

March 4, 1988

TO: File

FROM: Kent Wheeler, Reclamation Hydrologist

RE: Skyline Permit Technical Deficiencies Review
ACT/007/005, File #2, Carbon County, Utah

SUMMARY:

The above-referenced document was reviewed and found to have technical deficiencies that make it impossible to further review. In general, most of the required baseline and background information relating to hydrology is included and is satisfactory. The technical information and designs for the diversions were not complete enough to technically review. Most of the operator's responses to the deficiencies in the previous Determination of Completeness (DOC) were insufficient or unappropriate. The current review has attempted to address all of the operator responses and to clarify the information necessary to review the MRP, as well as identify other problems which were not previously identified.

ANALYSIS:UMC 783.24 Maps - General Requirements - KWDeficiencies Requiring Responses

1. All maps and plates showing the general area need to be corrected to show the actual permit boundaries of the loadout and the waste rock disposal area. This includes Plate 2.3.6-1 and Plate 3.2.8-3.
2. Map 4.16.1-1b needs to clearly delineate the areas that will be disturbed by the waste rock operation (Disturbed Area Boundaries).

UMC 783.25 Cross-Sections, Maps and Plans - DC (by KW)

The MRP has the potentiometric maps of the Starpoint and Blackhawk aquifers. These are found in Appendix A-1, Plates 7 and 11, of the Van Hansons and Associates report. These maps are sufficient to meet the requirements of this section.

UMC 784.14 Reclamation Plan: Protection of the Hydrologic Balance
- DC (by KW)

This section needs to specifically address the possible dewatering of the aquifer(s) in the Blackhawk Formation near Huntington Creek. A significant portion of the water yield in Huntington Creek is from this aquifer. Any impacts to this aquifer could affect the surface flow and associated water rights, as well as the fish habitat along Huntington Creek. The present commitment to replace impacted water rights from Scofield Reservoir seems unworkable, since it is located in a different watershed. In this area there is less than 1500 ft. of overburden, and subsidence is likely to occur. The Division acknowledges that the subsidence fractures may seal. However, this sealing process may be slow. In the meantime, subsidence could impact the aquifer and water yields of Huntington Creek and Electric Lake. The following sections need to be specifically addressed concerning this possible problem:

Deficiencies Requiring Responses

1. UMC 784.14(a)(3)
2. UMC 784.14(c).

UMC 784.19 Underground Developmental Waste - DC (by KW)

The Division is still waiting for the results requested under UMC 817.48 of the previous DOC document. If the results of the waste rock analysis show the potential for environmental harm, the Division may require the collection of baseline water quality data for this drainage.

DIVERSIONS:

UMC 784.14 Reclamation Plan: Protection of Hydrologic Balance - KW

UMC 784.22 Diversions - KW

UMC 784.23 Operation Plan: Maps and Plans - KW

UMC 817.43 Hydrologic Balance: Diversions and Conveyance of
Overland Flow, Shallow Ground Water, and Ephemeral
Streams - KW

UMC 817.44 Hydrologic Balance: Stream Channel Diversions - KW

UMC 817.47 Discharge Structures - KW

The sections dealing with diversions are incomplete at this time. Problems are due to poor organization, insufficient maps, insufficient details on the existing maps, and lack of design details. The following discussion will detail problems with the diversions in both the operational and reclamation phases.

PEAK FLOW CALCULATIONS:

The Division found calculations in the Appendix A-1 relating to the 100 yr. flood event for Eccles Creek (F.H.A., 1980 Determination of 100 yr. Flood Events for Eccles and Mud Creek). This report attempts to justify the use of extremely low curve numbers (CN) for calculating peak flow events. After reviewing the referenced article, the Division cannot justify the use of the low curve numbers and the resultant peak flows. Specific problems include:

- I. The report bases its curve numbers on a relationship developed between precipitation and runoff in Davis County, Utah, along the Wasatch Front. The report states that the Skyline Mine is presumably similar to the watersheds in Davis County. The Division believes that the Alpine Meadows Watershed on the Wasatch Plateau is a better site because of its geographic locality, which could produce similar site conditions. The relationship between precipitation and runoff at the Wasatch Plateau site suggests a much higher curve number.
- II. The report states that the use of the relationship between precipitation and runoff for extreme events can result in significant errors. The performance of these curves deteriorates so significantly that the curves are based only on the rainfall events with less than two inches of total precipitation.
- III. The CN are further discredited by the peak flows which are generated by their use. The calculations show a peak flow at the mouth of Eccles Creek of 22 cfs for the 100 yr. storm event. The above-referenced Appendix Supplement found that this flow could be passed by the existing channel. Fluvial geomorphic stream channel studies suggest that bank full discharges occur, on the average, once every 1.6 to 2.3 years for non-incised channels. This suggests that the 22 cfs is more likely a 2- to 3-year flow event. This is further substantiated by the gauge station at the mouth of Eccles Creek, which had a maximum peak flow of 46 cfs during the two years that the United States Geological Survey (USGS) had an established gauge on it. Furthermore, the USGS data indicates that the average daily flow was greater than 24 cfs for 30 consecutive days in 1980.

The Division believes that because of these major problems and other smaller problems, the use of a curve number of less than 55 for any undisturbed area is not justifiable.

GENERAL:

The operator's response to the comments under UMC 817.43 - DC of the previous DOC concerning diversions inside of the disturbed area, is not considered acceptable. Failure to provide the minimum diversion requirements for the disturbed area diversions may result in enforcement action.

The Division recognizes that the operator needs to have a flexible operational drainage plan to accommodate drainage, especially during the winter months when snow and ice can block drainage routes. However, the drainage system does have an infrastructure. The infrastructure is the primary diversions that drain large parts of the disturbed areas.

There are general deficiencies in the diversions' designs at all three permit areas (portal area, loadout area, waste rock area). Varying amounts of information describe these diversions, and is available in the MRP. The Division has tried to review the information that is available and has made technical comments where applicable.

The following is the minimum information necessary to evaluate diversion designs. The information required should be clearly and concisely presented, well-referenced and documented, and its location presented in the Table of Contents.

MINIMUM DIVERSION REQUIREMENTS:

- All primary diversions should be shown and labeled on the appropriate maps. (UMC 784.22, UMC 784.23(b)(6))
- A description and typical designs of each diversion should be included. All input parameters and assumptions used in the designs should be shown. If the channel has several different configurations, they should all be shown and described. (UMC 784.14, UMC 784.22, UMC 784.23)
- Design calculations (listing all assumptions) of the peak flows from each drainage area reporting to any hydrologic structure should be shown in the text, and referenced when used for calculations. (UMC 817.43, UMC 817.44)
- The drainage areas (that are not clearly discernible from the contour maps) reporting to any hydraulic structures (diversions or culverts) should be outlined. This is necessary to check the sizing requirements of these structures. (UMC 817.43, UMC 817.44)

- . Riprap designs are necessary, in any reach of any diversion, where expected velocities from the design event exceed 6 ft/sec. The channel slope, used to calculate channel velocities, should be determined using small segments of the channel, not the overall diversion gradient. (UMC 817.43, UMC 817.44)
- . All riprapped areas and any drop structures should be shown and labeled on the appropriate maps. (UMC 784.22, UMC 817.43, UMC 817.44)
- . Filter blanket designs are needed for all sections of the reclaimed channel that require riprap. Since these are perennial streams with aquatic habitat, this filter blanket should be designed using the proper gradation of sand.

PORTAL AREA:

Disturbed Area Diversions

The Division believes that the following diversions are the infrastructure of the drainage system at the portal area and must have the designs, maps, discussion and details listed above, under the Minimum Diversion Requirements.

- A. The diversion starting in the Southwest Fork area. It starts as the valley line and continues down to the swale just inside the main gate.
- B. The diversion starting in the West Fork area near the inlet structure on the stream channel diversion.
- C. The diversion labeled "V-ditch" which collects runoff from around the coal storage pile.
- D. The main diversion that starts north of the office-maintenance building.
- E. The diversion next to BC-3 Drivehouse (labeled "V-ditch"). This diversion is incorrectly shown as flowing uphill.
- F. The V-ditch along the north side of the east end. Currently this diversion is shown as connected to the V-ditch described previously (#5).
- G. The V-ditch south of the sewage treatment plant.
- H. The V-ditch north of the sewage treatment plant.

- I. All culverts in the permit area.
- J. All swales in the permit area.

There are some calculations of peak flows found in Appendix A-3. These peak flows may be from the disturbed portal area. However, it is not clear from the calculations where the drainage areas are, or to which structures the flow reports.

Deficiencies Requiring Responses

- 1. All of the above structures should be labeled and should have design calculations and details showing that they are capable of safely passing the design event. Meeting the criteria outlined in the Minimum Diversion Design Requirements for each channel will satisfy this deficiency.

LOADOUT AREA:

Disturbed Area Diversions

The Division believes that the following diversions are the infrastructure of the drainage system at the loadout area and must have the designs, maps, discussion and details listed above under the Minimum Diversion Requirements.

- A. The diversion starting near the truck dump, which flows to the sediment pond.
- B. The diversion that parallels, to the north, the previously mentioned (#1) diversion. This diversion is presently shown by the contours.
- C. The diversion that flows along the the northeast permit boundary and reports to the sediment pond.
- D. The diversion that flows from the culvert near the water treatment plant.
- E. All culverts in the permit area.
- F. All swales in the permit area.

Deficiencies Requiring Responses

- 2. All of the above structures should be labeled and have design calculations and details showing that they are capable of safely passing the design event. Meeting the criteria outlined in the Minimum Diversion Design Requirements for each channel will satisfy this deficiency.

DIVERSIONS OF OVERLAND FLOW:

All three of the permitted areas (portal area, loadout area, waste rock area) have diversions that keep flows, from the undisturbed area, from running onto the disturbed areas. These undisturbed area diversions must be designed, detailed, discussed, and shown on the maps in the same manner as the disturbed area diversions.

The MRP has calculations in Appendix A-3 showing the peak discharge for the undisturbed diversion ditches which collect overland flow. However, the methodology used for calculating the T_C and peak flows for the portal area and the loadout area needs to be documented. The Division cannot justify a T_C of over two (2) hours on a watershed of less than fifteen (15) acres and a steep slope. The T_C for small areas with steep slopes are normally much less than one (1) hour.

WATERSHED MAPS FOR UNDISTURBED DIVERSIONS:

Deficiencies Requiring Responses

3. Map 3.2.8-3 is of insufficient scale to use for sizing the undisturbed diversions. The map must be of sufficient detail to determine diversion locations, watershed boundaries, and permit boundaries. The Division recommends a map of the same scale or larger scale than Map 2.7.1-1.

PORTAL AREA:

Undisturbed Area Diversions

Deficiencies Requiring Responses

4. The diversions that collect the overland flow from undisturbed watersheds are not shown on Map 3.2.2-1. In some areas there are contours that suggest the diversion's location. In other areas there is a dark line labeled "undisturbed drainage", but there are no contours to show the channel slopes. In either event, all undisturbed diversions must be clearly shown and labeled on this map. The contours need to be shown so the Division can evaluate expected channel velocities.
5. The applicant needs to correct the narrative in the MRP stating that the ditches are sized to contain the 100yr - 24hr precipitation event; the calculations show that the applicant used the 10yr - 24hr value.

LOADOUT AREA

Undisturbed Area Diversions

Deficiencies Requiring Responses

6. The diversions that collect the overland flow from undisturbed watersheds are not shown on Map 3.2.1-3. All undisturbed diversions must be clearly shown and labeled on this map. The contours must be shown so the Division can evaluate expected channel velocities. Any section that has riprap protection or drop structures should also be shown on the map so that the map reflects the actual site conditions. Design calculations for peak flows and channel designs must be included.

WASTE ROCK AREA

Undisturbed Area Diversions

Deficiencies Requiring Responses

7. The single diversion (shown on Map 4.16.1-1B) that is used to divert runoff around the waste rock disposal site appears to be correctly designed. The present configuration of the fill, blocks the channel. Designs and discussion are needed showing that this section of the channel meets the performance standards of Subchapter K.
8. The MRP needs to discuss how the channel will be reclaimed following abandonment of the site. The operator's response that no further reclamation will be done is not acceptable, since the present designs only show the channel capable of passing the 10yr - 24hr precipitation event. Designs will be needed showing that this permanent diversion meets the performance standards of Subchapter K.
9. The operator's response did not address the Division's comment in the previous DOC, under Section UMC 817.43, concerning riprap design in the waste rock diversion channel. The operator's calculations show the expected channel velocities of greater than 6 ft/sec.

STREAM CHANNEL DIVERSIONS:

General

There have been diversions of perennial stream channels at both the portal area and the loadout area. These diversions must be designed, detailed, discussed, and shown on the maps in the same

manner as the disturbed area diversions. They also require detailed plans for reclamation, and restoration to their approximate natural stream channel characteristics. The operator's response to the previous DOC stated that information on the existing undisturbed stream channels was being collected. This information should be included with the future reclaimed stream channel designs to show compliance with UMC 817.44.

PORTAL AREA:

Stream Channel Diversions

The current channel configuration for the reclaimed channels is unacceptable. Moving the Southwest Fork across the pad area and then back to the same side does not approximate the natural stream channel characteristics. The stream channels need to be carefully designed. The 100-year flood plane should be a straight channel with a compound channel designed inside of the 100-year flood plane. This compound channel should be designed to assure adequate depths for aquatic habitat during low flows.

Furthermore, the methodology used to calculate riprap designs works poorly on steep slopes, as seen by the 9.5 ft D_{50} in the reclaimed channel designs. The Division recommends that the operator use one of the many empirically based sizing curves for riprap designs. The Division recommends the methodology found in OSM/TR-82/2 Surface Mining Water Diversion Design Manual.

Deficiencies Requiring Responses

10. The peak flows for the Eccles Creek culverts (Appendix A-3) cannot be verified. These should be referenced to the section in the MRP showing these calculations. As discussed earlier, the Division will not accept the peak flows found in the Appendix Supplement for Eccles Creek. The Division's calculations, using curve number (CN) methodology, found peak flows much greater than the designs show in Appendix A-3.
11. The calculations of culvert velocities are incorrect. The use of the equation $V = Q/A$ is based on the area of flow, not the cross-sectional area of the pipe.
12. The reclaimed channel designs are unacceptable. New discussion, details and designs will be needed for the redesigned channels. The riprap designs should incorporate a commitment to using well-graded riprap and a description of the installation.

13. There should also be detailed discussion on the steps that will be taken to restore aquatic habitat and riparian vegetation in and along the channels.

LOADOUT AREA:

Stream Channel Diversions

Deficiencies Requiring Responses

14. There are no calculations or references to the pipe arch culvert that is shown on Map 3.2.1-3. This culvert structure needs all the design calculation required for all stream channel diversions.
15. Leaving the above-referenced pipe arch culvert after reclamation is unacceptable. Designs for reclamation of this reach of stream must be included.
16. In the MRP there is discussion, on page 4-87, of a 600-foot section of Eccles Creek that has been disturbed and rechanneled. This disturbance must be shown on the appropriate map, along with all of the appropriate calculations to show that it is stable and can safely pass the expected peak flows.

WATER MONITORING PLAN:

UMC 784.14(B)(3) Protection of the Hydrologic Balance -KW
UMC 817.42 Hydrologic Balance: Water Quality Standards and
Effluent Limitations - KW
UMC 817.52 Hydrologic Balance: Surface and Ground Water
Monitoring- KW

General:

The water monitoring plan is complete and can be technically reviewed. The program consists of 15 stream stations, 1 mine portal, 1 French drain, 15 springs and 7 wells. The data for each of these sites is presented in tabular and graphical form in Volume 4. Generally, the plan is well presented and most of the problems are easily rectified.

Preliminary observations suggest that four of the monitoring stations that are not in the permit area and are unlikely to be impacted by mining, could be removed from the monitoring plan if the operator wishes to submit a modification to their Water Quality Monitoring program justifying their removal.

The monitoring plan has two (2) analyses that are performed. The first is detailed in Table 2.3.7-2 (Abbreviated Water Quality Analytical Schedule). This analysis nearly meets the requirements of the Division's Guidelines for operational monitoring of both surface and ground water. Three of the requirements not included are Total Hardness, Carbonate and Acidity. These three parameters are all heavily dependent on the amount of Carbonate (CO_3^{2-}) in the water. A measure of this parameter is still provided by the amount of Bicarbonate (HCO_3^-) in the water, which is measured in all of the water quality samples.

The fourth requirement of the Guidelines that is not met (by the Abbreviated Analysis) is for the measurement of settleable solids. Since there is no baseline information concerning this parameter, the Division believes that monitoring of this parameter is not necessary, unless required by an NPDES permit.

The second analysis is performed in August of each year at all sites. This analysis (Table 7.3.7-1) is more complete than the abbreviated analysis and includes sampling for most major cations in their total form. The Division Guidelines and the State Water Quality Standards require the monitoring of most of these constituents in their dissolved form. Since the baseline data is generally in the total form (with the exception of iron), the Division believes that changing these cation analyses to their dissolved form would not facilitate statistical analysis.

All of the above-referenced stations (except the wells) are monitored (at a minimum) once a quarter, and commonly on a monthly basis for the water quality parameter found in Table 7.3.7-1 and Table 7.3.7-2 as applicable. The monitoring program for the wells consists of static water levels taken in August each year. It appears that some of the wells are set up to allow for the measurement of water levels in two separate aquifers. However, the text is not sufficiently clear on this point. The MRP commits to continue with the approved monitoring program throughout the reclamation period and until bond release has been obtained.

The following points need to be specifically addressed before this section is complete and technically adequate:

Deficiencies Requiring Responses

1. The location of the water quality stations at the waste rock disposal site needs to be shown on Plate 2.3.6-1.
2. Spring 13-2 is not shown on Plate 2.3.6-1. This site cannot be dropped from the approved monitoring at this time.

3. Springs S10-1 and S12-1 are shown on Plate 2.3.6-1 as stream sites. This mistake needs to be corrected.
4. The location of Spring S22-11 needs to be checked. It is shown in a different drainage in the consultant's report.
5. Table 2.3.7-1 shows selenium (total and dissolved) and silver as being currently monitored at all stations. This parameter has not been monitored since the baseline period, since these parameters were below detection limits for most baseline measurements and have not been sampled since the baseline period. The Division will allow these two parameters to be dropped from the required sampling list.
6. The Division believes that the applicant needs to add dissolved iron to its Comprehensive Water Quality Analytical Schedule. This is needed to meet Division Guidelines and to show compliance with the State Water Quality Standards.
7. The second paragraph on page 2-43 needs to be updated to reflect the current monitoring of Huntington Creek.
8. The last paragraph on page 2-31 states that there are sixteen (16) springs being monitored. This needs to be corrected to fifteen (15) springs, or data needs to be presented on the sixteenth spring.
9. The plots of water quality parameters versus time in Volume 4 meet the requirements showing the seasonal variations. However, all data for 1985 needs to be included in the plots. The Division also requests that if the data is available, that these plots include all current information.
10. The description of the observation wells needs to be clarified. There appear to be two depth readings from some of the wells. It is not clear from the text if these wells are completed, to allow the monitoring of two separate aquifers. Furthermore, the Division believes that the applicant needs to commit to submitting the results of the water level readings from the observation wells on a yearly basis, to help describe the quality and quantity of the ground water.
11. The information describing the wells and the water levels needs to include information from all of the wells. Two wells currently are not shown in the water well data summary in Volume 4.

12. Table 2.3.7-2 needs to be corrected. In the field measurement section, it states that solids will be measured. This appears to be a typographical error and should be corrected or clarified.

UMC 817.13 Casing and Sealing of Exposed Underground Openings:
General Requirements - KW
UMC 817.53 Hydrologic Balance: Transfer of Wells - KW

Deficiencies Requiring Responses

1. The MRP needs to commit to sealing the monitoring well holes. The present description on page 4-45 deals with holes that have already been sealed. The methods outlined in this section are acceptable.

UMC 817.53 Stream Buffer Zones - KW

The operator has posted signs requiring protection of the environment along all necessary perennial streams. This meets the requirement of this section.

UMC 817.72 Disposal of Underground Development Waste and Excess
Spoil: Valley Fills - DC (KW)

Deficiencies Requiring Responses

1. The operator states that designs for the diversions through and/or around the topsoil storage area at the portal area were an approved modification to the MRP and are included in the renewal package. The designs were not found in a search of the Table of Contents. Please clarify where these designs can be found.

jr
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