DILIGENCE - This lease is subject to the conditions of diligent development and continued operation, except that these conditions are excused when operations under the lease are interrupted by strikes, the elements, or casualties not attributable to the lessee. The lessor, in the public interest, may suspend the condition of continued operation upon payment of advance royalties in accordance with the regulations in existence at the time of the suspension. Lessee's failure to produce coal in commercial quantities at the end of 10 years shall terminate the lease. If not submitted already, lessee shall submit an operation and reclamation plan pursuant to Section 7 of the Act not later than 3 years after the effective date of this lease readjustment.

The lessor reserves the power to assent to or order the suspension of the terms and conditions of this lease in accordance with, inter alia, Section 39 of the Mineral Leasing Act, 30 U.S.C. 209.

Sec. 5. LOGICAL MINING UNIT (LMU) - Either upon approval by the lessor of the lessee's application or at the direction of the lessor, this lease shall become a LMU or part of a LMU, subject to the provisions set forth in the regulations.

The stipulations established in a LMU approval in effect at the time of LMU approval will supersede the relevant inconsistent terms of this lease so long as the lease remains committed to the LMU. If the LMU of which this lease is a part is dissolved, the lease shall then be subject to the lease terms which would have been applied if the lease had not been included in an LMU.

Sec. 6. DOCUMENTS, EVIDENCE AND INSPECTION - At such times and in such form as lessor may prescribe, lessee shall furnish detailed statements showing the amounts and quality of all products removed and sold from the lease, the proceeds therefrom, and the amount used for production purposes or unavoidably lost.

Lessee shall keep open at all times for the inspection of any duly authorized officer of lessor, the leased premises and all surface and underground improvements, works, machinery, ore stockpiles, equipment, and all books, accounts, maps, and records relative to operations, surveys, or investigations on or under the leased lands.

Lessee shall allow lessor access to and copying of documents reasonably necessary to verify lessee compliance with terms and conditions of the lease.

While this lease remains in effect, information obtained under this section shall be closed to inspection by the public in accordance with the Freedom of Information Act (5 U.S.C. 552).

Sec. 7. DAMAGES TO PROPERTY AND CONDUCT OF OPERATIONS - Lessee shall comply at its own expense with all reasonable orders of the Secretary, respecting diligent operations, prevention of waste, and protection of other resources.

Lessee shall not conduct exploration operations, other than casual use, without an approved exploration plan. All exploration plans prior to the commencement of mining operations within an approved mining permit area shall be submitted to the authorized officer.

Lessee shall carry on all operations in accordance with approved methods and practices as provided in the operating regulations, having due regard for the prevention of injury to life, health, or property, and prevention of waste, damage or degradation to any land, air, water, cultural, biological, visual, and other resources, including mineral deposits and formations of mineral deposits not leased hereunder, and to other land uses or users. Lessee shall take measures deemed necessary by lessor to accomplish the intent of this lease term. Such measures may include, but not limited to, modification to proposed siting or design of facilities, timing of operations, and specification of interim and final reclamation procedures. Lessor reserves to itself the right to lease, sell, or otherwise dispose of the surface or other mineral deposits in the lands and the right to continue existing uses and to authorize future uses upon or in the leased lands, including issuing leases for mineral deposits, not covered hereunder and approving easements or rights-of-way. Lessor shall condition such uses to prevent unnecessary or unreasonable interference with rights of lessee as may be consistent with concepts of multiple use and multiple mineral development.

Sec. 8. PROTECTION OF DIVERSE INTERESTS, AND EQUAL OPPORTUNITY - Lessee shall: pay when due all taxes legally assessed and levied under the laws of the State or the United States; accord all employees complete freedom of purchase; pay all wages at least twice each month in lawful money of the United States; maintain a safe working environment in accordance with standard industry practices; restrict the workday to not more than 8 hours in any one day for underground workers, except in emergencies; and take measures necessary to protect the health and safety of the public. No person under the age of 16 years shall be employed in any mine below the surface. To the extent that laws of the State in which the lands are situated are more restrictive than the provisions in this paragraph, then the State laws apply.

Lessee will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended, and the rules, regulations, and relevant orders of the Secretary of Labor.

Neither lessee nor lessee's subcontractors shall maintain segregated facilities.

Sec. 9.(a) TRANSFERS

|X| This lease may be transferred in whole or in part to any person, association, or corporation qualified to hold such lease interest.

|__| This lease may be transferred in whole or in part to another public body, or to a person who will mine the coal on behalf of, and for the use of, the public body or to a person who for the limited purpose of creating a security interest in favor of a lender agrees to be obligated to mine the coal on behalf of the public body.

|__| This lease may only be transferred in whole or in part to another small business qualified under 13 CFR 121.

Transfers of record title, working or royalty interest must be approved in accordance with the regulations.

(b) RELINQUISHMENT - The lessee may relinquish in writing at any time all rights under this lease or any portion thereof as provided in the regulations. Upon lessor's acceptance of the relinquishment, lessee shall be relieved of all future obligations under the lease or the relinquished portion thereof, whichever is applicable.

Sec. 10. DELIVERY OF PREMISES, REMOVAL OF MACHINERY, EQUIPMENT, ETC. - At such time as all portions of this lease are returned to lessor, lessee shall deliver up to lessor the land leased, underground timbering, and such other supports and structures necessary for the preservation of the mine workings on the leased premises or deposits and place all workings in condition for suspension or abandonment. Within 180 days thereof, lessee shall remove from the premises all other structures, machinery, equipment, tools, and materials that it elects to or as required by the authorized officer. Any such structures, machinery, equipment, tools, and materials remaining on the leased lands beyond 180 days, or approved extension thereof, shall become the property of the lessor, but lessee shall either remove any or all such property or shall continue to be liable for the cost of removal and disposal in the amount actually incurred by the lessor. If the surface is owned by third parties, lessor shall waive the requirement for removal, provided the third parties do not object to such waiver. Lessee shall, prior to the termination of bond liability or at any other time when required and in accordance with all applicable laws and regulations, reclaim all lands the surface of which has been disturbed, dispose of all debris or solid waste, repair the offsite and onsite damage caused by lessee's activity or activities incidental thereto, and reclaim access roads or trails.

Sec. 11. PROCEEDINGS IN CASE OF DEFAULT - If lessee fails to comply with applicable laws, existing regulations, or the terms, conditions and stipulations of this lease, and the noncompliance continues for 30 days after written notice thereof, this lease shall be subject to cancellation by the lessor only by judicial proceedings. This provision shall not be construed to prevent the exercise by lessor of any other legal and equitable remedy, including waiver of the default. Any such remedy or waiver shall not prevent later

cancellation for the same default occurring at any other time.

Sec. 12. HEIRS AND SUCCESSORS - IN-INTEREST - Each obligation of this lease shall extend to and be binding upon, and every benefit hereof shall inure to, the heirs, executors, administrators, successors, or assigns of the respective parties hereto.

Sec. 13. INDEMNIFICATION - Lessee shall indemnify and hold harmless the United States from any and all claims arising out of the lessee's activities and operations under this lease.

Sec. 14. SPECIAL STATUTES - This lease is subject to the Federal Water Pollution Control Act (33 U.S.C. 1151 - 1175); the Clean Air Act (42 U.S.C. 1857 et seq.), and to all other applicable laws pertaining to exploration activities, mining operations and reclamation, including the Surface Mining Control and Reclamation Act of 1977 (30 U.S.C. 1201 et seq.)

Sec. 15. SPECIAL STIPULATIONS -

The following stipulations made part of this lease may be waived or amended with the mutual consent of the lessor and lessee.

1. In accordance with Sec. 523(b) of the "Surface Mining Control and Reclamation Act of 1977," surface mining and reclamation operations conducted on this lease are to conform with the requirements of this act and are subject to compliance with Office of Surface Mining regulations, or as applicable, a Utah program equivalent approved under cooperative agreement in accordance with Sec. 523(c). The United States Government does not warrant that the entire tract will be susceptible to mining.

2. The permitting of any mining operations on the lease will be subject to the possible designation of any portion of the lease as unsuitable for some or all kinds of surface mining under the regulations of the Department under the Surface Mining Control and Reclamation Act of 1977 (SMCRA) in effect at the time of action on the mine plan permit.

3. Before undertaking activities that may disturb the surface of previously undisturbed leased lands, the lessee may be required to conduct a cultural resource inventory of the areas to be disturbed. These studies shall be conducted by qualified professional cultural resource specialists and a report prepared

itemizing the findings. A plan will then be submitted making recommendations for the protection of, or measures to be taken to mitigate impacts for identified cultural resources.

If significant cultural resources are discovered during operations under this lease, the lessee shall immediately bring them to the attention of the authorized officer who shall evaluate or have evaluated such discoveries and, within 5 working days, shall notify the Lessee what action shall be taken with respect to such discoveries.

The cost of conducting the inventory, preparing reports, and carrying out necessary protective mitigating measures shall be borne by the lessee.

4. Before undertaking activities that may disturb the surface of previously undisturbed leased lands, the lessee may be required to conduct a paleontological appraisal of the areas to be disturbed. The appraisal shall be conducted by qualified paleontologists and a report prepared itemizing the findings. A plan will then be submitted making recommendations for the protection of, or measures to be taken to mitigate impacts for identified paleontological resources.

If paleontological remains (fossils) of significant scientific interest are discovered during operations under this lease, the lessee shall immediately bring them to the attention of the authorized officer who shall evaluate or have evaluated such discoveries brought to his attention and, within 5 working days, shall notify the lessee what action shall be taken with respect to such discoveries. Paleontological remains of significant scientific interest do not include leaves, ferns, or dinosaur tracks commonly encountered during underground mining operations.

The cost of conducting the inventory, preparing reports, and carrying out necessary protective mitigating measures shall be borne by the lessee. The cost of salvage of paleontological remains (fossils) shall be borne by the United States.

5. If there is reason to believe that threatened or endangered (T&E) species of plants or animals, or migratory species of high Federal interest occur in the area, the lessee shall be required to conduct an intensive field inventory of the area to be disturbed and/or impacted. A listing of migratory birds of high Federal interest in Federal coal producing regions is published by the Fish and Wildlife Service, Migratory Bird Management Office, Washington, D.C. The inventory shall be conducted by qualified specialist and a report of findings will be prepared. A plan will be prepared making recommendations for the protection of these species or action necessary to mitigate the disturbance.

The cost of conducting the inventory, preparing reports, and carrying out necessary protective mitigating measures shall be borne by the lessee.

6. The lessee shall be required to perform a study to secure adequate baseline data to quantify the existing surface resources on and adjacent to the lease area. Existing data may be used if such data is adequate for the intended purposes. The study shall be adequate to locate, quantify, and demonstrate the inter-relationship of the geology, topography, surface hydrology, vegetation, and wildlife. Baseline data will be established so that future programs of observation can be incorporated at regular intervals for comparison.

7. Powerlines on the lease area used in conjunction with the mining of coal from this lease shall be constructed so as to provide adequate protection for raptors and other large birds. When feasible, powerlines will be located at least 100 yards from public roads.

8. The lessee shall provide for the suppression and control of fugitive dust on haul roads and at coal handling and storage facilities on the lease area. The migration of road surfacing and subsurface materials into streams and water courses shall be prevented.

9. The lessee shall be required to establish a monitoring system to locate, measure, and quantify the progressive and final effects of underground mining activities on the topographic surface, underground and surface hydrology and vegetation. The monitoring system shall utilize techniques which will provide a continuing record of change over time and an analytical method for location and measurement of a number of points over the lease area. The monitoring shall incorporate and be an extension of the baseline data.

10. Except at specifically approved locations, underground mining operations shall be conducted in such a manner so as to prevent surface subsidence that would: 1) cause the creation of hazardous conditions such as potential escarpment failure and landslides, 2) cause damage to existing surface structures, and 3) damage or alter the flow of perennial streams.

11. In order to avoid surface disturbance on steep canyon slopes and to satisfy the need for surface access, all surface breakouts for ventilation tunnels shall be constructed from inside the mine, except at specifically approved locations.

12. Support facilities, structures, equipment, and similar developments will be removed from the lease area within 2 years after the final termination of use of such facilities. This provision shall apply unless the requirement of Section 10 of the lease form is applicable. Disturbed areas and those areas occupied by such facilities will be stabilized and rehabilitated, drainages reestablished, and the areas returned to a premining land use.

Table 7.1-8 Water Monitoring Matrix 1990 thru 1991

Location	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Upper Bear Creek BC-1		opper.			opper.	field	field	opper.	field	opper. (3)		
Lower Bear Creek BC-2		opper.			opper.	field	field	opper.	field	opper. (3)		
Rt. Fork Bear Cr. BC-3		opper.			opper.	field	field	opper.	field	opper. (3)		
Portal Well SBC-2		opper.			opper.			opper.		opper.		
Creek Well SBC-3		opper.			opper.			opper.		opper.		
Huntington Spring Overflow SBC-4		opper.			opper.			opper.		opper. (3)		
Birch Spring SBC-5					opper.					opper.		
Co-Op Dev Spring SBC-6		opper.			opper.			opper.		opper. (3)		
E. Bleeder #33 W. SBC-7		flow			flow			flow		flow		
E. Bleeder #30 E. SBC-8		flow			flow			flow		flow		
1st N. Bleeder #42 SBC-9		base.			base.			base.		base.		

Notes:
1. See Tables 7.1-7 and 7.2-5 for listing of water quality monitoring parameters.
2. opper. = opperational
   base. = baseline
3. Baseline parameters taken in 1990.

Table 7.1-9 Water Monitoring Matrix 1992 thru 1995

Location	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Upper Bear Creek BC-1		opper.			opper.	field	field	opper.	field	opper. (3)		
Lower Bear Creek BC-2		opper.			opper.	field	field	opper.	field	opper. (3)		
Rt. Fork Bear Cr. BC-3		opper.			opper.	field	field	opper.	field	opper. (3)		
Portal Well SBC-2		opper.			opper.			opper.		opper.		
Creek Well SBC-3		opper.			opper.			opper.		opper.		
Huntington Spring Overflow SBC-4		opper.			opper.			opper.		opper. (3)		
Birch Spring SBC-5					opper.					opper. (3)		
Co-Op Dev Spring SBC-6		opper.			opper.			opper.		opper. (3)		
1st N. Bleeder #42 SBC-9		opper.			opper.			opper.		opper.		

Notes:
1. See Tables 7.1-7 and 7.2-5 for listing of water quality monitoring parameters.
2. opper. = opperational
   base. = baseline
3. Baseline parameters taken in 1995.

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In a typical profile the surface layer is brown or yellowish brown, very stony fine sandy loam about 16 in. thick. The subsoil is very pale brown, very stony silty clay loam to a depth of 36 in. and the substratum is very pale brown silty clay loam to more than 60 inches.

Permeability is moderate to 36 inches. Available water capacity is 6.5 in. to a depth of 60 inches. Organic matter content in the surface layer is about 4 pct. Effective rooting depth is about 60 inches. Surface runoff is rapid and erosion hazard is high under native vegetation and very high if vegetation is removed and the soil is left bare. This soil is used for range, wildlife habitat, and mining operation.

Taxonomic classification is loamy-skeletal, mixed Typic Haplo boralls.

A typical pedon of Datino very stony fine sandy loam, 40 to 70 pct slopes described on the bank about 150 ft north of the old mine portal about 300 ft north and 300 ft east of the SW corner of Sec 24 T16S R7E.

A1 -- 0 to 3 in.; brown (10YR 5/4) stony fine sandy loam, dark brown (10YR 3/3) when moist; moderate fine granular structure; soft very friable, nonsticky, nonplastic; many very fine, few medium and course roots; moderately calcareous; moderately

alkaline (pH 8.4); abrupt smooth boundary.

A2 -- 3 to 16 in.; yellowish brown (10YR 5/4) stony fine sandy loam, dark brown (10YR 3/3) when moist; weak medium granular structure ;soft, friable, nonsticky, nonplastic; many very fine and fine, few medium and coarse roots; 2 pct boulders, 10 pct stones, 10 pct cobbles, 10 pct gravel; moderately calcareous; moderately alkaline (pH 8.4); clear smooth boundary.

B -- 16 to 36 in. very pale brown (10YR 7/3) very stony sandy clay loam, pale brown (10YR 6/3) when moist; weak medium subangular blocky structure; slightly hard, firm, slightly sticky, plastic common very fine and fine roots; many fine pores; 2 pct boulders, 15 pct stones, 15 pct cobbles, 10 pct gravel; moderately calcareous; strongly alkaline (pH 8.6); abrupt wavy boundary.

C -- 36 to 60 in. very pale brown (10YR 8/4) stony silty clay loam, light yellowish brown (10YR 6/4) when moist; moderate medium and coarse subangular blocky structure; hard, firm, sticky plastic; few very fine and fine roots, common fine pores; 2 pct boulders, 10 pct stones, 10 pct cobbles, 5 pct gravel; strongly calcareous; strongly alkaline (pH 8.9).

Rock outcrop is exposed sandstone and limestone.

TR - <u>Travessilla - Rock outcrop - Strych complex - 50 to 70 pct slopes.</u>

These soils are very shallow to deep and are on steep canyon sides, elevation of 7,000 to 8,000 ft. They are generally on southeast to southwest facing aspects. The average annual precipitation is 12 to 14 inches. Mean annual air temperature is 45 to 47 °F. and the freeze period is 80 to 120 days.

This unit is about 35 pct Travessilla soil on ridges and side slopes, about 30 pct rock outcrop and about 15 pct Strych soils in the draws and concave positions. Included in this unit is about 10 pct rubbleland and about 10 pct other soils including Podo, Datino, Sheepcan and a soil similar to Travessilla with loam or clay loam textures over weathered shale.

The Travessilla soil is shallow over sandstone bedrock and it is well drained. The soil formed in residuum and colluvium from sandstone and limestone. Slopes are 50 to 75 pct and generally convex. Vegetation is dominantly pinion pine, Utah juniper, curlleaf mountain mahogany, salina wildrye, Indian ricegrass, service berry and a few Douglas fir.

In a typical profile the surface layer is brown very bouldery fine sandy loam about 2 in. thick. The substratum is light brown gravelly fine sandy loam about 9 in. thick and pink very cobbly

fine sandy loam overlying sandstone bedrock at 14 inches.

Permeability is rapid, available water capacity is very low, about 0.6 to 1 inch. Organic matter content in the surface is low. Surface runoff is rapid and erosion hazard is very high. These soils are used for range, wildlife habitat and mining operations.

Taxonomic classification is loamy mixed, (calcareous), mesic, Lithic Ustic Torriorthents.

A typical pedon of Travessilla very bouldery fine sandy loam, 50 to 75 pct slopes described 100 ft south and 250 ft east of the northwest corner of Sec 25 T16 R7E.

A1 -- 0-2 in.; brown (7.5YR 5/2) very bouldery fine sandy loam, dark brown (7.5 YR 4/2) when moist; weak medium platey structure; soft, very friable, slightly sticky, slightly plastic; common very fine, fine, medium and few coarse roots; 7 pct boulders, 10 pct cobbles, and 25 pct gravel; slightly calcareous; mildly alkaline (pH 7.8); abrupt smooth boundary.

C1 -- 2 to 11 in.; light brown (7.5YR 6/4) gravelly fine sandy loam; strong brown (7.5YR 5/6) when moist; weak fine subangular blocky structure; soft very friable, slightly sticky, slightly plastic; common very fine, fine, medium and few coarse roots; 2 pct stones, 5 pct cobbles and 15 pct

gravel; moderately calcareous; moderately alkaline (pH 8.2); abrupt wavy boundary.

C2 -- 11 to 14 in.; pink (7.5YR 7/4) very cobbley fine sandy loam; reddish yellow (7.5YR 6/6) moist; massive; soft; very friable, slightly sticky, slightly plastic; common very fine, fine, medium and coarse roots; 5 pct stones, 20 pct cobbles and 25 pct gravel; moderately calcareous, moderately alkaline (pH 8.2); abrupt irregular boundary.

R -- 14 in. sandstone bedrock.

Rock outcrop is mostly exposed sandstone and limestone with some areas of shale and coal.

The Strych soil is deep and well drained. It is formed in colluvium and alluvium derived dominantly from sandstone and limestone. Typically the surface is grayish brown very stony loam about 4 in. thick. The subsoil is pale brown very cobbly loam about 4 in. thick. The substratum is very pale brown very gravelly loam to 60 inches.

Permeability of the Strych soil is moderate. Available water capacity is about 7 in. to a depth of 60 inches. Organic matter content of the surface layer is about 2 to 3 percent. Effective rooting depth is about 60 inches. Surface runoff is rapid and

erosion hazard is high under native vegetation and very high if the vegetation is removed.

Taxonomic classification of Strych is loam-skeletal, mixed, mesic Ustollic Calciorthid.

A typical pedon of Strych very bouldery loam, 50 to 75 pct slopes described 200 ft south, 300 ft east of the northwest corner of Sec 25 T16S R7E.

A -- 0 to 4 in.; grayish brown (10YR 5/2) very stony loam; dark grayish brown (10YR 4/2), when moist; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; common very fine, fine, medium and few coarse roots; 10 pct boulders 10 pct cobbles, 20 pct gravel; moderately calcareous; moderately alkaline (pH 8.0); abrupt wavy boundary.

BW -- 4 to 8 in.; pale brown (10YR 6/3) very cobbley loam, yellowish brown (10YR 5/4) when moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine, fine, medium and coarse roots; 5 pct stones, 15 pct cobbles and 20 pct gravel; moderately calcareous; moderately alkaline (pH 8.0); clear wavy boundary.

BK -- 8 to 36 in.; very pale brown (10YR 8/3) very gravelly loam; light yellowish brown (10YR 6/4) when moist; weak medium and fine subangular blocky structure; slightly hard, friable,slightly sticky, plastic; common very fine, fine and few medium and coarse roots; 2 pct stones, 5 pct cobbles and 35 pct gravel; violently calcareous; moderately alkaline (pH 8.5); clear wavy boundary.

C -- 36 to 60 in.; very pale brown (10YR 7/3) very gravelly loam; brown (10YR 5/3) when moist; massive; slightly hard; friable; slightly sticky, plastic; few very fine roots; 2 pct stones, 10 pct cobbles and 45 pct gravel; moderately calcareous; moderately alkaline (pH 8.4).

8.4 PRIME FARMLAND DETERMINATION

The entire permit area is deemed unsuitable for prime farmland based on:

1. There is no available water rights of an agricultural nature in conjunction with and of the land within the permit area.

2. The vast majority of the permit area is excessively steep to farm.

3. The nature of the soils (excessive rock) prohibit farming activities.

Based on all of the above the only conclusion possible is there are no Prime Farmlands within the permit area. See Appendix 8-C, SCS Correspondence.

8.5 SOILS, PHYSICAL AND CHEMICAL PROPERTIES

Soil testing, conducted on those soils in the permit area, are attached (Appendix 8-A). Co-Op has tested additional soil which

In a typical profile the surface layer is brown or yellowish brown, very stony fine sandy loam about 16 in. thick. The subsoil is very pale brown, very stony silty clay loam to a depth of 36 in. and the substratum is very pale brown silty clay loam to more than 60 inches.

Permeability is moderate to 36 inches. Available water capacity is 6.5 in. to a depth of 60 inches. Organic matter content in the surface layer is about 4 pct. Effective rooting depth is about 60 inches. Surface runoff is rapid and erosion hazard is high under native vegetation and very high if vegetation is removed and the soil is left bare. This soil is used for range, wildlife habitat, and mining operation.

Taxonomic classification is loamy-skeletal, mixed Typic Haplo boralls.

A typical pedon of Datino very stony fine sandy loam, 40 to 70 pct slopes described on the bank about 150 ft north of the old mine portal about 300 ft north and 300 ft east of the SW corner of Sec 24 T16S R7E.

A1 -- 0 to 3 in.; brown (10YR 5/4) stony fine sandy loam, dark brown (10YR 3/3) when moist; moderate fine granular structure; soft very friable, nonsticky, nonplastic; many very fine, few medium and course roots; moderately calcareous; moderately

alkaline (pH 8.4); abrupt smooth boundary.

A2 -- 3 to 16 in.; yellowish brown (10YR 5/4) stony fine sandy loam, dark brown (10YR 3/3) when moist; weak medium granular structure ;soft, friable, nonsticky, nonplastic; many very fine and fine, few medium and coarse roots; 2 pct boulders, 10 pct stones, 10 pct cobbles, 10 pct gravel; moderately calcareous; moderately alkaline (pH 8.4); clear smooth boundary.

B -- 16 to 36 in. very pale brown (10YR 7/3) very stony sandy clay loam, pale brown (10YR 6/3) when moist; weak medium subangular blocky structure; slightly hard, firm, slightly sticky, plastic common very fine and fine roots; many fine pores; 2 pct boulders, 15 pct stones, 15 pct cobbles, 10 pct gravel; moderately calcareous; strongly alkaline (pH 8.6); abrupt wavy boundary.

C -- 36 to 60 in. very pale brown (10YR 8/4) stony silty clay loam, light yellowish brown (10YR 6/4) when moist; moderate medium and coarse subangular blocky structure; hard, firm, sticky plastic; few very fine and fine roots, common fine pores; 2 pct boulders, 10 pct stones, 10 pct cobbles, 5 pct gravel; strongly calcareous; strongly alkaline (pH 8.9).

Rock outcrop is exposed sandstone and limestone.

TR - <u>Travessilla - Rock outcrop - Strych complex - 50 to 70 pct slopes.</u>

These soils are very shallow to deep and are on steep canyon sides, elevation of 7,000 to 8,000 ft. They are generally on southeast to southwest facing aspects. The average annual precipitation is 12 to 14 inches. Mean annual air temperature is 45 to 47 °F. and the freeze period is 80 to 120 days.

This unit is about 35 pct Travessilla soil on ridges and side slopes, about 30 pct rock outcrop and about 15 pct Strych soils in the draws and concave positions. Included in this unit is about 10 pct rubbleland and about 10 pct other soils including Podo, Datino, Sheepcan and a soil similar to Travessilla with loam or clay loam textures over weathered shale.

The Travessilla soil is shallow over sandstone bedrock and it is well drained. The soil formed in residuum and colluvium from sandstone and limestone. Slopes are 50 to 75 pct and generally convex. Vegetation is dominantly pinion pine, Utah juniper, curlleaf mountain mahogany, salina wildrye, Indian ricegrass, service berry and a few Douglas fir.

In a typical profile the surface layer is brown very bouldery fine sandy loam about 2 in. thick. The substratum is light brown gravelly fine sandy loam about 9 in. thick and pink very cobbly

fine sandy loam overlying sandstone bedrock at 14 inches.

Permeability is rapid, available water capacity is very low, about 0.6 to 1 inch. Organic matter content in the surface is low. Surface runoff is rapid and erosion hazard is very high. These soils are used for range, wildlife habitat and mining operations.

Taxonomic classification is loamy mixed, (calcareous), mesic, Lithic Ustic Torriorthents.

A typical pedon of Travessilla very bouldery fine sandy loam, 50 to 75 pct slopes described 100 ft south and 250 ft east of the northwest corner of Sec 25 T16 R7E.

A1 -- 0-2 in.; brown (7.5YR 5/2) very bouldery fine sandy loam, dark brown (7.5 YR 4/2) when moist; weak medium platey structure; soft, very friable, slightly sticky, slightly plastic; common very fine, fine, medium and few coarse roots; 7 pct boulders, 10 pct cobbles, and 25 pct gravel; slightly calcareous; mildly alkaline (pH 7.8); abrupt smooth boundary.

C1 -- 2 to 11 in.; light brown (7.5YR 6/4) gravelly fine sandy loam; strong brown (7.5YR 5/6) when moist; weak fine subangular blocky structure; soft very friable, slightly sticky, slightly plastic; common very fine, fine, medium and few coarse roots; 2 pct stones, 5 pct cobbles and 15 pct

gravel; moderately calcareous; moderately alkaline (pH 8.2); abrupt wavy boundary.

C2 -- 11 to 14 in.; pink (7.5YR 7/4) very cobbley fine sandy loam; reddish yellow (7.5YR 6/6) moist; massive; soft; very friable, slightly sticky, slightly plastic; common very fine, fine, medium and coarse roots; 5 pct stones, 20 pct cobbles and 25 pct gravel; moderately calcareous, moderately alkaline (pH 8.2); abrupt irregular boundary.

R -- 14 in. sandstone bedrock.

Rock outcrop is mostly exposed sandstone and limestone with some areas of shale and coal.

The Strych soil is deep and well drained. It is formed in colluvium and alluvium derived dominantly from sandstone and limestone. Typically the surface is grayish brown very stony loam about 4 in. thick. The subsoil is pale brown very cobbly loam about 4 in. thick. The substratum is very pale brown very gravelly loam to 60 inches.

Permeability of the Strych soil is moderate. Available water capacity is about 7 in. to a depth of 60 inches. Organic matter content of the surface layer is about 2 to 3 percent. Effective rooting depth is about 60 inches. Surface runoff is rapid and

erosion hazard is high under native vegetation and very high if the vegetation is removed.

Taxonomic classification of Strych is loam-skeletal, mixed, mesic Ustollic Calciorthid.

A typical pedon of Strych very bouldery loam, 50 to 75 pct slopes described 200 ft south, 300 ft east of the northwest corner of Sec 25 T16S R7E.

A -- 0 to 4 in.; grayish brown (10YR 5/2) very stony loam; dark grayish brown (10YR 4/2), when moist; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; common very fine, fine, medium and few coarse roots; 10 pct boulders 10 pct cobbles, 20 pct gravel; moderately calcareous; moderately alkaline (pH 8.0); abrupt wavy boundary.

BW -- 4 to 8 in.; pale brown (10YR 6/3) very cobbley loam, yellowish brown (10YR 5/4) when moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine, fine, medium and coarse roots; 5 pct stones, 15 pct cobbles and 20 pct gravel; moderately calcareous; moderately alkaline (pH 8.0); clear wavy boundary.

BK -- 8 to 36 in.; very pale brown (10YR 8/3) very gravelly loam; light yellowish brown (10YR 6/4) when moist; weak medium and fine subangular blocky structure; slightly hard, friable,slightly sticky, plastic; common very fine, fine and few medium and coarse roots; 2 pct stones, 5 pct cobbles and 35 pct gravel; violently calcareous; moderately alkaline (pH 8.5); clear wavy boundary.

C -- 36 to 60 in.; very pale brown (10YR 7/3) very gravelly loam; brown (10YR 5/3) when moist; massive; slightly hard; friable; slightly sticky, plastic; few very fine roots; 2 pct stones, 10 pct cobbles and 45 pct gravel; moderately calcareous; moderately alkaline (pH 8.4).

8.4 PRIME FARMLAND DETERMINATION

The entire permit area is deemed unsuitable for prime farmland based on:

1. There is no available water rights of an agricultural nature in conjunction with and of the land within the permit area.

2. The vast majority of the permit area is excessively steep to farm.

3. The nature of the soils (excessive rock) prohibit farming activities.

Based on all of the above the only conclusion possible is there are no Prime Farmlands within the permit area. See Appendix 8-C, SCS Correspondence.

8.5 SOILS, PHYSICAL AND CHEMICAL PROPERTIES

Soil testing, conducted on those soils in the permit area, are attached (Appendix 8-A). Co-Op has tested additional soil which

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In a typical profile the surface layer is brown or yellowish brown, very stony fine sandy loam about 16 in. thick. The subsoil is very pale brown, very stony silty clay loam to a depth of 36 in. and the substratum is very pale brown silty clay loam to more than 60 inches.

Permeability is moderate to 36 inches. Available water capacity is 6.5 in. to a depth of 60 inches. Organic matter content in the surface layer is about 4 pct. Effective rooting depth is about 60 inches. Surface runoff is rapid and erosion hazard is high under native vegetation and very high if vegetation is removed and the soil is left bare. This soil is used for range, wildlife habitat, and mining operation.

Taxonomic classification is loamy-skeletal, mixed Typic Haplo boralls.

A typical pedon of Datino very stony fine sandy loam, 40 to 70 pct slopes described on the bank about 150 ft north of the old mine portal about 300 ft north and 300 ft east of the SW corner of Sec 24 T16S R7E.

A1 -- 0 to 3 in.; brown (10YR 5/4) stony fine sandy loam, dark brown (10YR 3/3) when moist; moderate fine granular structure; soft very friable, nonsticky, nonplastic; many very fine, few medium and course roots; moderately calcareous; moderately

alkaline (pH 8.4); abrupt smooth boundary.

A2 -- 3 to 16 in.; yellowish brown (10YR 5/4) stony fine sandy loam, dark brown (10YR 3/3) when moist; weak medium granular structure ;soft, friable, nonsticky, nonplastic; many very fine and fine, few medium and coarse roots; 2 pct boulders, 10 pct stones, 10 pct cobbles, 10 pct gravel; moderately calcareous; moderately alkaline (pH 8.4); clear smooth boundary.

B -- 16 to 36 in. very pale brown (10YR 7/3) very stony sandy clay loam, pale brown (10YR 6/3) when moist; weak medium subangular blocky structure; slightly hard, firm, slightly sticky, plastic common very fine and fine roots; many fine pores; 2 pct boulders, 15 pct stones, 15 pct cobbles, 10 pct gravel; moderately calcareous; strongly alkaline (pH 8.6); abrupt wavy boundary.

C -- 36 to 60 in. very pale brown (10YR 8/4) stony silty clay loam, light yellowish brown (10YR 6/4) when moist; moderate medium and coarse subangular blocky structure; hard, firm, sticky plastic; few very fine and fine roots, common fine pores; 2 pct boulders, 10 pct stones, 10 pct cobbles, 5 pct gravel; strongly calcareous; strongly alkaline (pH 8.9).

Rock outcrop is exposed sandstone and limestone.

TR - <u>Travessilla - Rock outcrop - Strych complex - 50 to 70 pct slopes.</u>

These soils are very shallow to deep and are on steep canyon sides, elevation of 7,000 to 8,000 ft. They are generally on southeast to southwest facing aspects. The average annual precipitation is 12 to 14 inches. Mean annual air temperature is 45 to 47 °F. and the freeze period is 80 to 120 days.

This unit is about 35 pct Travessilla soil on ridges and side slopes, about 30 pct rock outcrop and about 15 pct Strych soils in the draws and concave positions. Included in this unit is about 10 pct rubbleland and about 10 pct other soils including Podo, Datino, Sheepcan and a soil similar to Travessilla with loam or clay loam textures over weathered shale.

The Travessilla soil is shallow over sandstone bedrock and it is well drained. The soil formed in residuum and colluvium from sandstone and limestone. Slopes are 50 to 75 pct and generally convex. Vegetation is dominantly pinion pine, Utah juniper, curlleaf mountain mahogany, salina wildrye, Indian ricegrass, service berry and a few Douglas fir.

In a typical profile the surface layer is brown very bouldery fine sandy loam about 2 in. thick. The substratum is light brown gravelly fine sandy loam about 9 in. thick and pink very cobbly

fine sandy loam overlying sandstone bedrock at 14 inches.

Permeability is rapid, available water capacity is very low, about 0.6 to 1 inch. Organic matter content in the surface is low. Surface runoff is rapid and erosion hazard is very high. These soils are used for range, wildlife habitat and mining operations.

Taxonomic classification is loamy mixed, (calcareous), mesic, Lithic Ustic Torriorthents.

A typical pedon of Travessilla very bouldery fine sandy loam, 50 to 75 pct slopes described 100 ft south and 250 ft east of the northwest corner of Sec 25 T16 R7E.

A1 -- 0-2 in.; brown (7.5YR 5/2) very bouldery fine sandy loam, dark brown (7.5 YR 4/2) when moist; weak medium platey structure; soft, very friable, slightly sticky, slightly plastic; common very fine, fine, medium and few coarse roots; 7 pct boulders, 10 pct cobbles, and 25 pct gravel; slightly calcareous; mildly alkaline (pH 7.8); abrupt smooth boundary.

C1 -- 2 to 11 in.; light brown (7.5YR 6/4) gravelly fine sandy loam; strong brown (7.5YR 5/6) when moist; weak fine subangular blocky structure; soft very friable, slightly sticky, slightly plastic; common very fine, fine, medium and few coarse roots; 2 pct stones, 5 pct cobbles and 15 pct

gravel; moderately calcareous; moderately alkaline (pH 8.2); abrupt wavy boundary.

C2 -- 11 to 14 in.; pink (7.5YR 7/4) very cobbley fine sandy loam; reddish yellow (7.5YR 6/6) moist; massive; soft; very friable, slightly sticky, slightly plastic; common very fine, fine, medium and coarse roots; 5 pct stones, 20 pct cobbles and 25 pct gravel; moderately calcareous, moderately alkaline (pH 8.2); abrupt irregular boundary.

R -- 14 in. sandstone bedrock.

Rock outcrop is mostly exposed sandstone and limestone with some areas of shale and coal.

The Strych soil is deep and well drained. It is formed in colluvium and alluvium derived dominantly from sandstone and limestone. Typically the surface is grayish brown very stony loam about 4 in. thick. The subsoil is pale brown very cobbly loam about 4 in. thick. The substratum is very pale brown very gravelly loam to 60 inches.

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BW -- 4 to 8 in.; pale brown (10YR 6/3) very cobbley loam, yellowish brown (10YR 5/4) when moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine, fine, medium and coarse roots; 5 pct stones, 15 pct cobbles and 20 pct gravel; moderately calcareous; moderately alkaline (pH 8.0); clear wavy boundary.

BK -- 8 to 36 in.; very pale brown (10YR 8/3) very gravelly loam; light yellowish brown (10YR 6/4) when moist; weak medium and fine subangular blocky structure; slightly hard, friable,slightly sticky, plastic; common very fine, fine and few medium and coarse roots; 2 pct stones, 5 pct cobbles and 35 pct gravel; violently calcareous; moderately alkaline (pH 8.5); clear wavy boundary.

C -- 36 to 60 in.; very pale brown (10YR 7/3) very gravelly loam; brown (10YR 5/3) when moist; massive; slightly hard; friable; slightly sticky, plastic; few very fine roots; 2 pct stones, 10 pct cobbles and 45 pct gravel; moderately calcareous; moderately alkaline (pH 8.4).

8.4 PRIME FARMLAND DETERMINATION

The entire permit area is deemed unsuitable for prime farmland based on:

1. There is no available water rights of an agricultural nature in conjunction with and of the land within the permit area.

2. The vast majority of the permit area is excessively steep to farm.

3. The nature of the soils (excessive rock) prohibit farming activities.

Based on all of the above the only conclusion possible is there are no Prime Farmlands within the permit area. See Appendix 8-C, SCS Correspondence.

8.5 SOILS, PHYSICAL AND CHEMICAL PROPERTIES

Soil testing, conducted on those soils in the permit area, are attached (Appendix 8-A). Co-Op has tested additional soil which

Table 9.5-3 Recommended Seed Mix, Pinyon Juniper Grass

Scientific Name	Common Name	PLS lbs/ac	Cost/ac*
SHRUBS			
Amelanchier utahensis	Serviceberry	2.0	$64.00
Artemisia tridentata	Big Sagebrush (Vasey)	0.2	$ 6.80
Cercocarpus ledifolius	Mtn. Mahogany	2.0	$76.00
Chrysothamnus nauseosus	Rubber Rabbitbrush	0.5	$16.50
Rhus trilobata	Squawbush	1.0	$14.70
FORBS			
Achillea millifolium	Yarrow	0.1	$ 1.60
Aster chilensis	Pacific Aster	0.2	$18.00
Hedysarum boreale	Northern Sweetvetch	1.5	$60.00
Linum lewsii	Lewis Flax	1.0	$10.00
Melilotus officinalis	Yellow Sweetclover	1.0	$ 0.45
Pentstemon palmeri	Palmer's Pentstemon	0.5	$ 7.13
GRASSES			
Elymus cinereus	Gt. Basin Wildrye	3.0	$12.15
Elymus lanceolatus	Thickspike Wheatgrass	2.0	$ 4.20
Elymus smithii	Western Wheatgrass	3.0	$ 9.60
Elymus spicatus	Bluebunch Wheatgrass	3.0	$ 5.55
Stipa hymenoides	Indian Ricegrass	2.0	$18.80
	TOTAL	23.0	$325.48

* Rates based on drill seeding pure live seed (PLS). The rate would be doubled if the seeding method employed is surface broadcasted.

The Bear Canyon Haul Road is a primary road approx 1800 ft long from the gate to the scale house. The road is 30 ft wide and crowned in the middle (Plate 3-5). Drainage is provided by ditches on each side and culverts are installed where needed.

The mine area/portal access road is a primary road, approx 2,112 ft long and drainage structures are also in place (Plates 3-1 and 3-5). Three other primary roads provide access to the Sediment Pond A, the coal preparation facility and to the bathhouse. Sections of these three roads are found on Plate 3-1a.

There is one ancillary (jeep trail) road shown near the portal on plate 2-4, but it is not in use.

Roads are maintained in such a manner that the performance standards will be met throughout the life of the entire transportation facility, including maintenance of the surface, shoulders, parking and side areas, and erosion control structures for safe and efficient utilization of the road.

Reclamation of roads and parking areas is treated in the same manner as other working areas. Any asphalt or treated surfaces will be removed prior to rehabilitated upon completion of mining. See Plates 3-1, 3-1a, 3-2 and 3-5, and road agreement under Appendix 3-D.

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3.3.14 Total Area for Surface Disturbance During Permit Term

Total area or surface disturbance during the permit term is approx 16 acres. Individual areas are shown on Plate 3-2.

3.3.15 Additional Area for Surface Disturbance for Life of Mine

Surface disturbance in addition to what has already been disturbed is not anticipated.

3.3.16 Detailed Construction Schedule

Construction of coal handling and processing facilities began on 1 April 1981, and were largely completed by 1 Nov 1985. Construction of truck scale and caretaker dwelling was completed by 1 Dec 1985. Construction of shop complex began on 15 Aug 1983, and completed on 1 Oct 1985. Construction of the new bath house and road widening over Bear Creek began in the summer of 1990.

3.4 OPERATION

Co-Op started it's mining operation through an existing mine in the Bear Canyon Seam and later extended into the Hiawatha Seam below. Access to the lower Hiawatha seam was made in the summer of 1986 through two new portals in the outcrop, and through a rock slope tunnel from the Bear Canyon seam. The following mining plans pertain to the existing operation in these two seams.

3.5.1.1 Projected Impacts of Mining on Current and Future Land Use

The tentative acreage to be disturbed for each activity described above are as follows:

Mine Shop Area		1.76	acres
Mine Access Road		2.15	acres
Portal Conveyor and Pad Areas		9.4	acres
Sediment Treatment Area		.5	acres
Scale Area		1.82	acres
	Total	15.63	acres

The management objectives and the impacts from the Bear Canyon Mine pertaining to these objectives are described in detail in Chapter 4.

Impacts. Approx 16 acres of soil will be disturbed within the permit area. This includes loadout areas, offices, shops and substations, roads, portal areas, bath house and the topsoil storage area. The reduction in desirable plant species will temporarily reduce forage production and wildlife capacities. The short-term negative impact of vegetation removal would be outweighed by the positive impacts of revegetation and improved fire protection and prevention.

Wildlife in the area will adapt to the operation in a relative short time as witnessed by existing coal operations. Proposed construction may temporarily disrupt wildlife if human disturbance

is not kept to a minimum. These topics are discussed in detail in the Wildlife Report, Chapter 10.

3.5.1.2 Control Measures to Mitigate Impacts

Reclamation activities in the permit area will be directed toward minimizing the overall impact of coal mining. This can be accomplished by careful planning of the disturbed areas that must be later reclaimed. Reclamation activities are defined in Section 3.6.

The proposed mine surface operation facility area, will be returned to a wildlife/grazing habitat at the conclusion of the mining operation. The pre-mining and proposed post-mining uses are therefore identical for all areas (Chapter 4).

3.5.2 Protection of Human Values

There are no public parks nor historical sites worthy of preservation in the permit area.

b. Water rights could be purchased for springs damaged by Co-Op, or, alternate water shares could be substituted (Appendix 7-C).

c. A well could be drilled at the affected site to provide an alternate supply (since artisan conditions do not exist).

d. Water produced in the mine could be piped to the affected site.

e. Water shares presently owned could be transferred.

Alternative d. may mean treating of poorer quality water and pumping to overcome elevation differences.

In the unlikely event that mining adversely affects a water source, Co-Op will select an alternative after considering all possibilities of each site-specific circumstance. Forest Service approval will be obtained for water effected on Federal Lease U-024316.

3.5.4 Preservation of Soil Resources

Co-Op is prepared to meet the requirements specified by 30 CFR 784.15. Backfilling, soil stabilization, compacting, grading and any other necessary operations will be performed when necessary with the best technology available, as approved by the regulatory agency. Section 3.6, Reclamation Plan, provides a detailed

discussion of the reclamation effort.

3.5.4.1 Projected Impacts of Mining on Soil Resources

Since the Bear Canyon Mine is an underground mine at the site of an old works, the overall impact of mining on soils will be minor, The impacts of surface operations and mining facilities on soil resources consist of coverage of soil by facilities, disturbance of soils during construction activities, erosion created by removing vegetation, reduced forage growth due to nutrient degradation, reduced wildlife capacity and particulate emissions to the air. However, the abandoned mine had large accumulations of debris which has now been cleaned up, which to a large degree constitutes enhancement.

3.5.4.2 Control Measures to Mitigate Impacts

The objectives of the proposed backfilling as soon as operation are concluded in each disturbed area, the removed topsoil will be redistributed on the site in a 6 in. uniform lift. Methods and techniques are detailed in Section 3.6.4.4, Soil Redistribution and Stabilization.

<u>Topsoil Removal and Protection</u>. Before new construction or mining activity that will disturb the surface of undisturbed areas, topsoil will be removed from the effected area. Vegetation

will first be removed, then topsoil will be segregated from other materials, removed and stockpiled separately in a stable approved site within the permit area. The stockpile will be protected from erosion, compaction, or contamination and will be stabilized with interim revegetation procedures.

Backfill, Compaction and Grading. Disturbed surface areas will be backfilled, compacted and graded according to the approved time schedule. Wherever possible, backfilling will return the various soil horizons to their original site and make them compatible with surrounding areas. Compaction will help the returned soils remain in place. Grading will restore the contour to as near the original state as possible. Post Mining Topography is shown on Plate 3-2.

Since this mine produces no acid-forming or toxic-forming materials, backfilling required to cover such materials will be limited (Appendix 3-E).

Physical and Chemical Soil Stabilization. Soils will be stabilized by physical and chemical methods before planting. This will include placement of crushed heavy material at the top of road-fill slopes, for example. Other approved and proven methods will be

employed as necessary. Chemical stabilization will include the addition of neutralizing chemicals to soils shown to be excessively acidic or basic. Nutrients and soil amendments will be added in the amounts indicated by soil testing (Section 8.9) so approved post-mining land use can be sustained.

Biological Soil Stabilization. Returned soils will be stabilized biologically by revegetation of disturbed areas. This stabilization effect will be accomplished by the new vegetative cover, particularly small shrubs and trees. This aspect of soil stabilization will begin as soon as topsoil is redistributed. Section 3.6.5, Revegetation Plan, provides specific detail on the aspect of the reclamation plan.

3.5.5 Protection of Vegetative Resources

Co-Op has maintained a commitment to reclaim the unused disturbed areas to the extent of the cover of the natural vegetation on the mine plan area. Chapter 9, Vegetative resources, provides a preliminary report on the vegetative resources of the area.

3.5.5.1 Projected Impacts of Mining on Vegetative Resources

Since the Bear Canyon Mine is an underground mine, the overall impact on surface vegetation is minor. The effects of surface operations on vegetation from new construction areas, on-site

erosion and reduction of desirable plant species which will reduce forage production and wildlife capacity.

Vegetated areas adjacent to the disturbed areas are protected from coal fines primarily by utilization of dust controls, such as water sprays on the coal handling facilities and watering of the coal haul roads. One of the major areas, located in the canyon below the Upper Storage Pad, does show past impact from coal fines; however, it is not established that this impact is negative or detrimental to the vegetation. As an added precaution, however, this area is planned to be drained into the sediment pond in 1991, to prevent possible coal fine accumulation from reaching Bear Creek.

Waste dumping or other disturbance on undisturbed areas is not permitted. Disturbed area perimeter markers delineate the boundaries of disturbance. Employees are trained not to dump or otherwise disturb areas outside those boundaries.

It is not felt that monitoring of these areas by photos is necessary, or even feasible, since long-range photos would give only a very general overview, and close-up photos would be so specific to a small area as to not be representative. In lieu of photo monitoring, it is proposed to visually check the areas on at least a yearly basis, and if it appears that coal fine accumulation or other impacts are occurring from the operation, additional

R614-301-528.330 Disposal of Non-Coal Waste. Co-Op has undertaken a massive clean-up operation wherein large quantities of scrap have already been removed from the permit area. This operation was completed (1 Sept 1983) the balance of the salvageable equipment is being stored in the designated area.

The equipment which is not scrapped out is temporarily stored in the storage yard in Bear Canyon. This site is situated in such a manner to insure that whatever runoff results from the area will pass through designated sediment facilities.

The non-coal waste (other than rock refuse) generated in the operation of the mine is placed in metal dumpsters which are strategically located on the property. A local trash collector is contracted to replace these bins when they are approx 80 pct full,

Appendix 3-E addresses a comprehensive plan to handle toxic or contaminated material in the course of reclamation.

vegetation standard is achieved, the sediment control structures will be removed.

3.6.1 Contemporaneous Reclamation

Interim Reclamation (during operations) has occurred in areas that are no longer needed or that require short term stabilization. These areas were seeded and mulched. Other areas may be reclaimed at different times during the operation as specific activities are concluded (Appendix 3-G). This same procedure will apply to any area which becomes available during the life of the mine, and will be implemented upon the first available favorable season.

3.6.2 Soil Removal and Storage

Topsoil material has been removed from disturbed areas, prior to 1990, as described in Sec 8.7 (Removal, Storage and Protection of Soils), of this plan. Prior to the start of any new construction, topsoil material will be analyzed, salvaged and stockpiled according to the procedures discussed in the same section.

3.6.3 Final Abandonment

Co-Op anticipated that the post-mining land uses of the permit area will be the same as the pre-mining. State and local governments have not proposed any land use changes for the post-mining period.

3.6.4 Backfilling and Grading Plans

The objective of the proposed backfilling, soil stabilizing, compacting, contouring and grading process is to achieve a reclaimed surface which will provide a variety of topographic features and enhance post-mining land use.

The steps to be taken in the backfill, soil stabilization, compaction, contouring and grading problems are described in the following subsections. Stability analysis of highwalls and backfilled areas are discussed in Appendix 3-F.

Backfilling operations, utilizing equipment such as rubber-tired scrappers, bulldozers, backhoes, front-end loaders and dump trucks, will be conducted in the portal and treatment facility areas. Holes or depressions will be filled when the mining operation is concluded. Compaction operations utilizing equipment such as sheeps-foot tampers, will be conducted to stabilize all filled holes and depressions.

In general, the backfilling and grading operation will take place in the following manner:

a. All mining portals will be sealed and backfilled as previously described in Section 3.6.3.1.

3.6.4.3 Terracing and Erosion Control

Site stability will be largely accomplished through the grading, compacting and the utilization of a tackifying agent. However, on those areas with slopes of more than 2:1, terracing and erosion control matting will be used to enhance erosion control.

Terraces effectively decrease the angle of repose of the slope in question. In accomplishing this you effectively modify the site and change those conditions which preclude vegetation from becoming established. Second, you change the severity of erosion and, in fact, use those surface waters which heretofore were destructive in nature. This is accomplished by creating basins wherein the water has time to soak in and thus can be utilized by vegetation.

By utilizing a small crawler tractor (JD450) terraces can be contoured with the resulting terrace creating a bench effect and spaced at 12 ft intervals down the slope. A terrace of 8 ft, toed toward the hill is thus created. Planting is then instigated at approximately 2 ft distance from the cut fact to minimize the detrimental effect of potential sluffing.

On a small portion of the disturbed area it may be necessary to utilize hand labor to construct small terraces, approximately 18 in. benches on a contour of 4 ft intervals. These terraces are constructed utilizing a "Region 6" hand tool and would only be