2.05.4 Reclamation Plan

Statement of Purpose and Pre-Mining Land Use

The goal of Mountain Coal Company's reclamation plan is to return disturbed land at the West Elk Mine site to a productive and useful status. It is recognized that many alternatives exist for restoring the disturbed acreage. Some of these potential uses include rangeland, hayland or pasture, forestland, wildlife habitat, recreation lands or residential, and light industrial use.

Mountain Coal Company proposes to return all disturbed lands to rangeland and wildlife habitat land uses. These uses will be consistent with the present surrounding uses. Information presented in Section 2.04.3 describes the pre-mining land uses in detail.

Reclamation activities will establish a permanent vegetative cover of the same seasonal variety native to the area and capable of self-regeneration and plan succession equal in extent and cover to the natural vegetation in the area. Any introduced species will be compatible with the plant and animal species of the region.

Rehabilitation of the disturbed surface areas will be accomplished in increments as suitable areas for reclamation become available. The facilities area will be returned to the approximate original contour and the reclaimed land will have a minimum stability factor of safety of 1.3. Surfaces will be dressed with previously stockpiled seedbed topsoil and planted with a variety of plant species. Planting will occur during the first normal period for favorable planting conditions after final preparation of the reclaimed surface.

Bear Coal Company Reclamation

The Bear Coal Company is responsible for reclaiming its surface disturbances as stated in their permit. However, there are three areas of the Bear Mine area that Mountain Coal Company will disturb and will be responsible for reclaiming. They are the proposed Freshwater Pond No. 2, the 44 KV powerline outside of the Delta-Montrose Electric Association corridor, and the spoil stockpile area described in Exhibit 47. These areas have or will be reclaimed by Mountain Coal Company according to Bear Coal Company's reclamation plan in Exhibit 64, except that MCC's approved seed mixtures shall be utilized.

Reclamation Methodology

Topsoil Salvage

Mountain Coal Company recognizes the importance of topsoil to plant and animal life of the area. For this reason, all useable topsoil has been and will continue to be salvaged and stockpiled for later use to cover reclaimed surfaces. To evaluate the soils present before activity began, a survey of the existing soils within the West Elk Mine site was conducted. Interpretations of the soil survey indicated that the existing soil types were suitable for use as seedbed quality material. A listing of the soil mapping units, their suitability for use as seedbed quality material, and pertinent information about each unit are presented in the Soils Resource Information Section. Any reference to "topsoil",

therefore, will mean only those soil horizons considered suitable for use as seedbed quality material. Topsoil will be removed ahead of surface disturbance activities. Any vegetative cover that would interfere with topsoil removal will be removed first. There will be no disturbance (except as approved by the regulatory authority) in the riparian areas as indicated on the reclamation schedule maps (Map 56 and Map 57). Every effort will be made to minimize the areas of disturbance and to strip the topsoil only as needed for construction or refuse disposal activities. Table 36 presents the topsoil material which has been salvaged to date.

Map 56 identifies two additional types of areas relevant to topsoil salvage; natural areas and rehandle areas. Natural areas are inclusions or native undisturbed vegetation within the confines of the portal, facilities and load-out areas. These areas have not been disturbed and remain as relict areas of native vegetation and soils, providing cover for wildlife and natural screening of the mine operations. Rehandled areas are those areas where the topsoil was disturbed and reconditioned and reseeded during construction operations or where topsoil was stripped and replaced subsequent to construction operations at the mine site. Both types of areas were mulched and reseeded. These areas will not require additional re-topsoiling during final revegetation activities, and are not included as disturbed areas for the purposes of topsoil redistribution.

Existing baseline soil depth information will continue to be visually verified in the field during topsoil salvage. Stripping operations will be closely monitored in the field to ensure that all useable topsoil is salvaged. Specific horizons will be visually delineated during topsoil stripping. Topsoil salvage volumes will be established through visual observation. A topsoil salvage monitoring plan is provided in the Topsoil Salvage Monitoring Plan Section.

Since it is necessary to stockpile topsoil from the plant facilities site during the life of the mining operation, the stockpiles have been designed and maintained so as to minimize wind and water erosion and to preserve the seedbed material in useable condition. All topsoil stockpiles are marked with appropriate signs. Topsoil stockpiles that will not be redistributed for five or more years will be seeded with the permanent seed mix (Table 37), excluding shrubs, and not the temporary seed mix. Stockpiles in place for less than five years will be seeded with the temporary seed mix described in Table 39. Trees, boulders, and other waste will be separated and removed before topsoil stockpiling. Subsoil materials at the West Elk Mine are typically not suitable for use as topsoil in reclamation. These materials are suitable for use in construction and for use as non-toxic, non-combustible cover as described by the regulations. Subsoil stockpiled for reclamation at the Lower Refuse Pile and in Sylvester Gulch will be used only for reclamation. Subsoil stockpiled at the north soil storage area will be utilized for reclamation of the Refuse Pile Expansion (RPE) area.

Disturbed areas will be covered with topsoil and revegetated only after activities have ceased in that specific area. When necessary, temporary erosion control measures, such as straw mulch, rock talus, jute netting or excelsior matting, will be used on disturbed areas that will be inactive for periods too short to establish grass cover. Areas that will be inactive for a year or more, reclamation will be handled by planting special seed mixtures. See the Revegetation Maintenance Section for a more complete description of temporary reclamation.

Table 36 Approximate Topsoil Stockpile Volumes for West Elk Mine Site

Location/Name[5, 10]	Destination Upon Reclamation	Maximum Storage (c.y.)	Actual[9] Storage (c.y.)
TOPSOIL STOCKPILES			
• Main Mine Site & Lone Pine Gulch			
• Main Stockpile	Main Mine Site	---	84,800[1]
• Materials Storage Bench Stockpile	Materials Storage Bench (MSB)	---	11,000
• Water Tank Stockpile	1998 ROM Expansion	53,000	6,200
• Parking Lot Stockpile	Parking Lot Expansion	---	250
• Lone Pine Gulch Stockpile	Lone Pine Substation & Fan	---	0[2,11]
• Topsoil Stockpile #5	1997 MSB Expansion	20,500	?
• North Soil Storage Area (NSSA)			
• Lower Refuse Pile (LRP) Stockpile	Lower Refuse Pile	---	19,400[3]
• Refuse Pile Expansion (RPE) Stockpile	Refuse Pile Expansion	---	16,405[8]
• Sylvester Gulch Facilities Area[6]			
• Shafts Site Stockpile	Shaft Site	50,000	49,900[6]
• Topsoil Stockpile #1	Dewatering Facility	18,650	18,000[6]
• Topsoil Stockpile #3		35,710	35,710[6]
• Power Pole 9	Pole 9 Road	25	
• Power Pole 11	Pole 11 Road	180	
• Power Pole 12	Pole 12 Road	50	
• Power Pole 13	Pole 13 Road	45	
• Power Pole 14	Pole 14 Road	140	
• Power Pole 16	Pole 16 Road	30	
SUBSOIL STOCKPILES			
• Main Mine Site & Lone Pine Gulch			
• Lone Pine Gulch Stockpile (Staging Area)	Lone Pine Gulch Fan	---	0[11]
• Sylvester Gulch Facilities Area			
• Live Subsoil Stockpile #1	Lower Refuse Pile & Various	58,000	Varies[4,7]
• Live Subsoil Stockpile #2	Various	15,200	Varies[7]

Notes:

1. Volume calculated by Envirocon, Inc. Based on the 1993 topsoil pile relocation designs and utilizing original (1996) contours and contour survey of the pile conducted in 1993 by Messenger & Associates.
2. Reclaimed, but had included approximately 400 c.y. at the Lone Pine substation and approximately 3,500 c.y. for the Lone Pine mine water treatment pond. (Not Constructed)
3. Volume calculated following LRP reconfiguration (TR78), July 1996.
4. Approximately 13,270 c.y. will be kept in Stockpile at all times for reclamation at Lower Refuse Pile
5. For topsoil and subsoil stockpile locations, see Map 53, 53A, and 53B
6. As-Built volumes from Nielson's Topographic Survey (Nov. 1997).
7. The volume of Live Subsoil Stockpiles will vary as soil is added to and removed from the pile for construction projects. Soil is not needed for reclamation, other than as noted in Footnote 4.
8. Actual storage volumes will vary depending on the phase of construction and reclamation of the RPE area. See Table 1 in Exhibit 70, which details the amount of soil that is stripped during each phase.
9. Unless otherwise specified, actual storage volumes have been estimated as of August 1998.
10. Stockpiles for methane drainage well sites are not included.
11. The Lone Pine facilities area has been reclaimed and the area has obtained partial bond release.

Table 37 Permanent Seeding Mix

Species	Scientific Name	Lb. Pure Live Seed Per Acre[1]
Western Wheatgrass[2]	*Agropyron smithii*	3.0
Kentucky Bluegrass[2]	*Poa pratensis*	0.25
Bluebunch Wheatgrass	*Agropyron spicatum*	3.0
Riparian Wheatgrass[3]	*Agropyron riparium*	3.0
Slender Wheatgrass[2]	*Agropyron trachycaulum*	3.0
Mountain Bromegrass[2]	*Bromus marginatus*	4.0
Thickspike Wheatgrass	*Agropyron dasystachyum*	4.0
Indian Ricegrass	*Oryzopsis hymenoides*	1.5
Sand Dropseed	*Sporobolus cryptandrus*	0.1
Beardless Wheatgrass	*Agropyron inerme*	1.5
Arizona Fescue	*Festuca arizonica*	0.5
Pubescent Wheatgrass	*Agropyron trichophorum*	2.0
Lewis Flax	*Linum lewisii*	0.25
White Yarrows	*Achillea millefolium*	0.25
Rocky Mountian Penstemon	*Penstemon strictus*	0.25
Utah Sweetvetch[2]	*Hedysarusm boreale*	1.0
Arrowleaf Balsamroot	*Balsamorhiza sagittata*	0.5
Scarlet Globemallow	*Sphaeralcea coccinea*	0.5
Cicer Milkvetch[2]	*Astragalus cicer*	1.0
Small Burnet	*Sanguisorba minor*	0.5
Smooth Aster	*Aster glaucodes*	0.5

Notes:
1. Seeding rate from drill seeding. Rate to be doubled if broadcast or hydroseeding methods are used.
2. Species always included in the seeding mix. In addition, a minimum of 2 grasses and 3 forbs not followed by this footnote will be included.
3. To be included in the mixed-shrub wet community.

Table 38 Shrub Planting Species List

Species	Scientific Name	Stems Per Acre[1]
Gambel's Oak	*Quercus gambelii*	150
Black Chokecherry	*Prunus virginiana melanocarpa*	250
Douglas Rabbitbrush	*Chrysothamnus viscidiflorus*	50
Serviceberry	*Amelanchier alnifolia*	250
Wood's Rose	*Rosa woodsii*	200
Total		**900**

Notes:
1. This rate represents the density within shrub clusters and not the overall density for the affected area.

Mountain Coal Company recovers and handles topsoil in a manner that maximizes recovery and

minimizes dilution as far as is technologically and economically feasible. Seedbed quality material is the final reclaimed soil surface. Table 36 presents the topsoil availability in the surface facilities and refuse disposal areas.

Topsoil in the affected areas is stripped and either applied to surfaces ready for reclamation or stockpiled for other use as shown in that table. Subsoil, not fully suitable for seedbed material, is also excavated, as necessary, for construction purposes. Topsoil consisting of all of the A horizon and part of the B horizon of each soil series present is stripped before construction begins and replaced following operational activities.

Evaluation of the soils present in the permit area indicates the upper portions of the B horizon are suitable for use as seedbed quality material. Lower portions of the B horizon were unsuitable due to the presence of heavy clay and/or coarse rock fragments. Mountain Coal Company can meet the final land use and bond release criteria without segregating A from B horizon material since both are good seedbed quality. This is also true for the soils in the Sylvester Gulch Facilities Area (Exhibit 27A).

The amount of stripped topsoil has been calculated to be adequate to cover the surface disturbed area of the main mine facilities with a minimum depth of 12 inches of seedbed quality material, the refuse disposal area with a minimum depth of 9 inches (or approximately half of the total soil cover per the approved variance), and a minimum of 12 inches to be replaced on the Sylvester Gulch Facilities Area. A Topsoil Assessment conducted in 1981 and verified in 1984 confirmed the availability of sufficient quantities of topsoil to reclaim the disturbed areas at West Elk. Another topsoil survey and balance was completed in 1993, again confirming sufficient topsoil quantities. Therefore, there is no need to salvage subsoil in the form of underlying B and C horizon materials. Any topsoil remaining after the above described amounts have been replaced over the disturbed areas, will be applied to slope faces and other areas subject to high erosion hazard potential before final seeding operations begin.

Table 39 Temporary Stabilization Seed Mix

Common Name	Species Name	Variety	Character[1]	Seeds/Lb.	Seeds Sq. Ft.	Seed Rate lbs. (PLS)/ac[2]
Graminoids						
Bluebunch wheatgrass	*Agropyron spicatum*	Secar	N, C, B	145,000	4	1.20
Pubescent wheatgrass	*Agropyron tricophorum*	Topar	I, C, S	90,000	10	4.84
Smooth brome	*Bromus inermis*	Manchar	I, C, S	140,000	15	4.67
Western wheatgrass	*Agropyron smithii*		N, C, S	125,000	7	2.44
Forbs						
Cicer milkvetch	*Astragalus cicer*	*Monarch*	I, C, L	130,000	10	3.35
Small burnet	*Sanguisorba minor*	*Detar*	I, C	42,000	4	4.15
Totals					**50**	**20.65**

Notes

1. Character codes: N = native, I = Introduced, C = Cool-season, B = Bunch grass, S = Sod-former, L = Leguminous
2. Rates proposed are for drill seeding, broadcast rate or hydroseeding 2X the rate.

Table 39A

Seed Mixtures for Paonia R.D.

Habitat type	Elevation	Species	lbs/acre (PLS)	% of Mixture
P/J Woodland	6-7,000	Galleta	3	16
		Western wheatgrass	4	20
		Great Basin Wildrye	3	16
		Indian Ricegrass	3	16
		Sandberg bluegrass	3	16
		Bottlebrush squirreltail	3	16
		Total	**19**	**100**

Habitat type	Elevation	Species	Lbs/acre (PLS)	% of Mixture
Mountain Shrub	7-8,000	Mountain Bromegrass	4	20
		Prairie Junegrass	3	15
		Western wheatgrass	4	20
		Indian Ricegrass	3	15
		Sandberg bluegrass	3	15
		Bluebunch wheatgrass	3	15
		Total	**20**	**100**

Habitat type	Elevation	Species	Lbs/acre (PLS)	% of Mixture
Aspen/Spruce-Fir	8-9,500	Mountain Bromegrass	5	26
		Slender Wheatgrass	3	16
		Thickspike Wheatgrass	3	16
		Canby Bluegrass	3	16
		Blue Wildrye	5	26
		Total	19	100

Temporary Revegetation	Elevation	Species	Lbs/acre (PLS)
Regreen (brand name)	All	Tall wheatgrass/winter wheatgrass	20 lbs/acre
Pioneer (brand name)	All	Tritacale/winter wheat	20 lbs/acre

The above **grass species may vary slightly** dependent on the particular field site. The mixes will be customized per location to optimize reclamation success.

The above **seed mixes will also include a mix of native forbs** from the following list: *Coreopsis lanceolota, Lupinus argentus, Phlox drummondii, Thermopsis Montana, Penstemon strictus, Vicia americana, Achillea millefolium var. occidentalis* (at a very low rate), *Aster chilensis, Erigeron speciosus, Eriogunum umbellatum or Geranium viscosissimum*. The precise forbs to be included will be prescribed on a case-by-case basis, as the particular site conditions dictate. **At least 3 forb species will be included in each mix**. The seed mix must contain enough pure live seed to have a reasonable prospect of success, and contain less than 1% weed seeds, none of which may be noxious.

Topsoil Salvage Monitoring Plan

A qualified Mountain Coal Company representative will be on site during all topsoil stripping operations to assure that no unsuitable topsoil material is salvaged and that all suitable material necessary for reclamation is stockpiled. To the extent practicable, the surface soil layer will be removed at a time when the physical and chemical properties of the topsoil can be protected and erosion can be minimized. Annual Reclamation Reports will include a statement similar to "The depth of topsoil stripped was more/less/the same as predicted from the baseline soil surveys." If the topsoil stripped is significantly less than predicted (e.g., would lead to an overall topsoil deficit than that necessary to replace a minimum depth of 12 inches of seedbed quality material on the surface disturbed areas of the main mine facilities, a minimum of 9 inches on the refuse disposal area and a minimum of 12 inches on the Sylvester Gulch Facilities Area, MCC will provide a volume comparison.

Topsoil Replacement and Sampling

Replacement of the seedbed material is an integral part of seedbed material handling. The seedbed material is replaced to a minimum depth of 12 inches on the surface disturbed areas of the general mine site, and a minimum of 9 inches on the Lower Refuse Pile and the Refuse Pile Expansion area on all rough graded, finished surfaces. See Exhibit 42A regarding topsoil salvage and replacement for the Lone Pine Gulch fan facility area. Before the seedbed material is replaced, compacted areas may be scarified or ripped to eliminate any slippage surfaces, establishing a suitable bond for the overlying seedbed material. Mountain Coal Company replaces the topsoil with mechanical equipment (either scrapers or truck and front end loader). Compaction is prevented as much as possible by limiting traffic after topsoil placement. If topsoil compaction should occur, the area is ripped or disked before seeding begins.

Prior to reclamation seeding, sampling will be conducted to determine the accuracy of topsoil placement to the depths specified in this plan. All disturbed portions of the surface facilities area and refuse disposal area will be sampled following soil redistribution. Redistributed soils will be sampled for depth on approximately 200-foot centers. A hand auger or truck mounted drill auger will be used to determine depth of redistributed soil material at each sample site. To assure that the topsoil will support the revegetation efforts, composite soil samples will be collected and analyzed for pH, nitrogen, phosphorus, and potassium. Appropriate measures will be taken by MCC to correct nutritional deficiencies by the application of soil amendments and/or fertilizers. A map of sample locations will be submitted in the annual reclamation report along with the sampling results and added amendments.

Topsoil Preparation

Following the distribution of seedbed material and final grading, the newly shaped surface is prepared for planting. Surface preparation loosens and roughens the surface by disking, harrowing, or dragging, thereby increasing infiltration and reducing surface runoff. The micro-relief increases soil/water availability in the small depressions, creates shaded areas, and reduces wind action in the depressions.

During topsoil preparation, seeding, and planting activities are conducted parallel to the contour unless such activities prove hazardous to equipment and/or operators due to conditions of steep slopes, etc. Various conditioners and neutralizers may be used to modify the seedbed conditions, or enhance vegetative cover, if required.

The ameliorative soil treatments proposed include the following:

- Deep harrowing with a long shanked chisel plow along the topographic contour to loosen the soil.

- Stubble mulching, mulching with straw pressed into the surface with a disc, or by using mulches of other kinds, e.g., excelsior, rock chips, wood chips, etc., appropriately applied.

- Fertilizing with an appropriate formula as indicated by soil analyses.

- Liming of seedbed material, if necessary, with application of agricultural ground limestone at the rates indicated by soil analysis.

Prior to liming, fertilizing, or planting, the soil surface is scarified or otherwise roughened, particularly if the soil surface is glazed or crusted. After liming and/or fertilizing, the soil treatments is worked into the soil. The prepared seedbed material is then seeded and planted.

Seeding Mixtures

A number of considerations are made in selecting plant species. These include the species listed in the baseline biological survey, species geographical range, soils, climate, slope and aspect, root competition, cover, and seasonal variation. The seed mixes have also been reviewed in light of experience gained on West Elk Mine revegetation test plots, and past reclamation efforts quantitative data collected in 1980 describing the present vegetative cover, and in terms of the wildlife requirements noted in Restoring Big Game Range in Utah by A. P. Plummer, D. R. Christensen, and S.M. Monsen (1968) and Management Guidelines for Selected Deer Habitats in Nevada by P. A. Tueller and L. A. Monroe (no date). Grasses are generally the most effective plant materials for controlling erosion in the early stages of reclamation. Shrubs and forbs are being planted to provide further soil stabilization. The shrubs will create a protective canopy and will further build up the surface organic litter which will control erosion and surface runoff. The combination of grasses and shrubs should provide diverse biological communities which will support both wildlife and domestic stock.

The revegetation objective for disturbed areas is to achieve a self-sustaining vegetative cover of hardy grasses and shrubs that will become a productive and ecologically stable biotic community. The revegetated areas will be reclaimed to support wildlife and livestock grazing. Areas disturbed during mining will be reseeded during final reclamation with native species or a mixture of native and introduced species.

Mixtures containing introduced species may be more efficient in establishing ground cover for preventing erosion and protecting topsoil since some may grow faster and produce cover more

quickly. In some cases, a temporary, fast-growing cover crop, such as a sterile annual ryegrass, or other similar nurse crop, may be used to prevent erosion either on disturbed slopes (areas removed of topsoil), topsoil piles or on reclaimed areas. The nurse crop will utilize a sterile grain which is seeded at the same time (or prior to) the desired seed mix. The nurse crop, being an annual cereal grain germinates rapidly, providing cover and shade for the developing seed mix, while protecting the slopes from erosion and sediment loss. It will then die back, allowing the desired seed mix to proliferate.

In addition to a nurse crop, MCC may utilize a temporary stabilization seed mix (Table 39) which is a combination of native and introduced species with the primary purpose of providing a good vegetative cover quickly to control erosion and sediment. The grasses and forbs in Table 39 have been specifically chosen to control erosion, as they are fast growing, have a large root and shoot mass and are cool season, which tend to be more successful at the elevation and location of the West Elk Mine. MCC will utilize this seed mix only on disturbed areas (areas removed of topsoil) during the operation of the mine. An area where the nurse crop and stabilization seed mix was utilized is the cut and fill slope of the Materials Storage Bench. For reclaimed areas and topsoil piles, MCC will continue to use the permanent seed mix in Table 37.

Seeding of grasses and forbs as well as planting of shrub seedings occur during the spring (March 15 through June 15) or fall (September 15 through November 15) of each year as disturbed areas become available for topsoiling and subsequent seedbed preparation. Planting and seedbed preparation occur only when soils are not frozen or extremely wet or dry. Air temperatures should be above freezing during the night. Soil should be friable and not wet or cloddy.

Shrub seedlings are planted immediately following planting of the appropriate seed mix or, if weather conditions change, at the next time that the above planting conditions exist.

The number of shrub seedlings replaced per acre is considerably less than the density of shrubs now on the affected and reference areas. Since the intent is to reestablish a rangeland/wildlife land use that is equal to or better than the existing condition, it is reasonable to replace fewer shrubs so as to optimize the grass forage production for livestock against the shrub cover needs of wildlife. Also, since the shrubs to be replaced have a tendency to reproduce by root sprouting, the number of stems per acre should increase during the bond release period. Seeds and seedlings listed in Table 37 and Table 38 are normally available from commercial firms. A temporary revegetation seeding mix found in Table 39 is used on areas scheduled for re-disturbance within five years. The seedling rates or seeding mixtures may be varied with regulatory authority approval in the future as better information is gathered, both from the on-site experience and from other sources. These seed mixtures are normally available from commercial firms. A temporary revegetation seeding mix found in Table 39 is used on areas scheduled for re-disturbance within five years.

Methods of Planting

After the seedbed has been prepared, it is planted with appropriate seeding mixtures. The grasses and forbs are seeded primarily by drill seeding. Broadcasting of seed is utilized on small areas with hydroseeding used on areas with slopes steeper than 3:1. In general, these small areas are less than 2 acres in size. The shrubs are planted in conjunction with the seeding operations or at a later time

depending upon weather conditions, shrub/grass seedling competition, and related factors.

Shrub species (Table 38) are planted in clusters after the affected acreage has been seeded with the permanent seed mixture. Shrub clusters complement the surrounding dense shrublands. Shrub clusters will cover approximately 30 acres of the total 110 affected acres, including the Sylvester Gulch Facilities Area. Each shrub cluster will be approximately 0.5 to 2 acres in size and will be located some 50 and 500 ft. from adjacent clusters. The area between clusters will be seeded with the permanent seed mixture. The approximate location of shrub clusters is shown on Map 58.

Clustered groupings of shrub seedlings are planted at a density of 900 stems/acre within each cluster. This density converts to a 7 foot spacing between plants. The clustering will produce a mosaic of shrub cover so that edge effect is maximized for wildlife needs and that open grasses areas are available for livestock forage production.

To protect newly reclaimed surfaces against drying and frost heaving, planted areas will be mulched with hay or straw following drill seeding and broadcasting seeding. Crimping or tracking will be used to stabilize the hay or straw mulch. Straw mulch or an equivalent cover of hydromulch, wood chips, jute netting, excelsior mat, etc. are applied to all such revegetated areas. Straw mulch is applied at a rate of 1500 - 2500 lbs/acre. The greater amounts of mulch is used on steep or otherwise potentially high erosion hazard areas.

All revegetated areas are mulched immediately following seeding operations. Slopes less than 3:1 are mulched using straw or wood chips or other similar materials. Slopes in excess of 3:1 are hydromulched or covered with jute netting, excelsior blankets, or similar materials.

After seeding, revegetated areas are protected from livestock grazing until areas are judged capable of withstanding grazing pressure based on the findings of monitoring activities discussed in the Diversion and Collection Ditches and Impoundment Section. Livestock grazing will then be undertaken only when operational conditions allow. Protection of revegetated areas are accomplished by excluding livestock from such areas by using fences, discontinuing grazing on adjacent areas or by other means. Such protection allows for seedling and stand establishment and minimizes erosion.

Noxious Weed Control Plan

Noxious weed infestations may occur in disturbed or reclaimed areas of the West Elk Mine. It is Mountain Coal Company's policy to treat these infestation to minimize the spread of listed noxious weeds and potential for revegetation failure. In order to control noxious weeds, MCC has developed a multi-faceted plan for survey, mapping, and eradication.

The first step in the weed control plan is the location of any noxious weed infestations. A visual survey of the mine site is conducted during late spring or early summer each year. Approximate locations of any noxious weed infestations are marked on a topographic map and kept on file at the mine site.

Upon location and identification of noxious weed infestations, MCC will employ one or more of the following categories of treatment; physical, chemical, and biological. A specific treatment will be employed based on the noxious weed species encountered.

Physical control methods may include removal of infestations through mowing, cutting or digging individual plants, discing, harrowing, or plowing an area, or through use of controlled burning.

Chemical methods of treatment may include application of herbicides or defoliants to kill noxious weeds. Chemical treatment will be conducted under regulated conditions by qualified individuals. Selection of chemicals to be used will be based on recommendations of the Natural Resources Conservation Service, USDA, CSU Agricultural Extension, or other land management agency. Chemicals, if stored at the mine site, will be stored in compliance with applicable regulations. In areas where there is direct drainage to public waters, methods other than chemical application will be employed to control noxious weeds.

Biological treatment methods may include introduction of insects or other biologic vectors to control noxious weeds through parasitism or predation. MCC has already cooperated with the Colorado Department of Agriculture in a release of *Trichosirocalus horridus* flies to control Russian and Bull Thistle in the mine facilities area and Sylvester Gulch.

If there is insufficient vegetation to control erosion after treatment to control noxious weeds, the treatment area will be reseeded with the approved seed mix and mulched.

Site-Specific Reclamation Procedures

Surface Facilities Sites

Efforts are made to minimize surface disturbance during construction. All suitable seedbed quality soil is removed from affected areas and stockpiled for reuse. Portions of the stockpiled material are replaced on areas around buildings and other facilities after construction is completed. The remaining material is stockpiled for the life of the surface facilities site. Stockpiles have been vegetated with the permanent seed mix for erosion control purposes.

As mentioned previously, it was necessary to remove oakbrush and other brush from around the substations, and portal areas to reduce the fire hazard. Certain areas were seeded with the permanent seed mixture. However, in accordance with MSHA regulations, the areas around the fans, powder magazines, substations, and portals were not revegetated.

Reclamation of the surface facilities area following construction involves filling, grading, scarifying, and topsoiling. MCC has installed a number of structures over the life of its operations to stabilize the landslide at the main mine site facilities. These structures include, but are not limited to, bin walls, a roller compacted concrete (RCC) buttress, rock buttresses, other retaining structures, stone columns, horizontal drains, and micro-piles. Most of these structures will remain for the life of the mine, to maintain stability of the site upon final reclamation. Retaining structures may be reduced to grade and then backfilled. Details of these structures are provided in Exhibit 14C. As discussed in Exhibit 14C, MCC was successful in preventing catastrophic failure with the corrective

measures installed in 1997 and 1998. However, due to the limited time that the structures have been in place, MCC has not had sufficient time to evaluate the effectiveness of these structures for the long term (i.e. post-reclamation). MCC is continuing to collect water level data and movement data from the various piezometers, inclinometers, and survey mirrors around the mine site on a scheduled interval. Based on the data collected, MCC will reevaluate the slope stability analyses after the spring runoff each year and where appropriate, update Exhibit 14C. The update will include an evaluation of the relative change in the factor of safety during the previous year and since the installation of the corrective measure in 1998. A revision including the updated information will be provided to the Division by July 30th of each year. In addition, after at least five years of data collection, MCC will reevaluate the reclamation plan in 2003, and modify as necessary to ensure that the mine will continue to be stable upon final reclamation. Seedbed quality material is removed from the temporary stockpile and distributed uniformly over the areas to be revegetated. Areas within the mine site are revegetated after construction using the permanent seed mix listed in Table 37 except for selected Areas which are landscaped to provide a pleasant working environment. Lower soil horizons are used for fill as subsoil base in order to obtain an overall soil depth necessary to enhance and sustain plant growth. Following topsoiling, and prior to planting, nutrients and soil amendments are added if needed to establish vegetative growth. Reseeded areas are mulched or the seed raked in to the soil.

The West Elk Mine site will be returned to approximate original contour (AOC) as shown on Maps 58 and 59. However, not all material excavated from specific areas is required to be returned to achieve AOC. One of these areas is the expanded materials storage bench (MSB) which occurred in 1997. Approximately 16,000 cy of material was excavated to the west of the existing cutslope of the MSB to reduce the slope from 1.5:1 to 2.25:1, improving slope stability in this area of the MSB. Approximately 4,000 cy of topsoil was stockpiled in Topsoil Stockpile #5. Approximately 2,000-3,000 cy of subsoil was used to repair and regrade slopes in the portal bench storage area and below the mine supply storage light-use road. The remaining 10,000 cy was placed on the east end of the MSB as an engineered fill to expand the surface area of the MSB. The subsoil used to repair and regrade nearby slopes will not be returned to the MSB during final reclamation, and as shown on Map 58B will not be needed to achieve AOC. The reclamation of all areas will be such that the areas will be stable, the hydrologic balance will not be impacted, topsoil will be salvaged, stored and replaced, and the disturbed areas will be revegetated.

When the surface facilities are removed and the site regraded, the topsoil will be redistributed to a depth of 12 -18 inches over areas of the main mine facilities and 24 inches over areas in the Sylvester Gulch Facilities Area. These surfaces will be revegetated using permanent vegetation seed and the seedling mixtures. Fertilizer and mulch will be applied in accordance with the Topsoil Preparation Section.

Roads

When no longer needed for mining operations, the primary haul/access roads and other access and light-use roads not approved as permanent facilities will be removed and the areas reclaimed. The roads will be filled and graded to the approximate original contour (unless the roads were part of the original contour). Topsoil will be spread over these areas to a 12 to 18 inch depth for reclaimed roads on the main mine facility, and to a depth of 24 inches in the Sylvester Gulch Facilities Area.

Finally, the area will be revegetated with the permanent seed mix listed in Table 37 and mulched and fertilized in accordance with the Topsoil Preparation and the Methods of Planting sections of this Chapter.

Roads will typically be reclaimed in five general steps. First, the road will be closed permanently to vehicular traffic. Second, the asphaltic concrete or other surfacing material will be removed and disposed of according to current regulations. Third, culverts will be removed and any natural drainage courses altered for road construction will be restored to approximate pre-mining condition. Fourth, cut and fill slopes will be reworked. Cut slopes will be reshaped to blend with the natural contour. Fill slopes will be rounded or reduced and shaped as appropriate to conform the site to adjacent terrain and to restore the approximate original natural drainage. Finally, the roadbed's surface will be ripped, plowed or scarified and seeded.

The Sylvester Gulch Fan access road was an existing light-use road at the time MCC proposed construction of the Sylvester Gulch Fan. As detailed in the Sylvester Gulch Fan Technical Revision, the road was leased from U.S. Steel for use by MCC. Subsequently, ARCO purchased the surface property containing the road (Map 2). Since the U.S. Forest Service controls property above the Sylvester Gulch Fan, without other access to their property, MCC will leave the road in place after mine reclamation and reclaim the main haul/access road, from Highway 133 to the intersection of the main access/haul road with the upgraded Sylvester Gulch Facilities Area access/haul road (described below), to a light-use road at the time of final reclamation to maintain the pre-existing access to those lands. Atlantic Richfield Company, as current owner of the property and road, intends the road remain open to serve the post-mining land use of grazing after the mine is closed.

In the Spring of 1997, the Sylvester Gulch Fan access road was upgraded to a haul/access road for access to the ventilation shafts facility. During final reclamation, MCC will also reclaim this haul/access road segment to a light-use road to maintain the pre-existing access to the federal lands south of the mine facilities site. In addition, the Electric Borehole light-use road located along the pre-mine alignment will be retained for the same reason. All other roads within the Sylvester Gulch Facilities Area will be reclaimed to approximate original contour as described above.

Diversion and Collection Ditches and Impoundments

All diversion and collection ditches and impoundments are temporary, with the exception of the diversion ditch above the Lower Refuse Pile. Topsoil is salvaged prior to construction of these facilities. During use, ditches that are not rip-rapped or otherwise lined, will be seeded using the temporary seed mix shown in Table 39. The slopes of the diversion and collection ditches will be either hydroseeded or broadcast seeded as appropriate.

At the end of their useful life, diversion ditches, collection ditches, and impoundments will be refilled and the surface returned to the approximate original contour. Ditch linings will be broken up and buried in place. Topsoil from a stockpile will be spread over the area. Then, the permanent seed mix will be applied and the area fertilized and mulched in accordance with Topsoil Preparation of this Chapter.

Temporary Surface Management Plan

During the course of day to day operations at the mine and during planned construction activities, instances occur whereby it is necessary to utilize temporary management techniques to maintain sound environmental practices. The goal of temporary surface management is to control soil erosion and protect other resources, including air, water quality, and vegetation on small areas both in and out of the disturbed area boundary.

Temporary surface management can be divided into two categories. The first includes revegetation efforts carried out on small areas subject to re-disturbance within 5 years. The second category includes physical management practices involving placing protective barriers or structures to maintain sediment control or otherwise prevent environmental damage.

The temporary surface management plan is as follows:

1. Small areas that are disturbed will be seeded with the temporary seed mix if appropriate. It has been determined during the first five year permit term that it is not necessary to replace seed bed quality material in every instance i.e., the subsoil can be adequately reseeded for short-term purposes. Seed bed quality material will be replaced if subsoil is not adequate. Other management practices will be used as necessary depending on the site, such as roughening the surface by ripping or scarifying, regrading or contouring, adding chemical soil stabilizers, watering for dust control with or without chemical additives, mulching and other feasible methods as deemed appropriate.

2. Temporary physical management practices will include the following:
   - temporary drainage ditches or berms to control surface runoff.
   - straw bales to filter sediment laden runoff and allow ponding for settling.
   - silt fence in the same application as straw bales.
   - rock rip-rap to prevent erosion.
   - temporary plastic (visqueen, etc.) ditch liners.
   - temporary drainage structures such as PVC pipe or other suitable devices.
   - pumping or transferring of water from one location to another to be treated in existing sediment control structures or waste water treatment plant.
   - sand bags to divert runoff or contain runoff.
   - other practices that are deemed appropriate to prevent environmental damage.

The temporary surface management plan is intended to be used only on a short-term basis until more permanent approved plans can be put into effect or constructed.

Revegetation Maintenance

Soil erosion is controlled by using mulch, matting, chemical stabilizers, or other appropriate techniques. Rills and gullies greater than nine inches deep are filled and stabilized. During revegetation, maintenance activities are conducted parallel to the contour unless such activities prove hazardous to equipment and/or operators. Mulch is used where needed after planting to control erosion until vegetation becomes established. Bare patches of failed planting are prepared and replanted. Where there is evidence of poor soil

conditions, the area is retreated or the topsoil replaced as conditions dictate. To prevent bare areas from being overrun by noxious weeds, attempts are made to control noxious weeds during reclamation by mowing or other appropriate methods approved by the Division.

Riparian Areas

Some facilities have been constructed in riparian vegetation and other areas within the 100-foot riparian/stream buffer zone of the North Fork of the Gunnison River and are identified in Figure 18 as areas of buffer zone variance. They include the water intake gallery, sediment ponds and associated spillways and ditches, a railroad siding, the railroad loadout facility, a light-use road and the area of sediment pond MB-5E (formerly a portion of the old Bear No. 1 and 2 Mines site.) Within Section 9 of T13S, R90W, the 100-foot wide riparian/stream buffer zone on each side of the river encompasses 11.9 acres along the north and south banks of the North Fork of the Gunnison River. Of this total acreage only 1.2 acres are covered by riparian vegetation. The remainder is rock debris and an industrial area. A total of 0.4 acres of the variance area was covered by riparian vegetation.

Sylvester Gulch is a stream with a biological community as defined by Rule 4.05.18(3). The realigned main haul/access road will be constructed within 100 feet of Sylvester Gulch, and a variance to the stream buffer zone as defined by Rule 4.05.17 is appropriate because the original stream channel will not be disturbed, water quality and quantity will not be adversely affected due to slope stabilization methods (BMPs, revegetation, and MSE walls), and the reclamation plan provides for the reestablishment of appropriate riparian vegetation. Both the North Fork and Sylvester Gulch stream buffer zones are marked with signs stating "Stream Buffer Zone". The US Forest Service has requested that no buffer zone signs be placed along streams within the Gunnison National Forest where roads, drill pads or other disturbances may cross or be within 100' of any stream with a drainage area above that disturbance of one square mile or greater. All such disturbances have been approved by the US Forest Service and CDRMS with a finding of no impact to water quantity or quality.

Mountain Coal Company will reclaim the 1.3 acres of disturbance within the North Fork of the Gunnison River riparian/stream buffer zone and the disturbance within the Sylvester Gulch riparian/stream buffer zone. The reclamation methods described in the Roads Section will be used to revegetate disturbances within the riparian buffer zone. In addition, all disturbances outside the present riparian vegetation community will be reclaimed as shrub clusters, where site conditions permit. If site conditions preclude shrub cluster vegetation, the CDRMS will be consulted to develop a mutually agreeable reclamation alternative. Also, the species used in the riparian vegetation community revegetation effort are noted below and are based on a survey of species present within the riparian vegetation communities (Table 40). The grass and forb species below, as well as streambank willow and up to six (6) Colorado blue spruce tublings (from Table 40) will be hand-planted along the banks for the restoration of a 50' area of South Prong Creek (see TR-148 in Exhibit 80).

Grass and Forb	Pounds/Acre PLS
Western Wheatgrass	4
Kentucky Bluegrass	1/2
Slender Wheatgrass	2
Streambank Wheatgrass	3
Alsike Clover	1/2
Cicer Milkvetch	1
	11

Shrub Species	Stems/Acre
Streambank Willow	250
Narrowleaf Cottonwood	200
River Birch	250
Hawthorn	50
Wood's Rose	250

	1000

Grass and forbs species will be hand broadcast at twice the above rate and shrubs and trees will be hand planted from container or cutting stock.

Success of this riparian buffer zone revegetation effort will be measured against the Wildlife Shrub Cluster success criteria noted in Table 41 using the same sampling methods noted.

Evaluation of Reclamation Success

Reclaimed Area Revegetation Success

During the initial permitting of the West Elk Mine in 1980 and 1981, revegetation success was proposed to be based on two reference areas established in Sylvester Gulch. Since two vegetation communities were initially disturbed during the construction of surface facilities at the West Elk Mine, a dry meadow reference area and an oakbrush reference area were established. The reference areas were to be used for evaluation of total vegetation cover and herbaceous production during revegetation evaluations for bond and liability release. Total vegetation cover and total herbaceous production from the reference areas were to be compared with like mean parameter values from the reclaimed and revegetated areas.

Subsequent to the initial permitting of the mine, evaluation of the reference area concept occurred in the regulatory, mining, and academic communities. Concerns arose with the long-term management and maintenance of reference areas, as well as their comparability to the expected (and observed) post-mining vegetation communities. Several options for development of revegetation success criteria existed in addition to reference areas, but technical standard and historic record approaches had not been pursued by industry or regulatory authorities, and involved unspecified commitments to data acquisition.

In 1995, the West Elk Mine began planning for expansion of the mine facilities, including a second refuse pile and ventilation and coal storage facilities. As a result of these projects, additional vegetation communities would be disturbed at the mine. Location, establishment, and maintenance of reference areas for each vegetation community disturbed or affected was no longer a viable option for determining revegetation success criteria. An evaluation of technical standard and historic record approaches to establishing vegetation success criteria for total vegetation cover and herbaceous production was undertaken.

Figure 18 Riparian/Stream Buffer Zone

Table 40 Species Identified in Riparian Areas at the West Elk Mine

Kentucky Bluegrass	*Poa Pratensis*
Timothy	*Phlelum pratense*
Slender Wheatgrass	*Agropyron trachycaulm*
Orchard Grass	*Dactylis glomerata*
Smooth Brome	*Bromus inermis*
Redcedar	*Juniperus scopulorum*
Douglas-Fir	*Pseudotsuga menziesii*
Service Berry	*Amelancher alnifolia*
Wood Rose	*Rosa woodsii*
Choke Cherry	*Prunus viginiana*
Hawthorn	*Crataegus erythropoda*
Canada Thistle	*Cirsium arvense*
Rabbit Brush	*Chrysothamnus naueosus*
Goldenrod	*Solidago sp.*
Yarrow	*Achillea lanulosa*
Vetch	*Vicia sp.*
Alfalfa	*Medicago sativa*
Oregon-Grape	*Mahonia repens*
Snowberry	*Symphoricarpes albus*
Sandbar Willow	*Salix exigua*
Willow	*Salix sp.*
Narrow Leaf Cottonwood	*Populus angustifolia*
Scrub Oak	*Quercus gambelii*
River Birch	*Betula fontinalis*
Alder	*Alnus tenuifolia*
Boxelder	*Acer negundo*
Dogwood	*Cornus stolonifera*
Sedge	*Carex sp.*
Scouring – Rush	*Hippochaete variegata*
Mountain Brome[+]	*Bromus marginatus*
Horsetail[+]	*Equisetum arvense*
Horsetail[+]	*Hippochaete hyemalis*
Rush[+]	*Juncus arcticus*
Needlegrass[+]	*Stipa columbiana*
Arnica[+]	*Arnica cordifolia*
Daisy[+]	*Erigeron speciosus*
Little Bedstraw[+]	*Galium septentrionale*
Geranium[+]	*Geranium richardsonii*
False Solomon's Seal[+]	*Maianthemum stellatum*
Yellow Sweetclover[+]	*Melilotus offinale*
Sweet Cicely[+]	*Osmorhiza depauperata*
Knotweed[+]	*Polygonum sawatchensis*
Pontentilla[+]	*Potentilla recta*
Golden Glow[+]	*Rudeckia ampla*
Golden Banner[+]	*Thermopsis montana*
Red Clover[+]	*Trifolium repens*
Valerian[+]	*Valeriana edulis*

Table 40 Species Identified in Riparian Areas at the West Elk Mine Cont.

Juniper	*Juniperus communis*
Mountain Lover+	*Paxistima myrsinites*
Colorado Blue Spruce+	*Picea pungens*
Aspen+	*Populus tremuloides*
Gambel's Oak+	*Quercus gambelii*
Red Osier Dogwood+	*Swida sericea*

+ Additional species identified in the Riparian Community during vegetation study in Sylvester Gulch, 1996 (Exhibit 32A)

Table 41 Rangeland Reclamation Success Criteria

Vegetation Parameter	Criteria	Reference Area or Standard
Rangeland Interspaces		
Cover	Total herbaceous percent cover	Historic Record Standard
Productivity	Total herbaceous productivity (lb/acre)	Historic Record Standard
Diversity	A minimum of 2 cool season grasses and 2 perennial forbs each with relative cover values lying between 3 and 63 percent	Standard Developed in Exhibit 61
Wildlife Shrub Clusters		
Cover	Total herbaceous percent cover	Historic Record Standard
Productivity	Total herbaceous productivity (lb/acre)	Historic Record Standard
Diversity	A minimum of 2 cool season grasses and 3 perennial forbs each with relative cover values lying between 3 and 40 percent	Standard Developed in Exhibit 61
Density	1000 stems/ acre	Standard established by the Colorado Division of Wildlife (see Exhibit 62)

Meetings and discussions with the CDMG yielded agreement on a site specific historic record approach to establishing revegetation success criteria for cover and production based on a reasonable expectation of the vegetation community to be established after reclamation. MCC and the CDMG selected a vegetation community in the immediate vicinity of the mine which closely approximated the biologic composition and character of a post-mine plant community as well as the physical characteristics of the affected areas of the mine. This vegetation community was a former agricultural and pasture area above the existing facilities area. The vegetation community and physical characteristics (slope, aspect, drainage patterns, etc.) closely approximated the anticipated character of the reclaimed landscape and vegetation community.

In order to obtain a representative record of the variability of the microclimate of the area, and

therefore the effect on vegetation growth, it was determined that the three years comprising the historic record should represent the variability of precipitation to be encountered at the site. For the purposes of the historic record; one low (dry), one average (normal), and one high (wet) precipitation year would be represented, based on precipitation records from a weather recording station in the area. Determination of the year type (low, average, high) would be made based on the precipitation sum preceding the growing season (i.e., the sum of precipitation from October of the previous year to May of the current year). Low and high precipitation years were defined as years where the precipitation sum differed by 10 percent or more from the average precipitation sum for the October-May time period.

This vegetation community is to be quantitatively sampled for three years for total vegetation cover, total herbaceous production, species composition and woody plant density. Initial collection of data began in 1996. After collecting the three different growing seasons data, the mean values from each parameter for each of the three years are averaged to obtain a historic record revegetation success standard for each parameter. The revegetation success criteria developed from the historic record data will be applied to all revegetated areas at the West Elk Mine.

A summary report will be completed after each year that vegetation sampling has occurred in the Historic Record Study Area. The summary report will be submitted to CDRMS for review. Upon completion of the final vegetation sampling (third year), a revision application will be submitted which includes a final report that details the results of all historic record vegetation sampling and establishes revegetation success standards based on the values of the historic record.

Revegetation success criteria for reclaimed and revegetated lands at the West Elk Mine are presented in Table 41. When monitored or sampled for bond or liability release, vegetation sampling will employ quantitative methods previously accepted by CDRMS. Timing of all sampling will be consistent with plant anthesis and/or maximum biomass development. Vegetation sampling will be undertaken to sample adequacy for bond release vegetation sampling. A Student's test comparison will be undertaken for each applicable parameter. Revegetation will be judged successful when the mean value from the revegetated area is equal or greater to 90 percent of the historic record standard with 90 percent statistical confidence for the parameters of total vegetation cover and total herbaceous production. Species composition will be judged successful if the revegetated area meets the standard. Woody plant density will be judged successful if the woody plant density within the wildlife shrub clusters is equal or greater to 90 percent of the numerical standard with 90 percent statistical confidence.

The Historic Records Study Area has been fenced to restrict access to domestic livestock and will remain fenced until revegetation success standards have been established. Weeds will be managed in accordance with the approved Weed Control Plan. The Historic Records Study Area site was chosen in an area which is partially permitted for an Upper Refuse Disposal Pile. MCC will maintain the Historic Record Study Area in its current state for the time period required to acquire the necessary historic record vegetation information. The location of the Historic Record Study area is shown on Map 53.

Reclaimed Area Monitoring Plan

Vegetation monitoring at the West Elk Mine will encompass both interim and final revegetation monitoring. *Interim* revegetation monitoring will be conducted on the Lower Refuse Pile for the purposes of evaluating revegetation plan elements, including, but not limited to, seed mix components, application rates and methods, and mulching. Generally, newly revegetated areas exhibit annual "weed" dominance for the first one to three years after seeding. Since this occurrence is widely acknowledged as normal in revegetation scenarios, information obtained from sampling during this period is not particularly useful. Mountain Coal Company does not plan to undertake any interim monitoring while annual "weedy" species are dominant. For this reason, MCC proposes interim revegetation monitoring after the perennial revegetation species have become well established.

Final reclamation monitoring of the revegetated mine site will commence in the second year following seeding, in accordance with the definition of the extended liability period. Monitoring will take place during years 2, 4, 6, 9, and 10 of the liability period. Sampling methods and statistical analysis will be consistent with those described in Section 2.05.4 of the MRP.

Grazing Success

During the last two years of the 10-year liability period, a grazing program using domestic livestock will be instituted. Grazing will occur at a capacity and management level consistent with that for adjacent properly managed non-mined lands.

Although grazing with domestic livestock is preferred, grazing trials may preclude or interfere with post mining vegetation sampling or operational requirements. In this case, grazing studies will be substituted for the direct use of livestock. These substitute studies will involve clipping large plots during normal periods of grazing to simulate grazing by livestock. Regardless of which grazing method is used, herbaceous production and cover will be estimated on both affected and reference areas. Data from affected and reference areas will then be compared using t-tests.

Agricultural Monitoring Plan

When the West Elk Mine was originally permitted, an annual survey was used to conduct agricultural monitoring. After each growing season, landowners with agricultural lands in the North Fork Valley were surveyed. The survey consisted of interviewing each landowner orally. Results of this survey are contained in Exhibit 9.

After the 1982 survey, OMLR and Mountain Coal Company determined the annual survey was no longer necessary. Both found mining practices and monitoring programs in effect at the West Elk Mine sufficient to ensure that the mining operation would not significantly degrade water quality or reduce water quantity in the North Fork of the Gunnison River. There is little, if any, chance the mine would affect the North Fork AVF. Based on these considerations, OMLR determined the yearly agricultural monitoring program was of little value and could be discontinued. Therefore, Mountain Coal Company ended the agricultural monitoring program after the 1982 survey.

Surface and Groundwater Monitoring

The surface and groundwater monitoring program has been changed since monitoring began in the 1970's to add hydrologic resources as the permit area was expanded, and to remove hydrologic resources that were no longer providing reliable or relevant data. These changes were included in Technical Revision Nos. TR-54 (1987), TR-85 (1998), TR-88 (1999), and TR-139 (2016), as well as Permit Revision Nos. PR-10 (2006), PR-11 (2005), and PR-12 (2008). Specifics about each revision can be found in the CDRMS revision files, as well as in Exhibit 18 – "Characterization of Groundwater Systems in the Vicinity of West Elk Mine", and Exhibit 71 – "Hydrologic Characterization of the South of the Divide/Dry Fork Lease Areas and Hydrologic Monitoring Plan for Mountain Coal Company, LLC, West Elk Mine".

The comprehensive hydrologic monitoring plan for the West Elk Mine facilities and permit area is presented in Exhibit 71. This monitoring program was designed to collect the hydrologic data needed to assess mining-related impacts on hydrologic resources. The monitoring schedule, including a baseline monitoring schedule and "sampling windows" established to capture the rising limb, the peak, and low flow of the hydrograph, is described. The chemical analyte suite for the first five years of monitoring (including the baseline period) of both surface and groundwater resources and subsequent reduced analytical parameters are provided in Exhibit 71 as well.

Surface Water Monitoring

In 1977 Mountain Coal Company installed, and has since maintained and operated, a network of six continuous recording stream gaging stations to establish the baseline surface water hydrology for the permit and adjacent areas of the West Elk Mine and provide a method of assessing the impacts of mining during the life of the West Elk Mine. Five of these gaging stations are located in the Minnesota Creek drainage basin on Horse Creek, Lick Creek, South Prong, Upper Dry Fork, and Lower Dry Fork. The sixth gaging station is located on Sylvester Gulch a tributary of the North Fork adjacent to the surface facilities. Data records for all of these gaging stations, in both tabular and graphic form have been provided to CDMG in previous permit submittals for the West Elk Mine. **These data are also found in the Annual Hydrologic Reports.** This comprehensive data base has served to more than adequately characterize the baseline surface water hydrology across the mine plan area for the West Elk Mine.

In addition to the original five gaging stations, Mountain Coal Company has installed and operates a gaging station on the main stem of Minnesota Creek, the Lower Minnesota Creek (USGS) gaging station and on the East Fork of Minnesota Creek just upstream of the confluence of East Fork and Dry Fork, Upper Minnesota Creek (USFS) gaging station. MCC also collects flow data from the North Fork of the Gunnison at the Upper North Fork gaging station, which is a USGS gaging station. MCC has since installed additional gaging stations at Middle Dry Fork and Upper and Lower Deep Creek. The locations of all surface water gaging stations can be found on Map 34. The currently monitored stations are listed in Table 5 in Section 2.04.7.

In addition to providing baseline data, a portion of the Minnesota Creek gaging station network will be relied upon to determine the existence of stream depletions to Minnesota Creek arising from Mountain Coal Company's mining operations. The extent of depletion, if any, will be quantified by

correlating the stream flows of Minnesota Creek at the Upper Minnesota Creek (USGS) gaging station located approximately six miles upstream from its confluence with sub-basins that could possibly be affected (Dry Fork and Lick Creek). A complete description of the streamflow correlation procedures is provided in the permit application as "Application for Approval of Plan for Augmentation Concerning the Application of Water Rights of Mountain Coal Company in Gunnison and Delta Counties" and "Engineering report, Water Augmentation Plan for Mountain Coal Company in Minnesota Creek Basin near Paonia," dated January 1985 (Exhibit 52).

It is estimated that it might be some time before secondary recovery mining will take place south of the Minnesota Creek watershed divide. As a result, there is no need to operate and maintain the entire Minnesota Creek gaging station network until mining advances to a point where a watershed might be impacted. Rather, some of the stations have been shut down until the summer before mining impacts can be expected; at which time the stations will be reactivated. Mountain Coal Company has closed the Horse Creek Flume, the South Prong Flume and the Beaver Reservoir Flume. All facilities have been removed and the sites regraded and reseeded to prevent erosion. Should mining advance to the point where these basins might be impacted, Mountain Coal Company will install a new gaging station, or reinstall the old station, at least one monitoring season before any potential exists for the stream to be impacted by mining. In the event that conditions are such that the gage cannot be reinstalled at the same location, the site for the new gage will be reviewed with appropriate persons/agencies prior to installation.

The following stations, because Mountain Coal Company needs the data to develop the streamflow correlations described in the augmentation plan, remain operational: Upper Minnesota Creek (USGS), Lower Minnesota Creek (USFS), Lower Dry Fork Flume, Lick Creek Flume and the Upper Dry Fork Flume. The Upper Dry Fork Flume was relocated to a location to better quantify the actual contributions of the Deep Creek Ditch to the Dry Fork of Minnesota Creek basin. These stations are monitored as previously agreed with the State Engineer per the augmentation plan in Exhibit 52.

Copies of all raw and reduced data from the gaging stations will be maintained on file at Mountain Coal Company's offices for public inspection during normal business hours. Annual reports for the stream gaging stations will be furnished to the CDMG in the Annual Hydrology Report. These reports will include monthly measurements of stream flows for each gaging station with maximum, minimum and mean flows reported.

As a result of TR-54, water quality monitoring of surface stations in the Minnesota Creek drainage was reduced until mining progresses into that area. Seasonal measurements (three times per year to correspond to the start of spring runoff, the peak spring runoff, and the fall low flow) of flow, pH, conductivity, and temperature will be taken. For surface water sites with less than five years of monitoring data, annually, during the second sampling (except for the North Fork of the Gunnison River, which will be during the third sampling), a full-suite laboratory analysis of water solids (TDS), total suspended solids (TSS), calcium, magnesium, sodium, SAR, hardness, bicarbonate, chloride, nitrate/nitrite, phosphate (PO_2^{-3} as P), sulfate, iron (total & dissolved), manganese (total & dissolved), aluminum (dissolved), arsenic (total recoverable), cadmium, copper, lead, mercury (total recoverable), molybdenum, selenium (total recoverable), boron, and zinc will be conducted. Once five years of data have been accumulated, the annual laboratory analysis will only include TDS,

TSS, pH, conductivity and iron (dissolved and total). A seasonal, rather than quarterly or semi-annual water quality monitoring schedule was instituted for a variety of reasons. The primary reason for selecting seasonal sampling is that, in many instances, particularly streamflow and spring flows, these are the only periods of measurable flow. Most of the streams are ephemeral or intermittent at best, and nearly all of the springs are ephemeral except in the wettest years. The baseline data clearly indicate that there is no reason to attempt to sample these locations during winter. The adverse conditions encountered in the remote areas of the West Elk Mine lease area severely hamper sampling procedures and influence the collection of meaningful data. As a result, by restricting sampling to the periods of flow and ensuring sample integrity, Mountain Coal Company will be able to provide meaningful data to the agency while reducing the costs associated with collecting unnecessary data or data that is not meaningful.

Mountain Coal Company has selected the water quality parameters in Table 5 for routine measurement because they will adequately characterize the quality of the water. Annual full-suite monitoring (and the reduced parameter list) will allow Mountain Coal Company to identify possible mining-induced changes in water quality.

West Elk Mine, in cooperation with the U.S. Forest Service District Office in Paonia, Colorado, has agreed to informally monitor the U.S. Forest Service surface water resources, as depicted on the U.S. Forest Service Water Resources Map, that are located directly over panels to be mined, and within the angle-of-draw per the agreement letter in Exhibit 19C.

Spring Monitoring

In 1977 Mountain Coal Company began a spring water monitoring program that incorporated monthly, quarterly and semi-annual monitoring of flow and/or water quality. Map 37 shows the springs identified on the West Elk Mine lease area, the monitored springs, the springs sampled for water quality, and the locations of the decreed springs on the West Elk Mine lease area and vicinity. Map 34 shows the location of springs currently in the monitoring program. The most recent Annual Hydrology Report provides a graphic representation of the flow data available for the springs monitored and water quality data.

It is estimated that it might be some time before secondary recovery mining will take place south of the Minnesota Creek watershed divide. As a result, there is no need to operate and maintain the entire spring monitoring network until mining advances to a point where a specific spring might be impacted. Rather, monitoring of some of the springs will be stopped until the summer before mining impacts can be expected, at which time monitoring of appropriate springs will be resumed. Monitoring will continue, on a seasonal basis, for the springs in the approved monitoring program as listed on Table 5.

In the Minnesota Creek drainage basin, monitoring was discontinued for springs J-4, J-7, J-10 and WCC-23 until the summer before mining impacts can be expected, at which time monitoring of these springs will be resumed. Monitoring of spring J-4 was reinitiated in 1996. Monitoring of a group of three springs (G-25, G-28a and G-31) in Gribble Gulch and one spring (G-26a) in Lone Pine Gulch were discontinued for several years due to access being blocked by landslides. The monitoring of spring G-26a in Lone Pine Gulch, spring G-25 (#15, Jumbo Spring No. 2 Pond) and spring G-31 (#18, Jumbo Mountain Spring No. 4 Pond) were resumed in 1993. Spring G-28a was

not located during the Jumbo Mountain field investigations, but was found to again be flowing in 1994, and monitoring was resumed. Fourteen springs and/or ponds identified on the Jumbo Mountain tract (Map 34) were monitored for baseline data and were monitored during and after mining in this area. Spring G-29 was found, but the spring no longer exists (i.e., no flow), and was not added to the monitoring program. In 1999, the number of springs monitored in this area were reduced to only those springs located above the North Jumbo Mains, where mining impacts could still occur.

Seasonal measurements (three times per year to correspond to the start of spring runoff, the peak spring runoff, and the fall low flow) will be taken of spring flow, pH, conductivity, and temperature. For springs with less than five years of monitoring data, annually, during the second sampling period, springs will be monitored for laboratory analyses of total dissolved solids (TDS), total suspended solids (TSS), calcium, magnesium, sodium, SAR, hardness, bicarbonate, chloride, nitrate/nitrite, phosphate (PO_2^{-3} as P), sulfate, iron (total and dissolved), manganese (total and dissolved), aluminum (dissolved), arsenic (total recoverable), cadmium, copper, lead, mercury (total recoverable), molybdenum, selenium (total recoverable), boron and zinc. All parameters will be analyzed for their dissolved form unless stated otherwise. Once five years of data have been accumulated the annual laboratory analysis will only include TDS, TSS, pH, conductivity and iron (dissolved and total). A seasonal, rather than quarterly or semi-annual spring flow and water quality monitoring schedule was instituted for a variety of reasons. The primary reason for selecting seasonal sampling is that, in the case of spring flows, these are the only periods of measurable flow. Most of the springs are ephemeral or intermittent at best, except in the wettest years. The spring flow baseline data, summarized graphically in the Annual Hydrology Report, clearly indicate that there is no reason to attempt to sample these locations during winter. The adverse conditions encountered in the remote areas of the West Elk Mine lease area severely hamper sampling procedures and influence the collection of meaningful data. As a result, by restricting sampling to the periods of flow and insuring sample integrity, Mountain Coal Company will be able to provide meaningful data to the agency while reducing the costs associated with collecting unnecessary or data that is not meaningful.

Ground Water Monitoring

In 1974, Mountain Coal Company began a groundwater monitoring program that incorporated monthly, quarterly and semi-annual monitoring of groundwater levels and/or water quality. Map 34 shows the distribution of monitored wells. Annual hydrology reports contain water quality and quantity data from the wells. Section 2.04.7 provides a detailed review of the history and development of groundwater monitoring activities at the West Elk Mine.

It is estimated that it might be some time before secondary recovery mining will take place south of the Minnesota Creek watershed divide. As a result, there is no need to operate and maintain a lease-wide groundwater monitoring network until mining advances to a point where a specific well might be impacted. Rather, monitoring of groundwater beyond the five-year permit area and adjacent area have been discontinued until the summer before mining impacts can be expected, at which time monitoring of the groundwater wells will be resumed. Monitoring will continue, on a seasonal basis (three times per year to correspond to the start of spring runoff, the peak spring runoff, and the fall low flow), for the wells listed in Table 5 in Section 2.04.7. Although no data was obtained from

monitoring well SOM-38-H-1 in 1994, as it was lost (the casing was pinched, bent or blocked) in 1993, monitoring was successfully resumed in early 1995. Monitoring of wells SOM 38-H-2 and SOM 38-H-3 were discontinued as the casing were apparently sheared by slide/subsidence activities (see the 1989 AHR). These monitoring wells have been temporarily capped for potential future use in monitoring the recovery of piezometric surface following the cessation of mining operations. The steel casing of alluvial well SG-1 had rusted, was apparently bent, and no longer contained water, so the well was deleted from the monitoring program in 1995 and replaced by well GB-1. Due to construction on the east side of the LRP, GP-1 and GB-1 had to be abandoned and were replaced with GP-6 and GP-7 in 1997.

Wells SOM-2H and SOM-16H are completed in the F-Seam and located in the Minnesota Creek drainage basin, fairly close to the drainage divide. Monitoring of these wells will be continued to provide assurance that mining is not having an impact on the Minnesota Creek basin. Additionally, should Mountain Coal Company be fortunate enough to meet the potential production levels, these wells are most likely to fall into the area of potential impact. For all other wells in the Minnesota Creek drainage basin, monitoring will be discontinued until the summer before mining impacts can be expected, at which time monitoring of those wells with a potential to be impacted in one year of mining will be resumed.

Monitoring well JMB-12 was completed (see Exhibit 12) within the Jumbo Mountain tract (Map 34) to monitor the B-Seam in this area. Baseline data was obtained and was monitored during mining, and subsequently removed from the monitoring program in 1998, because the bottom of the well had been mined through with the B-Seam.

Monitoring wells 96-2-2 and 96-27-1 were completed above and in the E-Seam, respectively, during the 1996 exploration project. Baseline data collection began in the fall of 1996. The wells are now in the regular monitoring program as indicated on Table 5.

Drill hole 96-15-1 was drilled during the 1996 exploration program and was completed as a water monitoring well in the B Seam. See Exhibit 12 for completion information. Because the well was venting a significant amount of gas, water measurement and sampling is precluded. The well has been fitted with a vent to allow de-gassing. In the event that the well discontinues producing gas, it will be incorporated into the monitoring program.

Seasonal measurements (three times per year to correspond to the start of spring runoff, the peak spring runoff, and the fall low flow) of water level, well water pH, conductivity, and temperature will be taken for all monitored wells. For groundwater wells with less than five years of monitoring data, annually, during the third sampling, a full-suite sample analysis consisting of pH, conductivity, total dissolved solids (TDS) calcium, magnesium, sodium, SAR, hardness, bicarbonate, chloride, un-ionized ammonia, nitrate/nitrite, phosphate (PO_4^{-3} as P), sulfate, iron (total and dissolved), manganese (total and dissolved), arsenic, cadmium, lead, mercury, selenium, boron, and zinc. All parameters will be analyzed for their dissolved form unless stated otherwise. Once five years of data has been accumulated the laboratory analysis will only include TDS, pH, conductivity and iron (total and dissolved). A seasonal, rather than quarterly or semi-annual well and water quality monitoring schedule was instituted for a variety of reasons. The primary reason for selecting seasonal sampling is that, in the case of groundwater

monitoring, these are the only periods of significant changes in groundwater levels. The groundwater baseline data clearly indicate that there is no reason to attempt to sample these locations during winter. The adverse conditions encountered in the remote areas of the West Elk Mine lease area severely hamper sampling procedures and influence the collection of meaningful data. As a result, by restricting sampling to the periods of flow and insuring sample integrity, Mountain Coal Company will be able to provide meaningful data to the Division while reducing the costs associated with collecting unnecessary data or data that is not meaningful.

B-Seam and Rollins Sandstone Hydrology Monitoring

Baseline hydrology monitoring has taken place on the West Elk mine block since about 1978. Baseline data has been collected for the entire Mesa Verde Formation including the Upper and Lower Coal members which contain the minable F, E, and B coal seams. A description of the hydrology and baseline data is contained Section 2.04. Additional baseline data are contained in the Quarterly Hydrology Monitoring Reports (1978 to present) and the Annual Hydrology Reports (1982 to present).

Monitoring of SOM 23-H-1 was discontinued. It appears that the PVC casing in the well was fractured or split by a nearby landslide. It also appears that better quality, alluvial water is seeping into the casing diluting the B-Seam water and changing the well head. Therefore, drill hole SOM-23-H-1 was deleted from the monitoring program. Historical data from this well obtained in 1977, should accurately represent the conditions existing in the B-Seam.

Water in drill hole SOM C-72-H exhibited high pH which may be due to contamination from grout. Mountain Coal Company flushed the well with water and jetted the well dry utilizing drilling equipment. Hydrologic consultants, as well as Mountain Coal Company geologists, feel that the high pH, if grout related, may be remedied in this manner. This well was eliminated from the monitoring program in 1999, as the bottom of the well was mined through with the B-Seam.

Monitoring well SOM 127-H is located on the West Elk Mine site and was completed in the fall of 1988 to monitor the B-Seam. This well was sealed in June, 1993, because methane liberated from the well had caused a safety concern in the maintenance shop constructed over the well. SOM 129-H was drilled nearby to replace SOM 127-H in the monitoring program.

Monitoring well JMB-12 was completed in the B-Seam (see Exhibit 12) during the Jumbo Mountain exploration project in the summer of 1993. Baseline data monitoring was begun in early fall of the same year and continued until one year of data was obtained. JMB-12 was then incorporated into the regular monitoring program. This well was removed from the monitoring program in 1999, as the well was mined through with the B-seam.

Well So.W-1 was completed into the B-seam in 1994. Baseline data were collected on the well and the well was then incorporated into the regular monitoring program.

Well So.W-3 was also completed in 1994, but was completed in the Rollins Sandstone. Due to a problematic completion (i.e., an unusual blockage), the well never provided any data, and was eliminated from the monitoring program in 1999.

An additional well, SOM 128-H, was completed during the fall of 1990 to monitor the Rollins Sandstone beneath the B-Seam. Exhibit 12 contains the well completion information. SOM 128-H is located east of the West Elk Mine's new office and bathhouse and south of the new haul road (Map 34). Baseline data collection was obtained during the 1991 water year. The well was removed from the monitoring program in 1999 because the unusual hydrograph of the well was likely the result of well casing damage, and therefore, was not providing useful data.

MCC plans to construct a monitoring well completed to the B-Seam, down-dip of the Box Canyon longwall panels. The well will be drilled prior to longwall mining panel 18 (the northern most Box Canyon panel). MCC will submit a revision to show the location of the well and to include it in the monitoring program, prior to beginning drilling.

Typical Hydrologic Sampling Methods-Surface Water

Surface water monitoring is measured seasonally as described on page 2.05-71. Monitoring measurements include measurement of flow, field parameters, and laboratory parameters as identified in Table 5. Surface water flow is measured through Parshall flumes (of varying throat widths and heights) at the continuous recording stations identified in the Surface Water Monitoring section of the permit document. Continuous recording is accomplished through use of Stevens Type F continuous recorders. In 1997, computerized data loggers were installed at all of the continuous recorders. The two Deep Creek sites and Middle Dry Fork have Global continuous recording devices (a different type and model of recorder from the ones installed at the Steven's recorders). These were also installed in 1997. Field data is maintained and compiled at the West Elk mine office. Surface water monitoring sample measurements include field parameters, and laboratory parameters as identified in Table 5. Field parameters of temperature, pH, and conductivity, are procured at the surface water sampling point by selecting a grab sample volume from surface water flow and measuring the sample for the parameters using standard instruments which have been calibrated in the field daily. Samples for analysis of laboratory parameters are collected by filling a clean pre-fixed sample bottle from non-aerated flow. Sample bottles are capped, labelled, placed on ice, and transported to the laboratory for analysis. All equipment is rinsed before and after sampling with distilled water as well as sample water prior to measurement of sample parameters.

Typical Hydrologic Sampling Methods-Springs

Springs are measured seasonally as described on page 2.05-74. Monitoring measurements include spring flow, field parameters, and laboratory parameters. In sampling springs, a location is selected, which approximates a channel as closely as possible. A step may be cut into the channel base to facilitate positioning of the container measuring volume. Flow measurements are taken through the use of a timed volume approach. The field technician times the spring flow into a specific measured volume container, establishing flow rate. Several measurements are taken and averaged prior to reporting. Field parameters of temperature, pH, and conductivity are procured at the spring by selecting a sample volume from the flowing spring and measuring the sample for the parameters using standard instruments which have been calibrated in the field daily. Samples for analysis of laboratory parameters per Table 5 are collected by filling a clean, pre-fixed sample bottle from non-

aerated spring flow. Care is taken to minimize any increases in turbidity. Sample bottles are capped, labelled, placed on ice, and transported to the laboratory for analysis.

Typical Hydrologic Sampling Methods-Ground Water

Ground water monitoring wells are measured seasonally as described on page 2.05-75. Monitoring measurements include field and laboratory parameters as identified in Table 5. Static water levels are measured first at each well. In obtaining samples from ground water wells, the field technician samples each well the same way each time. In general, the ground water wells at West Elk do not exhibit recovery within the time necessary to complete sampling. For this reason, as explained during the 1993 permit renewal, three casing volumes of water are not removed from the wells. A PVC thief with a brass foot valve is used to obtain samples. The bailer is rinsed with distilled water before and after each sample. After rinsing, the bailer is gently lowered into the water column in the well. The sample is obtained, striving to disturb the well water column as little as possible during sampling and retrieval. Prior to measurement, instruments and equipment (filters and instruments) are rinsed with distilled water. Field parameters are measured (Table 5) and the water sample is filtered, divided into the proper sample bottles, sealed, cooled as appropriate, boxed, and delivered to the laboratory for analysis. In some cases, samples may not be available since there is insufficient water for sampling. This means that there is not enough water to fill the sample bottles and an additional 300 to 500 ml of sample for rinsing and field parameter measurement.

Typical Hydrologic Sampling Methods-Mine Inflows

Flow measurements, field parameters and a water quality sample will be collected from mine inflow locations as close to the inflow source as safely possible. Flow estimates will be recorded for the inflows that are expressed as roof drippers, seeps, or dispersed flow that are less than 5 gpm. Field parameters and a water quality sample will be obtained if the inflow is of sufficient, discernable flow (>5 gpm) and/or lasts longer than 7 days. If the inflow is continuous, an initial sample will be obtained, and then sampled at least annually thereafter. Because the location and conditions of the inflows will vary, as they will originate from the roof, floor, or ribs and may be flowing at a very low or high rate, it is difficult to describe how information on each inflow will be collected. To the extent possible, flow measurements will be taken through the use of a timed volume approach as close to the source of the inflow as possible. The sampler will time the flow into a specific measured volume container to establish flow rate. Several measurements will be taken and averaged prior to reporting. Field parameters of temperature, pH, and conductivity will be procured as close to the inflow source as possible by selecting a sample volume from the inflow and measuring the sample for the parameters using standard instruments which have been calibrated. Samples for analysis of laboratory parameters per Table 5 will be collected by filling a clean, pre-fixed sample bottle from non-aerated flow. Sample bottles will be capped, labeled, placed on ice, and transported to the laboratory for analysis. If the sampler is unable to obtain a sample following the above described methods due to conditions in the mine or if the inflow is of very high volume and/or flow, the sampler will attempt to obtain the most accurate measurement of flow and as representative water quality sample, as safely possible.

Monitoring Mining Impacts-Surface Water

Monitoring of surface water to assess potential impacts of B-Seam mining will continue. No changes were made to the plan when mining was begun in the B-Seam, as the original B-Seam mining area is essentially the same as the original F-Seam 5-year permit area. The existing monitoring plan can be found in the Surface and Groundwater Monitoring Section. A technical revision to reduce hydrology monitoring was submitted in April, 1987 and was subsequently approved. Monitoring of surface water data for the water augmentation plan will continue, as will other surface water monitoring.

B-Seam monitoring data, results, impacts, if any, and predictions for the following year will be incorporated into the Mountain Coal Company Annual Hydrology Reports. The reports will be on a water year basis (September 30 to October 1) as are previous reports. Monitoring data will be kept on file at the mine site.

Monitoring Mining Impacts-Springs

Coal mining has not historically affected the discharge rates of springs in the vicinity of the West Elk Mine. Except for localized subsidence effects and mine openings that are near steep mountain fronts or are within a few hundred feet of land surface, coal mining does not have the potential to impact discharge rates for springs in the vicinity of West Elk Mine. Even though it is unlikely that coal mining will affect spring discharge rates, it is important that flow rate measurements continue on decreed springs in future mining areas. Continued measurement is necessary because MCC may at some time in the future have to verify that possible discharge rate changes are due to either seasonal or short-term climatic factors.

There has been no historical evidence that coal mining has affected the water chemistry of springs. Except for shallow groundwater systems, which may be impacted by the refuse pile, the potential for coal mining to affect the chemical character of spring discharges is extremely low.

The monitoring program will be completed as presented in the Surface and Groundwater Monitoring section in 2.04.7. There are no mapped springs in the projected mine plan area or angle of draw area within 350 feet depth range of the mine workings. A depth of 350 feet is the predicted limit of B-Seam mining effects which could cause impacts under worst case (no cave develops) conditions. The distance used for F-Seam impacts was 50 times seam height or 210 feet which was conservatively rounded up to 300 feet. This factor is based on a heuristic rule, general in the international coal community (Dr. Hamid Maleki, U.S. Bureau of Mines, personal communication, 1994). No springs above these zones are expected to be affected significantly.

Data, mining locations, interpretations, and predictions for the following year for B-Seam mining will be incorporated into the Mountain Coal Company Annual Hydrology Report. Spring monitoring locations are shown on Map 34. The decreed springs are shown on Map 37.

Monitoring Mining Impacts-Groundwater

Mining induced water level changes have been observed in some F, E, and B seam well hydrographs; however, these changes have not corresponded with influxes of water into mine workings. However, water level monitoring is important to continue, as well as in the Barren

Member wells, to document the relationship, or lack of, between mine water inflows and groundwater systems in the overlying bedrock. No chemical abnormalities, which can be attributed to mining, were observed in the historical monitoring data and there is no reason to anticipate that mining will affect water quality in the future.

The refuse pile wells, GP-3, GP-4, GP-6, and GP-7 will continue to be monitored to detect future impacts of the lower refuse pile on shallow groundwater resources.

As discussed previously in Section 2.04.7, the Rollins Sandstone monitoring wells do not provide predictable information regarding Rollins Sandstone groundwater conditions. In addition, groundwater systems in the Rollins Sandstone are not areally extensive and are not in hydrodynamic communication with each other and as such, the Rollins Sandstone is not an aquifer. As could be expected, there are no users of Rollins Sandstone water in the vicinity of the mine. For these reasons, MCC does not plan to complete any additional monitoring wells in the Rollins Sandstone.

Data, mining locations, interpretations, and predictions for the following year for B-Seam mining will be incorporated into MCC's Annual Hydrology Report using the wells currently in the monitoring program.

Inflows to the B-Seam workings will be mapped and flows estimated similar to that performed for F-Seam inflows. Mine discharges will be monitored, flows estimated or, where practical, measured, and annual samples collected, as described previously.

Mitigation Of Hydrologic Impacts

The final B-Seam pillar retreat mining and longwall mining in the B-Seam will cause subsidence in the North Fork of the Gunnison River drainage basin during the current permit term. Mining impacts with respect to hydrology, both surface and groundwater are expected to be minimal. Any water encountered during mining in sufficient quantities to require discharge will be pumped from the mine to an approved NPDES/CPDES discharge location. If water is of such quality as not to require settling or other chemical or filter type treatment it may be discharged directly to a receiving water at an approved discharge point, such as the Sylvester Gulch Fan (outfall 011). Water which may or may not require treatment may be pumped to Sediment Pond MB-1 which has been sized to handle 200 gpm continuous mine inflow. Water will be appropriately treated, if necessary, using chemical additives to aid in settling of suspended solids, pH adjustment, or others, as necessary. All precautions will be taken during the use of chemical additives to comply with State, Federal, and local regulations. Water will be discharged in compliance with NPDES/CPDES permit requirements for the West Elk Mine.

Water rights in the North Fork of Gunnison River are not anticipated to be affected by hydrologic impacts from mining, since mine inflows will ultimately be discharged to the North Fork of the Gunnison River. Mountain Coal Company shall comply with Rule 4.05.15 should a vested water right be injured, as specified in the rule. No surface water impacts from mining are anticipated since; 1. No intermittent or perennial streams cross the retreat mining area or are adjacent to the area, and 2. Discharges to surface waters will be in compliance with NPDES/CPDES permit

requirements.

Mountain Coal Company water withdrawals from the North Fork are not expected to cause any impact since they are a small percentage of stream flow even during low flow conditions.

No U.S. Forest Service water resources are located in the permit area projected to be retreat mined. Resource No. 131 is located over the projected B-Seam main entries, but is not expected to be impacted. See the additional discussions of mitigation measures in Section 2.05.6(6)(f) and in Exhibit 19C.

Water Augmentation Plan

The Mountain Coal Company Water Augmentation Plan was adjudicated in February, 1987, in Division 4, State of Colorado Water Court. A copy of the Adjudicated Water Augmentation Plan is included in Exhibit 52. The water augmentation plan covers mitigation of potential impacts from mining in the Minnesota Creek Basin. The water augmentation plan is based on worst case conditions where mining in the basin depletes the Dry Fork of Minnesota Creek and requires augmentation by Mountain Coal Company water rights up to 10.96 cubic feet per second (4919 gallons per minute) maximum headgate diversion.

The plan is not in effect during development mining in the basin. However, there is a provision to implement the plan should circumstances warrant, such as large inflows into the mine workings in the Minnesota Creek Basin.

In order to collect stormwater and then store the collected stormwater underground, West Elk must adhere to specific legal and regulatory frameworks designed to prevent injury to senior water rights. The primary mechanisms to achieve this are through Plans for Augmentation and Substitute Water Supply Plans (SWSP). West Elk will develop a Plan for Augmentation and Water Court application that details how, when, and where replacement water will be supplied to the affected stream system. The Water Court evaluates the plan to ensure it prevents injury to existing water rights and, if satisfactory, issues a decree approving the augmentation plan.

West Elk will request an SWSP approval from the State Engineer's Office pursuant to C.R.S. 37-92-308(4) to authorize operation of the system while the Plan for Augmentation application is pending with the Water Court. West Elk will be unable to operate the system until the SWSP is approved by the State Engineer's Office.

Annual Hydrology Report

Mountain Coal Company provides in the Annual Hydrology Report (AHR) a detailed assessment of mining impacts of the past water year as well as potential mining impacts and an estimate of production for the upcoming water year. A map is included in the Annual Hydrology Report showing the piezometric surface of the colluvial aquifer in the area of the Lower Refuse Pile, if one develops. An assessment of the impacts of the Lower Refuse Pile to the hydrology balance during the previous year is included in the report. Also included in the report are the analyses of hydrologic

data gathered during the year to assess the impacts of mining on the quality and quantity of streams, springs, groundwater aquifers, mine inflows and mine discharges (water balance) which may exist in the permit area. Mine maps showing the locations of mine inflows are provided in the Annual Hydrology Reports along with estimates of the quantity, quality and duration. Water quality samples will be taken as close to the inflow source as safely possible, to properly characterize the water quality. Estimates of water imported for use within the mine and mine discharge are also provided in the reports. The Annual Hydrology Report will include seasonal measurements of spring flows, streamflows, well levels, and water quality analyses of selected parameters for each monitored resource. Mountain Coal Company also evaluates the adequacy of the current monitoring plan in the report. The Annual Hydrology Report will also include an anion and cation balance on all water analyses. This will provide a quality assurance/quality control check on the laboratory data.

The Annual Hydrology Report is submitted by April 30 of the following year in association with the Annual Subsidence Report. Copies of all raw and reduced data from the monitoring program will be maintained on file at Mountain Coal Company's offices for public inspection during normal business hours.

Air Pollution Control Plan

Air pollution control of facilities at the West Elk Mine will be done in accordance with emissions permits issued by the Air Pollution Control Division of the Colorado Department of Health. A copy of each permit can be found in Exhibit 6.

Fugitive Dust Control Plan

Coal handling facilities are appropriately equipped to minimize dust generation. All conveyors outside the mine portal are suitably covered to prevent particulate dispersion of coal by the wind. Water sprays, using surfactant as necessary, are mounted so as to prevent dust generation from conveyors or coal stockpiling, if needed. A telescoping chute is used in loading railroad cars at the loadout to help prevent dust generation. Finally, all transfer points between conveyors, rotary breakers, and silo(s) are enclosed to control particulate emissions from these sources.

Mountain Coal Company also tries to minimize fugitive dust from roads at the West Elk Mine. Water is applied seasonally to active unpaved roadways, parking areas, and refuse disposal areas to control dust emissions from these areas. In addition, vehicle speed is restricted to a maximum of 20 miles per hour. Whenever these steps are insufficient in controlling fugitive dust emissions, chemical dust suppressants or surfactants are applied to road surfaces.

Fish and Wildlife Management Plan

The baseline wildlife information collected on the property indicates that the mine facilities area is not of prime significance to major wildlife species. The affected area is not know to be critical habitat for big game, raptors, eagles, migratory birds, any threatened or endangered species, or to contain wetlands, cliffs supporting raptors and/or areas offering special shelter, protection, reproduction, nursery or wintering areas.

Using the best technology currently available to the extent possible, disturbances and adverse impacts of these operations on fish, wildlife, and related environmental impacts are minimized. Where practicable, enhancement of such resources is achieved. In so doing, Mountain Coal Company will report to the Division the presence of any threatened or endangered animal or plant species listed or proposed to be listed by the State or Secretary of the Interior; any critical habitat of any threatened or endangered animal or plant species listed or proposed to be listed by the State or Secretary of Interior; or any bald or golden eagle, or nest thereof, of which Mountain Coal Company becomes aware and which was not previously reported to the Division. The design and construction of the electric power lines and other transmission facilities used for its underground coal mining operation on the permit area will be designed and constructed to prevent hazards to large birds either by spacing of wires or by protectors. All powerlines at the West Elk Mine are raptor protected in one of two ways:

a. Raptor protectors are constructed on the power pole cross-arms, or

b. The powerlines are configured vertically in such a way that the birds cannot land on charged lines. The top wire on which the birds land is the neutral wire, and the bird's wings or tail cannot contact the charged line on takeoff or landing.

Mountain Coal Company has taken the following factors into account to protect wildlife on the affected area;

1) Since the area is not a prime wildlife area, it is possible to operate and locate all roads so as to avoid and minimize impacts on fish and wildlife species.

2) Since no major migration routes have been identified on the permit area, it is not be necessary to guide such wildlife species by the means of fencing so as to direct their movement under roadways or other obstructions which might result from construction of the surface facilities.

3) There are no ponds containing toxic forming materials; however, should such a facility be constructed, the pond will be fenced to exclude wildlife.

4) Since no habitat of unusually high value for fish and wildlife have been identified, it will be unnecessary to take mitigation measures in this regard.

5) Aquatic communities existing in the North Fork of the Gunnison will be protected by the use of 50 foot wide buffer zones of undisturbed land along stream channels.

6) The use of persistent pesticides is not anticipated.

7) Mountain Coal Company will, to the extent possible, prevent, control, and suppress range, forest, and coal fires which are not approved by the Division as part of this or any other management plan.

8) Since wildlife habitat is to be the secondary post-mining land use, Mountain Coal Company

has selected plant species to be used on reclaimed areas based on the following criteria:

a. Their proven nutritional value for wildlife.

b. Their use for cover for wildlife species.

c. Their ability to support and enhance wildlife habitat after release of bond.

As discussed earlier, Mountain Coal Company's intent is to distribute the plant species in clusters so as to maximize the benefit to wildlife. This will provide adequate edge effect, cover and forage benefits for the wildlife species occurring on and adjacent to the site.

(1) Reclamation Timetable

Timing and locations of topsoil removal and replacement within the upper refuse disposal and the facilities site are shown on Map 56 and Map 57. It is uncertain at this time however, when (or if) the upper refuse disposal site will be constructed. The timing of topsoil removal and replacement within the lower waste coal disposal site is described in Exhibit 51.

Reclamation of the Refuse Pile Expansion disposal area will begin promptly as each phase of deposition of the refuse coal is completed and will follow the procedures described in the Reclamation Methodology Section and in Exhibit 50 and Exhibit 51. The Lower Refuse Pile will be used as a storage area and will be reclaimed when no longer required for a storage area. Refuse pile compaction and stabilization, topsoil replacement, and revegetation will occur as portions of the refuse disposal areas are completed. Disposal in the designated areas are also discussed in the Reclamation Methodology Section, Exhibit 50, and Exhibit 51.

The surface facilities site and other disturbed areas at the West Elk Mine will be reclaimed as described in the Reclamation Methodology Section. Permanent reclamation of operational areas will not commence until actual mine operations cease. Table 41A provides a timetable for the major reclamation tasks, other than reclamation of the refuse piles. Removal of the sedimentation ponds is not included, as they will not be removed until vegetation has been established following completion of the major reclamation tasks.

Table 41A Timetable for Major Reclamation Tasks*

RECLAMATION TASKS	APPROXIMATE TIME TO COMPLETE TASK
MAIN MINE SITE	
Remove buildings/structures	16 Weeks**
Backfill mine portals & Sylvester Gulch Fan Portal	12 Weeks**
Backfill and Grade	16 Weeks
Replace topsoil	8 Weeks
Seed	2 Weeks
LONE PINE GULCH	
Remove buildings/structures	6 Weeks
Backfill fan portals	4 Weeks
Backfill and Grade	6 Weeks

Replace topsoil	3 Weeks
Seed	2 Weeks
NORTH SOIL STORAGE AREA	
Backfill and Grade	6 Weeks
Replace topsoil	3 Weeks
Seed	1 Week
SYLVESTER GULCH FACILITIES AREA	
Remove buildings/structures	12 Weeks
Seal shafts #1, #2, and #3	12 Weeks
Backfill and Grade	16 Weeks
Replace topsoil	14 Weeks
Seed	3 Weeks
DEER CREEK SHAFT FACILITIES AREA	
Remove buildings/structures	12 Weeks
Seal Deer Creek Shaft and Hoist Shaft	12 Weeks
Backfill and Grade	16 Weeks
Replace topsoil	14 Weeks
Seed	3 Weeks

* Refer to Exhibit 77 for detail of the Reclamation Plan.

** Tasks could occur concurrently

Post-Mining Drainage and Sediment Control Plan

This plan is being carried out in three phases. The timing of each phase will be determined based upon the establishment of sufficient vegetation to control runoff.

Phase One will involve the removal of all surface facilities (except those described below), backfilling and recontouring, as necessary, all cuts and fills. All unnecessary access and haul roads will be removed as described in the Diversions and Collection Ditches and Impoundments Section. Only the main access road will be retained to access the main drainage ditches. During this phase however, even this road will be partially reclaimed, leaving only enough road width to allow passage of a pickup truck. All sedimentation ponds which are needed to maintain sediment control during this initial reclamation phase will be retained.

Phase Two will begin when the vegetation becomes sufficiently established to reduce the sediment load from runoff so that with control measures such as water spreading, undisturbed area water quality conditions can be met. At this time, the sedimentation ponds would be removed. Since the post-mining land use is grazing and wildlife habitat, portions of some of the sedimentation ponds may be converted to wildlife and livestock watering ponds. This of course, would be done in cooperation with the appropriate regulatory authorities.

During this phase, the major ditches flowing to Sedimentation Ponds MB-1 and 2 will be water-barred to spread the runoff over the established vegetation for irrigation and filtering. In steep areas, where erosion may be a problem, small catchment basins made from straw bales or soil may be built to slow the velocity and retain sediment.

During Phase Three, the remaining access road and ditches will be reclaimed when water quality monitoring indicates that the vegetation is sufficiently established to control sediment loading and

that undisturbed area water quality conditions are being met by the runoff. Any small remaining areas that need reseeding and mulching will be revegetated at this time.

(2) Reclamation Cost Estimate

The revegetation cost estimate (Exhibit 53) represents the estimated costs for demolishing facilities, backfilling and grading, and revegetating the West Elk Mine site. These costs are expressed in the current dollar value at the time of calculation; however, most areas will not be scheduled for revegetation until mine closure.

(3) Backfilling and Grading

Information on backfilling and grading has been presented throughout Section 2.05.4. Please refer to specific sections, such as those on roads and major surface facilities, for backfilling and grading procedures relating to reclamation.

(4) Topsoil Removal, Storage, and Redistribution

Topsoil is removed, stored, and distributed as described earlier in Section 2.05.4. These same procedures will guide handling of the topsoil after the West Elk Mine is closed and abandoned.

(5) Revegetation

Post-Mining Land Use and Topography

The pre-mining land use is rangeland and wildlife habitat. It is desired to provide final reclamation of the disturbed areas that is self-sustaining and provides habitat suitable for domestic livestock and wildlife.

As a result of concentrating the refuse disposal to as few acres as possible, only minimal impact will occur. The disposal areas will occupy a maximum of approximately 65 acres. Refuse disposal will occupy less than one percent of the total life-of-mine plan area (Exhibit 50 and Exhibit 51). Post-mining topography of the affected area is indicated on Map 58 and Map 59. Except within the landslide area (if the upper refuse disposal site is constructed) and the lower refuse disposal site described in Exhibit 51, the reclaimed slopes will be similar to the pre-mining topography or less, if necessary, to assure a 1.3 factor of safety after reclamation. Cut-and-fill terraces are not anticipated nor proposed at this time.

Rangeland and wildlife habitat was selected as the post-mining land use for the refuse disposal areas because of the pre-mining conditions in the area. Reclamation at the West Elk Mine will provide grazing for livestock as well as develop cover, food, and nesting areas for wildlife. The surrounding heavily shrubbed areas and clusters of planted shrubs will provide adequate edge effect to insure a diverse wildlife habitat within a rangeland meadow plant community.

(6) Sealing and Managing Mine Openings

Mine Area

The West Elk Mine will be abandoned and sealed after the mine life has expired. Currently, Mountain Coal Company plans to leave no openings to the surface. In addition, all seals will be placed underground. Details on seals for the mine openings are provided in Exhibit 54.

Shafts and Vents

Mountain Coal Company will provide appropriate seal designs for the ventilation shafts and vents to the CDMG before sealing. The seal designs will take into account the actual conditions for the particular areas for both quality and quantity of water, if present. MCC will seal the Sylvester Gulch ventilation shafts as required by MSHA and CMLRB regulations for permanent closure of mine openings.

Drill Hole Sealing

When no longer required, exploration drill holes or other drilled holes or exposed underground openings will be capped, sealed, backfilled, or otherwise properly managed to prevent access by persons, livestock, fish and wildlife and machinery. Sealing will also prevent contact between surface and ground waters and eliminate the potential for co-mingling and potential contamination.

Exploration drill holes and other drill holes will be sealed in one of the following ways, dependent upon presence of ground water in the drill hole.

Exploration drill holes and other drill holes not completed to aquifers will be sealed by replacing cuttings or other suitable material in the hole and placing an appropriate plug approximately ten feet below the ground surface. A cement (or other suitable media) plug will be placed in the hole to a depth of approximately three feet below the ground surface. The remaining three feet will be filled with native earth or other suitable material. The hole will be marked.

Exploration drill holes and other drill holes completed in aquifers not exhibiting artesian flow will be sealed by placing a cement plug extending approximately twenty feet above and below the water bearing zone. A surface plug will be placed as with dry holes. In the case of a hole exhibiting artesian flow at the surface, the hole will be sealed by placing cement from the bottom of the hole to within approximately ten feet of the ground surface. A surface plug will then be installed. Holes will be marked.

In shallow soil borings not penetrating bedrock (typically 30 feet deep or less), MCC will abandon the dry holes by shoveling the cuttings back into the holes. No contamination will occur and natural healing will augment MCC efforts.

In instances where sealing of drill holes encountering alluvium or bedrock are not specifically addressed under a coal exploration drilling permit, MCC will prepare an abandonment report and submit the report as soon as possible following completion of the plugging and abandonment project, but typically by the end of the calendar year in which it was completed. The report will contain the information identified in Rule 4.07.3(3).

Reclamation procedures for wells are also discussed elsewhere in Section 2.05.4 and Exhibit 53.

Utilities

All surface facilities and structures that involved the placement of utilities specifically serving the West Elk Mine will be removed. Disturbances associated with the utility facilities will be reclaimed using the methods described earlier under Site-Specific Reclamation Procedures.