

TECHNICAL MEMORANDUM

Utah Coal Regulatory Program

January 6, 2010

TO: Internal File

THRU: James D. Smith, Permit Supervisor *JDS 01/19/10*

FROM: Steve Christensen, Hydrologist *SCC*

RE: Mine Treatment Facility, Genwal Resources, Inc., Crandall Canyon Mine, C/015/0032, Task ID #3461, Outgoing File

SUMMARY:

On January 6th, 2010, the Division of Oil, Gas and Mining (the Division) received an application to amend the Crandall Canyon mining and reclamation plan (MRP) from Genwal Resources, Inc., (the Permittee). The application calls for the construction of a mine-water treatment system at the Crandall Canyon Mine facility.

Following the Crandall Canyon Mine disaster on August 6th, 2007, the mine was de-activated and the portals were sealed. Mine water inflow built up to the extent that it is now discharging from the portals and discharging through a 12" pipe into Crandall Creek. In early 2009, the iron concentrations in the mine water began to increase.

Iron levels in the mine water discharge are currently out of compliance with the Permittee's Utah Pollution Discharge Elimination System permit (UPDES #UTU0024368). The Department of Water Quality has issued the Permittee a violation in association with the elevated iron levels. In addition, the Division issued Notice of Violation #10043 (NOV) on August 10th, 2009. The Division's NOV cited a failure to minimize disturbance to the hydrologic balance and diminution or degradation of the quality of surface water. The gravity discharge from the mine portals and its excessive amounts of iron are causing orange staining to occur in the receiving stream. In order to abate the NOV, the Permittee was directed to submit a plan to immediately address and mitigate the iron discharge currently reporting to the Crandall Canyon drainage.

On April 6th, 2009, the Permittee submitted an application to treat the mine water discharge (Task ID #3261). The application outlined the utilization of the 'old load out' area located directly below the north portals to treat the mine-water discharge with a series of baffles. The baffles were to supply oxygen to the mine-water discharge and thus facilitate the

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precipitation of the iron. The Division performed a technical analysis and identified several deficiencies.

The Permittee re-submitted the application for treatment of the mine-water discharge on October 15th, 2009 (Task ID #3415). The application outlined the installation and operation of a mechanical aeration device known as the Maelstrom Oxidizer Unit (the Maelstrom Unit). Mine water is fed into the Maelstrom Unit on one end where it then travels over and under baffles. As the water travels through the unit, a large volume of air is forced through the water. The high oxygen content then reacts chemically to change the dissolved iron from the ferrous state to the ferric state, which forms iron precipitates, which can then be settled out and ultimately removed. The application was reviewed and the Division determined that there were outstanding deficiencies that needed to be addressed prior to final approval.

On December 9th, 2009, the Permittee again re-submitted the application for the utilization of a Maelstrom Unit to treat the mine-water discharge. The technical review conducted by the Division identified several deficiencies relative to the use of the Maelstrom Unit. The deficiencies were primarily focused on the maintenance and clean-out operations to be implemented with the Maelstrom Unit. Given the physical constraints of the site and the dimensions of the primary sediment pond, concerns were raised as to how to effectively conduct clean out and maintenance operations and still meet the performance standards as required by the State of Utah R645-Coal Mining Rules.

The application also proposes the extension of the existing French drain system near the old north portals to collect additional mine seepage water, which is currently discharging to the sediment pond. The Permittee proposes re-routing undisturbed watershed WSUD-3 to the existing surface drainage system for the mine-site. The diversion/pipe system that was collecting the undisturbed drainage was damaged during the sealing and deactivation of the Crandall Canyon Mine after the mine collapse in August of 2007.

The following is a technical evaluation relative to the hydrology regulations of the State of Utah R645-Coal Mining Rules.

FINDINGS:

The application meets the hydrology requirements of the State of Utah R645-Coal Mining Rules and should be approved with the following condition:

- The Permittee must revise the maintenance portion of the application based upon discussions with Division staff on January 6th, 2010. The revisions to the maintenance plan must discuss how an 8" mine hose will be located at the site and utilized to safely convey the mine-water discharge around the water treatment facility during periods when the system must come off-line for repairs/maintenance. In addition, the Permittee must

provide the supporting calculations that the 8" mine hose is adequately designed to convey the design flow of approximately 1,000 gallons per minute.

TECHNICAL ANALYSIS:

GENERAL CONTENTS

PERMIT APPLICATION FORMAT AND CONTENTS

Regulatory Reference: 30 CFR 777.11; R645-301-120.

Analysis:

The application meets the Permit Application Format and Contents requirements of the State of Utah R645-Coal Mining Rules.

The previous technical review (Task #3261) identified a deficiency on page 5-33. The application had referred to a Figure 7-14, which was not submitted with the package. The new application has an entirely different format and Figure 7-14 is not referred to and/or submitted under this task.

Findings:

The application meets the Permit Application Format and Contents requirements of the State of Utah R645-Coal Mining Rules.

OPERATION PLAN

TOPSOIL AND SUBSOIL

Regulatory Reference: 30 CFR Sec. 817.22; R645-301-230.

Analysis:

Topsoil Removal and Storage

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The application meets the Topsoil Removal and Storage requirements of the State of Utah R645-Coal Mining Rules.

No topsoil removal or storage will be required with the proposed surface facility alterations.

Findings:

The application meets the Topsoil Removal and Storage requirements of the State of Utah R645-Coal Mining Rules.

HYDROLOGIC INFORMATION

Regulatory Reference: 30 CFR Sec. 773.17, 774.13, 784.14, 784.16, 784.29, 817.41, 817.42, 817.43, 817.45, 817.49, 817.56, 817.57; R645-300-140, -300-141, -300-142, -300-143, -300-144, -300-145, -300-146, -300-147, -300-147, -300-148, -301-512, -301-514, -301-521, -301-531, -301-532, -301-533, -301-536, -301-542, -301-720, -301-731, -301-732, -301-733, -301-742, -301-743, -301-750, -301-761, -301-764.

Analysis:

Groundwater Monitoring

The application meets the Groundwater Monitoring requirements of the State of Utah R645-Coal Mining Rules.

The previous technical analysis (Task ID #3415) had identified a deficiency relative to groundwater monitoring. The deficiency called for the establishment of a monitoring point for collecting flow data from the sandstone seep discharge located directly below the north portals. The data is necessary in order for the Permittee to re-establish the approximate original contour (AOC) in the area of the 'old load out'/high wall area directly below the north portals.

On page 7 of Appendix 7-75 of the application, the Permittee commits to monitoring the sandstone seepage on a monthly basis and will provide the information to the Division via e-mail until such time as the revised final reclamation plan has been approved or is deemed no longer necessary by the Division.

Water-Quality Standards And Effluent Limitations

The application meets the Water-Quality Standards and Effluent Limitation requirements of the State of Utah R645-Coal Mining Rules.

The Permittee proposes the construction and utilization of a Maelstrom Oxidizer Unit (the Unit). Attachment 1 of the application provides information regarding the function and

utilization of the Unit. The Unit facilitates a mass transfer of oxygen into a liquid to strip carbon dioxide and to oxidize and precipitate metals. Mine-water reports to one end of the Unit where it then travels through a series of baffles. As this is occurring, a large volume of air is forced through the water via a number of nozzles located at the bottom of the Unit. The Unit has been sized according to the anticipated flow rate.

Attachment 2 provides bench test results obtained during the preparation of the application. Mine-water obtained at the Crandall Canyon mine-site was treated with the Unit. Prior to treatment, the mine-water had a total iron concentration of 2.16 milligrams/liter (mg/l) and a dissolved iron concentration of 0.79 mg/l. Following the treatment from the Unit, total iron levels were 0.52 mg/l with a corresponding value of 0.00 mg/l for dissolved iron.

As of now, it's unclear as to what is causing the elevated iron concentrations in the mine-water discharge. One possibility is that the iron concentrations are a result of dissolved pyrites in the coal. If that is the case, it's possible that as the pyrites are leached out, the iron levels will drop back to down to pre-existing compliance levels.

It is the hope that the construction and utilization of the aeration treatment facility under consideration with this permitting action will bring iron levels back into compliance with all federal and state water quality and effluent requirements. Monthly water monitoring (as required per UPDES requirements) of the aeration treatment facility's discharge will indicate whether it is effective. However, the data obtained through the bench tests and the effective utilization of the Unit in other locations is encouraging.

A previous technical analysis (Task ID #3415) had identified a deficiency regarding the proposed maintenance/clean-out plan for the proposed settling pond. The Permittee had proposed to route the in-mine water directly into Crandall Creek during periods when the settling pond required clean-out/maintenance. The previous analysis had requested that the Permittee provide the Division with documentation from the Department of Water Quality (DWQ) that such a practice would be acceptable per the terms of their UPDES permit and associated violations. DWQ representative Jeff Studenka informed Division staff that such re-routing of the discharge into Crandall Creek (even if only for a short period of time) would not be allowable under the Permittee's UPDES permit (UT0024368). As a result, the Permittee has revised the maintenance/clean-out plan.

Based upon input from Division staff and literature on treatment systems for mining sites, the Permittee submits that the solids content in the accumulated material in the settling basin will be approximately 5%. As a result, the Permittee proposes to utilize vacuum methods to remove the accumulated iron material from the settling basin. Vacuum tanker trucks will be positioned along the road directly adjacent to the settling basin in preparation for clean out. The mine-water will continue to be directed into the settling basin while vacuum operations are underway and not

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be routed directly into Crandall Creek. (See Below for additional discussion of the clean out/maintenance operations).

Previous technical reviews (Task ID #3261 and Task ID #3415) had identified a deficiency relative to the duration and characterization of the proposed treatment system. In previous applications, sections were noted where the Permittee had discussed the proposed treatment system as potentially 'permanent'. The Division requested that all references or language pertaining to the potential permanence of the water treatment system be removed. The utilization of the Maelstrom Oxidizer Unit in the old load out area of the Crandall Canyon Mine will be strictly operational. The application has removed the 'permanent' references that were previously identified on page 7-47 and page 3 of Appendix 7-65 of the application.

In consultation with the Permittee and other regulatory agencies, the Division is in the process of developing a final reclamation plan for the Crandall Canyon Mine site that will take into account the mine water discharge. Two of the design considerations/assumptions that will frame the final reclamation plan of the north portion of the mine site: 1) the mine-water currently discharging from the mine works will be permanent and 2) in light of the elevated total iron levels and potential for further water quality impacts, the mine-water discharge will require perpetual and permanent treatment prior to its ultimate discharge into Crandall Creek. As a result, the proposed water treatment system is considered to be short-term. At the time of final reclamation, the proposed water treatment system will be removed after the permanent (post-reclamation) passive facility is constructed.

Diversions: General Undisturbed Drainage Discussion

The application meets the Diversions: General requirements of the State of Utah R645-Coal Mining Rules.

Following the Crandall Canyon Mine disaster on August 6th, 2007, the mine was deactivated and the portals sealed. According to the Permittee, while constructing the portal seals, much of the UD-3 culvert diversion structure (See Plate 7-5, *Crandall Canyon Drainage Map*) was damaged beyond repair. The application proposes to route the undisturbed drainage from undisturbed watershed WSUD-3 (above the portals) into the existing disturbed drainage network rather than to try and re-establish the drainage back across the portals. The drainage from WSUD-3 will be routed to undisturbed drainage ditch UD-3, then to disturbed drainage ditch DD-8, then to culvert C-1, then to ditch DD-5, then to culvert C-12 and then into the primary sediment pond.

The application provides the updated routing and design calculations for disturbed drainage ditches DD-8 and DD-5 as well as culverts C-1 and C-12. The ditches and culverts are adequately sized to safely pass the 10-year/6-hour design storm event as required by R645-301-742.323.

Several deficiencies relative to the re-routing of undisturbed watershed WSUD-3 were identified during the two previous technical reviews (Task ID's #3261 and #3415) and the Permittee was directed to update the drainage calculations to account for the proposed change.

During technical review #3261, Table 4, *Runoff Summary Drainage to Sediment Pond* in Appendix 7-4, had identified undisturbed watershed WSUD-3 as reporting to the sediment pond. The application has revised Table 4 to account for the additional 0.23 cubic feet per second (cfs) of flow reporting from WSUD-3 to the sediment pond.

The Permittee was further directed to revise Table 5, *Runoff Control Structure Watershed Summary* in Appendix 7-4. A previous application (Task ID #3261) had not identified watershed WSUD-3 as reporting to the sediment pond or disturbed drainage ditch DD-8. The table has been revised to reflect the proposed alteration of the drainage control plan.

Additionally, the Permittee was asked to revise the flow depths and flow areas identified in Figure 3, *Undisturbed and Disturbed Ditch Typical Section*. The application has revised the figure to reflect the proposed alteration of the drainage control plan and additional storm water reporting to disturbed ditches DD-5 and DD-8.

Technical analysis (Task ID #3415) had identified a deficiency relative to the control/re-routing of the storm water runoff generated in undisturbed watershed 3 (WSUD-3). Based upon site inspections conducted at the mine site, the storm water runoff generated in undisturbed watershed WSUD-3 is not being controlled/diverted to the disturbed drainage system. The Permittee was directed to revise the application to identify how the storm water runoff generated in undisturbed watershed WSUD-3 will be diverted into the existing disturbed drainage system. Additionally, the Permittee was asked to provide detailed design drawings and a narrative.

On page 7-50 of the MRP, the Permittee describes how the storm water from WSUD-3 will be routed into the disturbed drainage network. The Permittee will utilize the existing inlet structure (concrete inlet box) and existing culvert. The existing culvert is an 18" PVC pipe, which is undamaged immediately above the portal. The 18" PVC will be cut off approximately 10' below the inlet structure and fitted with a PVC 90 degree elbow. A new segment of 12" HDPE pipe will be attached to the elbow and routed over and around the intake portal and allowed to discharge into existing disturbed drainage DD-8 (See Figure 7-5). The HDPE pipe will be supported by cables anchored into the concrete inlet box and by an existing steel lamppost located above the portal. The Permittee has provided the design drawings and schematics for the installation plans for the re-routing of WSUD-3 in Figures 13A and 13B of Appendix 7-4.

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Diversions: Miscellaneous Flows

The application meets the Diversions: Miscellaneous Flows requirements of the State of Utah R645-Coal Mining Rules.

A previous technical review of the proposed water treatment system (Task ID #3261) identified a deficiency relative to the re-routing of the mine-water to the proposed water treatment system. On page 1 of Appendix 7-65, the Permittee describes how the mine-water discharge will be routed to the proposed treatment facility. A 12" HDPE pipeline will be tapped into the existing discharge line near the upper portals and extend to the proposed treatment facility. The pipeline will be equipped with shutoff valves, which will allow for the flow of the mine-water to be routed to the treatment facility, or bypassed directly to the existing UPDES outfall. Bolts drilled into the ledge rock and epoxied into place directly below the north portals support the pipeline.

A previous technical review also identified a deficiency relative to the collection and routing of the Star Point Sandstone seepage located directly above the proposed aeration treatment facility. The quantification of flow from the seeps is necessary in order to design a final reclamation plan of the old load out area and establish the approximate original contour. To that end, the Permittee has established a concrete trough behind the existing retaining wall between the ledge rock and the back of the wall. The trough will collect this seepage water and route it through the wall and into the settling basin. In doing so, the seepage water can be monitored. Engineered drawings in Attachment 6 of the application depict the location and flow path generated with the construction of the trough. The concrete trough is discussed on page 3 of Appendix 7-65.

Sediment Control Measures

The application meets the Sediment Control Measures of the State of Utah R645-Coal Mining Rules.

A previous technical analysis (Task ID #3415) had identified a deficiency relative to the characterization of the proposed water treatment area as an Alternative Sediment Control Area (ASCA). An ASCA is not defined in the State of Utah R645-Coal Mining Rules. However, the Division finds that the proposed water treatment facility and the scope of its design and operation are beyond the common application of the term 'ASCA'. The previous application had referred to the proposed water treatment system as 'ASCA 12'. Such references were found on page 7-46 of the approved MRP, the table of contents, page 2 and page 37 of Appendix 7-65. In addition, 'ASCA 12' is depicted on Plate 7-5, *Crandall Canyon Mine Drainage Map*. These references as well as the depiction on Plate 7-5 have been revised.

A previous hydrologic analysis (Task ID #3261) had identified deficiencies relative to the base material and barricade/embankment construction of the proposed water treatment facility and adjacent roadway. Division staff engineer Mr. James Owen reviewed the deficiencies. Mr. Owen had identified deficiencies relative to the construction of the embankment and base material. The Permittee has provided Mr. Owen with additional embankment and base material information. Mr. Owen's technical analysis performed under Task ID #3455 did not identify any deficiencies relative to the embankment/base material

Technical analysis Task ID #3261 had identified a deficiency relative to the construction of the proposed water treatment facility. At that time, the Permittee had proposed the utilization of "*precast concrete parking curbs (wheel stops)*" to facilitate the oxidation of the mine-water discharge. The current application under review proposes the utilization of a Maelstrom Oxidizer Unit. As such, the aforementioned deficiency is no longer applicable.

Ponds, Impoundments, Banks, Dams, and Embankments

The application meets the Ponds, Impoundments, Banks, Dams and Embankment requirements of the State of Utah R645-Coal Mining Rules.

During the sealing and deactivation of the Crandall Canyon Mine following the disaster in August of 2007, undisturbed drainage culvert UD-3 was damaged beyond repair. As a result, the Permittee proposes to route the undisturbed drainage from undisturbed watershed 3 (WSUD-3) into the surface drainage system for the mine facility. The undisturbed flow would flow from culvert UD-3 to culvert C-1 to disturbed drainage ditch DD-5 to culvert C-12 and on to the sediment pond.

Previous technical analyses had identified a deficiency relative to the sediment level accumulation in the primary pond at the mine site. Up to date survey information was requested based upon field inspections by Division Staff and a review of the approved sediment pond design information. Division staff had reported the water level in the pond as less than 1 foot below the principal spillway. The updated survey information was thus requested to determine whether the pond required maintenance/cleaning in order to accommodate the proposed re-routing of undisturbed drainage.

The Permittee has demonstrated that the sediment pond had the capacity to accept the re-routed drainage from undisturbed watershed WSUD-3 and still contain the 10-year, 24-hour storm event. However, that was predicated on the sediment levels being maintained below their clean-out level. Annual reports submitted by the Permittee have provided estimated sediment accumulation elevations of 7,767' for 2006, 7,768' for 2007 and 7,768' for 2008 respectively. The sediment clean-out level for the pond is 7,769'.

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The Permittee provided the Division with updated survey information of the sediment pond on December 18th, 2009. The Permittee initiated clean-out activity at the sediment pond in November 2009. According to the survey information submitted by the Permittee, approximately 2,134 cubic yards of sediment was removed from the pond. The survey information shows that the sediment was cleaned out to an elevation level of 7,763.75', which is 5.25' lower than the maximum sediment level allowed (7,769').

The previous technical analysis (Task ID #3455) had identified several deficiencies relative to the operation/maintenance of the Maelstrom Unit. In order to accurately determine the point at which the accumulated material in the sediment basin was to be removed, the Permittee had proposed the use of staff gauges. The staff gauges were to be installed in the pond and utilized to determine when the 7,812' clean out elevation had been reached and clean out required. However, due to the excessive staining that could be produced by the elevated iron levels in the mine water, the Division determined that it might be impossible to accurately read an elevation or tick mark on a standard staff gauge. The Permittee was directed to establish a more readily apparent method for determining when clean out of the sediment basin was required. On page 4 of the application, the Permittee commits to establishing additional markers. The additional markers will be installed beside the gauges and their tops will be cut off at the 7,812' clean out elevation.

On page 4 of Appendix 7-65, the Permittee discusses the proposed clean out plan for the settling basin. The Permittee proposes to remove the accumulated iron precipitate by utilizing vacuum methods. Based upon literature of similar treatment systems for mining sites and input from Division staff, the Permittee is assuming that the accumulated iron material will be approximately 5% solid. Such a consistency would allow the removal of the material via vacuum methods. The Permittee proposes to position vacuum tanker trucks directly adjacent to the settling basin on the main access road. A semi-flexible 4" suction inlet line will be lowered into the deepest part of the basin and suck the material into the waiting trucks.

As clean out operations commence on the settling basin, the Permittee commits to being careful not to stir up the accumulations of iron material during the vacuuming and thus allowing suspended iron particles to flow out of the pond. The previous technical analysis had requested that the Permittee commit to taking additional precautionary measures to minimize the amount of suspended iron particles that could potentially flow out of the pond during the vacuuming of the material. On page 4 of the application, the Permittee states, "During the clean-out process, excelsior logs or other suitable sediment control (filtration) devices will be installed at the basin outlet spillway to help trap any iron material that is stirred up."

On page 4 of the application, the Permittee commits to sampling the iron material prior to initiating clean up activities. The material will be analyzed for RCRA hazardous constituents. The application states, "If the RCRA analysis shows the material to be hazardous, it will be disposed of at an approved, licensed hazardous waste disposal facility."

Additional sampling requirements and parameters for the mine-water discharge (both pre- and post- treatment) have been established in consultation with the Division. The Permittee commits to obtaining (in addition to the UPDES permit requirements) data to determine the effectiveness of the oxidation/settling methodology. The data will be collected monthly and will be provided to the Division via e-mail. The water samples will be collected from the 12" HDPE pipeline prior to entering the oxidizer unit and also at the UPDES sampling point at the outlet of the settling basin. The analytical parameters will include:

- Iron (total, dissolved and ferrous)
- Manganese (total and dissolved)
- Aluminum (total and dissolved)
- Alkalinity
- Sulfate
- pH
- Dissolved Oxygen

Maintenance Measures

On page 5 of the application, the Permittee discusses the process to be implemented when the Maelstrom Unit requires maintenance. The maintenance plan outlined in the previous application (Task ID #3455) had proposed to open the by-pass valve located ahead of the oxidizer unit thus allowing the mine-water to be directed (temporarily) into the main access road. The water would then flow down the road and around the proposed treatment facility before entering into the disturbed drainage system. The mine-water (once routed down the road and around the water treatment facility) would flow into disturbed drainage ditch DD-10 before entering culvert C-4 and ultimately reporting to the primary sediment pond for the mine site.

The State of Utah R645-Coal Mining Rules does not allow for any drainage to flow uncontrolled down a primary road surface. As a result, the Division found the maintenance plan deficient and requested that the Permittee revise the maintenance section of the application. Based upon discussions with Genwal Resources, Inc. representative Dave Shaver on January 6th, 2010, the Permittee has agreed to utilize either mine hose or a removable pipe that will be fitted to the Maelstrom Unit during times when the facility must come off-line for maintenance/repair. With this approach, the mine water discharge will be controlled and can be safely routed down the main access road during maintenance operations. As a condition of approval for this amendment, the Permittee will provide a discussion of how the mine water will be routed during

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maintenance operations. In addition, the Permittee agreed to provide the supporting calculations that the routing system to be implemented will be sized to safely convey approximately 1,000 gallons per minute of mine water flow.

The previous technical analysis identified a deficiency relative to the drainage components to be utilized during the operation of the Maelstrom Unit. The application proposes to route the treated mine water discharge from the settling basin's spillway to disturbed drainage ditch DD-10, to culvert C-4 and ultimately reporting to the primary sediment pond for the mine site. The Permittee was asked to demonstrate that all of the aforementioned drainage components were sized adequately to safely convey the design flow.

During discussions with Mr. Shaver on January 6th, 2010, it was determined that the approved MRP contained design flows that had not been revised since the Crandall Canyon Mine had been initially approved. As a result, the 10-year, 6-hour design storm events and resulting peak flows shown for Culvert C-4 in the approved MRP were larger than what's occurring at the site. Mr. Shaver discussed how the 10-year, 6-hour design flow of 3.01 cfs for culvert C-4 (See Table 9- Disturbed Culvert Design Summary) was part of the original mine plan. The original mine plan had depicted a larger portion of storm water runoff reporting to culvert C-4 from the southern portion of the mine site. During the construction of the mine, the Permittee was able to construct a culvert on the southern portion of the mine site that reported directly to the sediment pond thus reducing the amount of storm water routed to Culvert C-4 as has had been originally shown. The application has revised these design flow values to correspond to actual site conditions.

On page 5 of Appendix 7-65, the Permittee discusses the sediment pond volume relative to the amount of discharge it will receive during instances when the Maelstrom Unit must be taken off-line. The Permittee assumes that if the sediment level in the pond is below the approved clean-out level and that the pond has been previously decanted, the remaining capacity in the sediment pond provides for approximately 8 hours of mine water discharge to be routed to the sediment pond. The aforementioned scenario is based upon an assumed mine water discharge of 500 gallons per minute. Historically, the mine water discharge has approached 1,000 gallons per minute, which would cut the amount of time allowed for maintenance in half.

Due to the limited amount of time allowed to perform maintenance in the event that the Maelstrom Unit comes off-line and the water routed directly to the primary sediment pond, the Division requested that the Permittee provide a commitment to notify the Division 24 hours prior to initiating any clean up/maintenance activities. On page 5 of the application, the Permittee states, "Prior to initiating any cleaning of the basin, the company will provide a minimum of 24-hour notice to the Division".

Additionally, the previous technical analysis had requested that the Permittee provide a commitment to have the primary sediment pond decanted and the accumulated sediment below

the approved clean out level prior to initiating any clean up/maintenance that would require the Maelstrom Oxidizer Unit to be taken off-line and the mine water routed to the primary sediment pond. Beginning on the bottom of page 5 of the application and continuing on page 6, the Permittee states, "Prior to bypassing any water into the sediment pond, the sediment level in the pond will be verified to be below the approved clean-out level of 7,769."

The previous technical analysis identified a deficiency relative to maintenance of the Maelstrom Unit and how the Permittee would identify (in the field) the point at which the routing of the mine water discharge to the sediment pond must stop. On page 5 of the application, the Permittee states, "At no time during the flow bypass will the water level in the sediment pond be allowed to exceed the 7,773.2' level, unless specifically authorized by the Division". The Permittee proposes to install a visible reference marker within the sediment pond to clearly delineate the 7,773.2' elevation level. The 7,773.2' elevation is significant because above that elevation, the sediment pond no longer has the capacity to contain and treat the design storm event (10-year, 24-hour event). The reference marker will allow those who are performing maintenance operations on the Maelstrom Unit to easily determine when the bypassing of the mine water discharge must stop.

The Division finds that the proposed utilization of the 7,773.2' elevation marker addresses a deficiency identified in the previous technical analysis (Task ID #3455). The deficiency had requested that the Permittee commit to regularly monitor the discharge rate of the mine water during the bypass of the treatment facility. The monitoring was requested in order to calculate the time available for maintenance operations. Establishing a visible elevation marker in the sediment pond that clearly shows the point at which mine water bypass must cease addresses this deficiency.

The previous technical analysis (Task ID #3455) had identified a deficiency relative to the retention time of the settling basin and how it was calculated. It was not clear as to what design assumptions and calculations were utilized in designing the settling basin and it's function.

In Attachment 5 of Appendix 7-65, the Permittee provides the design considerations and basis for calculating the settling basin's volume. The Permittee assumes a removal rate of 7 milligrams/liter of iron from an assumed flow rate of 500 gallons/minute. Assuming the accumulated material is a semi-liquid (slurry) form composed of approximately 5% solids and 95% water; the yearly volume of accumulated sludge material would be approximately 8,200 cubic feet. The Permittee provides the stage/storage relationships for the proposed settling basin.

During a site visit on November 18th, 2009, Division staff determined that the location of the precast concrete drop inlet box below the settling basins spillway was not as depicted on Figure 1 of 5 in Attachment 7 in Appendix 7-65. The figure has been revised to accurately depict the location of the structure.

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The previous technical analysis had also identified another deficiency on Figure 1 of 5 and Figure 2 of 5 in Attachment 7 of Appendix 7-65. The Permittee was asked to revise the figures to depict how the seeps from the Star Point Sandstone ledge would be collected. Based upon the field visit discussed above, the Permittee indicated that the seep collection area would be in a different location than that depicted on the aforementioned figures. The Permittee revised Figures 1 of 5 and 2 of 5 of Appendix 7-65 to depict the location of the Star Point Sandstone seep collection system.

A previous technical analysis (Task ID #3415) identified a deficiency relative to the proposed utilization of an open channel spillway. The Permittee was advised to demonstrate that the proposed utilization of a single open channel spillway meets the criteria established in R645-301-742.223.1.

In Attachment 6 of Appendix 7-65, the Permittee provides the design calculations for the proposed single, open-channel spillway to be utilized with the settling basin. Based upon calculations provided from Blackhawk Engineering, Inc., the expected maximum flow of 2.65 cubic feet per second (cfs), produces a flow depth of approximately 0.26' which is less than 20% of the 16" total depth of the spillway. In addition, the receiving culvert has been designed to carry the flow at a full flow diameter of 0.80', which is approximately 55% of the full flow capacity of 4.79 cfs. Per R645-301-742.223.1 the Permittee can utilize a single open channel spillway if there is a demonstration that the spillway is of 'non-erodible construction and designed to carry sustained flows'. The Permittee proposes the utilization of an 18" culvert with a 4" concrete apron at the inlet. As a result of utilizing these materials, the proposed spillway design provides for 'non-erodible' construction and meets the requirements of the State of Utah R645-Coal Mining Rules regarding the utilization of a single, open-channel spillway.

At this time, it's not a certainty that the proposed water treatment facility will be effective in reducing the total iron levels to below UPDES limits. As a result, the Division is not requiring a back-up system be in place at the time the system comes on-line. However, the previous technical analysis (Task ID #3455) had requested that the Permittee commit to establishing a back-up/contingency plan for the Maelstrom Unit once it's been demonstrated that the mine-water discharge levels of total iron are within the UPDES limits for 3 consecutive months. On page 10 of the application, the Permittee states, "The company commits to establishing a back-up/contingency plan for the oxidizer unit once it has been demonstrated that the mine-water discharge levels of total iron are within UPDES limits for three consecutive months".

Findings:

The application meets the Hydrologic Information requirements of the State of Utah R645-Coal Mining Rules.

MAPS, PLANS, AND CROSS SECTIONS OF MINING OPERATIONS

Regulatory Reference: 30 CFR Sec. 784.23; R645-301-512, -301-521, -301-542, -301-632, -301-731, -302-323.

Analysis:

Mining Facilities Maps

The application meets the Mining Facilities Maps requirements of the State of Utah R645-Coal Mining Rules.

Plate 5-3, Crandall Canyon Mine Surface Facilities and Plate 7-5, Crandall Canyon Mine Drainage Map have been revised to reflect the proposed aeration treatment facility as well as the re-routing of the undisturbed drainage from watershed WSUD-3.

Certification Requirements

The application meets the Certification Requirements of the State of Utah R645-Coal Mining Rules.

Revisions to Plates 5-3, Crandall Canyon Mine Surface Facilities and Plate 7-5, *Crandall Canyon Mine Drainage Map* were signed and stamped by Mr. David Hibbs (Utah registered professional engineer). In addition, Figures 7-13a thru 7-13d, *Mine-Water Discharge Treatment Facility*, were signed and stamped by Mr. Hibbs.

Findings:

The application meets the Maps, Plans and Cross Sections of Mining Operations requirements of the State of Utah R645-Coal Mining Rules.

RECLAMATION PLAN

HYDROLOGIC INFORMATION

Regulatory Reference: 30 CFR Sec. 784.14, 784.29, 817.41, 817.42, 817.43, 817.45, 817.49, 817.56, 817.57; R645-301-512, -301-513, -301-514, -301-515, -301-532, -301-533, -301-542, -301-723, -301-724, -301-725, -301-726, -301-728, -301-729, -301-731, -301-733, -301-742, -301-743, -301-750, -301-751, -301-760, -301-761.

Analysis:

TECHNICAL MEMO

Hydrologic Reclamation Plan

The application meets the Hydrologic Reclamation Plan requirements of the State of Utah R645-Coal Mining Rules.

On page 4 of Appendix 7-65, the Permittee discusses the reclamation of the proposed water treatment facility. Due to the relatively amount of material utilized in the construction of the treatment facility (i.e. less than 500 cubic yards of material for the embankment, small pre-fabricated Maelstrom unit that's easily transported etc.) and the relatively small size of the entire treatment facility, the effort to reclaim the site will be minor.

Findings:

The application meets the Hydrologic Reclamation Plan requirements of the State of Utah R645-Coal Mining Rules.

RECOMMENDATIONS:

The application meets the requirements of the State of Utah R645-Coal Mining Rules. The application should be approved with the following condition:

The Permittee must revise the maintenance portion of the application based upon discussions with Division staff on January 6th, 2010. The revisions to the maintenance plan must discuss how an 8" mine hose will be located at the site and utilized to safely convey the mine-water discharge around the water treatment facility during periods when the system must come off-line for repairs/maintenance. In addition, the Permittee must provide the supporting calculations that the 8" mine hose is adequately designed to convey the design flow of approximately 1,000 gallons per minute.