



State of Utah

DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

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March 30, 2001

TO: Internal File

FROM: James D. Smith, Reclamation Specialist, Project Team Lead *JDS*

RE: Deer Creek Reclamation Plan, PacifiCorp, Deer Creek Mine, C/015/018-AM00D-1

SUMMARY:

Energy West	Date of Action	Division	Date of Action
Initial Submittal - Revision of Reclamation Plan	May 25, 1999	AM99C	July 07, 1999
2 nd Revision of Reclamation Plan	December 06, 1999	AM99C-2	March 13, 2000
1 st Revision of Chapter 9	August 25, 2000	AM00D - combined with AM99C-3	November 03, 2000
3 rd Revision of Reclamation Plan	September 08, 2000	AM99C-3	
2 nd Revision of Chapter 9	January 04, 2001	AM00D-1	This Document

The revision of Volume 9 potentially affects the reclamation plans for all the PacifiCorp mines on East Mountain: Des-Bee-Dove, Cottonwood - Wilberg, and Deer Creek; however, map HM-12 and the proposed changes to Appendix C deal mainly with the possible connection between the Deer Creek Mine and Cottonwood Spring in Cottonwood Canyon. Information has been added to map HM-3 in response to deficiencies identified in the TAs for the revised Deer Creek reclamation plan, and similar changes were made to HM-3 for the Cottonwood - Wilberg Mine. The reclamation monitoring plan in Appendix A has been revised for all three mines.

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AM00D, the first TA of the Volume 9 revision, was combined into AM99C-3. This TA, AM00D-1, is for Volume 9 only: comments and deficiencies on hydrology that were in AM99C-3 and that pertain to the revised reclamation plan rather than to Volume 9 specifically, such as soil loss, have not been addressed in this TA.

TECHNICAL ANALYSIS:

RECLAMATION PLAN

HYDROLOGIC INFORMATION

Regulatory Reference: 30 CFR Sec. 701.5, 784.14

Analysis:

Ground-water Monitoring

Ground-water monitoring points are described in Appendix A of Volume 9. Map HM-1 shows the location of all reclamation monitoring points.

Both baseline and operational ground-water monitoring parameters are listed in Table 2 - Groundwater Baseline, Operational, Postmining Water Quality Parameter List - Appendix A. This table is the same as Table 4 in the Division's Directive Tech 004 except that total alkalinity is not included: although total alkalinity is not listed in the operator's tables, this parameter has nonetheless been included on most water-quality reports submitted by the operator. (Also, total alkalinity is used to determine carbonate and bicarbonate and, if the need arises, it can be back-calculated from the reported values for those two parameters.)

Baseline analysis of ground water samples was done in 1996 and will be repeated every five years thereafter as part of the operational monitoring program. Groundwater Hydrology - Reclamation Sampling - Table 2 in Appendix A previously indicated that in the 5th and 9th years after final reclamation, analyses were to be done for baseline parameters for all springs and well T-18 (Oliphant); however, this is not part of reclamation monitoring under the most recent proposed reclamation monitoring plan:

- For well T-18, the wells in Cottonwood and Rilda Canyons, and all springs, monitoring will be done for three years following cessation of mining or until lease relinquishment rather than until bond release (Appendix A, p. 11 and 13 and Groundwater Hydrology - Reclamation Sampling - Table 2).

- Well TM-1B, the Cottonwood Waste Rock Well, and the Deer Creek Waste Rock Well will be sealed during Phase I reclamation. Until they are sealed, one sample will be collected and analyzed quarterly for operational parameters, and water levels will be measured monthly at TM-1B (Appendix A, p. 14 and Groundwater Hydrology - Reclamation Sampling - Table 2).

Arbitrarily stopping monitoring three years after mining has ceased is not acceptable in every case. Lease relinquishment does not release the permittee from the requirements for water monitoring. Water monitoring should not be stopped before bond release unless it can be demonstrated, using the water-quality and -quantity data, that water-quality is stable and variations in quantity correlate with historic fluctuations or Climatic variation. For bond release or property boundary reduction, the permittee should be able to use water monitoring data to demonstrate that the predicted outcomes of the PHC were met. Bond will be released only when state and federal and post-mining land use water-quality standards have been met.

A procedure for modifying the monitoring program, including cessation of monitoring, is found in Section 5E of Division directive Tech 004. Section 5D. - Post-Mining Monitoring - of that directive states "Water monitoring will continue through the life of the mine, and reclamation until bond release. Tables 3 and 4 include the parameters required for postmining monitoring. Water monitoring information will be used to determine that all State and Federal water quality laws are being met and that the reclaimed areas are not contributing additional contributions of Suspended Solids to stream flow outside the permit area. The Division may be formulating a bond release directive which would include the water monitoring."

If subsidence continues for some time after mining ceases, more water monitoring may be needed. Several criteria can be used as indicators that subsidence has ceased: 1) there has been a three-year period in which movement is less than 10 percent of the subsidence that occurred in the twelve months after coal extraction was complete; 2) there are no new cracks at the surface; 3) existing surface-cracks are not growing, and even better, they show signs of healing or closing; and 4) surface- and ground-water resources have remained at or returned to pre-mining conditions.

If the leases are not relinquished, mining can resume after a period of inactivity and there will be a gap in the water-monitoring data, with no documentation for changes in water-quality or -quantity, if any, during the interim. For any springs that are in or immediately adjacent to a disturbed area, water monitoring should continue through bond release, and baseline analyses should be done for final bond release determination.

For final bond release, there is to be a surface and groundwater quality and quantity impact analysis by the permittee to assess hydrology data relative to the impact projections contained within the Probable Hydrologic Consequences (PHC) and Cumulative Hydrologic Impact Assessment (CHIA). This is to include analysis of trends of identified impacts and a demonstration that water quality is adequate for the post mining land use. For the bond to be released, the analysis must show that onsite impacts have been minimized and that offsite impacts have been

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prevented. The Division will evaluate whether pollution of surface and subsurface water is occurring and the probability of future occurrence of such pollution, as well as, the estimated cost of abating such pollution (Directive Tech 006).

Well TM-3 in Straight Canyon and the wells in Cottonwood and Rilda Canyons (except for TM-1B) will be monitored monthly, subject to access, for water level only (p. 11 and Appendix A, Groundwater Hydrology - Reclamation Sampling - Table 2). Wells at the Cottonwood and Deer Creek waste rock sites and TM-1B at Trail Mountain will be monitored quarterly for operational parameters until they are sealed (p. 14 and Appendix A, Groundwater Hydrology - Reclamation Sampling - Table 2): quarterly operational monitoring for these wells includes monitoring of field parameters until bond release. No periodic monitoring for baseline parameters is indicated. Bond will be released only when state and federal and post-mining land use water-quality standards have been met.

The field monitoring schedule is outlined in part II A of Appendix A. Field parameters are listed there and in Appendix A in Table 1 - Surface Water (UPDES monitoring) Baseline, Operational, Postmining Water Quality Parameter List and Table 2 - Groundwater Baseline, Operational, Postmining Water Quality Parameter List. Field measurements are to be done in conjunction with each water quality sampling.

There is a potential of post-mining discharge of up to 150 gpm from mine portals (p. 169). The lowest-elevation portal is at the Trail Mountain Access portals in Cottonwood Canyon. Hydrologic seals will be installed at the Trail Mountain Access portals and in 7th West off 3rd South, which will prevent discharge from the Access portals and minimize discharge from the Miller Canyon portals (p. 170-171). The reason for sealing the Access portals rather than letting the water discharge isn't explained; it is likely the seals will leak. PacifiCorp commits to conduct annual surveys, until bond release, to identify new discharge locations within and below sealed portals. If discharge occurs, one water sample will be collected and analyzed per location quarterly. Baseline analyses will be done during the 5th and 9th years (p. 172; Appendix A, p. 14 and Groundwater Hydrology - Reclamation Sampling - Table 2).

UPDES discharge permit 22896-004 was obtained for the Miller Canyon portals in 1982 and monitoring began in February 1983 (Cottonwood/Wilberg MRP, Appendix XXII). The three portals were temporarily sealed in 1984 following the Wilberg Mine fire and permanently sealed in 1987. A pipe was installed in the seal of the eastern (#1) portal and extended at least 500 feet down the canyon to facilitate the collection of water samples. Initially there were only sporadic discharges: 25 gpm in both October and November 1986, 12.5 gpm in June 1987, and 4 and 12 gpm in, respectively, September and November 1988. Consistent water flow began in April 1989 and discharge jumped to 70 gpm. The highest discharge was 78 gpm in August 1989, after which flow-volume trended downward. There were some high flows in the spring of 1991, but flow-volumes decreased significantly in 1994 and there has been no reported discharge since July 1996. In May 1999 it was discovered that the pipe had been pinched-off by caving of the portal openings and that water was flowing from the seals, over the rock ledge, and to the canyon floor where it

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was dissipating within a few hundred feet: there was minor seepage from portals #2 and #3, and flow from portal #1 was estimated at 3 gpm. Photos taken in June 1999 during backfilling of the Miller Canyon portals show water seeping from the top of the Starpoint Sandstone ledge just below the portals. French drains were installed in 1999 in the base of the fill to prevent slope failure due to saturation. The water-sampling pipe was also removed at that time and the UPDES monitoring point is now in the stream bed of Miller Canyon near the confluence with Cottonwood Creek. It is unknown how long the monitoring pipe had been pinched-off and what effect this had on the accuracy of flow measurements, but losing the monitoring pipe and moving the monitoring point farther from the portals probably account for the consistency of recent "no-flow" reports.

Current operational discharge from Deer Creek Canyon portals is under a UPDES permit. Deer Creek is a High Quality Water - Category 2, as defined in UAC R317-2. Based on mine elevation contours and the placement of hydrologic seals in the Cottonwood Mine, the Deer Creek Mine intake portal in Deer Creek Canyon is projected to discharge after mining operations cease (p. 170 and 171): the reclamation plan calls for a sand and gravel filter behind the seal and four 6-inch pipes to drain water through the seal and into a French drain system that will direct the water to the surface (Revised Reclamation Plan - August 2000, p. 5-4 and Drawing DS-1780-D - #5 of 5). Water discharged at the surface, if any, will be monitored according to the specific UPDES permit conditions (Appendix A, p. 14).

Currently, water samples collected for UPDES monitoring are analyzed monthly for both UPDES and operational parameters. Details on reclamation monitoring have been added to Appendix A, where it states that UPDES monitoring will continue as needed according to the UPDES permit stipulations. (According to Table 3-2 in Section R645-301-341 (Revised Reclamation Plan - August 2000, p. 3-2), the operator proposes to monitor post-mining flow from portals according to the UPDES permit until the end of the Phase III ten-year vegetation-monitoring responsibility period.) UPDES permit requirements are the federal and state water quality standards for discharge into surface waters; therefore, the proposal is adequate for the Division to determine that the discharged waters meet all state and federal water quality criteria.

On pages 16 and 17 of Volume 9, it states that monitoring of a series of in-mine wells in the Deer Creek and Cottonwood/Wilberg Mine, shown on Plates HM-2 and HM-3, will continue and data collected will be utilized to document potential impacts related to ground-water dewatering and to determine the rate of recovery "once mining has been terminated." Page 14 in Appendix A of the proposed amendment clarifies that quarterly monitoring will continue until the mine is sealed or the sites become inaccessible.

According to Groundwater Hydrology - Reclamation Sampling - Table 2 in Appendix A, East Mountain and Trail Mountain springs will be monitored in July and October for operational parameters during reclamation. This is repeated in the text on page 14. In addition, text on page 10 states that East Mountain and Trail Mountain springs will be monitored during July and August for field parameters.

It states on page 11 that East Mountain - Rilda Canyon springs will be monitored monthly, when accessible, for field parameters. According to Groundwater Hydrology - Reclamation

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Sampling - Table 2 in Appendix A, these springs will be monitored quarterly for operational parameters. For clarity, the monthly field monitoring should be indicated on Groundwater Hydrology - Reclamation Sampling - Table 2 in Appendix A along with the quarterly operational monitoring (which already includes monitoring of field parameters for four of the twelve months.)

According to Groundwater Hydrology - Reclamation Sampling - Table 2 in Appendix A, East Mountain - Rilda Canyon springs will be monitored quarterly for operational parameters. This is repeated in the text on page 14. In addition, it states on page 11 that these springs will be monitored monthly, when accessible, for field parameters; for clarity this should be indicated on Groundwater Hydrology - Reclamation Sampling - Table 2 in Appendix A (the quarterly operational monitoring for these springs indicated in that table already includes monitoring of field parameters for those four months.)

Voids created by mine workings may redirect water and produce new discharge locations within or below the mined seam. PacifiCorp commits to conduct annual surveys, until bond release, to identify new discharge locations within and below sealed portals. If discharge occurs, one water sample will be collected and analyzed per location quarterly. Baseline analyses will be done during the 5th and 9th years (p. 14 and Appendix A, Groundwater Hydrology - Reclamation Sampling - Table 2).

The proposed amendment states that water will be discharged through the Deer Creek Portal during and possibly after reclamation (p. 170 and 171). Some reference points provided in Table 5-2 (Revised Reclamation Plan - August 2000, p. 5-4) identify elevations that might act to control postmining ground-water flow gradients. Where boundary faults were crossed by mining, a pre-existing hydrologic barrier may now transmit water. Maps HM-2 and HM-3 show mine floor elevations, in-mine water source locations, pertinent geologic controls, and other controls such as sealed mine sections. Interbasin diversion of flow between the Cottonwood and Huntington Creek drainages is discussed on pages 169 and 170; the conclusion is that interbasin water probably be less than 1 percent of the annual discharge in either drainage.

In Appendix C the permittee provides a hydrogeologic investigation, initially done in 1992 and updated in 2000, that was prepared in response to a citizen complaint (July 31, 1991) that mining at Deer Creek Mine had dried up flow from Cottonwood Spring (TM-23). Representatives for the complainant, the mine operator, the USFS, the Division of Water Rights, and the Division of Oil, Gas and Mining had an on-site meeting at the spring in August 1991. Questions were raised concerning the proximity of mining to the Roans Canyon Fault, in particular the 3rd North fault crossing and the longwall mining in 1st and 2nd Right off 4th South, where it was suspected that the mine was intercepting water that had previously recharged Cottonwood Spring. The mine and its consultants have concluded that the hydrologic system in the lower Cottonwood Canyon and lower Blackhawk Formation were independent hydrologic systems. In a letter dated October 27, 1998, the Division concluded that no definitive connection between the mine and the spring had been cited or proven and stated that the Division had made findings to conclude the citizen complaint.

In response to three possible actions recommended by the USFS to resolve the Cottonwood Spring issue, the operator conducted gain/loss surveys along the Cottonwood drainage for two

years, 1998 through 2000 (the USGS had used this method to measure the flow of Cottonwood Spring from 1978 through 1982, see p. 9.) These measurements indicate that:

- During drought periods, flow in Cottonwood Canyon Creek is limited to the discharge from the alluvium at the mouth of Roans Canyon;
- The stretch downstream from Roans Canyon for several miles is a losing reach where water enters the alluvium;
- Flow data correlate with climatic trends and compare directly with USGS data collected in 1978 and 1979.

Flow at Cottonwood Spring has proven not to be directly measurable as discharge from a pipe or other identifiable point source, and the flow from the PVC pipe that was measured from 1985 to 1995 by JBR Consultants, Trail Mountain Coal Company, Mountain Coal Company, and by PacifiCorp (as TM-23 in the Trail Mountain Mine operational plan) was not representative of Cottonwood Spring. Cottonwood Spring (TM-23) will no longer be monitored. PacifiCorp will monitor flow in Cottonwood Creek and water levels in the alluvium above Cottonwood Spring with the monitoring wells installed in 1992 and 1993.

Based on the information referred to above and other information, the operator supports a conclusion that Cottonwood Spring (TM-23) flow has not been impaired by mining operations in their East Mountain mines.

- Geology and geomorphology indicate that:
 - In Cottonwood Canyon, the Roans Fault system consists of two or more fractures with little or no displacement;
 - Cottonwood Spring is on the north dipping limb of the Straight Canyon Syncline;
 - Cottonwood Spring flows from alluvium at the bottom of a glacially-formed U-shaped valley, just above where the canyon transitions to a stream-cut V-shaped valley.
- Drilling and well-completion data indicate that:
 - There is no connection between the lower Blackhawk Formation - Starpoint Sandstone and the upper Blackhawk - alluvium in Cottonwood Canyon;
 - Water elevations in the alluvium vary in direct response to precipitation;
- Resistivity and induced polarization surveys indicate that:
 - Depth of alluvium is fairly constant along the length of the canyon surveyed, from approximately 2 ½ miles north of Cottonwood Spring to approximately ½ mile south of the spring, but width of alluvial deposits increases from south to north to point just north of Cottonwood Spring;
 - A possible extension of the Mill Fork Canyon fault system was detected a little over one mile upstream of Cottonwood Spring;
 - Fractures and faults cut lower Cottonwood Canyon (apparently just below Cottonwood Spring);

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- The faults and fractures dam the flow of water through the alluvium and the water level rises in the vicinity of Cottonwood Spring. (The narrowing of the valley and the transition from glacial to non-glacial alluvium probably contribute to this also);
- Seeps and springs along the east side of Cottonwood Canyon also contribute water to the alluvium.

Monitoring of Cottonwood Spring and other springs and wells in Cottonwood Canyon will be continued during reclamation, although less frequently than during mine operation. The Division previously recommended that analyses be done for carbon-14, tritium, deuterium, and oxygen-18 for the Cottonwood Canyon wells to differentiate level changes due to climate from those due to ground water discharge. Although there may be some intermixing of alluvial water and water from the Starpoint Sandstone, available information strongly indicate that ground-waters in the alluvium and consolidated rock are not related and there is little pertinent information to be gained from isotopic analyses.

Surface-water Monitoring

Both baseline and operational surface-water monitoring parameters are listed in Table 1 of Appendix A: there is no separate list of reclamation parameters. This table is the same as Table 3 in the Division's Directive Tech 004 except that total alkalinity is not included: although total alkalinity is not listed in the operator's tables, this parameter has nonetheless been included on most water-quality reports submitted by the operator. (Also, total alkalinity is used to determine carbonate and bicarbonate and, if the need arises, it can be back-calculated from the reported values for those two parameters.)

During reclamation, water samples will be collected and analyzed quarterly for operational parameters at surface monitoring sites listed in Appendix A. Quarterly monitoring will include one sample at high flow and one at low flow. Streams receiving discharges from UPDES sites will be monitored quarterly for operational parameters both upstream and downstream of reclaimed disturbed areas and UPDES discharge points in Grimes Wash and Deer Creek and Cottonwood Canyons. Monitoring will be done only downstream of the Meetinghouse Canyon portals. Following Phase I final reclamation backfilling and grading, monitoring will be done at points immediately above and below remaining sediment ponds (Appendix A, p.4). Water monitoring information will be reported to the Division quarterly (Appendix A, p.15). The operator proposes to report annually on sediment production information from points above and below the disturbed area of the Deer Creek Mine (Revised Reclamation Plan - August 2000, p. 3-7).

The field monitoring schedule is outlined in part II A of Appendix A. Field parameters are listed there and in Appendix A in Table 1 - Surface Water (UPDES monitoring) Baseline, Operational, Postmining Water Quality Parameter List. Field measurements are to be done in conjunction with each water quality sampling, except sites CCC01 in Cottonwood Canyon and RCLF1, RCLF2, and RCF2 in Rilda Canyon are to be monitored quarterly for field parameters only.

Baseline analysis was done in 1996 and will be repeated every five years. Baseline monitoring will be performed during the 5th and 9th year following final reclamation, but in no case will the time between baseline samples exceed five years (Appendix A, p. 13). If any of the analyses results exceed water-quality criteria, additional sampling may be needed to establish that water quality-standards have been met before final bond release can be made.

The Division recommended that the macro-invertebrate study conducted in 1991 be repeated in Deer Creek and Huntington Creek, in the spring and fall during the year before reclamation and in the 5th and final year prior to bond release, to allow assessment as to whether impacts to fisheries occur or remain insignificant over the reclamation period. The operator indicated in the December 6, 1999 cover letter to the application that the results from monitoring conducted in 1990, 1991, 1992 and 1994 showed no differences in macro-invertebrate densities in Huntington Creek and that additional studies are not warranted.

Gravity Discharges

PacifiCorp commits to conduct annual surveys, until bond release, to identify new discharge locations within and below sealed portals. If discharge occurs, one water sample will be collected and analyzed per location quarterly. Baseline analyses will be done during the 5th and 9th years (p. 172; Appendix A, p. 14 and Groundwater Hydrology - Reclamation Sampling - Table 2).

There is a potential of post-mining discharge of up to 150 gpm from mine portals (p. 169). The lowest-elevation portal is at the Trail Mountain Access portals in Cottonwood Canyon. Hydrologic seals will be installed at the Trail Mountain Access portals and in 7th West off 3rd South, which will prevent discharge from the Access portals and minimize discharge from the Miller Canyon portals (p. 170-171). The reason for sealing the Access portals rather than letting the water discharge isn't explained; it is likely the seals will leak.

The three Miller Canyon portals were sealed in 1987, but French drains were installed to allow drainage from the mine, and a water-sampling pipe was installed in the seal of the eastern portal: there has been no reported discharge since July 1996. Water samples collected for UPDES monitoring are analyzed for both UPDES and operational parameters. The Deer Creek Mine portals in Deer Creek and Meetinghouse Canyons could potentially discharge after mining operations cease. Current operational discharge from Deer Creek Canyon portals is under a UPDES permit, but there is no UPDES permit for the potential discharge to Meetinghouse Canyon.

The operator designed the seal for the Deer Creek Portal with a French drain system, using a sand filter behind the portal and four 6-inch pipes. The operator planned for multiple pipes to decrease the possibility that calcium carbonate precipitation from minewater could plug the discharge system.

Water Quality Standards and Effluent Limitations

The operator has provided a water monitoring plan in Appendix A. The current Volume 9 contains a commitment on page 177 that discharges of water from areas disturbed by coal mining

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and reclamation operations will be made in compliance with all Utah and federal water-quality laws and regulations and with effluent limitations for coal mining promulgated by the EPA and set forth in 400CFR Part 434. This commitment in Section R645-301-751, along with two other sections that follow Section R645-301-731.800, has been omitted from the revised text. UPDES information is in Appendix B.

Findings:

The plan does not meet minimum regulatory requirements for this section. The permittee must provide the following in accordance with:

R645-301-121.200, -731.214 - it states on page 11 that East Mountain - Rilda Canyon springs will be monitored monthly, when accessible, for field parameters. According to Groundwater Hydrology - Reclamation Sampling - Table 2 in Appendix A, these springs will be monitored quarterly for operational parameters. For clarity, the monthly field monitoring should be indicated on Groundwater Hydrology - Reclamation Sampling - Table 2 in Appendix A along with the quarterly operational monitoring (which already includes monitoring of field parameters for four of the twelve months.)

R645-301-121.200 - the current Volume 9 contains a commitment on page 177 that discharges of water from areas disturbed by coal mining and reclamation operations will be made in compliance with all Utah and federal water-quality laws and regulations and with effluent limitations for coal mining promulgated by the EPA and set forth in 400CFR Part 434. This commitment in Section R645-301-751, along with two other sections that follow Section R645-301-731.800, has been omitted from the revised text.

R645-301 -731.214, - for well T-18, the wells in Cottonwood and Rilda Canyons, and all springs, Groundwater Hydrology - Reclamation Sampling - Table 2 in Appendix A states that monitoring will be done for three years following cessation of mining or until lease relinquishment, rather than until bond release as stated in the previous version of this table. Arbitrarily stopping monitoring three years after mining has ceased is not acceptable in every case, and lease relinquishment does not release the permittee from the requirements for water monitoring. A procedure for modifying the monitoring program, which includes cessation of monitoring, is found in Section 5E of Division directive Tech 004, and Section 5D of that directive specifically covers post-mining monitoring. In general, to modify the monitoring program the permittee should be able to demonstrate that the predicted outcomes of the PHC have been met, that water quality is adequate for the post mining land use, that onsite impacts have been minimized, that offsite impacts have been prevented, and that state and federal and post-mining land use water-quality standards have been met.

RECOMMENDATION:

Prior to approval, the requirements of the Coal Mining Rules must provided as outlined above.

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