Alton Coal Development, LLC
463 North 100 West, Suite 1
Cedar City, Utah 84720
Phone (435) 867-5311 Fax (435) 867-1192

October 28, 2019

Steve Christensen
Coal Program Manager
Oil, Gas & Mining
1594 West North Temple, Suite 1210
Salt Lake City, UT 84114-5801

Re: **Pond 3 Certification, Task #5996, Alton Coal Development, LLC, Coal Hollow Mine, Kane County, Utah, C/025/0005**

Dear Mr. Christensen:

Alton Coal Development, LLC (ACD) is submitting this response to deficiencies identified in Task #5996 for the amendment to document the expansion and re-certification of Pond 3. Included in this submittal is the engineer's construction inspection certification and the certified as-built drawing for Pond 3.

As discussed with Amanda Daniels on Oct.28 2019, ACD will continue to submit as-built drawings and design drawings will remain in the approved MRP. Information on design drawings is relevant as it corresponds to the design information contained Appendices 5-12 and 5-12. However, ACD proposes adding an additional column to the tables in Chapter 7 on pond volumes. This allows the reader to quickly determine that a pond has been built to meet the "Required Storage Capacity". Also, text has been added to section 733 to clarify the definition of mine water and refer the reader to text in Chapter 5 with additional details on water pollution control facilities.

Changes to the MRP associated with this amendment have been uploaded to the DOGM's server for review. PDF versions of the drawing are not certified. Upon approval, 2 (two) clean hard copies of the text and certified drawings for insertion into the MRP will be submitted. Please do not hesitate to contact me if you have any questions 435-691-1551.

Very truly yours,

B. Kirk Nicholes
Environmental Specialist
Alton Coal Development

To Whom it May Concern:

I, Andrew R. Christensen, Registered Professional Engineer, State of Utah No. 10230818, have completed (at a minimum) weekly construction inspections on the Alton Coal Development, LLC (ACD), Coal Hollow Mine Sediment Pond 3 Expansion from the outset of construction in July of 2019. The as-constructed survey data and stage-volume information was completed on 8/13/2019. I have completed the as-constructed Pond 3 Drawing 5-30AB following complete installation of all rip-rap and erosion control measures at the ditch inlets and the emergency spillway and certified it as of today, 9/16/2019.

It is noted that Pond 3 has been approved under the UPDES Discharge Permit to accept both storm surface runoff and mine affected water. The total as-built storage capacity of the expanded pond is now 18.03 acre-ft before discharge over the new emergency spillway at an elevation of 6812 feet. The pre-existing decant pipe & valve remain at the elevation of 6808 feet with a new decant storage capacity of 10.30 acre-ft.

I hereby certify that the above noted inspections of Sediment Pond 3 were completed by me and finalized on the date specified below.

Andrew R. Christensen

September 16, 2019

APPLICATION FOR COAL PERMIT PROCESSING

Permit Change ☒ New Permit ☐ Renewal ☐ Exploration ☐ Bond Release ☐ Transfer ☐

Permittee: Alton Coal Development, LLC
Mine: Coal Hollow Mine **Permit Number:** C/025/0005
Title: Pond 3 Recertification

Description, Include reason for application and timing required to implement:
Pond 3 was cleaned and enlarged as part of the addition of LBA Block 1

Instructions: If you answer yes to any of the first eight questions, this application may require Public Notice publication.

☐ Yes ☒ No 1. Change in the size of the Permit Area? Acres: _____ Disturbed Area: _____ ☐ increase ☐ decrease.
☐ Yes ☒ No 2. Is the application submitted as a result of a Division Order? DO# _____
☐ Yes ☒ No 3. Does the application include operations outside a previously identified Cumulative Hydrologic Impact Area?
☐ Yes ☒ No 4. Does the application include operations in hydrologic basins other than as currently approved?
☐ Yes ☒ No 5. Does the application result from cancellation, reduction or increase of insurance or reclamation bond?
☐ Yes ☒ No 6. Does the application require or include public notice publication?
☐ Yes ☒ No 7. Does the application require or include ownership, control, right-of-entry, or compliance information?
☐ Yes ☒ No 8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
☐ Yes ☒ No 9. Is the application submitted as a result of a Violation? NOV # _____
☐ Yes ☒ No 10. Is the application submitted as a result of other laws or regulations or policies?
Explain: _____
☐ Yes ☒ No 11. Does the application affect the surface landowner or change the post mining land use?
☐ Yes ☒ No 12. Does the application require or include underground design or mine sequence and timing? (Modification of R2P2)
☐ Yes ☒ No 13. Does the application require or include collection and reporting of any baseline information?
☐ Yes ☒ No 14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
☐ Yes ☒ No 15. Does the application require or include soil removal, storage or placement?
☐ Yes ☒ No 16. Does the application require or include vegetation monitoring, removal or revegetation activities?
☐ Yes ☒ No 17. Does the application require or include construction, modification, or removal of surface facilities?
☐ Yes ☒ No 18. Does the application require or include water monitoring, sediment or drainage control measures?
☒ Yes ☐ No 19. Does the application require or include certified designs, maps or calculation?
☐ Yes ☒ No 20. Does the application require or include subsidence control or monitoring?
☐ Yes ☒ No 21. Have reclamation costs for bonding been provided?
☐ Yes ☒ No 22. Does the application involve a perennial stream, a stream buffer zone or discharges to a stream?
☐ Yes ☒ No 23. Does the application affect permits issued by other agencies or permits issued to other entities?
☐ Yes ☒ No 24. Does the application include confidential information and is it clearly marked and separated in the plan?

Please attach three (3) review copies of the application. If the mine is on or adjacent to Forest Service land please submit four (4) copies, thank you. (These numbers include a copy for the Price Field Office)

I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments, undertakings, and obligations, herein.

B. Kirk Nicholes	Environmental Specialist	09/16/2019 9/23/2019	B. Kirk Nicholes
Print Name	Position	Date	Signature (Right-click above choose certify then have notary sign below)

Subscribed and sworn to before me this 23 day of Sept, 2019

Notary Public: Wendy Smith, state of Utah.

My commission Expires: Sept 17, 2022 Iron CO

Commission Number: 702330

Address: 377 N Main

City: Cedar City State: UT Zip: 84721

WENDY SMITH
Notary Public - State of Utah
Comm. No. 702330
My Commission Expires on
Sep 17, 2022

For Office Use Only:	Assigned Tracking Number:	Received by Oil, Gas & Mining

Form DOGM- C1 (Revised December 10, 2007)

APPLICATION FOR COAL PERMIT PROCESSING
Detailed Schedule Of Changes to the Mining And Reclamation Plan

Permittee: Alton Coal Development, LLC
Mine: Coal Hollow Mine **Permit Number:** C/025/0005
Title: Pond 3 Recertification

Provide a detailed listing of all changes to the Mining and Reclamation Plan, which is required as a result of this proposed permit application. Individually list all maps and drawings that are added, replaced, or removed from the plan. Include changes to the table of contents, section of the plan, or other information as needed to specifically locate, identify and revise the existing Mining and Reclamation Plan. Include page, section and drawing number as part of the description.

			DESCRIPTION OF MAP, TEXT, OR MATERIAL TO BE CHANGED
☒ Add	☐ Replace	☐ Remove	Chapter 5, Drawing 5-30AB
☐ Add	☒ Replace	☐ Remove	Chapter 7, Text
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Any other specific or special instruction required for insertion of this proposal into the Mining and Reclamation Plan.	Received by Oil, Gas & Mining

CHAPTER 7

R645-301-700. HYDROLOGY

711. GENERAL REQUIREMENTS

711.100 – 711.500 Contents

This chapter provides a description of the hydrology and hydrogeology of the Coal Hollow Mine permit and adjacent area (including the 85.88-acre Dame Lease IBC area and the proposed North Private Lease area). Specifically, this permit section includes descriptions of existing hydrologic resources according to R645-301-720, proposed operations and potential impacts to the hydrologic balance according to R645-301-730, methods and calculations utilized to achieve compliance with the hydrologic design criteria and plans according to R645-301-740, applicable hydrologic performance standards according to R645-301-750, and reclamation activities according to R645-301-760.

This information is presented in subsequent sections of this chapter and in Appendix 7-1. Appendix 7-1 includes a comprehensive characterization of groundwater and surface-water systems in the Coal Hollow permit and adjacent areas (including the 85.88-acre Dame Lease IBC), recommendations for groundwater and surface-water monitoring, and the results of a field investigation regarding the potential for alluvial valley floors in the Coal Hollow Mine permit and adjacent area. It should be noted that Appendix 7-1 may be updated periodically in the future as additional hydrologic and hydrogeologic data become available. A characterization of groundwater and surface-water systems in the proposed North Private Lease area is presented in Appendix 7-16 (Petersen Hydrologic, 2015). Appendix 7-16 also includes recommendations for groundwater and surface-water monitoring in the proposed North Private Lease area. Appendix 7-18 provides further characterization of alluvial groundwater systems in the North Private Lease area.

712 CERTIFICATION

All cross sections, maps, and plans have been prepared per R645-301-512. Compliance with this section has been completed and certifications are available on all Drawings. The cross sections and maps that are included in this permit application and are required to be certified have been prepared by or under the direction of a qualified, registered, professional engineer or a professional geologist, with assistance from experts in related fields such as hydrology, geology and landscape architecture.

713 INSPECTION

Impoundments will be inspected as described under R645-301-514.300. Designs for impoundments in the Coal Hollow permit area are shown in Drawings 5-25 through 5-31 and Appendices A5-1 and A5-2. Designs for proposed impoundments in the North Private Lease are shown in Drawings 5-65 through 5-71A. No impoundments or sedimentation ponds meeting the size or other qualifying criteria of MSHA, 30 CFR 77.216(a) exist or are planned within the Coal Hollow Mine permit area including the proposed North Private Lease area.

A professional engineer or specialist experienced in the construction of impoundments will inspect impoundments. Inspections will be made regularly during construction, upon completion of construction, and at least yearly until removal of the structure or release of the performance bond. The qualified registered professional engineer will promptly, after each inspection, provide to the Division, a certified report that the impoundment has been constructed and maintained as designed and in accordance with the approved plan and the R645 Rules. The report will include discussion of any appearances of instability, structural weakness or other hazardous conditions, depth and elevation of any impounded waters, existing storage capacity, any existing or required monitoring procedures and instrumentation and any other aspects of the structure affecting stability. A copy of the report will be retained at or near the mine site.

720 ENVIRONMENTAL DESCRIPTION

721 GENERAL REQUIREMENTS

The existing, pre-mining hydrologic resources within the permit and adjacent areas that may be affected by coal mining and reclamation operations (including the 85.88-acre Dame Lease IBC and the proposed new North Private Lease area) are described in Appendix 7-1, Appendix 7-16 and Appendix 7-18 and are summarized below.

Groundwater Resources

A spring and seep survey of the Coal Hollow Mine permit and surrounding area (that includes the 85.88-acre Dame Lease IBC) has been conducted by Petersen Hydrologic, LLC (see sub-appendix B of Appendix 7-1). The locations of springs and seeps in the permit and adjacent area are shown on Drawing 7-1. The results of a spring and seep survey conducted by Petersen Hydrologic in the new North Private Lease area are presented in Appendix 7-16. Seasonal discharge and field water quality measurements for springs and seeps in the Coal Hollow Mine permit and adjacent area have been submitted electronically to the Utah Division of Oil, Gas and Mining Utah Coal Mining

Water Quality Database (UDOGM, 2007). Baseline discharge and water quality data for groundwater resources in the Coal Hollow Mine permit and adjacent area are have also been submitted electronically to the Utah Division of Oil, Gas and Mining, Utah Coal Mining Water Quality Database (UDOGM, 2007). Locations of baseline monitoring stations are shown on Drawing 7-2. Locations of water rights in and adjacent to the Coal Hollow Mine permit area (including the 85.88-acre Dame Lease IBC area) are shown on Drawing 7-3. Locations of water rights in the North Private Lease and adjacent area are shown on Drawing 7-3N. Water rights data from the Coal Hollow Mine permit and adjacent area are detailed in Appendix 7-3. Water rights data from the proposed North Private Lease and adjacent area are shown in Appendix 7-3N. A plot showing potentiometric levels in alluvial groundwater systems in the Coal Hollow Mine permit and adjacent area (including the 85.88-acre Dame Lease IBC) is presented in Drawing 7-13. Potentiometric levels and the direction of shallow groundwater flow in the alluvial groundwater systems in the proposed North Private Lease area are presented in Appendix 7-16 and Appendix 7-18.

There are no domestic water supply springs or wells in the mine disturbance area. However, springs that provide water for domestic and livestock use are located on and adjacent to the permit area (See Drawing 7-2 and Appendix 7-3). Spring SP-23 (Spring House Spring) is located on the eastern boundary of the Coal Hollow Mine permit area. Spring SP-23 is a groundwater seepage area with both discrete and diffuse flow with a total discharge that is usually about one gallon per minute or less. Historically, this seepage area was used as a domestic water source for the Pugh property (personal communication, Burton Pugh, 2008). However, water from SP-23, which is not developed, has not been used for this purpose for many years.

Spring SP-35 is located along the eastern boundary of the Coal Hollow Mine permit area. Discharge from SP-35 averages less than 0.25 gallons per minute and is occasionally used for drinking water during camping trips or visits to the Pugh property (personal communication, Burton Pugh, 2008). However, there is apparently no associated domestic water right associated with this spring.

Two additional springs, which are located more distant from the proposed mining areas are also used for domestic water supply sources. These include SP-40, which is located at the Sorensen property, and SP-33, which is located at the Johnson property. Springs with stockwatering rights are listed in Appendix 7-3.

As described in Appendix 7-16, only one spring has been identified within the proposed North Private Lease permit area. This spring (Coyote Seep) discharges from the alluvial groundwater system at less than one gallon per minute. There is no water right associated with this spring. There are no Utah state appropriated groundwater rights within the North Private Lease area.

Some lands east of and adjacent to the Coal Hollow Mine permit area have historically been irrigated using water from alluvial springs. However, irrigation from these springs was apparently limited to home gardens and a few fruit trees. No irrigation of these lands

(other than some yard watering at the Swapp Ranch house) is currently occurring nor has it occurred in at least the past 10 years (Personal communication, Burton Pugh, 2008; Richard Dames, 2007). Additionally, limited irrigation of lands occurs east of the Coal Hollow permit area using surface waters derived from runoff from the adjacent Paunsaugunt Plateau area. Irrigation of these lands is largely limited to years with appreciable precipitation and stream runoff (Personal communication, Darlynn Sorensen, 2008).

Groundwater discharge occurs from springs and seeps in the upland areas of the Paunsaugunt Plateau east of the permit area (Tilton, 2001; Appendix 6-3). However, these springs discharge from rock strata that are topographically and stratigraphically up-gradient of and considerable distances from the Coal Hollow Mine permit area and the North Private Lease area. Consequently, groundwater systems in these areas will not be impacted by mining activities and these are not considered further here.

Groundwater resources in the Tropic Shale and underlying Dakota Formation in the permit and adjacent area and the North Private Lease area are not appreciable. During drilling activities in the Coal Hollow Mine permit and adjacent area, appreciable groundwater inflows were not encountered in the Tropic Shale. Other than a single seep (SP-37; Drawing 7-1) which discharges at a rate of less than 0.05 gpm from an apparent fracture system in a sandy horizon along the eastern margin of lower Sink Valley, no springs or seeps with measurable discharge have been identified in the Tropic Shale. The lack of appreciable groundwater discharge in the Tropic Shale is a result of the poor water transmitting properties of the marine shale unit. While sandstone units occur stratigraphically higher in the Tropic Shale in the surrounding area, in areas proposed for surface mining, the unit present consists of a fairly uniform sequence of soft shale, silty shale, and claystone with minor siltstone horizons. Competent sandstone strata in the Tropic Shale overlying proposed mining areas were not observed during drilling. The Tropic Shale acts as a barrier impeding downward migration of groundwater in the Coal Hollow Mine permit and adjacent area where it is present. The unit also forms a basal confining layer for alluvial groundwater systems in the permit area. Similar hydrogeologic properties in the Tropic Shale were noted during drilling activities in the proposed North Private Lease area.

Groundwater discharge from the Dakota Sandstone in the permit and adjacent area is also meager. The Dakota Formation consists of shaley strata interbedded with lenticular, fine- to medium-grained sandstone and coal. Because of the pervasiveness of interbedded low-permeability horizons in the formation and the vertical and lateral discontinuity of sandstone horizons, the potential for vertical and horizontal movement of groundwater is limited. While no springs discharge from the Dakota Formation in the permit area, a spring with a discharge of about 1 gpm and displaying little seasonal variability in discharge (SP-4; Drawing 7-1) discharges from an apparent fault zone in the Dakota Formation approximately 1.1 miles south of the existing Coal Hollow permit area. Additionally, two seeps with discharges of less than 0.05 gpm (SP-27 and SP-34; Drawing 7-1) seep from the Dakota Formation in lower Sink Valley more than ½ mile south of the Coal Hollow Mine permit area. The results of slug testing performed on

wells screened in the Smirl coal seam indicate relatively low values of hydraulic conductivity for the coal seam (Table 7-8). In much of the mining area, the coal seam is dry (UDOGM, 2007). Thus, appreciable migration of groundwater through the Smirl coal seam is not anticipated.

In the proposed North Private Lease area, there are no springs or seeps discharging from the Dakota Formation (Appendix 7-16). The lack of springs in the Dakota Formation is likely attributable to 1) the presence of Tropic Shale bedrock overlying the formation, which limits the potential for vertical recharge to the formation, 2) the limited surface exposure of the formation, and 3) the overall poor water transmitting potential of the Dakota Formation (Appendix 7-1).

It should be noted that there are springs that discharge below irrigated fields near the town of Alton, Utah west of the proposed North Private Lease mining areas (Appendix 7-16). These springs, which are isolated from the proposed mining areas by upland areas of low-permeability Tropic Shale bedrock, discharge at locations that are stratigraphically near the Tropic Shale/Dakota Formation contact. The bedrock in these areas has apparently been altered as a result of near-surface burning of the Smirl coal seam, which can alter the water bearing and water transmitting characteristics of the bedrock relative to the unaltered bedrock petrology. Appreciable faulting associated with the Sevier Fault Zone has also been mapped in the area to the west of the spring discharge locations (Tilton, 2001).

No water wells are known to exist in the Tropic Shale or Dakota Formation in the Coal Hollow Mine permit and adjacent area (including the 85.88-acre Dame Lease IBC area and the proposed North Private Lease area), demonstrating the inability of these formations to transmit useful quantities of water to wells. Groundwaters from the Tropic Shale and Dakota Formation do not contribute measurable baseflow to streams in the Coal Hollow Mine permit and adjacent area and the North Private Lease area (at least at the surface in stream channels).

Groundwater discharging from springs below the town of Alton, Utah do contribute to the baseflow discharge in the Simpson Hollow tributary to Kanab Creek (Appendix 7-16) west of the proposed North Private Lease area.

Natural groundwater discharge in the existing Coal Hollow Mine permit and adjacent area occurs primarily from alluvial sediments. Alluvial discharge occurs both as discrete springs and seeps (Drawing 7-1) and also locally as diffuse seepage to the surface. Groundwater discharge areas in the Coal Hollow Mine permit and adjacent area are shown on Drawing 7-4 (see also photograph section). The area of most appreciable alluvial groundwater discharge occurs in central Sink Valley in the northwest quarter of Section 29, T39S, R5W (see Drawing 7-4; groundwater discharge area A). The alluvial groundwater system in this area exists under artesian conditions, resulting from the presence of a considerable thickness of sloping, low permeability clayey sediments overlying coarser, water-bearing alluvial sediments at depth (See Drawing 6-3). The artesian alluvial groundwater system in Sink Valley is likely recharged via mountain-

front-recharge along the flanks of the Paunsaugunt Plateau to the east and north of the Coal Hollow Mine permit area. This artesian alluvial groundwater system that exists along the eastern margins of Sink Valley is likely continuous from near mountain-front recharge areas southward along the eastern margins of Sink Valley to the lower portion of Sink Valley. Discharge from the alluvial groundwater systems in and adjacent to the Coal Hollow Mine permit area occurs primarily in two areas (Drawing 7-4). In the northwest quarter of Section 29, T39S, R5W, considerable natural discharge from the alluvial groundwater system occurs through springs and seeps (Drawing 7-4; groundwater discharge area A). Minor discharge from several flowing artesian wells also occurs in this area. The artesian alluvial groundwater system in eastern Sink Valley also likely provides recharge to the clayey alluvial sediments in the southwestern portion of the valley in the Coal Hollow Mine permit area. Discharge from the alluvial groundwater system in groundwater discharge area A area results in decreases to the amount of water in storage in the alluvial groundwater system and also decreases in artesian hydraulic pressure in the aquifer.

Appreciable discharge from the alluvial groundwater system also occurs in lower Sink Valley in the northwest quarter of Section 32, T39S, R5W (see Drawing 7-4; groundwater discharge area B). Sink Valley constricts markedly in this area, which forces shallow alluvial groundwaters flowing down the valley to discharge at the land surface as springs, seeps, and diffuse discharge to the surface (i.e., there is a significant decrease in the cross-sectional area of the alluvial sediments). Groundwater discharge in this area occurs from diffuse seepage to the surface and also as discharges to two springs and several small seeps (Drawing 7-1).

Much of the alluvial groundwater in Sink Valley likely ultimately leaves the valley via evapotranspiration. This conclusion is based on the observation that there is very rarely any discharge of surface water (at least at the surface in the channel) in Sink Valley Wash below Sink Valley (See site SW-9; Drawing 7-2; UDOGM, 2007). The clayey, low-permeability sediments present at the surface over most of Sink Valley also impede appreciable infiltration of precipitation and snowmelt waters into the deeper subsurface. Hence, groundwater recharge to the lower half of the Sink Valley sediments (including the Coal Hollow Mine permit area) likely occurs primarily via horizontal migration of alluvial groundwaters from up-gradient areas.

Flowing artesian groundwater conditions are also observed in monitoring wells screened near the base of the alluvial sediments in the northwest corner of Section 32 T39S, R5W. It is probable that the artesian alluvial groundwater system in Section 29, T39S, R5W is continuous with that in the northwest corner of Section 32. It should be noted that within the Coal Hollow permit area, artesian conditions were not observed in monitoring wells. While the thickness of the alluvial sediments in the artesian groundwater system east of the Coal Hollow permit area range up to 150 feet thick, the thickness of alluvium overlying areas with mineable coal in the Coal Hollow permit area generally does not exceed about 50 feet and in many locations it is considerably thinner.

Natural discharge of alluvial groundwater in the Robinson Creek drainage area is meager. This condition is largely due to the presence of the elevated ridge of impermeable Tropic Shale bedrock associated with the Sink Valley Fault that dissects and effectively isolates the alluvium east of the fault from that west of the fault (See Drawing 6-1). Because of the low permeability of the Tropic Shale, this condition apparently forces alluvial groundwater east of the Tropic Shale ridge to flow to the south toward Sink Valley that would otherwise report to the Robinson Creek drainage. During high flow conditions in the alluvial groundwater system east of the Tropic Shale ridge, minor amounts of groundwater "overtop" the bedrock ridge and drain via surface flow over the Tropic Shale bedrock, where it either recharges shallow alluvial sediments to the west of the fault or is lost to evapotranspiration. The influence of the Tropic Shale ridge is readily evident in field observations, with marked differences in vegetation and soil moisture being apparent on opposite sides of the ridge. During low-flow conditions, discharge from the overtopping of the bedrock ridge has generally not been observed. Isolated areas of soil wetness and shallow perched alluvial groundwater systems that exist west of the bedrock ridge in the northeast corner of Section 30 and the southeast corner of Section 19, T39S, R5W are likely sourced via this mechanism.

Seepage of alluvial groundwater into the deeply incised lower Robinson Creek stream channel occurs near the contact with the underlying Dakota Formation in the southeast quarter of Section 19, T39S, R5W. This water is likely related to saturated alluvial deposits underlying the Robinson Creek stream channel. The alluvial groundwater emerges near where the stream channel intersects the alluvial groundwater system. It is noteworthy that the location of the emergence of alluvial water in the channel has varied somewhat over time. The bank seepage water is likely alluvial groundwater that seeps to the surface where the incised stream channel intersects the potentiometric surface of the alluvial groundwater system. Typically, this is near the contact with the underlying Dakota Formation bedrock in the bottom of the stream channel. Because of the seasonal changes in the elevation of the potentiometric head in the alluvial groundwater system, the location of the bank seepage is variable over time (i.e. the variability in the bank seepage locations are likely controlled primarily by temporal variability in potentiometric levels in the alluvial groundwater system rather than by fixed, permeability-controlled groundwater preferential pathways in the aquifer skeleton). Consequently, the bank seepage locations are not well-defined point sources, but rather dynamic seepage fronts along this general reach of the stream.

The Robinson Creek stream channel above this location is almost always dry (except for in direct response to torrential precipitation events or during the springtime runoff season during wet years. This seepage of alluvial water in the Lower Robinson Creek channel is typically about 5 to 10 gpm or less and is routinely monitored at monitoring station SW-5 (Drawing 7-2).

Information on water quality for groundwaters and surface-waters has been uploaded into the Utah Division of Oil, Gas and Mining, Utah Coal Mining Water Quality Database (UDOGM, 2007) and is summarized and described in Appendix 7-1.

Appreciable spatial variability exists in water quality in groundwaters and surface waters in the Coal Hollow permit and adjacent area. Stiff diagrams depicting solute compositions and overall water quality for groundwaters and surface waters in the Coal Hollow Mine permit and adjacent area are shown in Appendix 7-1. Important water quality characteristics for groundwaters are summarized below.

Groundwater Source	Chemical type	TDS (mg/L)
Alluvial groundwaters, coarse-grained system east of permit area	Calcium-magnesium-bicarbonate	380 mg/L to 500 mg/L typically, Little seasonal variability
Alluvial groundwaters in south sink valley	Variable, magnesium-bicarbonate sulfate, calcium-magnesium-bicarbonate	450 mg/L to 3,600 typically, Highly variable based on season and climate for shallow systems, less variability in deeper system
Dakota Formation, fault groundwater system south of permit area	Sodium-bicarbonate	500 mg/L to 600 mg/L typically, Little seasonal variability

Water quality characteristics for groundwaters in the proposed North Private Lease area are summarized in Appendix 7-16 as well as Appendix 7-18. It is apparent that the overall water quality of alluvial groundwater degrades from the mountain-front recharge water to the artesian groundwater system east of the Coal Hollow permit area to the non-artesian shallow alluvial groundwater systems located in the more distal portions of Sink Valley. These changes are due to groundwater interaction with soluble minerals in the primarily Tropic Shale-derived sediments that make up the shallow alluvial materials in the permit area.

This down-gradient degradation in water quality is shown graphically on Drawing 7-5. In Drawing 7-5, the average specific conductance values in μS/cm for representative springs and seeps in the Sink Valley drainage are plotted on the map as circles with the circle areas being proportional to the specific conductance average for the spring or seep. The specific conductance information used in generating Drawing 7-5 has been submitted electronically to the Division's hydrology database (UDOGM, 2007). It is readily apparent from Drawing 7-5 that the specific conductance (which is a reflection of the dissolved solids concentration) is degraded from the mountain-front recharge water (represented by stream SW-8) to the artesian alluvial groundwater system in the northwest quarter of Section 29, T5W, R39S, to the alluvial groundwaters in the southern portion of Sink Valley below the Coal Hollow Mine permit area.

Specific conductance values were used for plotting in Drawing 7-5 because specific conductance values are available for all springs and seeps, while laboratory chemical analyses are available for only some of the springs and seeps. Stiff (1951) diagrams for

selected springs along this geochemical evolutionary pathway are shown on Figure 14 of Appendix 7-1. It is apparent from the Stiff diagrams and from geochemical information submitted to the Division (UDOGM, 2007) that the mountain-front recharge water (represented by monitoring site SW-8 in upper Swapp Hollow) is of the calcium-magnesium-bicarbonate chemical type with an average TDS concentration of 333 mg/L. Groundwater downgradient of the mountain-front recharge areas in the artesian alluvial groundwater system in Section 29, T5W, R39S, is also of the calcium-magnesium-bicarbonate chemical type, with an average TDS concentration at artesian well Y-61 of 400 mg/L. Further downgradient in the artesian alluvial groundwater system in Section 29, the geochemical composition at SP-8 is of the calcium-magnesium-bicarbonate chemical type with a somewhat increased TDS concentration of 425 mg/L. In the lower portions of Sink Valley in Section 32, T5W, R39S, the chemical quality of the alluvial groundwater is appreciably degraded relative to that in the upper portions of the groundwater system. At spring SP-6, the composition of the alluvial groundwater is seasonally variable and is of the magnesium-bicarbonate-sulfate, or calcium-magnesium-bicarbonate-sulfate chemical type. The TDS concentrations at SP-6 average 970 mg/L. The chemical composition of alluvial groundwater at SP-33 is of a geochemical type similar to that at SP-6, although TDS concentrations are somewhat lower, averaging 795 mg/L. The spatial variability apparent in the TDS concentrations in the alluvial groundwater in Section 32 is likely related to flushing effects resulting from higher groundwater fluxes through zones of increased permeability in the alluvium. It is noteworthy that groundwater in the gravelly zones in the deeper alluvium east of the permit area in Section 32 monitored at the 85-foot deep well LS-85 is considerably lower in TDS concentration with an average of 457 mg/L. The lower TDS concentrations of artesian alluvial groundwater in the deeper, coarser-grained portions of the alluvium are likely attributable to the isolation of these groundwaters from the shallow, clayey, Tropic Shale derived alluvial sediment in the near-surface alluvial groundwaters.

The appreciable temporal variability in the solute geochemical compositions of the shallow alluvial groundwaters in Section 32 is likely attributable to seasonal and climatic variability in the groundwater flux rate through these systems and corresponding variability in rock/water ratios and residence time in the evaporate mineral rich Tropic Shale derived shallow alluvial sediments present in this portion of Sink Valley. Alluvial groundwaters in the deeper portions of Sink Valley to the east in Section 32 are part of a larger, more continuous groundwater system that is hydraulically isolated from overlying shallow recharge sources, and consequently have not exhibited similar temporal variability in solute geochemical composition.

Surface Water Resources

Surface-water resources in the Coal Hollow Mine permit and adjacent area (including the 85.88-acre Dame Lease IBC) are described in Appendix 7-1 and are summarized below. Surface-water resources in the proposed North Private Lease area are described in Appendix 7-16 and Appendix 7-18.

Surface waters in the Coal Hollow Mine permit and adjacent area and the proposed North Private Lease area are tributary to Kanab Creek. Surface waters in the northern portion of the existing permit and adjacent area drain into the Robinson Creek and upper Kanab Creek drainages. Surface waters in the southern portion of the permit and adjacent area drain into the Sink Valley Wash drainage which is tributary to Kanab Creek about 6 miles below the Coal Hollow Mine permit area. Surface-water drainages in the permit and surrounding areas are shown in Appendix 7-1. Surface-water drainages in the proposed North Private Lease area are shown in Appendix 7-16. Surface-water baseline monitoring stations are shown on Drawing 7-2. Locations of surface-water water rights in and adjacent to the Coal Hollow Mine permit and adjacent area are shown on Drawing 7-3. Locations of surface-water rights in and adjacent to the proposed North Private Lease are shown on Appendix 7-3N. Water rights data from the Coal Hollow Mine permit and adjacent area are detailed in Appendix 7-3. Water rights data from the proposed North Private Lease and adjacent area are detailed in Appendix 7-3N. Information regarding alluvial groundwater systems and Kanab Creek in the North Private Lease are presented in Appendix 7-18.

Information on water quality for groundwaters and surface-waters has been uploaded into the Utah Division of Oil, Gas and Mining, Utah Coal Mining Water Quality Database (UDOGM, 2007) and is summarized and described in Appendix 7-1 and Appendix 7-16, Appendix 7-16 and Appendix 7-18.

Surface waters in Kanab Creek are used for stock watering and crop irrigation in the irrigable lands adjacent to Kanab Creek west of the Coal Hollow Mine permit area. Discharge in Kanab Creek measured near the town of Alton (SW-1) is seasonally dependent and largely influenced by upstream water use. Discharge in Kanab Creek monitored at SW-1 typically ranges from 10 cfs or less during the springtime runoff period to 1 cfs or less during the summertime.

Discharge in Lower Robinson Creek drainage is meager. Other than during the springtime runoff event in wet years or during torrential precipitation events, flow has not been observed at monitoring stations SW-4 and SW-101 (Drawing 7-2). Discharge at the lower monitoring site on Lower Robinson Creek (SW-5; Drawing 7-2) is meager. The small discharge occasionally present at SW-5 is derived from the seepage of alluvial groundwater into the Lower Robinson Creek stream channel between monitoring sites SW-101 and SW-5.

Tributaries to the Sink Valley Wash drainage in the Coal Hollow Mine permit and adjacent areas include (from north to south) Water Canyon, an unnamed drainage south

of Water Canyon in Section 21 T39S, R5W, and Swapp Hollow. Discharge rates in these drainages are highly seasonally dependent (UDOGM, 2007; Appendix 7-1). Discharges in the Water Canyon and Swapp Hollow drainages are intermittent or perennial in nature with discharge peaks occurring during the springtime runoff season and much lower flows occurring during the late summer and fall months. Discharge in the unnamed drainage in Section 21 T39S, R5W is ephemeral.

The water quality and discharge characteristics of surface waters in the Coal Hollow Mine permit and adjacent area are presented in UDOGM (2007) and described in Appendix 7-1. The water quality and discharge characteristics of surface waters in the proposed North Private Lease area are described in Appendix 7-16 and Appendix 7-18. Solute compositions of stream waters are also depicted graphically as Stiff diagrams in Appendix 7-1 and Appendix 7-16. The solute compositions of surface waters in the Coal Hollow Mine permit and adjacent area are summarized below. Solute compositions of surface waters in the proposed North Private Lease and adjacent areas are summarized in Appendix 7-16. Information regarding groundwater-surface-water interactions along Kanab Creek in the North Private Lease is presented in Appendix 7-18.

Source	Chemical type	TDS (mg/L)
Robinson Creek/Dry Fork	Calcium-magnesium-bicarbonate	300 mg/L typical
Lower Robinson Creek	Variable, magnesium-sulfate-bicarbonate	300 – 3,500 mg/L typical, dependent on discharge
Swapp Hollow	Calcium-magnesium-bicarbonate	250-350 mg/L typical
Kanab Creek	Magnesium-calcium-bicarbonate-sulfate during high flow, variable during low-flow, variability likely due largely to interaction with Tropic Shale soils and irrigation return flows	500-1,300 mg/L typical, Variable dependent on season and irrigation use
Sink Valley Wash	Magnesium-calcium-bicarbonate	600 -1,500 mg/L typical, variable dependent on discharge

Considerable seasonal variability exists in the solute compositions of stream waters in Kanab Creek in the Coal Hollow Mine permit and adjacent area (UDOGM, 2007; Appendix 7-1). During low-flow conditions, interactions between stream waters and Tropic Shale or Tropic Shale-derived alluvial sediments likely result in increased TDS concentrations. Return flow from irrigated fields and interactions with soils rich in soluble minerals also likely contribute to increased TDS concentrations in the summertime. During the spring runoff season, high surface-water flows that originate from the adjacent upland areas dominate the flow in the channel. The TDS concentrations of Kanab Creek waters during high-flow conditions are thus lower than during the low-flow season. Much less seasonal variability in solute content in surface water flows from the mountain stream in Swapp Hollow (UDOGM, 2007; Appendix 7-1). This condition is likely attributable to the fact that the stream in Swapp Hollow, which originates on geologic formations overlying the Tropic Shale, has considerably less contact with the Tropic Shale than does Kanab Creek. Additionally, there are no known irrigation diversions or returns above the stream monitoring point (SW-8; Drawing 7-2) in Swapp Hollow.

722 CROSS SECTIONS AND MAPS

722.100 A map showing the locations of springs and seeps in the Coal Hollow Mine permit and adjacent area (including the 85.88-acre Dame Lease IBC area) is presented in Drawing 7-1. A map showing the locations of springs and seeps in the North Private Lease area is provided in Appendix 7-16. A map showing potentiometric levels in alluvial groundwater systems in the Coal Hollow and adjacent areas (including the 85.88-acre Dame Lease IBC) is presented in Drawing 7-13. A Map showing potentiometric levels in the North Private Lease area is provided in Appendix 7-16. Additional information from the alluvial groundwater system in the North Private Lease is provided in Appendix 7-18. It is important to note that the alluvial groundwater potentiometric contours depicted in Drawing 7-13 are not representative of a laterally or vertically continuous groundwater system. Within the Coal Hollow Mine permit and adjacent area, appreciable portions of the alluvial sediments are not saturated. Additionally, perched groundwater conditions are present in many locations in the alluvium in the area. In other words, the alluvial groundwater systems in the Coal Hollow Mine permit and adjacent area are not a single, interconnected aquifer. Rather, there exist several areas of saturated alluvium, which may or may not be in good hydraulic communication with adjacent areas. Consequently, it is not possible or meaningful to construct a true potentiometric contour map in the strict sense. Consequently, it is not appropriate to evaluate regional potentiometric trends over large distances or to infer precise groundwater flow directions or hydraulic gradients in the alluvial groundwater system based on Drawing 7-13. The alluvial groundwater system potentiometric map presented in Drawing 7-13 is useful for evaluating approximate local potentiometric conditions and general saturation trends.

722.200 Location of surface water bodies

Within the Coal Hollow Mine permit and adjacent area, no significant natural ponds or lakes occur. The locations of springs and streams are shown in Drawing 7-1. The locations of springs and streams in the North Private Lease area are shown in Appendix 7-16. Many small earthen impoundments and ponds have been created to store surface-water runoff and spring discharge water for stock watering and irrigation use. Some of these impoundments were created by constructing straight or semi-circular berms across ephemeral surface water drainages to impound surface runoff. Because of the character of the alluvial sediments, some of the

ponds have become filled with sediment over time and the holding capacities have diminished. The locations of ponds and associated conveyance ditches are shown on Drawing 7-7.

722.300 Baseline monitoring stations

Baseline monitoring stations are shown on Drawing 7- 2. A map showing the locations of monitoring wells in the Coal Hollow permit and adjacent area is presented in Drawing 7-12 and on Figure 12 of Appendix 7-1. The locations and completion details of monitoring wells in the North Private Lease area are provided in Appendix 7-16 and Appendix 7-18. Drawing-7-12 also shows monitoring stations from which baseline hydrologic data were collected in previous studies. Monitoring station locations, elevations, and other details are presented in Table 7-1 and Appendix 7-16 Appendix 7-18.

722.400 Location of water wells

Water well locations are shown in Drawing 7-2 and Drawing 7-12. Well construction details and locations are presented in Table 7-2. Locations and construction details of water wells in the North Private Lease area are shown in Appendix 7-16 and Appendix 7-18.

Five dewatering wells were drilled in the North Private Lease along the eastern edge (approximately 230' inside of the planned pit disturbance) of the pits in Area 2. Each well was completed with a 4" PVC casing and a 1hp pump capable of pumping up to 20 gpm. The configuration of wells are connected to a 4" poly pipe which discharges to Pond 7. At such time as the dewatering of the pits has been completed, the dewatering wells will be removed with the advancing pits, thus providing a bond for reclamation is not necessary. The location of the dewatering wells can be seen on drawing 7-10.

722.500 Contour map(s) of disturbed area(s)

Surface contours representing the existing land surface configuration of the Coal Hollow permit area (including potentially disturbed areas) are shown on Drawing 5-1 and the post mining land configuration is shown on 5-37. Cross sections with both these landforms are shown on Drawing 5-37A. Surface contours representing the existing land surface configuration of the North Private Lease permit area (including potentially disturbed areas)

are shown on Drawing 5-45 and the post mining land configuration is shown on 5-74. Cross sections with both these landforms are shown on Drawing 5-75. The premining landform, with exception of the Facilities area and Lower Robinson Creek, are from an aerial flight that was limited to a five-foot contour interval. Therefore, contours have been interpolated down to a 2-foot level using the available aerial flight information. This interpolation provides accuracy for the Division to make the necessary determinations. The Facilities area and portions of Lower Robinson Creek are actual survey data to the accuracy of 2-foot contours.

723 SAMPLING AND ANALYSIS

Water quality sampling and analyses have been and will be conducted according to the "Standard Methods for the Examination of Water and Wastewater" or EPA methods listed in 40 CFR Parts 136 and 434. Information regarding laboratory analytical methods utilized in performing water quality analyses at the analytical laboratories has been submitted to the Utah Division of Oil, Gas and Mining, Utah Coal Mining Water Quality Database (UDOGM, 2007).

724 BASELINE INFORMATION

Baseline groundwater, surface-water, geologic, and climatologic data (including information for the 85.88-acre Dame Lease IBC area) are described in Appendix 7-1 and summarized below. Baseline information for the North Private Lease area are provided in Appendix 7-16 and Appendix 7-18.

724.100 Groundwater Information

The location of wells and springs in the Coal Hollow Mine permit and adjacent area (including the 85.88-acre Dame Lease IBC) are shown on Drawings 7-1 (Spring and seep survey map), 7-2 (Baseline monitoring locations), and 7-12 (Monitoring well location map). Groundwater rights in and around the Coal Hollow Mine permit area are shown on Drawing 7-3 and tabulated in Appendix 7-3. Groundwater rights information for the North Private Lease area are provided in Appendix 7-3N and shown on Drawing 7-3N.

Seasonal quality and quantity of groundwater and usage is presented in Appendix 7-1 and UDOGM (2007). Baseline discharge and water quality data have been submitted electronically to the Utah Division of Oil, Gas and Mining, Utah Coal Mining Water Quality (UDOGM, 2007).

Baseline monitoring of groundwater resources in and around the Coal Hollow permit area have been carried out by several entities. Previous hydrologic studies of the region have been made in the Alton Coal Field area by Goode (1964, 1966), Sandberg (1979), Cordova (1981), and Plantz (1983). Selected hydrologic data collected in conjunction with these studies have been incorporated into the hydrologic analysis and baseline data included in this permit application.

During the 1980's, extensive monitoring of groundwater resources in the permit and surrounding areas was performed by Utah International, Inc. Utah International Inc.'s groundwater monitoring activities included the construction of numerous groundwater monitoring wells, aquifer testing activities, and the performance of discharge, water level, and field and laboratory water quality monitoring of springs, seeps, and wells. These baseline monitoring activities were performed as part of a proposed coal mine permitting

action in the Alton Coal Field. Ultimately, the proposed coal mining action did not proceed. Relevant monitoring information from the Utah International, Inc. baseline monitoring activities have been included as supplemental baseline data included in this permit application.

Commencing in the 2nd quarter of 2005, regular quarterly baseline monitoring of groundwater resources has been commissioned by Alton Coal Development, LLC. Baseline monitoring of springs, seeps, and groundwater wells in and around the Coal Hollow Mine permit area have been routinely performed. Data collected in the baseline monitoring activities have been submitted electronically to the Utah Division of Oil, Gas and Mining, Utah Coal Mining Water Quality Database (UDOGM, 2007).

Baseline potentiometric information from wells has been input into the DOGM database. For non-flowing-artesian wells, this information has been input in a depth-to-water-relative-to-the-top-of-the-well-casing format using units of feet. For wells experiencing flowing artesian conditions, the potentiometric data are reported to the database in feet as a height-of-the-potentiometric-surface-above-the-top-of-the-well-casing format expressed as a negative number (which makes the flowing-artesian and non-flowing-artesian potentiometric measurements directly comparable). For both conditions, the reported measurements can be directly converted to an absolute water elevation by subtracting the reported value from the elevation of the top of the well casing.

The potentiometric head in monitoring wells experiencing flowing-artesian conditions is measured either 1) by temporarily extending the height of the well casing and allowing the water level to stabilize and the performing a height of the water column measurement (where the artesian pressure is small), or 2) by using a pressure gauge to measure the shut-in artesian pressure in the well and then converting that number to an equivalent height in feet.

During December 2006 and January 2007 an extensive drilling and monitoring well construction program was implemented. This hydrogeologic program included the installation of 30 groundwater monitoring wells in and adjacent to the Coal Hollow Mine permit area. The focus of the drilling program was to characterize the stratigraphy and hydrogeologic properties of alluvial groundwater systems in and adjacent to mining areas. Aquifer characterization of the alluvial groundwater system was also performed using pump testing and slug testing techniques. Investigative methods utilized and the results of the analysis of the data are described in Appendix 7-1.

Descriptions of alluvial groundwater systems in the mine permit and surrounding areas, including information on quantity and quality of alluvial groundwaters, are presented in Appendix 7-1. Estimated rates of alluvial groundwater inflow into the mine are presented in Table 7-9. Additional information on alluvial groundwater inflows is provided in Section 728.333.

As indicated in the Alluvial Groundwater Management Plan for the Coal Hollow Mine (See Appendix 7-9), the land surface overlying proposed alluvial groundwater interceptor

drains will be contoured to match the existing surrounding topography. Accordingly, alterations of existing surface-water drainage patterns should not occur.

Water monitoring information provided to the Division demonstrates that water levels in shallow alluvial groundwater systems in the Coal Hollow Mine area do respond to seasonal and climatic variability. However, as described in Appendix 7-1, the shallow alluvial sediments in the Coal Hollow Mine area are dominated by silts, clays, and fine-grained sands which generally do not have appreciable hydraulic conductivity. Because of the overall pervasiveness of silts, clays, and fine-grained sands in the alluvial system in the mine permit area, rates of alluvial groundwater migration are generally not rapid (See information provided in Table 7-9). (It should be emphasized that alluvial groundwater flow velocities in the coarser-grained alluvial systems in areas adjacent to proposed mining areas generally to the east and south are known to be appreciably greater). In cross-sectional exposures of saturated alluvial deposits in the up-gradient highwalls at the Coal Hollow Mine, only modest quantities of groundwater discharge have been observed. Although the alluvial sediments are largely saturated, where the saturated alluvial sediments have been exposed, sustained discharges of alluvial groundwater of more than a few gallons per minute are generally not observed. While discharges on the magnitude of a few gallons per minute have been observed in a fluvial channel system intercepted by the mine (which deposits contained sands, silts, and gravels), the much more pervasive fine-grained alluvial sediments where exposed were observed to weep only very minor, un-measurable quantities of water through the highwall. During a site visit on June 2, 2011, Petersen Hydrologic (2011) estimated that the total flow from the 600-foot-long exposure of clayey, silty alluvium in the mine highwall was less than 1 gpm. The total discharge from the exposed fluvial channel system was measured at 5.5 gpm. The total flow from a recently constructed, 870-foot-long up-gradient alluvial groundwater intercept trench was only 13.4 gpm. What this demonstrates is that, while the alluvial sediments adjacent to the mine openings are largely saturated, the presence of low permeability sediments in the alluvium limits the potential for the alluvial groundwaters to rapidly flow into the mine pit areas.

It should be emphasized here, however, that although highly permeable, saturated, coarse-grained alluvial sediments have not been intersected at the Coal Hollow Mine to date, the potential for intercepting such sediments is always present in heterogeneous mountain-front alluvial deposits. Appreciably greater inflow volumes are possible from such sediments were they to be encountered unexpectedly at the Coal Hollow Mine.

The overall low hydraulic conductivity of most of the alluvial sediments in proposed mining areas generally precludes the effective dewatering of saturated alluvial deposits adjacent to proposed mining areas through the use of vertical dewatering wells. For this reason, as described in the proposed alluvial groundwater management plan for the Coal Hollow Mine, horizontal drain systems (with large, long horizontal “screened” intervals in targeted strata to collect intercepted alluvial groundwater) are proposed for use in dewatering the alluvial sediments adjacent to proposed mining areas.

724.200 Surface Water Information

The locations of streams, stock watering ponds, and conveyance ditches in the Coal Hollow Mine permit and adjacent area (including the 85.88-acre Dame Lease IBC area) are shown on Drawing 7-7. Surface-water information for the North Private Lease area are provided in Appendix 7-16 and additionally in Appendix 7-18. Surface-water rights in and adjacent to the Coal Hollow Mine permit area are shown on Drawing 7-3 and tabulated in Appendix 7-3. Surface-water rights information for the North Private Lease area are provided in Appendix 7-3N and shown on Drawing 7-3N. Surface-water discharge rates and water quality data have been submitted electronically to the Utah Division of Oil, Gas and Mining, Utah Coal Mining Water Quality Database (UDOGM, 2007). Additional surface-water information is provided in Appendix 7-1.

It is not anticipated currently that discharge from the Coal Hollow Mine will be necessary. Where necessary, alluvial groundwater that may be intercepted by mining will be placed in drains and diverted away from disturbed areas and discharged (i.e., as groundwater dewatering). However, a Utah UPDES discharge permit will be obtained so that if discharge of mine water becomes necessary, it can be discharged in accordance with the UPDES discharge permit. The exact locations of mine water discharge points will be established upon issuance of the UPDES discharge permit. Any mine discharge water will be placed in either the Lower Robinson Creek drainage or the Sink Valley Wash drainage. Both of these drainages are tributary to Kanab Creek.

As described in R645-301-728.320, acid drainage is not expected from the proposed mining operation (including the proposed operations in the North Private Lease area). This is due to the pervasiveness of carbonate minerals in the mine environment that will neutralize any acid produced.

Seasonal quality and quantity of groundwater and usage is described herein and in Appendix 7-1, Appendix 7-16 and Appendix 7-18. Baseline discharge and water quality data have been submitted electronically to the Utah Division of Oil, Gas and Mining, Utah Coal Mining Water Quality (UDOGM, 2007).

Baseline monitoring of surface-water resources in and around the Coal Hollow permit area have been carried out by several entities. Previous hydrologic studies of the have been made in the Alton Coal Field area by Goode (1964, 1966), Sandberg (1979), Cordova (1981), and Plantz (1983). Selected hydrologic data collected in conjunction with these studies have been incorporated into the baseline data as part of this permit application.

During the 1980's, extensive monitoring of surface water resources in the permit and surrounding areas was performed by Utah International, Inc. Utah International Inc.'s surface-monitoring activities included the operation of continuous recording stations on selected streams, and the performance of routine surface-water discharge measurements and field and laboratory water quality analyses. These baseline monitoring activities were performed as part of a proposed coal mine permitting action in the Alton Coal Field.

Ultimately, the proposed coal mining action did not proceed. Relevant monitoring information from the Utah International, Inc. baseline monitoring activities have been included as supplemental baseline data as part of this permit application. Commencing in the 2nd quarter of 2005, regular quarterly baseline monitoring of surface-water resources has been commissioned by Alton Coal Development, LLC. Baseline monitoring of surface-waters in and around the Coal Hollow permit area, including surface-water discharge measurements and field and laboratory water quality analyses, have been routinely performed.

All surface waters in the Coal Hollow Mine permit (including the proposed North Private Lease area) and adjacent area are tributary to the Kanab Creek drainage. Surface-water monitoring stations from which baseline data have been collected are shown on Drawing 7-2 and include the following:

Sink Valley Wash drainage

SW-8 (Swapp Hollow above proposed mining areas), SW-7 (unnamed drainage in Section 21, T39S, R5W), RID-1 (irrigation diversion of water from Water Canyon drainage above proposed mining areas), SW-6 (headwaters of unnamed tributary to lower Sink Valley Wash), SW-9 (Sink Valley Wash below proposed mining areas), SW-10 (unnamed tributary to Sink Valley Wash approximately 1.7 miles south of proposed mining areas), SVWOBS-1 (Sink Valley Wash above proposed mining areas, and SVWOBS-2 (Sink Valley Wash east of proposed mining areas).

Lower Robinson Creek drainage

SW-4 (Robinson Creek above proposed mining areas), SW-101 (Lower Robinson Creek near proposed mining areas), BLM-1 (Lower Robinson Creek adjacent to proposed mining areas) and SW-5 (Lower Robinson Creek below proposed mining areas).

Kanab Creek drainage

SW-1 (Kanab Creek near Alton, Utah; above proposed mining areas), SW-3 (Kanab Creek above proposed mining areas), and SW-2 (Kanab Creek below Lower Robinson Creek and below proposed mining areas). Additionally, baseline hydrologic data from Lamb Canal, which is an irrigation ditch that conveys water from a diversion in Kanab Creek to irrigated lands adjacent to Kanab Creek west of proposed mining areas, is also collected.

724.300 Geologic Information

Geologic information in sufficient detail to determine the probable hydrologic consequences of mining and determine whether reclamation as required by R645 can be accomplished is given in Chapter 6 of this permit application package and in Appendix 7-1, Appendix 7-16 and Appendix 7-18.

724.400 Climatological Information

Climatological information, including temperature and precipitation data, have been routinely measured and recorded at the Alton, Utah weather station (420086) since 1928. The station is located in the town of Alton, approximately two miles north of the Coal Hollow Mine permit area. Climatological data collected at the Alton station for the 77-year period from 1928 to 2005 are summarized in Table 7-3. Climatological data from the Coal Hollow Mine permit and adjacent area are plotted in Drawing 7-8.

An automated weather station was installed in the Coal Hollow Mine permit area in December 2005. The station is configured to continuously monitor and record temperature, wind velocity, and wind direction data. The station is also configured to continuously measure and record precipitation, although the tipping rain-gauge is not operative during winter months. Climate data from the Coal Hollow Mine and adjacent area are also presented in Appendix 7-6.

724.411 Seasonal precipitation

Precipitation data from the Alton, Utah weather station indicates average annual precipitation of 16.38 inches per year. Doelling (1972) reports average annual precipitation in the Alton Coal Field area ranging from 9 to 20 inches annually with slightly higher increments likely in the higher parts of the plateau (Doelling, 1972). There are generally two annual wet periods in the region. During the wintertime, cyclonic storms bring precipitation (mainly snowfall) to the region. During the summertime, storms originating from convection of air from the Gulf of Mexico or the Pacific Ocean bring rains to the region. Of the two annual wet cycles, the summer rainfall is most reliable. Average monthly precipitation at the Alton station ranges from a low of 0.57 inches in June to a maximum of 1.80 inches in February. Daily temperature and precipitation data recorded at the Coal Hollow Project weather station during 2006 and early 2007 are presented in Appendix 7-6.

The Palmer Hydrologic Drought Index (PHDI; NCDC, 1997) indicates long-term climatic trends for the region. The PHDI is a monthly value generated by the National Climatic Data Center (NCDC) that indicates the severity of a wet or dry spell. The PHDI is computed from climatic and hydrologic parameters such as temperature, precipitation, evapotranspiration, soil water recharge, soil water loss, and runoff. Because the PHDI takes into account parameters that affect the balance between moisture supply and moisture demand, the index is a useful for evaluating the long-term relationship between climate and groundwater recharge and discharge. A plot of the PHDI for Utah Region 4 (which includes the Coal Hollow Mine permit and surrounding area) is shown in Drawing 7-9. It is apparent in Drawing 7-9 that the region has experienced cyclical periods of drought and wetness since 1980. Baseline hydrologic monitoring performed by Utah International, Inc in 1987 and 1988 occurred during a period of near normal wetness. Recent baseline hydrologic monitoring conducted in 2005 and 2006 occurred during a period of moderate to severe wetness, with 2005 being wetter than 2006.

724.412 Wind direction and velocity

Wind data have been collected at the Coal Hollow Project weather station since December 2005. Monthly wind data from the Coal Hollow Project weather station are available from January 2006 through March 2006, and from November 2006 through May 2007. Monthly wind data are plotted as wind rose diagrams, which depict the average direction and velocity of prevailing winds, in Appendix 7-1. Based on recent data from the Coal Hollow Project weather station, it is apparent that the predominant wind direction in the Coal Hollow Mine permit area (during the months for which data are available) are from the northeast, with secondary peaks from the north and south-southwest (Appendix 7-6). Surface winds recorded at the Coal Hollow Project weather station averaged about 6.4 miles per hour. Tabulated hourly wind data from the Coal Hollow Project weather station are maintained on file at Alton Coal Development, LLC.

Wind data have also been collected historically at nearby locations by governmental and other entities. The regionally predominant direction of winds in the region is southwest through west. Secondary peaks are from southeast and northwest. Surface winds in the area average approximately 8 miles per hour. Higher wind speeds are associated with fronts and storms and generally occur during the springtime.

724.413 Seasonal temperature ranges

Temperature data from the region are summarized in Table 7-3. Temperatures in the permit area vary greatly. Temperature data from the Alton station (1928-2005) indicate that monthly average low temperatures are below freezing for the 6-month period from November to April. Monthly average minimum temperatures range from a low of 15.1 °F during January to a high of 49.8 °F in July. Monthly average maximum temperatures range from a low of 39.5 °F in January to a high of 82.6 °F in July. Daily maximum and minimum temperature data collected at the Coal Hollow Project weather station during 2006 through August 2015 are presented in Appendix 7-6. The maximum temperature recorded during this period was 94.1 °F in June 2013. The minimum temperature recorded during this period was -8.4 °F in January 2011.

724.500 Supplemental Information

Other than the possible short-term diminution in discharge rates from alluvial groundwater systems, including the potential short-term diminution of discharge rates from some springs and seeps in Sink Valley, adverse impacts to the hydrologic balance, either on or off the permit area are not expected to occur. Significant adverse impacts to the hydrologic balance in the North Private Lease are likewise not anticipated, although one seep that discharges at less than 1 gpm is planned to be intercepted by the mine workings. It is not anticipated that acid- and toxic-forming materials will cause significant contamination of groundwater or surface-water supplies in either the existing mine area or at the proposed North Private Lease. Any discharges of mine waters to surface-water systems will be regulated under and meet the criteria of a UPDES discharge permit. The mining and reclamation plan for the existing mine area and the

proposed North Private Lease has been designed to minimize the potential for disturbance or disruption of the hydrologic balance and to protect groundwater and surface-water resources in the area.

If substantial alluvial groundwater inflows into mining areas occur as mining progresses in close proximity to alluvial springs and seeps in the eastern ¼ of Section 30, T39S, R5W and the northwest ¼ of Section 29, T39S, R5W or in close proximity to coarse-grained alluvial sediments in the artesian groundwater system along the eastern side of Sink Valley, Alton Coal Development, LLC will evaluate hydrogeologic conditions at the time such may occur. It should be noted that very large discharges into mine workings are not anticipated based on the results of recent drilling and aquifer testing performed in these areas (see Appendix 7-1). Based on the hydrogeologic conditions encountered, where necessary Alton Coal Development, LLC will use a suitable technique to minimize groundwater inflow rates into the mine, which may include the use of bentonite or natural clay filled cutoff walls or other means where appropriate to protect groundwater resources up-gradient of mining activities. The potential for success of such protective measures in minimizing drainage of alluvial deposits up-gradient of proposed mining areas is believed to be good, given that the thickness of the alluvium in these areas is generally on the order of about 20 to 50 feet and these sediments are directly underlain by essentially impermeable Tropic Shale in proposed mining areas. It is important to note that while temporary impacts to groundwater discharge rates from alluvial springs and seeps could possibly occur, these impacts will likely be short-lived. This conclusion is based on the fact that individual mine pits in most instances will remain open for no more than about 60 to 120 days (measured from the time the mining of the pit is completed to the time the pit is backfilled). The variability in the time individual pits remain open is related to the thickness of overburden at the pit and the state of the overall spoil balance. It should be noted that these times could be somewhat greater if the mining production rate is less than the currently anticipated rate (in the event that contracts for the full 2 million tons of coal per year are not in place). However, the backfilling and rough grading requirements of R645-301.553 will be met (except where a variance to this regulation has been requested to assist with the transition to the adjacent federal coal reserves in the south pits area). After mine pits are backfilled and reclaimed, the potential for appreciable continued drainage of up-gradient alluvial groundwater through the backfilled pits in that area is low. When mining is complete in an area, seasonal recharge to alluvial groundwater systems will gradually replenish groundwater to the alluvial groundwater system. Large-scale dewatering of the alluvial groundwater system, such that appreciable compaction of the aquifer skeleton could occur, is not anticipated (see Appendix 7-1).

If diminution of discharge rates from seeps and springs does occur as a consequence of mining and reclamation activities in either the existing mining area or the proposed North Private Lease, any lost water will be replaced according to all applicable Utah State laws and regulations using the water replacement source specified in R645-301-727. The quantity and quality of replacement water detailed in R645-301-727 will be suitable for the existing premining uses and approved postmining land uses.

It should be noted that the Coal Hollow Mine plan calls for the temporary diversion of a reach of the Lower Robinson Creek stream channel approximately 2,000 feet in length in the southeast ¼ of Section 19, T39S, R5W. Details of the proposed diversion are given in Chapter 5, Section 527.220 of this MRP. If this action results in diminution of groundwater or surface-water resources, where required a suitable mitigation for this potential impact will be designed and implemented in consultation with the Division of Oil, Gas and Mining.

If excess groundwater were to be encountered during mining operations in the existing permit area or in the proposed North Private Lease such that it could not be adequately managed or discharged in compliance with the Utah UPDES discharge permit (which is considered unlikely), Alton Coal Development, LLC may when necessary and with the approval of the Utah Division of Oil, Gas and Mining construct supplemental containment and settlement ponds in which mine discharge waters may be held for treatment (where necessary) and subsequent discharge through UPDES discharge points in compliance with the UPDES discharge permit.

Mining in the Coal Hollow project area will be a combination of surface mining, either open pit or highwall mining, and underground mining. Both the highwall mining and underground mining are designed such that subsidence is not expected to occur or have a negative impact on renewable resources lands.

724.700 Alluvial Valley Floor Determination

A field investigation has been performed in the Coal Hollow Mine permit and adjacent area to provide to the Division the information required to make an evaluation regarding the existence of a probable alluvial valley floor in the Coal Hollow Mine permit and adjacent area. The results of this field investigation and related information is provided in Appendix 7-1. Additional information regarding potential alluvial valley floors in the area is provided in Appendix 7-7.

A report detailing the findings of a previous field investigation performed by Water Engineering & Technology, Inc., entitled “Geomorphological and sedimentological characteristics of Sink Valley, Kane County, Utah” is included as Appendix 7-4.

A field investigation has been performed in the North Private Lease Area and adjacent area to provide to the Division the information required to make an evaluation regarding the existence of a probable alluvial valley floor in the North Private Lease permit and adjacent area. The results of this field investigation and related information is provided in Appendix 7-17.

725 BASELINE CUMULATIVE IMPACT AREA INFORMATION

Appendix 7-1 contains the results of a comprehensive investigation of groundwater and surface-water systems in the Coal Hollow Mine permit and adjacent area (including the 85.88-acre Dame Lease IBC area and the proposed North Private Lease area). Appendix

7-1 also includes information regarding the probable hydrologic consequences of coal mining in the Coal Hollow Mine permit area and recommendations for hydrologic monitoring. Appendix 7-1 also includes the results of a field investigation performed in the Coal Hollow Mine permit and adjacent area to provide to the Division of Oil, Gas and Mining the information required to make an evaluation regarding the existence of a probable alluvial valley floor in the Coal Hollow Mine permit and adjacent area. This Information together with the information submitted herein can be used to assess the probable cumulative hydrologic impacts of coal mining and reclamation operations in the Coal Hollow Mine permit and adjacent area (including the 85.88-acre Dame Lease IBC area) as required by R645-301-729. The results of a field investigation regarding potential alluvial valley floors in the proposed North Private Lease area was previously provided to the Division and is included in the MRP as Appendix 7-17. The AVF report includes baseline information for the North Private Lease area including groundwater and surface-water quality information. The report also includes geologic information including maps of geology and geomorphology of the North Private Lease and Adjacent area.

Information on groundwater and surface-water systems in the North Private Lease area at the North Private Lease area is provided in Appendix 7-16 (Petersen Hydrologic, 2015) and Appendix 7-18. Appendix 7-16 includes a map showing hydrologic baseline monitoring locations as well as a map showing spring and seep locations in the North Private Lease and adjacent areas. A plot of the Palmer Hydrologic Drought Index and a geologic map of the North Private Lease and adjacent area are provided in Appendix 7-16. Appendix 7-16 also provides a series of hydrogeologic cross-sections through the North Private Lease and adjacent area that show water levels under seasonal conditions. Discharge hydrographs for springs and streams and water level hydrographs for wells are provided in Appendix 7-16. Baseline water quantity and water quality data for springs, streams, and wells in the North Private Lease and surrounding areas are tabulated in Appendix 7-16. A map showing Stiff diagrams that depict solute geochemical compositions for groundwaters and surface waters in the North Private Lease and surrounding areas is provided in Appendix 7-16. A map showing the locations of ponds and ditches is also provided. Plots of TDS concentrations in Kanab Creek during high flow and low flow conditions are provided in Appendix 7-16, as is a graph of discharge rates plotted versus TDS in the creek. A water table map is also provided in Appendix 7-16. Monitoring well details for wells in the North Private Lease area are also provided in Appendix 7-16. A map showing the proposed hydrologic monitoring locations associated with the North Private Lease area is also provided in Appendix 7-16. The results of a comprehensive drilling and well installation program in the alluvial groundwater system in the North Private Lease during 2016 is presented in Appendix 7-18. Monitoring well completion data and geologic borehole logs for North Private Lease alluvial monitoring wells is provided in Appendix 7-18. Water-quality data from the alluvial monitoring wells are also provided in Appendix 7-18. Appendix 7-18 also includes the results of an aquifer pumping test in the North Private Lease area. Time drawdown plots and tabulated drawdown data for monitored wells from the pumping test are provided in Appendix 7-18. An analytical modeling simulation in the alluvial groundwater system in the North Private Lease was performed to project likely groundwater drawdowns

associated with the proposed mining activities in the North Private Lease. The results of these simulations are provided in Appendix 7-18.

A Petersen Hydrologic, LLC report of an investigation of groundwater flow rates in alluvial groundwater systems near the southern permit boundary of the North Private Lease is provided as Appendix 7-19. That investigation incorporated the results of an alluvial groundwater well drilling and well construction program, routine monitoring of alluvial groundwater levels in monitoring wells, and the results of a May 2017 aquifer pumping test conducted in the alluvial groundwater sediment near the southern boundary of the North Private Lease. It was calculated in the Petersen Hydrologic report that, based on an analysis of the available information, the subsurface flow of alluvial groundwater exiting the North Private Lease area beneath the 160-foot wide Kanab Creek stream channel is likely on the order of 5 gallons per minute. The discharge measured in Kanab Creek at monitoring station Kanab Creek @ C.R. at the time of the May 2017 aquifer pumping test was 330 gpm. Thus the total volume of surface-water and groundwater outflow from the area was calculated to be about 335 gpm based on the calculations presented in the Petersen Hydrologic report (Appendix 7-19). From these calculations, it is apparent that the amount of alluvial groundwater subsurface outflow at the time the testing was performed is small relative to the total surface-water outflow (less than 2%). Under low-flow conditions, the alluvial underflow might constitute a more substantial portion of the total surface-water and groundwater outflow from the valley.

The surface-water discharge rates measured at station Kanab Creek @ C.R. and SW-3 on 9 May 2017 were 330 gpm and 316 gpm, respectively. The lack of an appreciable gain in flow between monitoring station Kanab Creek @ C.R. and the down-stream monitoring station SW-3 (Appendix 7-19) supports the conclusion that there was not a large flux of groundwater flowing beneath the stream channel at that time (i.e. no significant quantity of alluvial groundwater upwelled to the surface in the stream drainage for a distance of at least 0.5 miles downstream of the North Private Lease boundary). Rather, the flow at SW-3 was slightly lower (but within the anticipated margin of measurement error) than that measured at Kanab Creek @ C.R. (330).

R645-301-726 Modeling

No numerical models have been created for the permit area. Analytical modeling of alluvial groundwater systems in the North Private Lease area was performed. Details of this modeling activity are presented in Appendix 7-18.

The analytical groundwater model will be updated every mid-term. The model update will consider the water levels in backfilled mine pits and the surrounding undisturbed alluvial aquifer to the extent that such information is available. Where such information is not available, reasonable projections will be made. Where feasible, it will also calculate the groundwater recharge rate of backfilled sediments and the surrounding alluvial aquifer. From these activities, in conjunction with all available data, updated

estimates of the time it will take for the alluvial aquifer to reach pre-mining aquifer characteristics of water table elevation and recharge/discharge rates will be made.

727 ALTERNATIVE WATER SOURCE INFORMATION

This section provides information on the alternative water source that will be used to replace water from groundwaters or surface waters should they be impacted by mining and reclamation activities in the Coal Hollow Mine permit and adjacent area (including the 85.88-acre Dame Lease IBC area and the North Private Lease area).

The alternative water source is a water production well that was constructed on private land leased by Alton Coal Development, LLC in the northwest quarter of Section 29, Township 39 South, Range 5 West. The location for the well, which is situated within the Coal Hollow Mine permit area, is shown on Drawing 5-8C. The well produces water from the alluvial groundwater system in Sink Valley in locations up-gradient of proposed mining operations. Based on aquifer testing performed in the alluvial groundwater system near the proposed water well (using the existing well Y-61 as a pump testing well), it is believed that adequate water can be produced from the new well to satisfy the potential water replacement needs of the mine. Details of the aquifer testing and information on the hydrogeologic characteristics of the Sink Valley alluvial groundwater system are presented in Appendix 7-1.

Water quality data from the Sink Valley alluvial groundwater system near the location of the new water well have been collected from well Y-102 and have been submitted electronically to the Utah Division of Oil, Gas and Mining Utah Coal Mining Water Quality Database (UDOGM, 2007). The quantity and quality of water produced from the new water production well has been suitable for the existing premining uses and approved postmining land uses. Well testing performed on the new water well indicated a yield of 150 gpm (see well driller's report for well ID 434305 and water right 85-774 on file at the Utah Division of Water Rights and at waterrights.utah.gov).

It should be noted that the water replacement well source produces water from the coarse-grained alluvial groundwater system in Sink Valley. Nearby springs that could potentially be impacted by mining and reclamation activities are supported by the same alluvial groundwater system. However, while modest decreases in the artesian hydraulic pressures in the alluvial groundwater system could potentially result in diminution of spring flows, the planned new water well will likely be approximately 100 feet deep and will be equipped with an electric well pump giving it the capacity to produce groundwater from the alluvial system even if the hydraulic head in the area were to be diminished such that artesian flow conditions temporarily ceased to exist.

An analysis of the total average discharge of state appropriated groundwaters from the permit and adjacent area has been performed to determine whether the quantity of water

that could likely be produced from the new water replacement well will be adequate for potential replacement needs. Based on baseline spring discharge data submitted to the Division (UDOGM, 2007), it is determined that the average discharge of all state appropriated groundwater from groundwater discharge area A (Drawing 7-3, Drawing 7-4) is approximately 35 gpm. The state appropriated waters in groundwater discharge Area A include most of the significant springs in the area and essentially all of the largest springs in the area (Drawing 7-3; Appendix 7-3). The average discharge of all state appropriated groundwater from groundwater discharge area B (Drawing 7-4) is approximately 17 gpm. Using an unlikely worst-case scenario and assuming that all springs with state appropriated waters in both Areas A and B were to cease flowing, a total replacement of approximately 52 gpm would be required. The proposed new water well located in Section 29, Township 39 South, Range 5 West will be designed to produce water at that quantity and, therefore, should be able to provide adequate replacement water in even this worst-case scenario (which is not considered likely). Aquifer analysis described in Appendix 7-1 suggests that the yield of the alluvial groundwater system in which the new water well will be constructed should be capable of sustaining discharges of the required magnitude and for the lengths of time that the need for replacement water would be likely. It should be noted that if the need arises to provide replacement water for impacted state appropriated waters, the duration of the need will likely be of a relatively short duration (see Section 728 below).

Alton Coal Development, LLC has entered into a written agreement with the town of Alton, Utah to transfer the point of diversion for 50 acre-feet of water for use at the Coal Hollow Mine. A copy of this agreement is included in Appendix 7-8 (in confidential binder). This water available for all uses at the mine including potential use for water replacement. The new water well has been constructed on lands currently leased by Alton Coal Development, LLC. Consequently, no new landowner access agreement will be required for the drilling of the well.

728 PROBABLE HYDROLOGIC CONSEQUENCES (PHC) DETERMINATION

This section describes the probable hydrologic consequences of surface coal mining in the Coal Hollow Mine permit area. This determination is based on data presented herein and on information provided in Appendix 7-1. The probable hydrologic consequences associated with proposed highwall mining activities within the 85.88-acre Dame Lease IBC area are presented in Appendix 7-4. The probable hydrologic consequences associated with the proposed underground mining activities at the Coal Hollow Mine are presented in Appendix 7-15. The probable hydrologic consequences of proposed coal mining and reclamation activities in the North Private Lease area are presented in Appendix 7-16 and further characterization and analysis of the alluvial groundwater systems in the North Private Lease are shown in Appendix 7-18. This mining and reclamation plan has been designed to minimize potential adverse impacts to the hydrologic balance. Information regarding pre- and post-mining potentiometric levels and groundwater flow conditions, including the potential for impacts to surrounding groundwater systems, is provided in Appendix 7-20. It should be noted that this PHC and also Appendix 7-1 may be updated periodically as required as additional hydrogeologic information and mining data become available in the future.

728.310 Potential adverse impacts to the hydrologic balance

Other than the possible short-term diminution in discharge rates from alluvial groundwater systems, including the potential short-term diminution of discharge rates from some springs and seeps in Sink Valley, appreciable adverse impacts to the hydrologic balance, either on or off the permit area are not expected to occur. The basis for this determination is discussed below.

As discussed in Section 721 above, minimal groundwater resources exist in the Tropic Shale, which directly overlies the coal reserves in proposed mining areas. Groundwater in the Tropic Shale does not provide measurable baseflow discharge to streams in the area. The lack of appreciable groundwater flow in the Tropic Shale is a result of the poor water transmitting properties of the marine shale unit. Consequently, it is anticipated that little groundwater will be encountered in the Tropic Shale in mining areas. Thus, the potential for adverse impacts to the hydrologic balance resulting from mining through the Tropic Shale in the Coal Hollow Mine permit area is minimal.

Similarly, as described in Section 722 above, groundwater resources in the Dakota Formation underlying the coal seam to be mined are not appreciable. This condition is fundamentally a result of the heterogeneity of the rock strata in the Dakota Formation which impedes the ability of the formation to transmit groundwaters significant distances vertically or horizontally. The presence of the essentially impermeable Tropic Shale on top of the Dakota Formation also minimizes the potential for vertical recharge to the Dakota Formation. Mining operations will remove the overlying Tropic Shale rock strata from the Dakota Formation in addition to the Smirl coal seam deposit at the top of the Dakota Formation in mined areas. However, because the pre-mining hydraulic

communication between the Tropic Shale and the underlying Dakota Formation in planned mining areas is believed to be minimal, the removal of the Tropic Shale overburden and Smirl coal seam from the Dakota Formation, followed by the rapid backfilling of pit areas with low-permeability fill materials should not result in adverse impacts to the hydrologic balance in the Dakota Formation (i.e., the post-mining degree of hydraulic communication between the Dakota Formation and the overlying low-permeability backfill material will be similar to that of the pre-mined condition).

It should be noted that the first water-bearing strata underlying the coal seam to be mined in the Coal Hollow Mine permit area from which appreciable quantities of groundwater can be produced is the Navajo Sandstone. The Navajo Sandstone aquifer is of regional significance in that it provides groundwater of good quality to domestic, agricultural, and municipal wells regionally and provides baseflow to springs and streams. The Navajo Sandstone does not crop out in the Coal Hollow Mine permit and adjacent area. The formation is effectively isolated from proposed mining areas by more than 1,000 feet of rock strata of the Dakota and Carmel Formations (which includes large thicknesses of low-permeability shales and siltstones). The Navajo Sandstone aquifer will not be impacted by proposed mining operations. It should be noted that some previously proposed mining operations in the Alton Coal Field have proposed drilling and pumping of large amounts of groundwater from high-capacity production wells in the Navajo Sandstone aquifer for operational use. No such wells are planned in the Coal Hollow Mine permit and adjacent area.

Of primary importance to the hydrologic balance in the Coal Hollow Mine permit and adjacent area are alluvial groundwater systems. As discussed in Section 722 and in Appendix 7-1, alluvial groundwater systems in the area support springs, seeps, diffuse groundwater discharge, and a limited number of wells. The bulk of the alluvial groundwater flux through the area occurs in alluvial sediments that include coarse-grained and finer-grained sediments near the eastern margins of Sink Valley, east of the Coal Hollow Mine permit area. Lesser quantities of alluvial groundwater migrate through finer-grained alluvial sediments (predominantly clays, silts, and sands) in the western portions of Sink Valley and in the Lower Robinson Creek drainage within the Coal Hollow Mine permit area. Discharges from alluvial groundwater systems in Sink Valley do not contribute measurable quantities of baseflow to streams (at least at the surface in the stream channel). Alluvial groundwater systems in the Lower Robinson Creek area are much less extensive than the alluvial groundwater systems in Sink Valley. Other than the emergence of small quantities of alluvial groundwater from the stream banks where the stream channel intersects the alluvial groundwater system, discharge from the alluvial groundwater system as springs or seeps in Lower Robinson Creek is generally not observed. Perched groundwater conditions exist locally in the alluvial groundwater system in the Lower Robinson Creek drainage.

In the general sense, surface coal mining activities in the Coal Hollow Mine permit area have the potential to impact groundwater systems primarily through three mechanisms:

1) Where water-bearing strata in proposed mining areas are mined through, groundwater systems within these strata will obviously be directly intercepted,
2) Where groundwater flow paths through mine openings are interrupted, groundwater flow in down-gradient areas could be diminished, and
3) Where mine openings intercept permeable strata, groundwater resources in up-gradient areas could potentially be diminished if appreciable quantities of groundwater were to be drained from up-gradient areas.

The potential for the occurrence of each of these potential impacts are described in the following.

Direct Interception of Groundwater Resources

As discussed above, groundwater resources in the relatively impermeable Tropic Shale in the proposed permit area are meager. Consequently, it is improbable that direct interception of appreciable groundwater in the Tropic Shale will occur. Additionally, because Tropic Shale groundwater systems generally do not support discharges to springs or provide baseflow to streams, the potential interception of limited quantities of groundwater in the Tropic Shale will not adversely impact the hydrologic balance. Similarly, groundwater resources in the Dakota Formation (including within the Smirl coal seam) are meager. While the Smirl coal seam will be extracted through mining operations, the underlying strata of the Dakota Formation will not be disturbed. Consequently, adverse impacts to groundwater systems in the Dakota Formation through direct interception of groundwater resources are not anticipated.

Alluvial groundwater systems in planned mining areas in the Coal Hollow Mine permit area will be directly intercepted by the mine openings. It is not anticipated that the direct interception of shallow alluvial groundwater will adversely impact the overall hydrologic balance in the region. This is because no substantial springs, seeps or other important groundwater resources have been identified in proposed mine pit areas (Drawing 7-1). In the pre-mining condition, any diffuse groundwater discharge to the ground surface that occurs is primarily lost to evapotranspiration and does not contribute appreciably to the overall hydrologic balance in the area.

Because of the prevailing low-permeabilities of the alluvial sediments within the proposed mine disturbance area, it is unlikely that the direct mining of the alluvial groundwater system within these areas could cause impacts to subirrigation and soil moisture contents in up-gradient areas.

It is considered likely that the average hydraulic conductivity of the placed run-of-mine backfill material will be low. This is because of the pervasiveness of low-permeability, clay-rich materials in the mine overburden and the anisotropic nature of the placed fill material. Consequently, the potential for the migration of appreciable quantities of groundwater through the fill is considered low. Accordingly, the potential for impacts to subirrigation and soil moisture in the lands up-gradient of mining areas will be minimized by the placement of the low-permeability backfill.

An engineered low-permeability barrier previously planned for the eastern edge of pit 15 will no longer be necessary and will not be constructed. The original purpose of the proposed engineered barrier was to minimize the potential for long-term impacts to the alluvial groundwater system in Sink Valley up-gradient of mining areas that could occur as a result of the long-term draining of alluvial groundwater into the pit backfill area. Because surface (pit) mining in those areas adjacent to the Sink Valley alluvial groundwater systems (pits13, 14, and 15) is no longer planned, such a barrier will not be necessary.

The potential for short-term impacts to subirrigation and soil moisture in the lands up-gradient of proposed mining areas will be minimized through the implementation of the hydrology resource contingency plan described in Appendix 7-9.

As has been the case generally at previous mining areas at the Coal Hollow Mine, it is anticipated that within the North Private Lease mining areas, that hydraulic conductivity of the placed run-of-mine backfill material will likely be low. This is because of the pervasiveness of low-permeability, clay-rich materials in the mine overburden in the North Private Lease and the nature of the mixed, anisotropic nature of placed backfill material.

As was the case during mining operations at the existing Coal Hollow Mine (south) area, mining in the North Private Lease will include excavating and handling overburden consisting of Tropic Shale bedrock and unconsolidated sediments consisting of clays, silts, sands, and gravels in varying proportions. A mixture of these materials will comprise the material backfilled into the completed surface mining pits. It is anticipated that the composition of the backfill vary from location to location depending on the character of the materials being excavated at active mining areas at the time that the backfilling of the completed mining pits occurs.

Predicted mine pit backfill final aquifer hydraulic properties

In the absence of specific information on the hydrologic properties of future mine pit backfills (i.e. because the backfilled pits do not currently exist), it is difficult to make definitive determinations about what the final hydraulic properties of the placed backfill will be. However, using published ranges of values for various types of rocks and sediments, it is possible to estimate hydraulic conductivity of materials that are anticipated to comprise the material used to backfill mine pits at the North Private Lease area. Based on the pervasiveness of silty and clayey materials in the lease area, and the likelihood that the run-of-mine backfill will contain appreciable quantities of these fine-grained materials, it is anticipated that hydraulic conductivities of the mixed backfill may fall in the lower range of silty sand or the range of silt, which is on the order of perhaps 10^{-5} to 10^{-6} cm/sec (Freeze and Cherry, 1979).

A sample of Tropic Shale bedrock was collected from the Coal Hollow Mine for laboratory testing of hydraulic conductivity. A drilling core consisting of unweathered Tropic Shale was analyzed at the laboratory to determine its hydraulic conductivity. The core sample was remolded and compacted at the laboratory prior to the analysis. The

measured hydraulic conductivity of this sample was 8.24×10^{-8} cm per second. This value of hydraulic conductivity likely represents a lower limit to the projected range of hydraulic conductivity for the backfill material (i.e. this could be similar to the hydraulic conductivity of the backfill if it were to be composed entirely of soft Tropic Shale bedrock that became tightly compacted within the backfill – which is considered to be an unlikely occurrence.

It is anticipated that groundwater that may potentially become present within the placed backfill will occur under unconfined or semi-confined conditions. This is because in order for the backfill sediments to become saturated, downward vertical groundwater flow (recharge) of the sediments would need to occur (i.e.

Time to saturate backfilled pit areas

In the absence of specific information on the hydrologic properties of future mine pit backfills (i.e. because the backfilled pits do not currently exist), it is difficult to make definitive determinations of the time it will take for the placed backfill in reclaimed mine pits to become water saturated. However, information useful in making as a first order approximation is presented below.

The rate at which the backfilled mine pits will become saturated is related to the amount of recharge water available, the hydraulic conductivity of the backfill sediments, and the effective porosity of the sediments. As indicated in Section 724.411, precipitation in the Coal Hollow Mine region averages about 16 inches annually. If it is arbitrarily assumed that of this total, 90 percent is lost to surface-water runoff and evapotranspiration in the clayey sediments of the mine environment, 10% (1.6 inches or 0.666 feet) of recharge water could be available to recharge underlying backfilled mine pit area. Assuming that the porosity of the placed backfill could be on the order of 0.15 (in the typical range for unconsolidated deposits), the 1.6 inches of infiltrating precipitation water could saturate a soil thickness of about 10.7 inches (0.89 feet) each year. Using this relationship, a first order approximation of the time to fill a mine pit 100 feet deep could be determined by dividing the total number of feet of backfill thickness by the per-year infiltration rate. In this arbitrary example, the time required to saturate the backfill would be 100 feet of thickness divided by 0.88 feet of infiltration per year, or about 114 years. Similarly, using the same methods, if the average percentage of the annual precipitation water available for groundwater recharge were doubled to 20%, a time to fill for a 100-foot deep mine pit would be 57 years.

In making these rough projections, it is important to consider that other factors may also significantly influence the time required for backfilled pits to eventually re-saturate. Some of these include the existing saturation state of the materials at the time the materials are placed as backfill, and the potential that infiltrating precipitation waters could be held under perched conditions on impermeable strata, or the downward migration rates could be so slow that it could take many years for the water to migrate

vertically to the base of the backfilled pit, resulting in discontinuous zones of saturation. Additionally, in low-lying areas where ponding of surface runoff can occur, a greater percentage of the precipitation water could infiltrate into the underlying backfill areas. Contrastingly, in sloped areas where the runoff of precipitation is favored, infiltration rates could be significantly lower.

It is considered unlikely that the backfilled mine pit areas in the North Private Lease will act as "aquifers". Rather, the heterogeneous mixture of shales, clays, silts, sands, and gravels will more likely as aquitards. Consequently, alluvial groundwaters flowing in close proximity to Kanab Creek will likely tend to remain in the undisturbed sediments adjacent to the stream channel rather than spreading out into the surrounding low-permeability mine backfill areas.

In order to better characterize the actual aquifer conditions in backfilled mine pit areas in the North Private Lease, Alton Coal Development proposes to construct a monitoring well (if it is possible to do so) within the backfill of mine pit 12 when the mining in that area is complete and the pit is backfilled. This well may then be used for the purposes of 1) monitoring the rate at which the backfilled material re-saturates over time, and 2) eventually for the purpose of performance of aquifer testing to determine the aquifer characteristics of the placed backfill material after the sediments have become adequately saturated for such tests to occur.

Diminution of down-gradient groundwater resources

Where groundwater flow paths that convey groundwater to down-gradient areas exist in areas that will be mined, there is the potential that diminution of down-gradient groundwater resources could occur. In the Coal Hollow Mine permit area, it is considered unlikely that appreciable diminution of down-gradient resources will occur as a result of mining and reclamation activities. The basis of this conclusion is presented below.

Groundwater resources in the Tropic Shale are meager and groundwater flow rates are very slow through the marine shale unit. Groundwater systems in the Tropic Shale do not support appreciable spring or seep discharge nor do they provide measurable baseflow to streams down-gradient of mining areas. Consequently, the potential for adverse impacts to the hydrologic balance as a result of mining through Tropic Shale is considered minimal.

Similarly, groundwater resources in the Dakota Formation are meager. The potential for lateral and vertical migration of groundwater through the formation is limited by the pervasiveness of low-permeability shaley strata in the formation and the lateral discontinuity of permeable strata. Groundwater systems in the Dakota Formation do not support appreciable spring or seep discharge nor do they provide measurable baseflow to streams down gradient of mining areas. Additionally, with the exception of the relatively low-permeability Smirl coal seam located at the top of the formation, groundwater systems in Dakota Formation rock strata below the coal seam will not be disturbed by

mining and reclamation activities. Consequently, the potential for adverse impacts to the hydrologic balance as a result of mining through Dakota Formation strata is considered minimal. It should be noted that spring SP-4 discharges at about 1 gpm approximately 1.1 miles south of the Coal Hollow Mine permit area from an apparent fault/fracture system in the Dakota Formation that may be related to the Sink Valley Fault. It is unlikely that appreciable migration of groundwater through the Sink Valley Fault system in the relatively impermeable Tropic Shale or shallow alluvium in the Coal Hollow Mine permit area occurs. Consequently, it is considered unlikely that mining and reclamation activities in the Coal Hollow Mine permit area will cause a diminution of discharge from spring SP-4.

Alluvial groundwater systems in proposed mining areas area supported primarily by clays, silts, and fine-grained sands. In proposed mining areas in Sink Valley, appreciable coarse-grained alluvial sediments were not encountered in drill holes or back-hoe excavations. Significant layers of clean coarse alluvium, which could rapidly convey significant amounts of groundwater, were likewise not observed. The results of slug testing performed on wells in and adjacent to proposed mining areas likewise suggest that the potential for rapid migration of groundwaters through alluvial sediments in proposed mining areas is low (Tables 7-8 and 7-9). These data and observations suggest that the flux of groundwater migrating through the alluvial sediments in proposed mining areas in Sink Valley (that could support down-gradient groundwater systems) is not large. Much of the groundwater migrating through the alluvial sediments in proposed mining areas (in the East ¼ of Section 30, T39S, R5W) likely leaves the groundwater system through diffuse discharge to the land surface and is lost evapotranspiration and does not contribute to the overall hydrologic balance in the area. In Sink Valley, a preferential pathway for alluvial groundwaters through deep coarse-grained alluvial sediments likely exists along the east side of Sink Valley. While the thickness of the alluvium in proposed mining areas in Sink Valley generally does not exceed 50 feet (and in many locations is much less), the alluvial sediments along the eastern side of Sink Valley adjacent to proposed mining areas range from about 120 to 140 feet. Of the total flux of groundwater through the alluvial groundwater systems in Sink Valley, most of the flux is likely through this coarse-grained portion of the system. The percentage of the total flux that migrates through clayey and silty alluvial sediments in proposed mining areas along the western flanks of Sink Valley is likely much less.

It should be noted that highly permeable strata were encountered from about 60 to 75 feet depth just above the bedrock interface at the SS well cluster (monitoring well SS-75; Table 7-2). This well is screened in an area of burned or eroded coal (the coal is absent) and consequently, mining will not occur at this location. The coal seam is present at the nearby C9 cluster area. Were mining operations to intercept this highly permeable zone, substantial groundwater inflows into the mine openings could occur. Consequently, prior to surface mining in this area, the boundary between the competent coal seam and the area of burned or eroded coal will be more precisely defined by drilling or other suitable techniques such that mine openings can be designed to avoid these areas of potentially large groundwater inflows.

As discussed in Section 722 above, alluvial groundwater from Sink Valley discharges to several springs and seeps and as diffuse discharge to the ground surface in the northwest ¼ of Section 32, T39S, R5W (see Drawing 7-4; groundwater discharge area B). This groundwater discharge is likely a result of the constriction in Sink Valley in this area and the corresponding decrease in the cross-sectional area of the alluvial sediments in the valley, which forces groundwater to discharge at the surface. Most of the groundwater discharge in this area is likely derived from the up-gradient alluvial groundwater systems in the eastern portion of the valley (i.e., the coarse-grained portion of the alluvial groundwater system), which is situated east of the Coal Hollow Mine permit area. This conclusion is based on 1) the substantially larger cross-sectional area of the alluvium in the deeper eastern portion of the valley relative to that in proposed mining areas near the western margins of the valley, 2) the higher hydraulic conductivity of the sediments in the coarse-grained part of the alluvial system, and 3) the lack of other apparent discharge mechanisms for the coarse-grained system further downstream in Sink Valley Wash (i.e., there are no significant alluvial springs or seeps further downstream in Sink Valley Wash and the system apparently does not contribute measurable baseflow to Sink Valley Wash further downstream (at least at the surface in the stream channel, as evidenced by the lack of baseflow in the wash monitored at SW-9).

Because most of the alluvial groundwater discharge supporting springs and seeps in this area is likely not derived from groundwater systems that underlie planned mining areas in the Coal Hollow Mine permit area, it is considered unlikely that discharges from the springs and seeps in northwest ¼ of Section 32 T39S, R5W will be appreciably diminished as a result of the proposed mining and reclamation activities. While considered unlikely, some temporary impacts to discharge rates from springs and seeps in this area are possible. In particular, it should be noted that mining in the southernmost portions of the Coal Hollow Mine permit area has a somewhat greater potential to decrease groundwater discharge rates at spring SP-6, which is located about 600 feet below the southernmost proposed mining areas (Drawing 7-2). SP-6 is an alluvial seep which has been impounded with an earthen dam from which measurable discharge is generally not present.

It is critical to note that individual mine pits in this area will remain open for short lengths of time, generally no more than about 60 to 120 days (measured from the time the mining of the pit is completed to the time the pit is backfilled). Mining operations in the vicinity near the alluvial groundwater discharge area in the northwest ¼ of Section 32 T39S, R5W are planned to be completed in about 1 year. Thus, any potential impacts to discharge rates from down-gradient groundwater systems will be short-lived. Following the backfilling and reclamation of mine openings, the potential for interception or re-routing of alluvial groundwater away from the groundwater discharge area in northwest ¼ of Section 32 T39S, R5W will be negligible. As stated above, most of the flux through the Sink Valley alluvial groundwater system that supports springs and seeps in the area occurs in the eastern portion of the valley, which will not be impacted by mining and reclamation activities. Consequently, long-term impacts to discharge rates from springs and seeps in this area are not anticipated. It should also be noted that if increased quantities of groundwater were to be encountered in mine workings in lower Sink Valley

such that the water would need to be discharged to surface drainages, the mine water will ultimately be discharged to the Sink Valley Wash drainage (i.e., the water will remain in its drainage basin).

Alluvial groundwater systems in the Lower Robinson Creek area are much less extensive than the alluvial groundwater system in Sink Valley. Perched groundwater conditions exist locally in the alluvial groundwater system in the Lower Robinson Creek drainage. Other than the re-emergence of alluvial groundwater flowing beneath the Lower Robinson Creek stream channel where the stream channel exists directly on bedrock substrate, discharges from the alluvial groundwater system as springs or seeps in Lower Robinson Creek are not observed. Consequently, mining operations in the Lower Robinson Creek drainage will likely not result in diminution of down-gradient groundwater resources.

It should be noted that the Coal Hollow Mine plan calls for the temporary diversion of a reach of the Lower Robinson Creek stream channel approximately 2,000 feet in length in the southeast ¼ of Section 19, T39S, R5W. Details of the diversion are given in Chapter 5, Section 527.220 of this MRP. If this action results in diminution of groundwater or surface-water resources, where required a suitable mitigation for this potential impact will be designed and implemented in consultation with the Division of Oil, Gas and Mining.

If any Utah State appropriated water rights are impacted by mining and reclamation operations in the Coal Hollow Mine, these will be replaced according to all applicable Utah State laws and regulations using the designated water replacement source described in Section 727 above.

Draining of up-gradient groundwater resources

Where surface mining occurs adjacent to up-gradient groundwater systems, there is a potential that draining of groundwater from the up-gradient groundwater system into the mine voids could occur. This condition could occur if a sufficiently large and permeable stratum were to be intercepted that is in good hydraulic communication with the up-gradient groundwater system through which appreciable quantities of water could be transmitted.

To more fully evaluate the potential for draining of up-gradient groundwater resources, a field investigation was performed during the winter of 2006-2007 that was designed to facilitate the characterization of the alluvial groundwater system in the Coal Hollow Mine permit and adjacent area. Specifically, this program was designed 1) to better define the vertical and lateral extent of permeable, coarse-grained sediments in the alluvial groundwater system, 2) to characterize the water bearing and water transmitting properties of alluvial sediments, and 3) to evaluate the degree of hydraulic communication between the coarse-grained portion of the alluvial system in Sink Valley and the clayey alluvial sediments in proposed mining areas.

This field investigation included 1) the drilling and installation of 30 monitoring wells, 2) the performance of a 28-hour pumping and recovery test on the alluvial testing production well Y-61 (which is a 6.625-inch well constructed in 1980 as part of a previous coal mining application for groundwater pumping for alluvial aquifer testing) with contemporaneous measuring of water levels in the monitoring well network and contemporaneous measuring of spring discharge rates at three alluvial springs, and 3) the slug testing of 20 monitoring wells to determine approximate values of hydraulic conductivity. The results of the field investigation including analysis of the data collected in the investigation are presented in Appendix 7-1 and are summarized below.

Other than occasional pebbles or small rocks, coarse-grained sediments (i.e., gravels and coarse sands) were not encountered in the drilling of wells along the eastern margins of proposed mining areas in Sink Valley (C1, C2, C3, and C4 well clusters). (It should be noted that the C2 well cluster is located west of the eastern limit of the mine disturbance. The mine openings will intercept the C2 well cluster and the area to the east to locations west of well Y-102). Rather, the sediments encountered in the drilling of these wells were dominated by clays and silts with subordinate amounts of fine-grained sand. Similarly, coarse-grained deposits were not encountered in well clusters C6, C7, C8, and C9. There was no indication during drilling of any appreciable thickness of highly permeable strata through which groundwater could rapidly be transmitted (although it should be noted that the presence of thin sand layers are difficult to identify in wet auger drilling returns). Similarly, appreciable amounts of high-permeability coarse-grained alluvial sediments were not noted in alluvial sediments investigated in backhoe excavated pits and erosional escarpments in Sink Valley.

The hydraulic heads measured in alluvial monitoring wells near proposed mining areas in Sink Valley (C2, C3, C4, C7, C8, and C9) did not indicate artesian pressures. Rather, marked upward or downward vertical hydraulic gradients were not observed in any of these areas and water levels were consistently within several feet of the ground surface.

The results of pump testing in the alluvial groundwater system demonstrate that the springs in the northwest ¼ of Section 29, T39S, R5W are in direct hydraulic communication with the coarse-grained alluvial groundwater system in which the pumping well Y-61 is screened. Discharge rates (or water levels at Sorensen Spring) measured at each of the four springs (SP-8, SP-14, SP-20, and Sorensen spring) monitored during the 28-hour pumping test responded to pumping at the well. Monitoring wells at clusters C2, C3, and C4 near the easternmost proposed mining areas also showed small, muted responses, with declines measured in water levels during the 28-hour test ranging from about 0.05 to 0.10 feet. Other monitoring wells in proposed mining areas did not respond measurably to pumping at Y-61. It should be noted that after the pumping well was turned off at the end of the 28-hour pumping test, spring discharge rates and water levels in alluvial monitoring wells recovered to approximate pre-testing levels.

The results of slug testing of wells in the Coal Hollow Mine and adjacent area are presented in Table 7-8. Using these hydraulic conductivity values together with

measured thicknesses of saturated alluvial sediments determined during drilling, and hydraulic gradient values determined from water levels measured in monitoring wells, rates of estimated groundwater inflows to mine openings have been calculated using Darcy's Law (Table 7-9).

Darcy's Law may be expressed as.

$$Q = KIA$$

Where	Q	=	groundwater discharge rate
	K	=	hydraulic conductivity
	I	=	hydraulic gradient
	A	=	cross-sectional area

The values listed in Table 7-9 are reported as inflow rates per 100 lineal feet of mine openings oriented perpendicular to the groundwater flow direction. Calculations at individual locations are adjusted for the thickness of the saturated alluvium at that location. For all calculations in Table 7-9, a gradient of 0.10 has been used, which is considered a conservative estimate for the alluvial groundwater system in the vicinity of the planned Coal Hollow Mine workings. It is important to note that while values for saturated aquifer thickness and local hydraulic gradient in the alluvial groundwater system can be determined relatively precisely, hydraulic conductivity values determined from slug testing methods are generally considered as order-of-magnitude estimates. Consequently, the information from Table 7-9 should be used for general purposes only. The estimated groundwater inflow rates presented in Table 7-9 suggest that copious, unmanageable amounts of alluvial groundwater will likely not be encountered. It should be noted, however, that alluvial sediments located east of the C2 well cluster may contain coarser grained sediments similar to those intercepted in well Y-102. Special mining protocols will be employed (See Appendix 7-9) when mining in this area (pit15; see Section 728.333) to minimize the potential for interception of large groundwater inflows.

As described in Appendix 7-11, Table 7-9 has been updated to reflect the current pit mine-inflow conditions in the Pit #2 and adjacent areas.

As surface mining operations advance toward the alluvial groundwater discharge area in the northwest ¼ of Section 29, T39S, R5W (See Drawing 7-4; groundwater discharge area A), the information in Table 7-9 suggests that groundwater inflow rates in this area will be modest, generally on the order of a few tens of gallons per minute or less per 100 lineal feet of mine opening. However, it should be noted that, as discussed above, if mine openings in this area were to intersect a substantial thickness of coarse-grained alluvial material that was in good hydraulic communication with the coarse-grained alluvial system located along the eastern margins of Sink Valley, substantially greater rates of groundwater inflow could occur. Based on the information in Tables 7-8 and 7-9, this is not considered likely.

As mining operations advance toward the alluvial groundwater discharge area in the northwest ¼ of Section 29, T39S, R5W (See Drawing 7-4; groundwater discharge area A) and groundwater discharge from up-gradient alluvial groundwater systems occurs, there is the potential that discharge rates from alluvial springs in this area could be diminished. The magnitude of this potential impact will be largely dependent on the drainage rate and volume of groundwater that may be drained from the up-gradient alluvial groundwater system.

The potential for diminution of discharge from alluvial springs near proposed mining areas near the northwest ¼ of Section 29, T39S, R5W will be minimized because:

1) As mining progresses toward the groundwater discharge area in the northwest ¼ of Section 29, T39S, R5W (see Drawing 7-4, groundwater discharge area A), groundwater inflows into mine openings and discharge rates from the nearby alluvial springs will be closely monitored. If groundwater inflow rates into mine openings are excessive, where necessary Alton Coal Development, LLC will use a suitable technique to minimize groundwater inflow rates into the mine. These techniques may include the use of bentonite or natural clay filled cutoff walls or other means where appropriate to isolate and protect groundwater resources up-gradient of mining activities, and

2) Individual mine pits in the Coal Hollow Mine will remain open for short lengths of time, generally no more than about 60 to 120 days (measured from the time the mining of the pit is completed to the time the pit is backfilled). Consequently, any potential impacts to spring discharge rates in the alluvial groundwater system in this area will likely be short-lived. Because the alluvial groundwater recharge areas are located well up-gradient of proposed mining areas (mountain-front recharge) and will not be impacted, recharge to the alluvial system should continue uninterrupted, it is anticipated that water levels in the artesian groundwater system should recover from any mining-related declines in hydraulic head subsequent to the completion of mining in the area.

Groundwater discharge from the springs in the northwest ¼ of Section 29, T39S, R5W (See Drawing 7-4; groundwater discharge area A) do not contribute any measurable baseflow discharge to streams in the area. This conclusion is based on the lack of any baseflow discharge in streams down-gradient of this area in Sink Valley (see monitoring data for SW-6 and SW-9). Rather, most of this discharge is likely ultimately lost to evapotranspiration as the water migrates across the low-permeability, near-surface clayey sediments in Sink Valley. Consequently, the potential temporary diminution of discharge from alluvial springs in the northwest ¼ of Section 29, T39S, R5W would not result in appreciable adverse impacts to the surrounding hydrologic balance.

It is considered likely that the average hydraulic conductivity of the placed run-of-mine backfill material will be low. This is because of the pervasiveness of low-permeability, clay-rich materials in the mine overburden and the anisotropic nature of the placed fill material. Consequently, the potential for the migration of appreciable quantities of

groundwater through the fill is considered low. Accordingly, the potential for impacts to subirrigation and soil moisture in the lands up-gradient of mining areas will be minimized by the placement of the low-permeability backfill.

The potential for short-term impacts to subirrigation and soil moisture in the lands up-gradient of proposed mining areas will be minimized through the implementation of the hydrology resource contingency plan described in Appendix 7-9.

The Coal Hollow Mine has designed a plan to divert upgradient alluvial groundwater through an alluvial groundwater interceptor drain system. This plan is designed to minimize the potential for the interception of alluvial groundwater in the mine pit areas and to protect alluvial groundwater quality. The details of this plan are described in the Coal Hollow Mine Alluvial Groundwater Management Plan, which is presented in Appendix 7-9.

If any Utah State appropriated water rights are impacted by mining and reclamation operations in the Coal Hollow Mine, these will be replaced according to all applicable Utah State laws and regulations using the designated water replacement source described in Section 727 above.

728.320 Presence of acid-forming or toxic-forming materials

Chemical information on the acid- and toxic-forming potential of earth materials naturally present in the proposed permit area are presented in Appendix 6-2. Chemical information on the low-sulfur Smirl coal seam proposed for mining is presented in Appendix 6-1 (confidential binder). Based on laboratory analytical data, it is apparent that acid-forming and toxic-forming materials that could result in the contamination of surface-water or groundwater supplies in the Coal Hollow Mine permit and adjacent area are generally not present.

Total selenium (with a 5 mg/kg laboratory lower detection limit) was not detected in any of the samples from the Coal Hollow Mine permit area. Water-extractable selenium concentrations were also generally low (see Section 728.332 below). Likewise, concentrations of water-extractable boron were also low, being less than 3 mg/kg in all samples analyzed. The pH of groundwaters in and around the Coal Hollow Mine permit area are moderately alkaline (UDOGM, 2007). Data in Appendix 6-2 likewise indicate moderately alkaline conditions in sediments in the permit area. The solubility of dissolved trace metals is usually limited in waters with alkaline pH conditions. Consequently, high concentrations of these metal constituents in groundwaters and surface waters with elevated pH levels are not anticipated. Additionally, most of the materials that will be handled as part of mining and reclamation activities in the Coal Hollow Mine area are of low hydraulic conductivity (i.e. clays, silts, shales, siltstones, claystones, etc.). Consequently, it is anticipated that groundwater seepage volumes through low-permeability backfill and reclaimed land surfaces in reclaimed mine pit areas and excess spoils storage areas will not be large. Additionally, reclaimed areas will be regraded, sloped, and otherwise managed to minimize the potential for land erosion, to

restore approximate surface-water drainage patterns, and also to minimize the potential for ponding of surface waters on reclaimed areas (other than "roughening" or "gouging" of some areas to enhance reclamation). Thus, the potential for interactions between large amounts of disturbed earth materials and groundwaters and surface waters, which could result in leaching of chemical constituents into groundwater and surface-water resources, will be minimized.

Additionally, the mining plan calls for the emplacement of 40 inches of suitable cover material over backfilled areas made up of material types which could appreciably impact vegetation (materials with elevated SAR ratios or other physical or chemical characteristics that could adversely impact vegetation).

The neutralization potential greatly exceeded the acid potential in all overburden and underburden samples analyzed, with the neutralization potential commonly exceeding the acid potential by many times, suggesting that acid-mine-drainage will not be a concern at the Coal Hollow Mine (see Section 728.332 below for a further discussion) Acid-forming materials in western coal mine environments often consist of sulfide minerals, commonly including pyrite and marcasite, which, when exposed to air and water, are oxidized causing the liberation of H^+ ions (acid) into the water. Oxidation of sulfide minerals may occur in limited amounts in the mine pits where oxygenated water encounters sulfide minerals. However, the acid produced by pyrite oxidation is quickly consumed by dissolution of abundant, naturally occurring carbonate minerals (Appendix 6-2). Dissolved iron is readily precipitated as iron-hydroxide in well aerated waters, and consequently excess iron is not anticipated in mine discharge water.

Other acid-forming materials or toxic-forming materials have not been identified in significant concentrations nor are such suspected to exist in materials to be disturbed by mining.

Because of the overall low-permeability of the rock strata and sediments surrounding the mine workings (primarily the shales and claystones of the lower Tropic Shale), the potential for seepage of mine water outward into adjacent stratigraphic horizons is low. Additionally, because the floors of the mine pits need to be accessible in order to extract the coal, the mining operations will be carried out in such a manner that the accumulation of large amounts of water in the mine pits will be avoided.

728.331 Sediment yield from the disturbed area.

Erosion from disturbed areas will be minimized through the use of silt fences and other sediment control devices. Surface runoff occurring on disturbed areas will be collected and treated as necessary to remove suspended matter. Four diversion ditches along with four sediment impoundments are proposed for the permit area. In addition, miscellaneous controls such as silt fence and berms are also proposed for specific areas. The proposed locations for these structures are shown on Drawing 5-3. Details associated with these structures can be viewed on Drawings 5-25 through 5-34 and Appendix 5-2.

The smallest practicable area, consistent with reasonable and safe mine operational practices will be disturbed at any one time during the mining operation and reclamation phases. This will be accomplished through progressive backfilling, grading, and prompt revegetation of disturbed areas. The backfilled material will be stabilized by grading to promote a reduction of the rate and volume of runoff in accordance with the applicable requirements. The excess spoil and fill above approximate original contour will be graded to a maximum 3h:1v slope and revegetated to minimize erosion.

Cut ditches will be established on the shoulders of all primary roads to control drainage and erosion. Cut and fill slopes along the primary roads will be minimal and are not expected to cause significant erosion. In locations where there are culvert crossings (i.e. Lower Robinson Creek), the fills slopes will be stabilized by utilizing standard methods such as grass matting or straw wattles. The location and details for roads can be viewed on Drawings 5-3 and 5-22 through 5-24.

Through the implementation of these sediment control measures, it is anticipated that sediment yield from disturbed areas in the Coal Hollow Mine permit area will be minimized.

728.332 Impacts to important water quality parameters

As discussed above, appreciable quantities of groundwater are not anticipated to be intercepted in the Tropic Shale overlying proposed mining areas. Consequently, discharge of Tropic Shale groundwaters from mining areas is not anticipated. Because of the very low hydraulic conductivity of the marine Tropic Shale unit which immediately overlies the coal in proposed mining areas, the lateral migration of appreciable amounts of groundwater outward from proposed mine pit areas is not anticipated. Therefore, no impacts to important water quality parameters in surrounding groundwater and surface-water resources that could result from the interception of Tropic Shale groundwaters are anticipated.

Similarly, appreciable quantities of groundwater are not expected to emanate from the Dakota Formation in the mine floor into the mine openings. This conclusion is based on the fact that 1) vertical and horizontal groundwater flow in the Dakota Formation is impeded by the presence of low-permeability shales that encase the interbedded lenticular sandstone strata in the formation (i.e., the formation is not a good aquifer), 2) appreciable natural discharge from the Dakota Formation in the surrounding area to springs or streams is not observed, supporting the conclusion that the natural flux of groundwater through the formation is meager, and 3) mining will commence near the truncated up-dip end of the formation, minimizing the potential for elevated hydraulic head in the Dakota Formation. The results of slug testing performed on wells screened in the Smirl coal seam indicate relatively low values of hydraulic conductivity for the coal seam (Table 7-8). In much of the proposed mining area, the coal seam is dry. Thus, large inflows of groundwater from the coal seam into mine workings are not anticipated. Likewise, the potential for seepage out of mine pits through the coal seam is minimal. Consequently,

impacts to important water-quality parameters in the Dakota Formation potentially resulting from mining operations are not anticipated, nor are impacts to important water-quality parameters in surrounding groundwater and surface-water systems anticipated as a result of interactions with intercepted Dakota Formation groundwater.

The water quality of groundwaters in the alluvial groundwater system up-gradient of mining operations will likely not be impacted by mining and reclamation activities in the Coal Hollow Mine. Were alluvial groundwaters intercepted by mine openings allowed to flow into the mine pits, there would be the potential for substantially increased TDS concentrations as the water interacts with the marine Tropic Shale and the Smirl coal seam. This occurrence will be avoided.

As groundwater naturally migrates through the shallow, fine-grained alluvial sediments in the Coal Hollow Mine permit and adjacent area (most evident in Sink Valley), the quality of the water is naturally degraded (see Appendix 7-1). In the distal portions of Sink Valley, most notably concentrations of magnesium, sulfate, and bicarbonate are elevated in the alluvial groundwater.

The potential for TDS increases associated with interaction of waters with the Tropic Shale can be minimized by avoiding contact where practical between water sources and earth materials containing soluble minerals. Where possible, in the existing mine area and in the proposed North Private Lease, groundwater that will be encountered in alluvial sediments along the margins of mine pit areas will be routed through pipes, ditches or other conveyance methods away from mining areas via gravity drainage so as to prevent or minimize the potential for interaction with sediments disturbed by mining operations (including contact with the mined coal seam). If diverted alluvial groundwater were allowed to interact extensively with the Tropic Shale bedrock or Tropic Shale-derived alluvial sediments, similar increases in magnesium, sulfate, bicarbonate, and TDS concentrations would be anticipated. Consequently, where intercepted groundwaters will be routed around disturbed areas through pipes or well-constructed and maintained ditches, it is anticipated that detrimental impacts to important water quality parameters in these waters will be minimal.

The pumping and discharging of mine water from mine pits at the Coal Hollow Mine permit area is not anticipated. The impoundment of substantial quantities of water within the mine pits would likely result in degradation of groundwater quality and is also not compatible with the proposed surface mining technique (the coal extraction operations occur at the bottom of the mine pit and thus they cannot be performed in flooded mine pits). As discussed above, the only likely foreseeable source of appreciable quantities of groundwater is from the alluvial groundwater systems overlying the low-permeability Tropic Shale in proposed mining areas. Where this alluvial groundwater is encountered in mining areas, it will be diverted away from mine workings prior to significant interaction with sediments in disturbed areas. Any discharge from the mine pits that does occur will be regulated under a Utah UPDES discharge permit.

Acid mine drainage is not anticipated at the Coal Hollow Mine permit area. This is due primarily to the relatively low sulfur content of the coal (see Appendix 6-1; confidential binder) and rock strata in the permit and adjacent area, and to the pervasiveness of carbonate minerals in the soil and rock strata which neutralize the acidity of the water if it occurs. If sulfide mineral oxidation and subsequent acid neutralization via carbonate dissolution were to occur, increases in TDS, calcium, magnesium, sulfate, and bicarbonate concentrations (and possibly also sodium concentrations via ion-exchange with calcium or magnesium on exchangeable clays) would be anticipated.

An analysis of the acid/base potential of samples collected from the overburden and underburden in the proposed mining area indicates that acid mine drainage will be unlikely to occur at the Coal Hollow Mine. The results of laboratory analysis of the acid/base potential of samples collected from the overburden, underburden, and Smirl coal zone are presented in Appendix 6-2. None of the overburden or underburden samples were acid forming, as each of the intervals sampled showed excess neutralization potential. Taken as a whole, the un-weighted composite average acid/base potential of the 57 overburden and underburden samples indicates a net neutralization potential of 174 tons per kiloton. The neutralization potential of the composite overburden/underburden (180 tons per kiloton) exceeds the acid potential (5.5 tons per kiloton) by more than 32 times. A general consensus opinion mentioned by the National Mine Land Reclamation Center (OSM, 1998) is that if the net acid/base potential exceeds 30 tons per kiloton, and the ratio of neutralization potential to acid potential exceeds two, then *alkaline* water will be generated and acid mine drainage will not occur. The acid/base characteristics of composite overburden and underburden in the Coal Hollow Mine area greatly exceed both of these two criteria, suggesting the strong likelihood that acid mine drainage will not be an issue at the Coal Hollow Mine.

Because of the net neutralization potential of the composite overburden/underburden in the Coal Hollow Mine area described above, the pH values of groundwater in fill areas will likely be neutral to alkaline. Accordingly, the solubility of dissolved trace metal species in the alkaline water will likely be low. Consequently, the potential for the mobilization and transport of trace metals in groundwater in the fill will likely also be low. Concentrations of total selenium, water extractable selenium, water extractable boron and other important chemical species in the overburden samples from the Coal Hollow Mine area are generally low. Water extractable selenium concentrations in the analyzed Dakota Formation underburden samples range from 0.05 to 0.2 mg/kg (see Appendix 6-2). Water extractable boron concentrations in the Dakota Formation underburden in a single location (CH-08; 6.5 mg/kg) marginally exceed the Division standard of 5 mg/kg. The limited quantities of material containing water extractable selenium and boron in these concentration ranges in backfill materials are not anticipated to result in appreciably elevated selenium or boron concentrations in groundwater or surface water supplies. Because the hydraulic conductivity of the composite run-of-mine backfill material (which will be rich with clays, silts, and shale) is expected to be low, the flux of groundwater that might migrate through the backfilled pit areas is likely to be low. Additionally, the reclaimed land surface will be graded to promote runoff of surface waters overlying backfilled areas, thus minimizing the potential for infiltration of surface

waters into backfilled areas. Consequently, the potential for acid mine drainage or toxic drainage from backfilled areas to surrounding groundwater and surface-water supplies will be minimized.

Similar conditions are anticipated to occur within mining areas at the North Private Lease area. The hydraulic conductivity of the composite run-of-mine backfill material in the North Private Lease (which will be rich with clays, silts, and soft, waxy shale) is expected to be low. Consequently, the flux of groundwater that might migrate through the backfilled pit areas is likely to be low. Lateral migration of groundwaters that could potentially accumulate in reclaimed mine pit areas outward into surrounding aquifers will be minimized by the presence of Tropic Shale bedrock where it is present in the pit walls. The Tropic Shale is the bedrock unit that overlies the Smirl coal seam to be mined and is known to be of low hydraulic conductivity. The presence of undisturbed Tropic Shale bedrock where it is present in mine pit walls will tend to contain accumulating groundwaters in the backfilled pits and prevent lateral migration of these waters to surrounding aquifers.

Reclaimed land surfaces in the North Private Lease will be graded to promote runoff of surface waters overlying backfilled areas, thus minimizing the potential for infiltration of precipitation waters into backfilled areas.

To further minimize the potential for water quality in North Private Lease alluvial groundwaters to become degraded as a result of interactions with soluble minerals in the run-of-mine backfill material in reclaimed mine pit areas, Alton Coal Development, LLC will, where reasonably feasible, place low-permeability materials (likely clayey alluvium or Tropic Shale bedrock) along the margins of the mine pits adjacent to Kanab Creek alluvium. It is anticipated that the TDS concentrations of groundwaters that may accumulate in the reclaimed mine pits will be higher than those of surrounding alluvial groundwater systems. Through the placement of a low-permeability barrier along the margins of the mine pit areas, alluvial groundwaters in the undisturbed alluvial groundwater systems near the Kanab Creek stream channel will be largely isolated from the reclaimed mining areas. In other words, the potential for lateral migration of undisturbed alluvial groundwaters away from the Kanab Creek stream channel into higher-TDS pit backfill areas (or flow from the higher TDS backfill areas towards Kanab Creek) will be minimized.

As outlined in the topsoil and subsoil sampling plan in Chapter 2 of this MRP, materials with poor quality SAR, elevated selenium or boron concentrations, or poor pH as defined by Division guidelines will not be placed in the upper four feet of the reclaimed surface. These materials will also not be placed in the backfill within the top four feet of ephemeral drainages with 100-year flood plains, or in the top four feet in surface water impoundments, or in the top four feet in intermittent or perennial drainages including 100-year flood plains as outlined in the Division guidelines. Materials placed in the top four feet will be sampled to ensure that only suitable materials are placed in the top four feet of the reclaimed surface.

It is noteworthy that in the neighboring state of Wyoming, a water extractable selenium standard of 0.3 mg/kg is considered suitable for topsoil and topsoil substitutes, with concentrations ranging from 0.3 to 0.8 mg/kg being considered marginally suitable for topsoil and topsoil substitute.

As is typical with coal seams regionally, laboratory analyses of coal samples from the Coal Hollow Mine area indicates that there is a net acid forming potential in the coals of the Smirl coal zone (see Appendix 6-2). However, the mining plans call for the mining and removal of 95% of the total coal seam thickness from mining areas, leaving only minor amounts of coal in backfilled areas. Consequently, the potential contribution to the overall acid/base potential of the composite backfill material would be small. Assuming a worst-case-scenario – that all the coal would be retained in the backfill material – the calculated acid/base potential of the composite backfill material is still well within the limits suggested by OSM (1998) to indicate that alkaline discharge without acid mine drainage would be likely.

As described in Chapter 5, Section 532, surface runoff that occurs on disturbed areas will be treated through sedimentation ponds or other sediment-control devices and particulate matter will be allowed to settle prior to the discharging of the water to the receiving water, thus controlling suspended solids concentrations.

At any mining operation there is the potential for contamination of soils, surface-water and groundwater resources resulting from the spillage of hydrocarbons. Diesel fuels, oils, greases, and other hydrocarbons products will be stored and used at the mine site for a variety of purposes. A spill Prevention Control and Countermeasure Plan will be implemented that will help minimize any potential detrimental impacts to the environments.

Spill control kits will be provided on all mining equipment and personnel will be trained to properly control spills and dispose of any contaminated soils in an appropriate manner.

Based on these findings, it is concluded that the potential for mining and reclamation activities in the Coal Hollow Mine permit area to cause detrimental impacts to important water quality parameters is minimal.

728.333 Flooding or streamflow alteration

As described above, appreciable groundwater inflow from the Tropic Shale and Dakota Formation into mine pits at the Coal Hollow Mine are not anticipated. Appreciable groundwater inflows are anticipated only from the relatively thin, overlying alluvial groundwater systems. The thicknesses of the alluvium adjacent to mine openings in the proposed mining areas is generally less than 40 to 50 feet. The hydraulic conductivities of the predominantly clayey and silty alluvial sediments are low, and consequently, very large or sudden groundwater inflows into mine openings are not anticipated. Where appreciable alluvial groundwater is encountered adjacent to mine openings, it will be routed away from mining areas through ditches or other conveyance mechanisms.

Details of the Coal Hollow Mine Alluvial Groundwater Management Plan are provided in Appendix 7-9. Consequently, discharge of mine water from the mine pits is not anticipated. The rates of alluvial groundwater drainage that could occur will likely not be of a magnitude that could potentially cause flooding or streamflow alteration in either the Sink Valley Wash or Lower Robinson Creek drainages.

If excess groundwater were to be encountered during mining operations at the existing mine area or in the proposed North Private Lease such that it could not be adequately managed or discharged in compliance with the Utah UPDES discharge permit (which is considered unlikely), Alton Coal Development, LLC may when necessary construct supplemental containment and settlement ponds in which mine discharge waters may be held for treatment (where necessary) and subsequent discharge through UPDES discharge points in compliance with the UPDES discharge permit, minimizing the potential for flooding or streamflow alteration in areas adjacent to mining.

When coal mining near the eastern edge of the Coal Hollow Mine permit area occurs (mine pits 13-15), special measures will be taken to minimize the potential for the interception by the mine openings of large quantities of groundwater from artesian groundwater system in the northwest ¼ of Section 29, T5W, R39S, and to adequately deal with groundwater inflows if such occur. Details of the contingency plan for this occurrence are provided in Appendix 7-9.

When mining operations advance toward the eastern edge of the permit boundary in pit 15, material excavating in the alluvial sediments will be performed incrementally and with caution. As excavation proceeds, if coarse, water-bearing alluvial sediments (gravels) are encountered, overburden removal in that area will be stopped. The excavation equipment operator will recover the exposed gravel zone with local impermeable sediments (abundant in the alluvium in the area) to halt groundwater inflow if possible. The hydrogeologist will be called to the site to access the hydrogeologic conditions. An investigation of the situation will be performed and a suitable work plan will be developed prior to the resumption of overburden removal in that area. The work plan will be designed to minimize the potential for intercepting unacceptably large inflows of groundwater into the mine pits. The work plan will most likely involve trenching in the alluvium in zones up-gradient of the mine pit area and the emplacement of a low-permeability cut-off wall. The cut-off wall would be emplaced in the excavated trench using acceptable native low-permeability materials. The cut-off wall would be designed to isolate the mine openings from the coarse-grained alluvial groundwater system sufficient to decrease mine inflows to acceptable levels (i.e. so as to minimize the potential for detrimental impacts to the hydrologic balance and to minimize the potential for flooding of mine pits or causing flooding or stream alteration).

As a temporary measure to manage any potential large groundwater inflows that may occur in these areas prior to the installation of a suitable up-gradient hydraulic barrier, the intercepted alluvial groundwaters would be routed along mine benches that “daylight” to the natural land surface in areas to the south. The water would be diverted into pond 4 which has an appreciable storage capacity and discharge structure.

It should be noted that the interception of moderate amounts of groundwater from shallow alluvial groundwater systems in these areas is considered likely. Modest inflows of shallow groundwater intercepted by the mine workings in these areas would be manageable and not of significant concern. The objective of the work plan would be to ensure that strong hydrodynamic communication between the coarse-grained artesian alluvial groundwater systems in the eastern portion of Sink Valley with the Coal Hollow Mine workings is not established.

The rate at which alluvial groundwater will be intercepted by the Coal Hollow Mine will be variable by location and time in permit area. Because of the heterogeneity inherent in most alluvial deposits, the quantifying of precise aquifer parameters in the various mining areas is not straightforward. Additionally, the geometry of the mine openings including the horizontal lengths and heights of mine pit faces adjacent to saturated groundwater systems that are exposed at any point in time are dynamic variables in the surface mining environment. Consequently, precise quantifications of mine groundwater interception rates are not readily obtainable. However, using the estimated mine pit groundwater inflow rates presented as discharge per linear foot of open pit in Table 7-9, it is considered likely that mine interception will be on the order of a few tens of gallons per minute in dry areas and at times when open pit sizes are small, to several hundred gallons per minute in wetter areas and at times when the open pit size is large. It is important to note that inflows into individual pit areas will be short lived, as the individual pits will commonly remain open for a few weeks to a few months.

The reasonably foreseeable maximum quantity of water that could be intercepted by the Coal Hollow Mine is largely a function of the manner in which coal mining operations are conducted in areas where the potential for encountering appreciable groundwater inflows is greatest. If large areas of water-bearing coarse-grained sediments were to be rapidly exposed in mine pit areas, large quantities of water would be anticipated (likely several thousands of gallons per minute). However, as described above, mining operations will be carried out in these areas using the special mining protocols described above. Consequently, large cross-sectional exposures of water-bearing coarse-grained alluvial sediments will not be allowed to be exposed to the mine pits and large inflows of groundwater on that magnitude are not anticipated.

In the unanticipated event that excessive quantities of water were to flow into the mine pits by any mechanism, the water would be pumped from the pits using a suitable pump and piping equipment that will be located on-site at the Coal Hollow Mine for such a contingency. Such water would be managed appropriately as required by all applicable State and Federal regulations. It should be noted that it is not in the mine's interest to allow excessive water to flow into the mine pits. All reasonable efforts will be taken to minimize the potential for flooding of the mine pits (an event that is not considered reasonably foreseeable or probable to occur).

Through the implementation of the above described mining protocols in areas where potentially large groundwater inflows could reasonably be anticipated to occur, the

potential for the interception of large quantities of water by the mine is minimized. Consequently, the potential for flooding or streamflow alteration that could occur as a result of intercepting and discharging large quantities of water will be minimized and is considered unlikely.

The principal surface-water drainages in and adjacent to the Coal Hollow Mine permit area are in many locations not stable in their current configurations (see photograph section). Currently, these stream drainages are actively eroding their channels during precipitation events, resulting in down-cutting and entrenchment of stream channels, the formation of unstable near-vertical erosional escarpments adjacent to stream channels (which occasionally spall off into the stream channel), aggressive headward erosion of stream channels and side tributaries, and the transport of large quantities of sediment associated with torrential precipitation events. These processes are currently actively ongoing in the proposed permit and adjacent area and the upper extents of these erosional processes are in many locations migrating upward in stream channels, resulting in increasing lengths of unstable stream channels.

Hereford (2002) suggests that the valley fill alluviation in the southern Colorado Plateau occurred during a long-term decrease in the frequency of large, destructive floods, which ended in about 1880 with the beginning of the historic arroyo cutting. Hereford (2002) further suggests that the shift from deposition to valley entrenchment coincided with the beginning of an episode of the largest floods in the preceding 400-500 years, which was probably caused by an increased recurrence and intensity of flood-producing El Nino Southern Oscillation events beginning at ca. A.D. 1870.

The exact causes of the entrenchment of stream channels and the creation of the numerous arroyos currently in existence in the southwestern United States are not completely understood. Vogt (2008) suggests that three primary factors resulted in the arroyo formation. These factors included 1) changes in climate that produced heavy rainfall, 2) land-use practices such as livestock grazing, and 3) natural cycles of erosion and deposition caused by internal adjustments to the channel system. The temporal coincidence of the causes may have magnified the effect of each factor.

Each of these factors likely contributed to the formation of the entrenched stream drainages and arroyos in the Coal Hollow Project area. Gregory (1917) states that historical evidence indicates that the cutting of Kanab Creek began when a large storm occurred on 29 July 1883, and that unusually large amounts of precipitation were received in 1884-85. In this period the Kanab Creek channel was down-cut by 60 feet and widened by 70 feet for a distance of about 15 miles. The lowering of Kanab Creek may have resulted in a lowering of the local base level and consequent incision of both Sink Valley Wash and Lower Robinson Creek. As suggested by Vogt (2008), other factors, such as the heavy livestock grazing in the local area, which was occurring contemporaneously with the heavy thunderstorm events, likely also contributed to the overall conditions that brought about the stream down-cutting episode in the late 1800s.

While the precise sequence of events and conditions that triggered the arroyo formation and stream entrenchment in the principle surface drainages in and adjacent to the Coal Hollow Project area is not known, it is readily apparent that the principle surface water drainages are not currently in a condition of equilibrium. Stream head-cutting (headward erosion), bank erosion, and spalling of the steep stream channel walls are ongoing processes in the Coal Hollow Project area.

The mining and reclamation plan for the Coal Hollow Mines has been designed to minimize the potential for sediment yield and erosion in the mine permit areas. Accordingly, the mining and reclamation plan minimizes the potential for stream channel erosion and instability within the permit area. No mining-related activities are planned that would likely result in a worsening of the current instability of the surface water drainages in the permit and adjacent area.

The Coal Hollow Mine mining and reclamation plan calls for reclamation activities concurrent with mining progression, which results in the smallest disturbed area footprint and minimizes the length of time that the land surface is susceptible to erosion. The plan also calls for soil tackifiers to be used as a temporary soil stabilizer on reclamation areas prior to seeding. Seeded areas will be mulched. Vegetation established in final reclamation areas will minimize the potential for sediment yield and stream erosion in the long term.

The potential for erosion on the planned excess spoils pile will likewise be minimized. The design plans for the excess spoils pile call for the side slopes exceeding 60 feet in height to be constructed with concave slopes to promote slope stability and to minimize the erosion potential. The excess spoils pile will also be revegetated to minimize the erosion potential.

The Lower Robinson Creek reconstruction will likewise be constructed to promote stability and resistance to erosion. Details of the Lower Robinson Creek reconstruction are shown on Drawings 5-20A and 5-21A. The construction of the channel will include riprap of the channel bottom and the inclusion of an inner flood plane to minimize erosion during flooding events. The stream channel will be revegetated to minimize erosion potential. The Lower Robinson Creek reconstruction is designed to leave the drainage in a condition at final bond release that is at least as stable as the current pre-mining condition.

Following reclamation, stream channels will be returned to a stable state to the extent possible given the currently unstable state of natural drainage channels in the area. Stream channels will be designed to withstand anticipated storm events, thus minimizing the potential of flooding in the reclaimed areas.

The overall condition of the land surface and the surface-water drainages within the permit area at final bond release will likely meet or exceed the current pre-mining conditions. However, it should be noted that Alton Coal Development, LLC will have no control over the land management practices and landowner activities that may be

implemented on the privately-owned lands of the reclaimed Coal Hollow Mine area after final bond release. Accordingly, the degree of erosional stability and overall conditions in the reclaimed lands and stream drainages in the post bond-release period is not in the control of Alton Coal Development, LLC.

The existing principle surface-water drainages adjacent to the Coal Hollow Mine permit area have large discharge capacities (lower Sink Valley Wash below the County Road 136 crossing, Lower Robinson Creek, and Kanab Creek). These drainages periodically convey large amounts of precipitation runoff water associated with torrential precipitation events. The anticipated discharge rates from alluvial groundwater drainage and the maximum reasonably foreseeable amount of mine discharge water that could potentially be required to be discharged from mine pits is much less than that periodically occurring during major torrential precipitation events. The addition of modest amounts of sediment-free water into these stream channels has the potential to cause minor increases in channel erosion. However, the magnitude of this potential impact will likely be small relative to that occurring during torrential precipitation events.

Most precipitation waters falling on disturbed areas will be contained in diversion ditches and routed to sediment impoundments that are designed to impound seasonal water and storms. Sediment control facilities will be designed and constructed to be geotechnically stable. This will minimize the potential for breaches of sediment control structures, which if they occur could result in down-stream flooding and increases in stream erosion and sediment yield. Emergency spillways will be part of the impoundment structures to provide a non-destructive discharge route should capacities ever be exceeded.

Details associated with these structures at the existing Coal Hollow can be viewed on Drawings 5-25 through 5-34 and Appendix 5-2, the structures at the North Private Lease can be viewed on Drawing 5-67 through 5-71 and Appendix 5-12.

It should be noted that during the startup and construction phase of the mine operation, while the ditches and sediment control ponds are being constructed, temporary silt control measures will be utilized. These measures may include the use of silt fences or other appropriate sediment control measures as necessary.

As shown on Drawing 5-26 for the Coal Hollow Mine, there are two sediment impound watershed areas within the mine permit area (Watershed 5 and Watershed 6) from which precipitation runoff water will not be routed through sediment ponds.

Watershed 5 area includes 28 acres near the Sink Valley Wash/Lower Robinson Creek drainage divide. The land surface in Watershed 5 is relatively flat, sloping at about a one percent grade. Because of the flatness of the land surface in Watershed 5, it is not practical to construct ditches to convey water from this area to a sediment pond. Consequently, control of sediment in runoff water from Watershed 5 will be accomplished through the use of a silt fence or other appropriate sediment control measure placed along the western permit boundary adjacent to Watershed 5 (see Drawing 5-26). Precipitation water falling on Watershed 5 will be retained as soil moisture,

retained in the lowest portions of the watershed and allowed to evaporate or infiltrate or, after treatment with silt fences or other appropriate sediment control measures, allowed to flow down gradient onto lower lying adjacent areas.

Watershed 6 includes 19 acres located within the permit boundary east of the proposed Lower Robinson Creek reconstruction (see Drawing 5-26). The land surface in this area slopes gently toward the west at an approximately three to four percent grade. The Watershed 6 area will be isolated from a sediment pond by the reconstructed Lower Robinson Creek stream channel. Control of sediment in Watershed 6 will be accomplished through the installation of a silt fence or other appropriate sediment control measure along the margin of the watershed as shown on Drawing 5-26. The soils on the post-mining land surface in Watershed 6 will initially be stabilized with the use of tackifiers. Subsequent revegetation of the land surface in Watershed 6 will minimize the potential for erosion. After treatment with silt fences or other appropriate sediment control measures, precipitation water falling on Watershed 6 will be allowed to flow down-gradient toward adjacent lands or toward the Lower Robinson Creek stream channel.

The potential for flooding or streamflow alteration resulting from mining and reclamation activities at the Coal Hollow Mine permit area is considered minimal.

728.334 Groundwater and surface water availability

Groundwater use in the Coal Hollow Mine permit and adjacent area is generally limited to stock watering and domestic use in Sink Valley. Some limited use of spring discharge water for irrigation has occurred in Sink Valley, although such irrigation is not occurring presently nor has it occurred in at least the past 10 years. The areas of groundwater use in the Coal Hollow Mine permit and adjacent area are located in the northwest ¼ of Section 29, T39S, R5W (see Drawing 7-4; groundwater discharge area A), and in the northwest ¼ of Section 32, T39S, R5W (see Drawing 7-4; groundwater discharge area B). The likely future availability of groundwater in each of these areas is discussed below.

Groundwater discharge area A (Northwest ¼, Section 29, T39S, R5W)

Groundwater use in area A occurs from several alluvial springs and seeps that are used for stock watering and limited domestic use. As described in Section 728.311 above, short-term diminution in discharge rates from springs in northwest ¼ of Section 29, T39S, R5W are possible as mining operations advance toward these springs. This potential impact is associated with the possible drainage of up-gradient alluvial groundwater into mine openings as mining advances toward groundwater discharge area A. Because individual mine pits will typically remain open for less than about 60 to 120 days (measured from the time the mining of the pit is completed to the time the pit is backfilled) before subsequently being backfilled and reclaimed, the potential for long-term drainage of alluvial groundwater into the mine voids is negligible, and thus any

potential decreases in alluvial discharge in groundwater discharge area A is anticipated to be short-lived.

If groundwater inflow rates into mine openings in this area are excessive, such that appreciable impacts to the springs and seeps in groundwater discharge area A are likely, where necessary Alton Coal Development, LLC will use a suitable technique to minimize groundwater inflow rates into the mine voids. These techniques may include the use of bentonite or natural clay filled cutoff walls or other means where appropriate to isolate and protect groundwater resources up-gradient of mining activities. Consequently, the potential that groundwater could become unavailable in this area is minimal. Additionally, if alluvial groundwater resources were to become unavailable in this area due to mining and reclamation activities in the Coal Hollow Mine permit area, groundwater will be replaced according to all applicable State laws and regulations using the replacement water source described in Section 727 above. Details of the contingency plan for this occurrence are provided in Appendix 7-9.

It should be noted that the proposed water replacement source is a new well that will produce groundwater from the coarse-grained alluvial groundwater system in Sink Valley. Nearby springs that could potentially be impacted by mining and reclamation activities are supported by the same alluvial groundwater system. However, while modest decreases in the artesian hydraulic pressures in the alluvial groundwater system could potentially result in diminution of spring flows, the new well will be equipped with an electric well pump providing the capability to produce groundwater from the alluvial system even if the hydraulic head in the alluvial groundwater system were to be diminished such that artesian flow conditions temporarily ceased to exist.

Groundwater discharge area B (Northwest ¼, Section 32, T39S, R5W)

Groundwater use in groundwater discharge area B occurs at alluvial springs and seeps located southeast of the Coal Hollow Mine permit area that are used for stock watering and limited domestic use. As described in Section 728.311 above, although some temporary and short-lived diminution in discharge rates from springs in northwest ¼ of Section 29, T39S, R5W is possible, this potential impact is not considered likely.

In the event that alluvial groundwater resources were to become unavailable in this area due to mining and reclamation activities in the Coal Hollow Mine permit area, groundwater will be replaced according to all applicable State laws and regulations using the replacement water source described in Section 727 above.

Surface-water availability

Surface-water use in the Coal Hollow Mine permit and adjacent area occurs in the Sink Valley Wash drainage and in Lower Robinson Creek. Surface waters in the Sink Valley Wash drainage (primarily from Water Canyon via an irrigation diversion and from Swapp Hollow; appreciable discharge in Sink Valley Wash below Section 29 T39S, R5W is usually absent) are utilized for both stock watering and limited irrigation use. Stream

water in the Sink Valley Wash drainage is derived from runoff from the adjacent Paunsaugunt Plateau area. Because the surface water in the drainage originates from areas up-gradient areas located large distances from proposed mining areas, and because the stream channel is entirely outside the permit area and will not be impacted by mining and reclamation activities, there is essentially no probability that surface water availability in the Sink Valley Wash drainage could become unavailable as a result of mining and reclamation activities.

Discharge in Lower Robinson Creek immediately above the Coal Hollow Mine permit area typically occurs only in direct response to significant precipitation or snowmelt events. Thus, surface-water availability is currently limited in this drainage prior to any mining activities.

Seepage of alluvial groundwater into the deeply incised lower Robinson Creek stream channel occurs near the contact with the underlying Dakota Formation in the southeast quarter of Section 19, T39S, R5W. This water is likely related to saturated alluvial deposits directly underlying the Robinson Creek stream channel and emerges near where the stream channel intersects the alluvial groundwater system. This seepage of alluvial water is usually about 5 - 10 gpm or less and is routinely monitored at monitoring station SW-5 (Drawing 7-2).

It should be noted that the Coal Hollow Mine plan calls for the temporary diversion of a reach of the Lower Robinson Creek stream channel approximately 2,000 feet in length in the southeast ¼ of Section 19, T39S, R5W. Details of the proposed diversion are given in Chapter 5, Section 527.220 of this MRP. If this action results in diminution of the meager discharge of surface water in the drainage below the planned diversion, where required a suitable mitigation for this potential impact will be designed and implemented in consultation with the Division of Oil, Gas and Mining.

The information presented above suggests that the potential for significant impacts to groundwater and surface-water availability resulting from mining and reclamation activities in the Coal Hollow Mine permit and adjacent systems in the region is low.

728.340 Whether mining and reclamation activity will result in contamination, diminution or interruption of State-appropriated waters

State appropriated water rights in the Coal Hollow Mine permit and adjacent area are shown on Drawing 7-3 and tabulated in Appendix 7-3.

Appropriated groundwaters include alluvial springs and seeps in the northwest ¼ of Section 29, T39S, R5W (groundwater discharge area A), springs and seeps in the northwest ¼ of Section 32, T39S, R5W (groundwater discharge area B). State appropriated surface waters include reaches of Sink Valley Wash east of the Coal Hollow Mine permit area, and reaches of Lower Robinson Creek.

The potential for mining and reclamation activities at the Coal Hollow Mine permit area to result in contamination, diminution or interruption of State-appropriated water in the Coal Hollow Permit and adjacent area are described in detail in Sections 728.310, 728.320, 728.332, and 728.334.

With the possible exception of short-term diminution in discharge rates from springs and seeps in the northwest ¼ of Section 29, T39S, R5W, Contamination, diminution, or interruption of State-appropriated waters in the Coal Hollow Mine permit and adjacent area are not anticipated. It should be noted that if groundwater inflow rates into mine openings in this area are excessive, such that appreciable impacts to the springs and seeps in groundwater discharge area A are likely, where necessary Alton Coal Development, LLC will use a suitable technique to minimize groundwater inflow rates into the mine voids. These techniques may include the use of bentonite or natural clay filled cutoff walls or other means where appropriate to isolate and protect groundwater resources up-gradient of mining activities, minimizing the potential for diminution of discharge rates from these springs.

At no point during the development and extraction of Pits 10-B to F-8 will overburden removal extend beyond the Tropic Shale ridge located directly to the east of these pits. Coal extraction via underground mining or highwall mining may extend under and beyond this ridge, but overburden removal would result in potential impacts to the groundwater aquifer and would first require an update to the PHC document included as an appendix to Chapter 7 of this MRP.

Additionally, it should be noted that the Coal Hollow Mine plan calls for the temporary diversion of a reach of the Lower Robinson Creek stream channel approximately 2,000 feet in length in the southeast ¼ of Section 19, T39S, R5W. Details of the proposed diversion are given in Chapter 5, Section 527.220 of this MRP. If this action results in diminution of the meager discharge of surface water in the drainage below the planned diversion, where required a suitable mitigation for this potential impact will be designed and implemented in consultation with the Division of Oil, Gas and Mining.

In the event that any State appropriated waters were to be contaminated, diminished, or interrupted due to mining and reclamation activities in the Coal Hollow Mine permit area, groundwater will be replaced according to all applicable State laws and regulations using the replacement water source described in Section 727 above.

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730 **OPERATION PLAN**

Coal mining in the Coal Hollow Mine permit area will occur using surface and underground mining techniques. Planned coal mining operations in the North Private Lease area will be conducted using conventional pit surface mining and highwall mining techniques. All coal mining and reclamation operations will be conducted to minimize disturbance to the hydrologic balance within the permit and adjacent areas, to prevent material damage to the hydrologic balance outside the permit area and support approved postmining land uses in accordance with the terms and conditions of the approved permit and the performance standards of R645-301 and R645-302. Operations will be conducted to assure the protection or replacement of water rights in accordance with the terms and conditions of the approved permit and the performance standards of R645-301 and R645-302.

In order to maximize the use and conservation of the coal resource, coal will be recovered using a combination of large hydraulic backhoes or front-end loaders and off-road trucks, highwall mining and underground mining equipment. Mined coal will be hauled to a central coal processing area for crushing and placement into a stockpile. Coal from the stockpile will be transferred into a bin and loaded into over the road trucks for transport.

The plan, with Drawings, cross sections, narrative, descriptions, and calculations indicates how the relevant requirements will be met. The lands subject to coal mining and reclamation operations over the estimated life of the operations are identified and briefly described. All appropriate information is located in the subsequent sections and Drawings 5-1 through 5-39 and Appendices A5-1 through A5-3.

731 **GENERAL REQUIREMENTS**

Operations will be conducted to assure protection or replacement of water rights in accordance with the terms and conditions of the approved permit and the performance standards of R645-301 and R645-302.

Groundwater and Surface-Water Protection

To protect the hydrologic balance, coal mining and reclamation operations will be conducted to handle earth materials and runoff in a manner that minimizes acid, toxic, or other harmful infiltration to the groundwater system. Additionally, excavations, and disturbances will be managed to prevent or control discharges of pollutants to the groundwater.

Products including chemicals, fuels, and oils used in the mining process will be stored and used in a manner that minimizes the potential for these products entering groundwater systems. Concrete oil and fuel containments will be constructed as shown on Drawings 5-3 and 5-8.

A facilities spill plan for the Coal Hollow Mine is provided in Appendix 7-5. When operations begin, there will be an EPA SPCC plan available on site for inspection.

The wash bay sump sludge will be removed as necessary and transported off site to an approved hazardous waste disposal facility.

The wash bay at the mine site will include a closed-circuit water recycle system. This system will eliminate and store water impurities and reroute water back through the wash bay for cleaning equipment, thus minimizing water consumption the potential for contamination of groundwater resources. Details for this structure can be viewed on Drawings 5-3, and 5-8.

As mining operations approach springs and seeps in the northwest ¼ of Section 29, T39S, R5W (See Drawing 7-4; groundwater discharge area A), there is the potential for drainage of up-gradient into mine openings to cause short-lived diminution of discharge from these springs. If groundwater inflow rates into mine openings in this area are excessive, such that appreciable impacts to the springs and seeps in groundwater discharge area A are likely, where necessary Alton Coal Development, LLC will use a suitable technique to minimize groundwater inflow rates into the mine voids. These techniques may include the use of bentonite or natural clay filled cutoff walls or other means where appropriate to isolate and protect groundwater resources up-gradient of mining activities, minimizing the potential for diminution of discharge rates from these springs. Details of the contingency plan for this occurrence are provided in Appendix 7-9.

The mine will replace loss of water identified for protection in this MRP that are impacted by mining and reclamation operations.

To protect the hydrologic balance, coal mining and reclamation operations will be conducted to handle earth materials and runoff in a manner that minimizes acidic or toxic drainage, prevents to the extent possible, additional contributions of suspended solids to streamflow outside the permit area and otherwise prevents water pollution. Runoff and sediment control measures are described in detail in Chapter 5 of this MRP. The mine will maintain adequate runoff- and sediment-control facilities to protect local surface waters.

Discharge of mine water that has been disturbed by coal mining and reclamation operations is not anticipated. However, any discharges of water from areas disturbed by coal mining and reclamation operations that do occur 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 U.S. Environmental Protection Agency set forth in 40 CFR part 434. Discharge of mine waters will be regulated by a Utah UPDES discharge permit.

Water pollution associated with mining and reclamation activities within the permit areas will be controlled by:

- Construction of berms and/or diversion ditches to control runoff from all facilities areas.
- Roads will be constructed with ditches to capture runoff
- Diversion ditches will be constructed as necessary around active mining and reclamation areas to capture runoff from those areas.
- Sedimentation impoundments will be constructed to control discharges
- In areas where impoundments or diversions are not suitable to the surrounding terrain, silt fence or straw bales will be utilized to control sediment discharge from the permit area.

In order to accomplish these objectives for the Coal Hollow Mine, watershed analysis of the permit and adjacent areas has been completed and specific designs are established for each water pollution control structure. Primary control structures include five sediment impoundments, four diversion ditches and miscellaneous berms. The locations of these structures can be viewed on Drawing 5-3. The detailed analysis for these structures and specific designs can be viewed on Drawings 5-25 through 5-34. In addition, a geotechnical analysis of the impoundments to ensure stability can be viewed in Appendix 5-1. The watershed and structure sizing analysis can be viewed in Appendix 5-2. In addition to these primary structures, temporary diversions and impoundments may also be implemented, as necessary, in mining areas to further enhance pollution controls.

Sediment control measures will be located, maintained, constructed and reclaimed according to plans and designs given under R645-301-732, R645-301-742 and R645-301-760. Siltation structures and diversions will be located, maintained, constructed and reclaimed according to plans and designs given under R645-301-732, R645-301-742 and R645-301-763. Storm water and snow melt that occurs within the facilities area will be routed to an impoundment that will contain sediment. This impoundment will have a drop-pipe spillway installed that will allow removal of any oil sheens that may result from parking lots or maintenance activities by using absorbent materials to remove the sheen. Details for this impoundment can be viewed on Drawings 5-28.

There are five sediment impoundments proposed for the permit area. These structures will be constructed using a combination of dozers and backhoes. The structures have been designed to contain the required storm events as specified in Appendix 5-2. The structures will have sediment removed as necessary to ensure the required capacities. Details for these structures can be viewed on Drawings 5-25, 5-26 and 5-28 through 5-32. Calculations and supporting text can be viewed in Appendix 5-2.

Six diversion ditches along with five sediment impoundments are proposed for the permit area. In addition, miscellaneous controls such as silt fence and berms are also proposed for specific areas. The proposed locations for these structures are shown on Drawing 5-3. Details associated with these structures can be viewed on Drawings 5-25 through 5-34 and Appendix 5-2.

In order to accomplish these objectives for the North Private Lease, watershed analysis of the permit and adjacent areas has been completed and specific designs are established for each water pollution control structure. Primary control structures include three sediment impoundments, ten diversion ditches. The locations of these structures can be viewed on Drawing 5-65. The detailed analysis for these structures and specific designs can be viewed on Drawings 5-67 through 5-71. In addition, a geotechnical analysis of the impoundments to ensure stability can be viewed in Appendix 5-11. The watershed and structure sizing analysis can be viewed in Appendix 5-12. In addition to these primary structures, temporary diversions and impoundments may also be implemented, as necessary, in mining areas to further enhance pollution controls. While approval of Area 2 is dependent on the timely approval of permits from the U.S. Army Corps of Engineers, Area 1 extended for pits 7, 8 and 9 will require the use of two temporary diversions and an impoundment. The detailed analysis for these structures and specific designs can be viewed on Drawings 5-65A, 5-71A and 5-73. The watershed and structure sizing analysis can be viewed in Appendix 5-12A. Once approval to proceed into Area 2 is acquired, these temporary features will no longer be necessary and will be mined through.

Sediment control measures will be located, maintained, constructed and reclaimed according to plans and designs given under R645-301-732, R645-301-742 and R645-301-760. Siltation structures and diversions will be located, maintained, constructed and reclaimed according to plans and designs given under R645-301-732, R645-301-742 and R645-301-763.

As shown on Drawing 5-64 for the North Private Lease, there is one watershed areas within the mine permit area (ASCA-1) from which precipitation runoff water will not be routed through sediment ponds.

ASCA-1 area includes 3.1acres of access road to the North Private Lease that will not flow to a sediment impoundment. Consequently, control of sediment in runoff water from ASCA-1 will be accomplished by routing runoff from the road to a row of straw bales for treatment. These straw bales surround a drop box to a culvert flowing under the road (see Appendix 5-13).

The smallest practicable area, consistent with reasonable and safe mine operational practices will be disturbed at any one time during the mining operation and reclamation phases. This will be accomplished through progressive backfilling, grading, and prompt revegetation of disturbed areas.

There are no other coal processing waste banks, dams or embankments proposed within the permit area.

Diesel fuels, oils, greases, and other hydrocarbons products will be stored and used at the mine site for a variety of purposes. A spill Prevention Control and Countermeasure Plan will be implemented that will help minimize any potential detrimental impacts to the environments.

Products including potentially hazardous chemicals, fuels, and oils used in the mining process will be stored and used in a manner that minimizes the potential for these products to contaminate surface-water resources. Concrete oil and fuel containments will be constructed as shown on Drawings 5-3 and 5-8.

The wash bay at the mine site will include a closed-circuit water recycle system. This system will eliminate and store water impurities and reroute water back through the wash bay for cleaning equipment, thus minimizing water consumption the potential for contamination of surface-water resources. Details for this structure can be viewed on Drawings 5-3, 5-8, and Appendix 5-4.

Roads will be located, designed, constructed, reconstructed, used, maintained and reclaimed according to R645-301-732.400, R645-301-742.400 and R645-301-762. The specific plan for road locations and design are presented in R645-301-534. The location and details for roads can be viewed on Drawings 5-3 and 5-22 through 5-24 for the Coal Hollow Mine and on Drawings 5-47 and 5-58 through 5-64 for the North Private Lease.

Roads will be located, designed, constructed, reconstructed, used, maintained and reclaimed to control or prevent additional contributions of suspended solids to stream flow or runoff outside the permit area; Neither cause nor contribute to, directly or indirectly, the violation of effluent standards given under R645-301-751; minimize the diminution to or degradation of the quality or quantity of surface- and ground-water systems; and refrain from significantly altering the normal flow of water in streambeds or drainage channels. No acid- or toxic-forming substances will be used in road surfacing.

All roads for the Coal Hollow Mine will be removed and reclaimed according to Drawings 5-37 and 5-37A. The estimated timetable for removing these roads is shown on Drawing 5-38. All roads for the North Private Lease will be removed and reclaimed according to Drawings 5-74 and 5-75. The estimated timetable for removing these roads is shown on Drawing 5-76. Cut ditches will be established on the shoulders of all primary roads to control drainage and erosion. Cut and fill slopes along the primary roads will be minimal and are not expected to cause significant erosion. In locations where there are culvert crossings (i.e. Lower Robinson Creek), the fills slopes will be stabilized by utilizing standard methods such as grass matting or straw wattles.

All wells will be managed to comply with R645-301-748 and R645-301-765. Water monitoring wells will be managed on a temporary basis according to R645-301-738.

Wells constructed for monitoring groundwater conditions in the Coal Hollow Mine permit and adjacent area, including exploration holes and boreholes used for water wells or monitoring wells, will be designed to prevent contamination of groundwater and surface-water resources and to protect the hydrologic balance. A diagram depicting typical monitoring well construction methods is shown in Drawing 7-11. Monitoring wells will include a protective hydraulic seal immediately above the screened interval, an annular seal plugging the borehole above the hydraulic seal to near the ground surface, and a concrete surface seal extending from the top of the hydraulic seal to the ground

surface which is sloped away from the well casing to prevent the entrance of surface flows into the borehole area. Well casings will protrude above the ground surface a sufficient height so as to minimize the potential for the entrance of surface water or other material into the well. A steel surface protector with a locking cover will be installed at monitoring wells to prevent access by unauthorized personnel. Where there is potential for damage to monitoring wells, the wells will be protected through the use of barricades, fences, or other protective devices. These protective devices will be periodically inspected and maintained in good operating conditions. Monitoring wells will be locked in a closed position between uses.

When no longer needed for monitoring or other use approved by the Division upon a finding of no adverse environmental or health and safety effects, or unless approved for transfer as a water well under R645-301-731.100 through R645-301-731.522 and R645-301-731.800, each well will be capped, sealed, backfilled, or otherwise properly managed, as required by the Division in accordance with R645-301-529.400, R645-301-631.100, and R645-301-748. Permanent closure measures will be designed to prevent access to the mine workings by people, livestock, fish and wildlife, machinery and to keep acid or other toxic drainage from entering ground or surface waters.

If a water well is exposed by coal mining and reclamation operations, it will be permanently closed unless otherwise managed in a manner approved by the Division.

Permanent closure and abandonment of water wells greater than 30 feet in depth will be in accordance with the requirements of "Administrative Rules for Water Well Drillers", State of Utah, Division of Water Rights or other applicable state regulations. Abandonment of wells will be performed by a licensed water well driller. The wells to be abandoned will be completely filled using neat cement grout, sand cement grout, unhydrated bentonite, or bentonite grout, or other materials approved by the Utah State Engineer's office. Alternatively, the well may be abandoned using a different procedure upon approval from the Utah State Engineer's office.

Abandonment materials will be introduced at the bottom of the well or required sealing interval and placed progressively upward to the top of the well. The casing will be severed a minimum of 2 feet below the ground surface. A minimum of 2 feet of compacted native material will be placed above the abandoned well upon completion.

The locations of wells that are planned to be removed by intercepting mining operations in the North Private Lease are shown on Figure 20 of Appendix 7-16. Monitoring wells to be removed by mining operations in the North Private Lease that are deeper than the depths of the advancing mine working will be plugged and abandoned prior to their interception by the mining operations. Shallow monitoring wells that will be completely excavated by mine disturbance will not be plugged/abandoned because the entire well/borehole length will be removed by mining operations and thus plugging and abandoning these wells serves no purpose.

The six monitoring wells that are planned to be removed by mining operations are not planned to be replaced. Monitoring of the alluvial groundwater system within the North Private Lease after mining is completed will be accomplished using the monitoring wells that are not planned to be intercepted by mining (see Figure 20 of Appendix 7-16) and also using additional monitoring wells proposed for construction in the North Private Lease. As directed by the Division, ACD has proposed the construction of up to 30 additional alluvial monitoring wells in locations within and adjacent to the North Private Lease that are to remain after mining is complete. Monitoring of alluvial groundwater quantity and quality can be accomplished using these wells.

Within 30 days of the completion of well abandonment procedures, a report will be submitted to the State Engineer by the responsible licensed driller giving data related to the abandonment of the well. This shall include the name of the licensed driller or other person(s) performing abandonment procedures, name of well owner at the time of abandonment, the address or location of the well by section, township, and range, abandonment materials and equipment used, water right or file number covering the well, the final disposition of the well, and the date of completion.

Water wells less than thirty feet deep are not regulated by the Utah Division of Water Rights. The permanent closure and abandonment of water wells less than 30 feet deep will be accomplished by filling the well casing with neat cement grout, sand cement grout, unhydrated bentonite, or bentonite grout, or other appropriate materials. The well casing will then be cut off below the ground surface and native materials placed over the abandoned well site.

Exploration holes and boreholes will be backfilled, plugged, cased, capped, sealed, or otherwise managed to prevent acid or toxic contamination of water resources and to minimize disturbance to the prevailing hydrologic balance. Exploration holes and boreholes will be managed to ensure the safety of people, livestock, fish and wildlife, and machinery.

If a water well is exposed by coal mining and reclamation operations, it will be permanently closed unless otherwise managed in a manner approved by the Division.

If any exploration boreholes are to be used as monitoring wells or water wells, these will meet the provisions of R645-301-731 and be managed according to the following.

Boreholes will be backfilled to within 1 foot of the land surface with concrete or other materials approved by the Division as necessary to prevent contamination of groundwater or surface-water resources or to protect the prevailing hydrologic balance. The upper approximately 1 foot will be backfilled with native materials to facilitate reclamation (see Drawing 6-11). Exploration holes and boreholes that may be uncovered during mining and reclamation activities will be permanently closed unless approved for water monitoring or otherwise managed in a manner approved by the Division.

If mining and reclamation activities result in the contamination, diminution, or interruption of State appropriated groundwater or surface-water sources, replacement water will be provided using the alternate water source described in R645-301-727.

Seasonal baseline water monitoring information for all water rights that could be affected by mining in the permit and adjacent area have been submitted electronically to the Division's on-line hydrology database.

731.200 Water Monitoring

This section describes the hydrologic monitoring plan (including that for the 85.88-acre Dame Lease IBC). The hydrologic monitoring plans for groundwaters and surface waters in the proposed North Private Lease area are provided in Appendix 7-16 and Appendix 7-18. Locations of surface-water and groundwater monitoring sites are indicated on Drawing 7-10. Hydrologic monitoring protocols, sampling frequencies, and sampling sites are described in Table 7-4. Groundwater and surface-water monitoring locations are listed in Table 7-5. Operational field and laboratory hydrologic monitoring parameters for surface water are listed in Table 7-6, and for groundwater in Table 7-7. The hydrologic monitoring plan during reclamation will be the same as during the operational phase. The hydrologic monitoring parameters have been selected in consultation with the Division's directive Tech-006, *Water Monitoring Programs for Coal Mines.*

The groundwater and surface-water monitoring plan is extensive and includes more than 50 monitoring sites. The monitoring plan is designed to monitor groundwater and surface-water resources for any potential impacts that could potentially occur as a result of mining and reclamation activities in the Coal Hollow Mine permit and adjacent area. Each of the sampling locations and their monitoring purpose are described below.

Streams

Kanab Creek will be monitored at sites SW-3 (above the permit area), and SW-2 (below the permit area). Lower Robinson Creek will be monitored at sites SW-4 (above the permit area), SW-101 (within the permit area), and SW-5 (below the permit area above the confluence with Kanab Creek). The irrigation water near SW-4 will also be monitored at site RID-1. Swapp Hollow creek will be monitored above the permit area at site SW-8. Sink Valley Wash will be monitored at SW-6 (a small tributary to the wash immediately below the permit area) and at SW-9, located in the main drainage below the permit area. All of these locations, with the exception of RID-1) will be monitored for

discharge and water quality parameters specified in Table 7-6 quarterly, when reasonably accessible. Additionally, Lower Robinson Creek will be monitored at site BLM-1, which is near the location of alluvial groundwater emergence in the bottom of the stream channel. RID-1 will be monitored for discharge and field water quality parameters. BLM-1 will be monitored for discharge and water quality parameters specified in Table 7-6 quarterly. Monitoring sites BLM-1, SW-5, SW-6, and SW-9 will also be monitored for total and dissolved selenium quarterly.

Surface-water monitoring stations from the North Private Lease are included in the Coal Hollow Mine monitoring plan. These include SW-1A, SW-1M, SW-1, Kanab Creek @ C.R., and SW-3 on the main stem of Kanab Creek; Priscilla Creek, April Creek, and SW-15 on Simpson Hollow Creek; RSD-1 and SW-11, which are tributaries to Kanab Creek in and adjacent to the North Private Lease area; and EW-1, which is an ephemeral wash adjacent to the permit area. Monitoring protocols for these surface water monitoring sites are as listed in Tables 7-6. We recommend the monitoring of SW-1, Kanab Creek @ C.R., SW-3, SW-11, April Creek, and SW-15 for discharge rate and field and laboratory water quality measurements. We recommend that monitoring at the other surface-water monitoring sites be for discharge rate and for field water quality parameters only.

Springs

Eight springs from alluvial groundwater area A will be monitored including SP-8, SP-14, SP-16, SP-19, SP-20, SP-22, SP-24 and Sorensen Spring. Spring SP-8 is a developed spring in area A that provides culinary water for the Swapp Ranch house. SP-8 will be monitored for discharge and operational laboratory water quality measurements quarterly when reasonably accessible. Springs SP-14, SP-16, SP-19, SP-20, SP-22, SP-24 and Sorensen Spring springs will be monitored for discharge and field water quality measurements quarterly when reasonably accessible.

Springs SP-4 and SP-6, and SP-33, which are located in Sink Valley below the proposed mining area, will also be monitored. SP-6 is an area of diffuse seepage above an earthen impoundment in the wash immediately below the permit area. Spring SP-33 is a developed spring that discharges into a pond below the permit area and provides culinary water to two adjacent cabins. Each of these Springs SP-6 and SP-33 will be monitored for discharge and operational laboratory water quality measurements quarterly when reasonably accessible. SP-4 discharges from a fault/fracture system in the Dakota Formation near the canyon margin in Sink Valley Wash below the permit area. Spring SP-4 will be monitored for discharge and field water quality measurements quarterly when reasonably accessible. Spring SP-3 discharges from pediment alluvium in the upland area above Sink Valley Wash more than a mile from the permit area. It is extremely unlikely that discharge rates or water quality at this spring could be impacted as a result of mining-related activities in the mine permit area. However, this spring will

be monitored for discharge and field water quality measurements quarterly, primarily to provide background data from springs in the region.

The Coal Hollow Mine monitoring plan includes six springs and seeps in and around the North Private Lease area. These include Coyote Seep (which is located within the lease boundary area), Seep Z, Alkali Seep, and Dakota Seep (which are located adjacent to the lease area), and Pond Spring and Hill Spring (which are located below the town of Alton west of the lease area). Impacts to Coyote Seep are anticipated to occur because the seep area is situated within the planned location of a mine pit. Impacts to the other springs and seeps are not anticipated, but are proposed for monitoring 1) to verify that impacts do not occur, and 2) to document any influence of seasonal variability on water quantity and water quality at these locations. It is noted that upper Dakota Formation strata at Pond Spring and Hill Spring are up-gradient from the elevation of the Dakota Formation strata in proposed mining areas in the North Private Lease area (i.e. the stratigraphic dip is toward the east or northeast). Accordingly, impacts to these springs are not anticipated. However, because these springs are associated with Utah state-appropriated water rights and have importance to agriculture, we recommend the monitoring of these two springs. We recommend the monitoring of Pond Spring and Coyote Seep for discharge rate and field and operational laboratory water quality measurements. The other spring locations are recommended for discharge rate and field water quality measurements only.

Coyote Seep is an alluvial groundwater seepage zone that is located in the bottom of a deeply incised surface-water drainage/erosional scour in the soft alluvial sediments in the North Private Lease. The soils at the Coyote Seep location have been previously excavated, creating a small pool/pond at the seep. The elevation of the pool at Coyote Seep approximately coincides with the local alluvial groundwater elevation, suggesting the likelihood that the pool at Coyote Seep is a surface expression of the local alluvial groundwater surface. Accordingly, to fully monitor groundwater quantity at the seep, discharge monitoring at Coyote Seep will include 1) a measurement of the discharge rate of groundwater outflow from the pool, and 2) a measurement of the water elevation at the Coyote Seep pool using a staff gauge installed at the seep for that purpose. The staff gauge will be surveyed to enable accurate determinations of the water level elevations at the seep.

Wells

Wells Y-98 (Robinson Creek alluvium above the permit area), Y-45 (coal seam well in Swapp Hollow above permit area), Y-102 (flowing alluvial well in alluvial groundwater discharge area A), Y-36 (coal seam well in Sink Valley above the permit area), Y-38 (coal seam well in Sink Valley permit area), Y-61 (alluvial well at the Sorenson Ranch), and C5-130 (new monitoring well in alluvial groundwater discharge A) will be monitored quarterly when reasonable accessible. Well Y-61 will be monitored for groundwater operational laboratory water quality parameters to monitor groundwater quality in alluvial groundwater discharge area A. The other wells will be monitored for water level only.

Additionally, 19 newly constructed monitoring wells constructed in the Sink Valley alluvial groundwater system will be monitored quarterly. These include C2-15, C2-28, C2-40, C3-15, C3-30, C3-40, C4-15, C4-30, C4-50, C7-20, C9-15, C9-25, C9-40, LS-28, LS-60, LS-85, SS-15, SS-30, and SS-75. All of these wells will be monitored quarterly for water level. Additionally, wells LS-85 and SS-30 will be monitored for groundwater operational laboratory water quality measurements.

Additionally, two wells in the Lower Robinson Creek alluvium will be monitored for water level and groundwater operational laboratory chemistry. These include UR-70 located above proposed mining locations in the Lower Robinson Creek drainage, and LR-45, located below proposed mining areas adjacent to Lower Robinson Creek. It should be noted that LR-45 is located near a proposed sediment pond impoundment. Consequently, if this well becomes unsuitable for monitoring, an alternate location will be used to monitor the Lower Robinson alluvial groundwater system in this area.

Wells C0-18 and C0-54 are located near the initial proposed mining areas in the Lower Robinson Creek drainage. These will be monitored for water level quarterly.

It should be noted that many of the wells specified for monitoring in this monitoring plan will at some point be destroyed or rendered inoperable as the mine workings precede through the area. These wells will be monitored until such a time as they are destroyed or become inoperable.

The possible need for an additional monitoring well located along the east-west permit boundary in Section 30, T39S, R4W has been evaluated. As described in Section 728.332, based on the laboratory analyses of acid and toxic forming materials in the overburden, coal seam, and underburden, it has been determined that discharges from the mine areas will likely be alkaline in character and acid mine drainage will likely not occur. Similarly, the potential for toxic drainage is not anticipated (see Section 728.332). Additionally, given the general east to northeasterly direction of the bedrock dip in the mine area, groundwater migrating through the pit backfill areas after mining will likely migrate down slope in those same directions (to the east). Because the lower portions of the highwalls surrounding the mine pit areas consist of relatively impermeable Tropic Shale bedrock, the potential for migration of appreciable quantities of groundwater from the mine pit fill areas into surrounding unmined areas is low (see Section 728.320). Shallow alluvial groundwater that could potentially migrate to the west is monitored for laboratory water quality parameters at well LR-45. Surface runoff from these areas is monitored for laboratory water quality parameters at site SW-5, which is located in Lower Robinson Creek below the proposed mining areas. For these reasons, the installation and monitoring of an additional monitoring well is not deemed necessary at this time.

Monitoring wells in the North Private Lease and adjacent areas are included in the monitoring plan for the Coal Hollow Mine. The monitoring wells are monitored quarterly when reasonably accessible. These include Y-103, NLP-1, NLP-2, NLP-3,

NLP-4, NLP-5, NLP-6, NLP-7, NLP-8, NLP-9, NLP-10, NLP-11, CN0-60, CN1-43, CN1-58, CN2-70, CN3-69, CN3-80, CN3-81, CN3-93, CN3-98, CN4-49, CN5-52, CN5-58, CN7-70, CLEM-1, CLEM-2, CLEM-3, and CLEM-4 which are monitoring wells completed in the alluvial groundwater system in the Kanab Creek valley in and around the permit area. Monitoring well NLP-13 is located in the Simpson Hollow drainage below mining areas and is also included in the mining plan. Of these wells, Y-103, NLP-4, NLP-5, CN0-60, CN1-58, CN2-70, CN3-98, CN4-49, and CN7-70 will be monitored for water levels and field and operational laboratory water quality measurements. The other alluvial monitoring wells are to be monitored for water level measurements only. Monitoring wells Y-53, Y-55, Y-69, and Y-70 monitor groundwater in the Smirl coal seam. These wells will be monitored for water level only.

The post-mining monitoring network will include a minimum of one backfill monitoring well. Alton Coal Development, LLC will, if possible, construct a new monitoring well in a suitable backfilled mine pit area east of Kanab Creek in the North Private Lease. The proposed future well is designated as BW-1 in the Coal Hollow Mine monitoring plan. The projected location of the backfill monitoring well is in Pit 12. The proposed construction designs for BW-1 include drilling the borehole to the base of the backfilled area and constructing the well with the screens extending upward from the bottom of the well.

If upon completion of the mining and backfilling in the Pit 12 area it is determined by ACD that the Pit 12 area is not a suitable location for BW- well, an alternate site will be selected in consultation with the Division of Oil, Gas and Mining.

Alton Coal Development will provide an updated map of potentiometric levels in the alluvial groundwater system in the North Private Lease and adjacent area during operational and reclamation phases at least every three years. The map will be an update to the map included as Figure 18 of Appendix 7-16. The alluvial groundwater contour map will be updated using all available monitoring data, which will include potentiometric data collected from wells completed in the alluvial groundwater systems within and adjacent to the North Private Lease, potentiometric data collected from the proposed mine pit backfill well BW-1 (when it becomes available), and any other relevant potentiometric data that may be available at the time of the map update

Groundwater and surface-water monitoring will continue through the post-mining periods until bond release. The monitoring requirements, including monitoring sites, analytical parameters and the sampling frequency may be modified in the future in consultation with the Division if the data demonstrate that such a modification is warranted.

85.88-acre Dame Lease IBC

In conjunction with highwall mining activities within the 85.88-acre Dame Lease IBC, supplemental water monitoring activities will be performed at selected nearby springs and wells. This will include weekly monitoring of spring discharge rates at sites SP-8, SP-14, SP-20, SP-22, and SP-40, and weekly measurements of water levels in monitoring wells C4, C2, C3, C5, and Y-61. The weekly monitoring at these sites will begin one month prior to the commencement of highwall mining in the 85.88-acre Dame Lease IBC and will continue until one month after highwall mining in the IBC is concluded. Following the period of weekly monitoring, the above specified stations will be monitored monthly for a period of six months. The flow and water level data generated during this period of accelerated monitoring will be sent to the Division of Oil, Gas and Mining as a spreadsheet via e-mail at the end of each month.

In accordance with R645-302.245.230 all holes discharging water will be sealed within 72 hours after completion with impervious and noncombustible material. However, in the approved Ground Control Plan for CHM, MSHA requires the adjacent hole remain open for monitoring of the web. Thus, if an adjacent hole is discharging water and needs to be kept open for web monitoring then the discharge will be tested to determine if it contains acid or toxic-forming material and approval to keep this hole open for web monitoring will be requested from the Division in accordance with R645-302.245.230.

In order to verify that the highwall mining holes excavated into the 85.88-acre Dame Lease IBC do not cause depletion of the overlying shallow alluvial groundwater systems, the groundwater discharge rate (if any) that occurs from the mouths of the holes within the Dame Lease IBC will be monitored daily. The daily monitoring will commence upon completion of the hole excavation and continue until the hole is sealed. Where it is reasonably possible to do so, the discharge rate measurements will be performed using an appropriate field flow measurement technique (i.e. pipe and a calibrated container, flume, weir, etc.). In areas where the performance of a field discharge measurement is not reasonably possible (i.e. under diffuse seepage conditions or where unconcentrated dispersed flow conditions exist) the discharge rate will be estimated. Discharge rate measurements from the highwall holes will not be performed in areas where such measurements cannot be performed safely. In those areas where the discharge rates cannot safely be measured, this will be noted in the flow record and, where possible, a visual estimate of the discharge rate will be made. Upon approval from the Division, at times when no discharge is occurring from any of the open highwall mining holes in the Dame Lease IBC, discharge measurements will be performed daily on those days that the mine is operating (generally Monday through Friday). Under conditions where measurable flows are present at any open highwall mining hole in the 85.88-acre Dame Lease IBC, the flow measurements will be performed on a continuous daily basis (7 days a week) until the hole is sealed. The flow data for each hole will be sent to the Division as a spreadsheet via e-mail at the end of each month.

The details of the hydrologic monitoring plan for the North Private Lease area are provided in Appendix 7-16 and are summarized in Tables 7-4, 7-5, 7-6 and 7-7. The

locations of surface-water and groundwater monitoring sites in the North Private Lease are shown in Appendix 7-16.

Instruction for the use of the groundwater and surface-water monitoring plans

The hydrologic monitoring plans for groundwaters and surface-waters at the Coal Hollow Mine (including the North Private Lease area) may be used to detect potential impacts to groundwater and surface-water systems that could occur as a result of the proposed operations. Prior to the performance of coal mining and reclamation activities at the mine, baseline monitoring of groundwater and surface-water resources was performed. This has included monitoring water quantity (stream and spring discharge rates and water levels in wells), and water quality (both field and laboratory water quality measurements). The monitoring data may be used by comparing the water quantity and water quality characteristics of groundwaters and surface-waters measured during the operational mining and post-mining periods with that measured during the baseline monitoring period for any parameter of interest to evaluate the nature and magnitude of any potential impacts (i.e. changes would be indicated by differences between the baseline data and the operational or reclamation phase data). In evaluating potential impacts, it is important that all potential factors which could potentially cause variability in water quantity and/or water quality characteristics be considered. These factors could include short-term or long-term variability in climatic conditions (which may conveniently be evaluated using the Palmer Hydrologic Drought Index as described in Appendix 7-1), changes in land use practices over time, or several other factors. A convenient way to evaluate the water quality characteristics and detect potential impacts to water quality of groundwaters and surface waters is through the use of Stiff diagrams (see Appendix 7-1 for further explanation). Information is also provided by the Utah Division of Oil, Gas and Mining regarding the use of Stiff diagrams (Utah.gov).

731.300. Acid- and Toxic-Forming Materials.

At the existing Coal Hollow Mine and the proposed North Private lease area, drainage from acid- and toxic-forming materials and underground development waste into surface water and ground water will be avoided by identifying and burying and/or treating, when necessary, materials which may adversely affect water quality, or be detrimental to vegetation or to public health and safety if not buried and/or treated.

Materials will be stored in a manner that will protect surface water and ground water by preventing erosion, the formation of polluted runoff and the infiltration of polluted water. Storage will be limited to the period until burial and/or treatment first become feasible, and so long as storage will not result in any risk of water pollution or other environmental damage.

Storage, burial or treatment practices will be consistent with other material handling and disposal provisions of R645 Rules.

During the period of operation of the Coal Hollow Mine, the observed pH of the water that has infrequently been discharged through the UPDES discharge points has consistently been alkaline in nature (UDOGM, 2015). No acid mine discharge has been observed at the Coal Hollow Mine. Measured concentrations of selenium and

manganese in the mine discharge water have consistently been low (near the lower laboratory detection limits). Similarly, concentrations of total iron have also usually been low, although on a few occasions slightly elevated concentration of total iron (<1.61 mg/L) in the mine discharge water has been measured. These total iron concentrations are generally associated with suspended solids associated with storm water runoff or snowmelt events.

Based on the overall similarities in the geologic environments at the existing Coal Hollow Mine permit area and the proposed North Private lease area, it is considered likely that mine discharge waters that could potentially be discharged from the North Private Lease would have similar water quality characteristics (i.e. no acid mine drainage and no appreciable toxicity).

731.400. Transfer of Wells

Before final release of bond, exploratory or monitoring wells will be sealed in a safe and environmentally sound manner in accordance with R645-301-631, R645-301-738, and R645-301-765. With the prior approval of the Division, wells may be transferred to another party for further use. However, at a minimum, the conditions of such transfer will comply with Utah and local laws and the permittee will remain responsible for the proper management of the well until bond release in accordance with R645-301-529, R645-301-551, R645-301-631, R645-301-738, and R645-301-765.

731.530 State-appropriated water supply

A water supply well was constructed in the Sink Valley Alluvial groundwater system in October of 2010. The water well is being used as a water supply source for the mine and can also be used for water replacement if needed (also for use if needed as a replacement water source for mining in the 85.88-acre Dame Lease IBC).

731.600 Stream Buffer Zones

Any perennial or intermittent streams in the mine area will be protected by 100-foot stream buffer zones on either side of these streams. Coal mining and reclamation operations will not cause or contribute to the violation of applicable Utah or federal water standards and will not adversely affect the water quality and quantity or other environmental resources of the stream.

Temporary or permanent stream channel diversion will comply with R645-301-742-300. It should be noted that the Coal Hollow Mine plan calls for the temporary diversion of a reach of the Lower Robinson Creek stream channel approximately 2,000 feet in length in the southeast ¼ of Section 19, T39S, R5W. Details of the proposed diversion are given in Chapter 5, Section 527.220 of this MRP. If this action results in diminution of the meager discharge of surface water in the drainage below the planned diversion, where

required a suitable mitigation for this potential impact will be designed and implemented in consultation with the Division of Oil, Gas and Mining.

The areas surrounding the streams that are not to be disturbed will be designated as buffer zones, and will be marked as specified in R645-301-521.260.

731.700 Cross sections and Maps

The locations of springs and seeps identified in the Coal Hollow Mine permit and adjacent area are shown in Drawing 7-1. The locations of springs and seeps in the North Private Lease area are shown in Appendix 7-16. The locations of baseline hydrologic monitoring locations (including those for the North Private Lease) are shown on Drawing 7-2. Monitoring well locations in the North Private Lease and adjacent areas are shown in Appendix 7-16 and Appendix 7-18. The locations of water rights in the Coal Hollow permit and adjacent area are provided on Drawing 7-3. Water rights in the North Private Lease area are shown on Drawing 7-3N. Cross-sections depicting the stratigraphy and hydrostratigraphy of the Coal Hollow Mine permit and adjacent area are presented in Chapter 6, Drawing 6-2 and in Appendix 7-16. Designs for impoundments in the Coal Hollow permit area are shown in Drawings 5-25 through 5-31 and impoundments in the North Private Lease area are shown in Drawings 5-65 through 5-67.

731.800 Water Rights and Replacement

Alton Coal Development, LLC commits to replace the water supply of an owner of interest in real property who obtains all or part of his or her supply of water for domestic, agricultural, industrial, or other legitimate use from the underground or surface source, where the water supply has been adversely impacted by contamination, diminution, or interruption proximately resulting from the surface mining activities. Baseline hydrologic information required in R645-301-624.100 through R645-301-624.200, R645-301-625, R645-301-626, R645-301-723 through R645-301-724.300, R645-301-724.500, R645-301-725 through R645-301-731, and R645-301-731.210 through R645-301-731.223 will be used to determine the extent of the impact of mining upon ground water and surface water.

Sorensen Spring (SP-40) is the current domestic water supply for the Sorensen Ranch (Personal communication, Darlynn Sorensen, 2008). There is currently no development at the spring that would convey water to the ranch house. Rather, water from the spring is obtained directly from the spring for use at the ranch. Monitoring of discharge rate and water quality is included in the proposed water monitoring plan for the Coal Hollow Mine. The operational and reclamation phase water monitoring protocols for this spring are listed in Tables 7-5 and 7-7A. Should the water source be interrupted, diminished, or contaminated, replacement water will be provided from the new water well that will be constructed prior to the beginning of overburden removal for pits 13, 14, and 15 (see description in section R645-301-727 above, and Drawing 5-8C) or other suitable water replacement source as approved by the Division.

There are no state-appropriated groundwater rights in the North Private Lease area.

As specified in R645-301-112, groundwater quantity will be protected by handling earth materials and runoff in a manner that will restore approximate premining recharge capacity of the reclaimed area as a whole, excluding coal mine waste disposal areas and fills, so as to allow the movement of water to the groundwater system.

732 Sediment Control Measures

Sediment control measures have been designed, constructed and maintained to prevent additional contributions of sediment to streamflow or to runoff outside the permit area.

732.100 Siltation Structures

Siltation structures within the permit area are described in Section 732.200

732.200 Sedimentation Ponds

Nine diversion ditches along with five sediment impoundments are proposed for the Coal Hollow permit area. As mining advances into the federal coal, the open pits will mine out Pond 2 and Ditch 2. These structures will not be rebuilt following backfill and reclamation. In addition, miscellaneous controls such as silt fence and berms are also proposed for specific areas. The proposed locations for these structures are shown on Drawing 5-3. Details associated with these structures can be viewed on Drawings 5-25 through 5-34 and Appendix 5-2.

Ten diversion ditches along with three sediment impoundments are proposed for the North Private Lease permit area. In addition, miscellaneous controls such as berms are also proposed for specific areas. The proposed locations for these structures are shown on Drawing 5-47. Details associated with these structures can be viewed on Drawings 5-67 through 5-71 and Appendix 5-12. While approval of Area 2 is dependent on the timely approval of permits from the U.S. Army Corps of Engineers, Area 1extended for pits 7, 8 and 9 will require the use of two temporary diversions and an impoundment. The detailed analysis for these structures and specific designs can be viewed on Drawings 5-65A, 5-71A and 5-73. The watershed and structure sizing analysis can be viewed in Appendix 5-12A. Once approval to proceed into Area 2 is acquired, these temporary features will no longer be necessary and will be mined through.

Sedimentation ponds have been designed in compliance with the requirements of R645-301-356.300, R645-301-356.400, R645-301-513.200, R645-301-742.200 through R645-301-742.240, and R645-301-763.

No sedimentation ponds or earthen structures that will remain open are planned.

The sedimentation plan has been designed to comply with the MSHA requirements given under R645-301-513.100 and R645-301-513.200.

732.300 Diversions

The runoff control plan is designed to isolate, to the maximum degree possible, runoff from disturbed areas from that of undisturbed areas. Where possible, this has been accomplished by allowing up-stream runoff to bypass the disturbed area, and routing any runoff from undisturbed areas that enter the disturbed area into a sediment control system.

Nine diversion ditches along with five sediment impoundments are proposed for the Coal Hollow permit area. As mining advances into the federal coal, the open pits will mine out Pond 2 and Ditch 2. These structures will not be rebuilt following backfill and reclamation. In addition, miscellaneous controls such as silt fence, berms and temporary diversion ditches are also proposed for specific areas. The proposed locations for these structures are shown on Drawing 5-3. Details associated with these structures can be viewed on Drawings 5-25 through 5-34 and Appendix 5-2. A segment of Diversion Ditch 4 (DD4), due to premining contours, was not constructed until fill from the spoils pile attained an elevation that allowed positive flow. Prior to disturbances and until completion of DD4, a silt fence provided protection from offsite impacts. During reclamation, Pit 10 will be the final pit backfill requiring the remaining spoil stockpiled to be relocated, thus DD4 will be relocated with the Pit 10 borrow operations. All borrow activity will occur south of DD4 until elevations south of DD4 cause a positive flow directly to Sediment Pond 3. At this time DD4 can be realigned allowing final removal of Pit 10 borrow material. All temporary ditches will meet the design requirements of Diversion Ditch 4 (designed for the 10-year, 6-hour storm) and will be adjusted within the permitted active mining area in relation to the active pit, currant spoils pile configuration and reclamation.

Ten diversion ditches along with three sediment impoundments are proposed for the North Private Lease permit area. In addition, miscellaneous controls such as silt fences, berms and temporary diversion ditches are also proposed for specific areas. The proposed locations for these structures are shown on Drawing 5-63. Details associated with these structures can be viewed on Drawings 5-67 through 5-71 and Appendix 5-12. While approval of Area 2 is dependent on the timely approval of permits from the U.S. Army Corps of Engineers, Area 1 extended for pits 7, 8 and 9 will require the use of two temporary diversions and an impoundment. The detailed analysis for these structures and specific designs can be viewed on Drawings 5-65A, 5-71A and 5-73. The watershed and structure sizing analysis can be viewed in Appendix 5-12A. Once approval to proceed into Area 2 is acquired, these temporary features will no longer be necessary and will be mined through.

732.400 Road Drainage

All roads will be constructed, maintained and reconstructed to comply with R645-301-742.400. Road drainage facilities include diversion ditches, culverts, containment berms, and/or water bars. Specific plans for road drainage, road construction, and road maintenance are presented in Chapter 5, Section 534 of this MRP.

A description of measures to be taken to obtain division approval for alteration or relocation of a natural drainage way will be presented to the Division when necessary.

A description of measures to be taken to protect the inlet end of a ditch relief culvert will be submitted to the Division when necessary.

All road drainage diversions will be maintained and repaired to operational condition following the occurrence of a large storm event. Culvert inlets and outlets will be kept clear of sediment and other debris.

733 IMPOUNDMENTS

733.100 General Plans

A professional engineer experienced in the design and construction of impoundments with assistance from a geotechnical expert has used current, prudent, engineering practices to design the proposed impoundments.

The plans for the Coal Hollow Mine have been certified and a detailed geotechnical analysis has been provided in Appendix 5-1. The certifications, drawings and cross sections can be viewed in Drawings 5-25 through 5-31 and Appendices 5-1 and 5-2. The plans for the North Private Lease have been certified and a detailed geotechnical analysis has been provided in Appendix 5-11. The certifications, drawings and cross sections can be viewed in Drawings 5-67 through 5-71 and Appendices 5-12.

As requested by the Division, the design criteria of the mine site sediment ponds have been reevaluated in light of groundwater that is being encountered at the site (see Appendix 7-11). It was the determination of this reevaluation that the sediment ponds currently in place meet or exceed the minimum requirements of the Utah Coal Mining Rules and that the construction of additional ponds or the redesigning of existing ponds is not required at this time. Accordingly, the small ephemeral channel tributary to Lower Robinson Creek near the toe of the spoils pile mentioned in the Division Deficiency List (Task No. 3799) has been evaluated as a potential sediment pond site, but the construction of a sediment pond in that location is not required at the current time.

As indicated in Section 728.332, where appreciable alluvial groundwater inflows into the mine pit areas occur and where deemed necessary and possible, alluvial groundwater

inflows into the mine pit areas will be diverted away from the mine pit areas through pipes, ditches, or other conveyance methods, minimizing the need for the pumping of mine discharge waters to the sediment ponds. Any Surface or Groundwater that interacts with the Tropic Shale and the Smirl coal seam in the mine pits is considered as mine water and accordingly it will be either routed to Pond #3 or Pond #4 in the Coal Hollow Permit and Pond #7 in the North Private Lease and subsequently discharged under the approved Coal Hollow Mine UPDES discharge permit, or it will be contained and managed within the pit areas and not discharged. Additional details on water pollution control facilities can be found in section 526.300 of Chapter 5.

Depending on prevailing climatic conditions and on the nature and quantity of encountered mine waters, at times it may periodically be necessary to discharge water from the Coal Hollow Mine sediment ponds. The discharges from the ponds at the Coal Hollow Mine will occur in compliance with the approved Coal Hollow Mine UPDES permit (see Appendix 7-12).

Five impoundments are proposed to control storm water runoff and sediment from disturbed areas of the Coal Hollow Mine. Each impoundment is designed to contain the run off from a 10-year, 24-hour duration storm event. The locations of the impoundments and the associated watersheds can be viewed on Drawing 5-26. The following table summarizes the final capacity results for each impoundment:

	Coal Hollow Mine Sedimentation Impoundment Capacities				
Structure	Storage Required (ac/ft)	Design Storage (ac/ft)	As-built Storage (ac/ft)	Percent of requirement	Additional Storage (ac/ft)
1	2.86	3.1	3.1	108	0.2
2	1.7	2.3	2.3	135	0.6
3	14.89	15.0	18.03	101	0.1
4	4.83	5.5	5.5	114	0.7
1B	0.66	0.8	0.8	121	0.1

Structure 1 is a rectangular impoundment approximately 127 feet long by 82 feet wide and 9 feet in depth. This impoundment will control storm water runoff from the facilities area. The impoundment will be constructed with a 24” drop pipe spillway in order to prevent any oil sheens that may occur from discharging. This impoundment will be incised into the existing ground. Part of the excavated material will be utilized to construct an embankment on the down grade side to provide a minimum of 3 feet freeboard. This pond will control storm water from a watershed of approximately 27 acres. The cleanout and spillway elevation are 6911’ and 6920’, respectively. The top of the embankment is at elevation 6924’. Details for the design can be viewed on Drawing 5-28.

Structure 1B is a small rectangular impoundment that is approximately 40 feet long by 20 feet wide. This impoundment will control storm water runoff from the facilities access

road system. The impoundment will be constructed with a 24" drop pipe spillway in order to prevent any oil sheens that may occur from discharging. This impoundment will be incised into the existing ground. Part of the excavated material will be utilized to construct an embankment on the down grade side to provide a minimum of 2 feet freeboard. This pond will control storm water from a watershed of approximately 5 acres. The cleanout and spillway elevation are 6894' and 6906', respectively. The top of the embankment is at elevation 6908'. Details for the design can be viewed on Drawing 5-28B.

Structure 2 is a rectangular impoundment approximately 188 feet long by 36 feet wide and 9 feet in depth. This impoundment will control storm water runoff from the disturbed areas immediately south of Lower Robinson Creek. The impoundment will be constructed with a 24" drop pipe spillway. Part of the excavated material will be utilized to construct an embankment on the down grade side to provide a minimum 3 feet freeboard. This pond will control storm water runoff from a watershed of approximately 74 acres. The cleanout and spillway elevation are 6891' and 6900', respectively. Top of the embankment is at elevation 6903'. Details for the design can be viewed on Drawing 5-29.

Structure 3 is a valley fill impoundment that will impound an area approximately 472 feet long by 229 feet wide and 9 feet deep. The fill for the impoundment will be constructed from an excavation 378 feet wide by 229 feet long and 8 feet deep. The embankment will be constructed in 2 foot lifts utilizing a dozer. The top of the embankment will be a minimum 12 feet wide. This pond will have a decant pipe install at the 6808' elevation that allows for the pond level to be managed and to still be able to contain the 10-year 24-hour event. Also, this pond has a secondary open channel spillway that will have rip-rap min. 6" underlain with erosion control fabric. This pond will control storm water runoff from a watershed of approximately 388 acres post mining, it will also be capable of receiving ground water from the underground in the event it cannot be managed at the underground operation (not considered likely). The cleanout and spillway elevation are 6801' and 6811', respectively. Top of the embankment is at 6813'. Details for the design can be viewed on Drawing 5-30.

Structure 4 is a rectangular pond located at the south end of the permit area that is approximately 90 feet wide by 582 feet long and 12 feet deep. This impoundment will be incised into the existing ground. Part of the excavation will be used to construct a 12-foot-wide embankment. The spillway will be an open channel that will have rip-rap min. 6". This pond will control storm water runoff from a watershed of approximately 96 acres. The cleanout and spillway elevation are 6822' and 6834', respectively. Top of the embankment is at elevation 6838'. Details for the design can be viewed on Drawing 5-31.

Open channel spillway details for impoundments 3 and 4 are provided in Drawing 5-32. These spillways are designed for emergencies and are not expected to be used during normal operations.

Four impoundments (one temporary for Area 1 expanded) are proposed to control storm water runoff and sediment from disturbed areas of the North Private Lease. Each impoundment is designed to contain the run off from a 10-year, 24-hour duration storm event. The locations of the impoundments and the associated watersheds can be viewed on Drawing 5-65. The following table summarizes the final capacity results for each impoundment:

	North Private Lease Sedimentation Impoundment Capacities				
Structure	Storage Required (ac/ft)	Design Storage (ac/ft)	As-built Storage (ac/ft)	Percent of requirement	Additional Storage (ac/ft)
5	1.28	1.55	1.43	122	0.28
6	1.43	3.15	3.36	220	1.71
7	8.07	19.26	12.97	239	11.19
T1	0.81	1.50	Mined out	185	0.69

Structure 5 is a trapezoid impoundment 8 feet in depth. This impoundment will control storm water runoff from the western side of the permit area were mining will begin. The impoundment will be constructed with an 18" primary spillway with an oil skimmer and an open channel secondary spillway that will have 6" D50 rip-rap. This impoundment will be incised into the existing ground. Part of the excavated material will be utilized to construct an embankment on the down grade side to provide a minimum of 2 feet freeboard. This pond will control storm water from a watershed of approximately 18.8 acres. The cleanout and spillway elevation are 6840' and 6848' respectively. The top of the embankment is at elevation 6850'. Details for the design can be viewed on Drawing 5-67.

Structure 6 is a trapezoid impoundment 8 feet in depth. This impoundment will control storm water runoff from the western side of the permit area were mining will begin. The impoundment will be constructed with an 18" primary spillway with an oil skimmer and an open channel secondary spillway that will have 6" D50 rip-rap. This impoundment will be incised into the existing ground. Part of the excavated material will be utilized to construct an embankment on the down grade side to provide a minimum of 2 feet freeboard. This pond will control storm water from a watershed of approximately 24.0 acres. The cleanout and spillway elevation are 6858' and 6866' respectively. The top of the embankment is at elevation 6868'. Details for the design can be viewed on Drawing 5-68.

Structure 7 is a square impoundment 8 feet in depth. This impoundment will control storm water runoff from the western side of the permit area were mining will begin. The impoundment will be constructed with a 24" primary spillway with an oil skimmer and an open channel secondary spillway that will have 9" D50 rip-rap. This impoundment will be incised into the existing ground. Part of the excavated material will be utilized to construct an embankment on the down grade side to provide a minimum of 2 feet freeboard. This pond will control storm water from a watershed of approximately 133.9

acres. The cleanout and spillway elevation are 6840' and 6848' respectively. The top of the embankment is at elevation 6850'. Details for the design can be viewed on Drawing 5-69.

Structure T1 is a trapezoid impoundment 8 feet in depth. This temporary impoundment will control storm water runoff from Area 1 expanded for pits 7, 8, and 9. The impoundment is intended to be total containment, and therefore, will not be equipped with a spillway. Instead, the impoundment will be drained as necessary via an engineered pump and pipeline system, and discharged into existing structure 6. This impoundment will be incised into the existing ground. Part of the excavated material will be utilized to construct an embankment on the down grade side to provide a minimum of 2 feet freeboard. This pond will control storm water from a watershed of approximately 14.4 acres. The top of the embankment is at elevation 6874'. Details for the design can be viewed on Drawing 5-71A.

The outer slopes of the impoundments will be sloped to a maximum grade of 3h:1v. Inside slopes will be graded to a maximum 2h:1v. The slopes will be graded and revegetated for erosion control.

No underground mine workings exist near or under the impoundment structures; therefore, subsidence surveys are not provided.

Geologic data for the area where impoundments will be located consists of mainly fine-grained alluvium with high clay content. Seepage from the impoundments is expected to be minimal based on the high clay content of the existing materials. Characterization of the soils is contained in Chapter 2. Acid and Toxic analysis of the soils indicates that water seeping through the alluvium layer will not result in reducing water quality. The acid and toxic analysis for the alluvium can be viewed in Appendix 6-2.

Hydrologic data for the permit area is provided in Appendix 7-1. This data indicates that there will be some seepage through the subsurface that may travel to adjacent drainages. The quantities for this seepage are expected to be minimal and will have minimal impact to the overall hydrologic balance. Even though seepage may occur, analysis of the soils indicates that water quality will not be diminished.

The above information provides a summary of all the impoundment structures that are for the Coal Hollow Project and North Private Lease. Detailed designs and calculations are provided in this section, Drawings 5-26 through 5-32 and Appendix 5-2. No other impoundments are anticipated.

At some times it may be necessary to discharge water from the sediment ponds at the Coal Hollow Mine. The approved Coal Hollow UPDES permit (Appendix 7-12) allows for discharges.

733.200 Permanent and Temporary Impoundments

All impoundments have been designed and constructed using current, prudent engineering practices and have been designed to comply with the requirements of R645-301-512.240, R645-301-514.300, R645-301-515.200, R645-301-533.100 through R645-301-533.600, R645-301-733.220 through R645-301-733.226, R645-301-743.240, and R645-301-743.

No impoundments or sedimentation ponds meeting the size or other qualifying criteria of MSHA, 30 CFR 77.216(a) exist or are planned within the Mine Permit Area. Should impoundments and sedimentation ponds meeting the size or other qualifying criteria of MSHA, 30 CFR 77.216(a) become necessary, compliance with the requirements of MSHA, 30 CFR 77.216 will be met.

All eleven planned impoundments have been evaluated by a professional engineer to ensure stability of each structure. The stability analysis performed resulted in a static safety factor of at least 2.2 for each structure. The details for this analysis can be viewed in Appendix 5-1 for the Coal Hollow Mine and Appendix 5-12 & 5-12A for the North Private Lease.

No permanent impoundments are planned in the project area.

If any examination or inspection discloses that a potential hazard exists, the person who examined the impoundment will promptly inform the Division according R645-301-515.200.

734 Discharge Structures

Discharge structures will be constructed and maintained to comply with R645-301-744.

The proposed impoundments are designed to temporarily store water from storm events and snow melt. Long term standing water in the impoundments is anticipated to be seasonal and sediment will be removed as necessary to provide the required storage capacities. Emergency spillways have been included in the designs to provide a non-destructive discharge route should the capacities ever be exceeded. Surveys of these impoundments will be regularly conducted to ensure that the required design capacities are available.

Impoundments 3 and 4 will be constructed with open channel spillways. These spillways are designed to discharge a 6-hour duration, 100-year storm event even though they are not expected to be used. They will have rip-rap min 6” to minimize erosion and spillway slopes will not exceed 3h:1v. Drawing 5-32 provides the details for the open channel spillways. Also, impoundment 3 will have a decant installed at the 6808 elevation that will allow for the pond level to be managed and to still be able to contain the 100-year 24-hour event.

Impoundments 1, 1B, 2, 5, 6 and7will be constructed with a drop pipe spillway system. Storm water and snow melt that occurs within the associated watersheds will be routed to these impoundments to contain sediment. These impoundments will have the drop-pipe spillways installed which will allow removal of any oil sheens that may result from parking lots, primary roads or maintenance activities by using absorbent materials to remove the sheen. The drop-pipe spillways are 24" diameter pipes that are vertical in the impoundment. These pipes have a metal cover over the end. This cover is recessed over the pipe by at least an inch, with a gap between the cover and the pipe. This leaves a route for water to discharge once the impoundment is full but prevents debris or pollutants located on the water surface from discharging. This system was chosen for these three impoundments based on their locations in relation to the facilities and primary roads. This discharge system will be constructed for precautionary measures only since pollutants are not expected in the impoundments during normal operations.

Impoundment T1 will not be equipped with a spillway. Instead, the impoundment will be drained as necessary via an engineered pump and pipeline system, and discharged into existing structure 6.

Disposal of Excess Spoil

Areas designated for the disposal of excess spoil and excess spoil structures will be constructed and maintained to comply with R645-301-745.

Details of proposed excess spoil disposal plans are presented in Chapter 5, Section 535 of this MRP and are summarized below.

A geotechnical analysis has been completed for the proposed excess spoil structure. This analysis estimates the long-term safety factor to be 1.6 to 1.7 based on the proposed design. Following proper construction practices of building the structure in maximum four foot lifts and meeting 85% compaction based on the standard Procter will ensure that the structure will be stable under all conditions of construction. This construction will occur only in the designated excess spoil area as shown on Drawing 5-3 and 5-35. The fill will be placed with end dump haul trucks and lifts will be constructed using dozers. High precision GPS systems will be regularly utilized to check grades and appropriate lift thickness. The geotechnical analysis for this structure can be viewed in Appendix 5-1.

The excess spoil is planned to be placed in an area where natural grades range from 0 to 5%. This is one of the most moderately sloping locations in the Permit Area. Stability of this structure is estimated to be 1.6 to 1.7 based on the Appendix 5-1.

Geotechnical borings were completed in the foundation of the proposed disposal area. Laboratory analysis of these borings has also been completed. Details of this analysis can be viewed in Appendix 5-1.

Permanent slopes for the proposed excess spoil will not exceed 3h:1v (33 percent), therefore no keyway cuts have been proposed in the design. Appendix 5-1 details the stability analysis for the proposed structure.

Excess spoil will not be disposed of in underground mine workings.

Horizontal lifts will not exceed four feet in thickness unless otherwise approved by the Division. The lifts will be concurrently compacted to meet 85% of the standard Procter. The geotechnical analysis (Appendix 5-1), provides information showing that these construction standards will provide mass stability and will prevent mass movement during and after construction. The excess spoil will be graded to provide drainage similar to original flow patterns. Topsoil and subsoil as designated in Chapter 2 will be removed and separated from other materials prior to placement of spoil.

A description of the character of the bedrock and any adverse geologic conditions in presented in Appendix 5-1.

Spring and seep survey information is provided on Drawing 7-1. There are no springs or seeps identified in the excess spoil area.

There are no historical underground mining operations in the proposed excess spoil area. There are future underground operations proposed.

There are no rock chimneys or drainage blankets proposed.

A stability analysis including strength parameters, pore pressures and long-term seepage conditions is presented together with all supporting data in Appendix 5-1.

Neither rock-toe buttresses nor key-way cuts are required under R645-301-535.112 or R645-301-535.113.

No valley fills or head-of-hollow fills are proposed.

No durable rock fills are proposed.

No disposal of waste on preexisting benches is planned

The excess spoil structure and fill above approximate original contour are the only alternative specifications proposed. A geotechnical analysis has been completed for this proposal and can be viewed in Appendix 5-1. All other mined areas will be restored to approximate original contour.

735 Coal Mine Waste

Areas designated for disposal of coal mine waste and coal mine waste structures will be constructed and maintained to comply with R645-301-746.

No structures for the disposal of coal mine waste are planned.

736 Noncoal Mine Waste

Noncoal mine waste will be stored and final disposal of noncoal mine waste will comply with R645-301-747

Noncoal mine waste, including but not limited to grease, lubricants, paints, flammable liquids, garbage, machinery, lumber and other combustible materials generated during coal mining and reclamation operations will be temporarily stored in a controlled manner. Final disposal of noncoal mine wastes will consist of removal from the project area and transportation to a State-approved solid waste disposal area.

Only sizing of the coal is proposed. This process will not produce any waste.

At no time will any noncoal mine waste be deposited in a refuse pile or impounding structure, nor will any excavation for a noncoal mine waste disposal site be located within eight feet of any coal outcrop or coal storage area.

Notwithstanding any other provision to the R645 Rules, any noncoal mine waste defined as "hazardous" under 3001 of the Resource Conservation and Recovery Act (RCRA) (Pub. L. 94-580, as amended) and 40 CFR Part 261 will be handled in accordance with the requirements of Subtitle C of RCRA and any implementing regulations.

Debris, acid-forming, toxic-forming materials and materials constituting a fire hazard will be identified and disposed of in accordance with R645-301-528.330, R645-301-537.200, R645-301-542.740, R645-301-553.100 through R645-301-553.600, R645-301-553.900, and R645-301-747. Appropriate measures will be implemented to preclude sustained combustion of such materials.

Plans do not include using dams, embankments or other impoundments for disposal of coal, overburden, excess spoil or coal mine waste.

738 Temporary Casing and Sealing of Wells

Wells constructed for monitoring groundwater conditions in the Coal Hollow Mine permit and adjacent area, including exploration holes and boreholes used for water wells or monitoring wells, will be designed to prevent contamination of groundwater and surface-water resources and to protect the hydrologic balance. A diagram depicting typical monitoring well construction methods is shown in Drawing 7-11. Monitoring wells will include a protective hydraulic seal immediately above the screened interval, an annular seal plugging the borehole above the hydraulic seal to near the ground surface, and a concrete surface seal extending from the top of the hydraulic seal to the ground surface which is sloped away from the well casing to prevent the entrance of surface flows into the borehole area. Well casings will protrude above the ground surface a sufficient height so as to minimize the potential for the entrance of surface water or other material into the well. A steel surface protector with a locking cover will be installed at monitoring wells to prevent access by unauthorized personnel. Where there is potential

for damage to monitoring wells, the wells will be protected through the use of barricades, fences, or other protective devices. These protective devices will be periodically inspected and maintained in good operating conditions. Monitoring wells will be locked in a closed position between uses.

When no longer needed for monitoring or other use approved by the Division upon a finding of no adverse environmental or health and safety effects, or unless approved for transfer as a water well under R645-301-731.100 through R645-301-731.522 and R645-301-731.800, each well will be capped, sealed, backfilled, or otherwise properly managed, as required by the Division in accordance with R645-301-529.400, R645-301-631.100, and R645-301-748. Permanent closure measures will be designed to prevent access to the mine workings by people, livestock, fish and wildlife, machinery and to keep acid or other toxic drainage from entering ground or surface waters.

If a water well is exposed by coal mining and reclamation operations, it will be permanently closed unless otherwise managed in a manner approved by the Division.

Permanent closure and abandonment of water wells greater than 30 feet in depth will be in accordance with the requirements of "Administrative Rules for Water Well Drillers", State of Utah, Division of Water Rights or other applicable state regulations. Abandonment of wells will be performed by a licensed water well driller. The wells to be abandoned will be completely filled using neat cement grout, sand cement grout, unhydrated bentonite, or bentonite grout, or other materials approved by the Utah State Engineer's office. Alternatively, the well may be abandoned using a different procedure upon approval from the Utah State Engineer's office.

Abandonment materials will be introduced at the bottom of the well or required sealing interval and placed progressively upward to the top of the well. The casing will be severed a minimum of 2 feet below the ground surface. A minimum of 2 feet of compacted native material will be placed above the abandoned well upon completion.

Within 30 days of the completion of well abandonment procedures, a report will be submitted to the State Engineer by the responsible licensed driller giving data related to the abandonment of the well. This shall include the name of the licensed driller or other person(s) performing abandonment procedures, name of well owner at the time of abandonment, the address or location of the well by section, township, and range, abandonment materials and equipment used, water right or file number covering the well, the final disposition of the well, and the date of completion.

Exploration holes and boreholes will be backfilled, plugged, cased, capped, sealed, or otherwise managed to prevent acid or toxic contamination of water resources and to minimize disturbance to the prevailing hydrologic balance. Exploration holes and boreholes will be managed to ensure the safety of people, livestock, fish and wildlife, and machinery.

If any exploration boreholes are to be used as monitoring wells or water wells, these will meet the provisions of R645-301-731

Boreholes will be backfilled to within 1 foot of the land surface with concrete or other materials approved by the Division as necessary to prevent contamination of groundwater or surface-water resources or to protect the prevailing hydrologic balance. The upper approximately 1 foot will be backfilled with native materials to facilitate reclamation (see Drawing 6-11). Exploration holes and boreholes that may be uncovered during mining and reclamation activities will be permanently closed unless approved for water monitoring or otherwise managed in a manner approved by the Division.

740 DESIGN CRITERIA AND PLANS

741 GENERAL REQUIREMENTS

742 SEDIMENT CONTROL MEASURES

742.100 General Requirements

742.110 Design

Appropriate sediment control measures will be designed, constructed and maintained using best technology currently available to prevent to the extent possible, contributions of sediment to stream flow or to runoff outside the permit area; meet the effluent limitations under R645-301-751; and minimize erosion to the extent possible.

Nine diversion ditches along with five sediment impoundments are proposed for the Coal Hollow permit area. As mining advances into the federal coal, the open pits will mine out Pond 2 and Ditch 2. These structures will not be rebuilt following backfill and reclamation. In addition, miscellaneous controls such as silt fence and berms are also proposed for specific areas. The proposed locations for these structures are shown on Drawing 5-3. Details associated with these structures can be viewed on Drawings 5-25 through 5-34 and Appendix 5-2. These impoundments in combination with the ditches will be the primary method that will be used to control sediment resulting from disturbed areas. In addition to the drawings and Appendix 5-2, the following is a description of the structures:

A professional engineer experienced in the design and construction of impoundments with assistance from a geotechnical expert has used current, prudent, engineering practices to design the proposed impoundments.

The plans have been certified and a detailed geotechnical analysis has been provided in Appendix 5-1. The certifications, drawings and cross sections can be viewed in Drawings 5-25 through 5-31 and Appendices 5-1 and 5-2.

Five impoundments are proposed to control storm water runoff and sediment from disturbed areas. Each impoundment is designed to contain the run off from a 10-year, 24-hour duration storm event. The locations of the impoundments and the associated watersheds can be viewed on Drawing 5-26. The following table summarizes the final capacity results for each impoundment:

	Coal Hollow Mine Sedimentation Impoundment Capacities				
Structure	Storage Required (ac/ft)	Design Storage (ac/ft)	As-built Storage (ac/ft)	Percent of requirement	Additional Storage (ac/ft)
1	2.86	3.1	3.1	108	0.2
2	1.7	2.3	2.3	135	0.6
3	14.89	15.0	18.03	101	0.1
4	4.83	5.5	5.5	114	0.7
1B	0.66	0.8	0.8	121	0.1

Structure 1 is a rectangular impoundment approximately 127 feet long by 82 feet wide and 9 feet in depth. This impoundment will control storm water runoff from the facilities area. The impoundment will be constructed with a 24" drop pipe spillway in order to prevent any oil sheens that may occur from discharging. This impoundment will be incised into the existing ground. Part of the excavated material will be utilized to construct an embankment on the down grade side to provide a minimum of 4 feet freeboard. This pond will control storm water from a watershed of approximately 27 acres. The cleanout and spillway elevation are 6911' and 6920', respectively. The top of the embankment is at elevation 6924'. Details for the design can be viewed on Drawing 5-28.

Structure 1B is a small rectangular impoundment that is approximately 40 feet long by 20 feet wide. This impoundment will control storm water runoff from the facilities access road system. The impoundment will be constructed with a 24" drop pipe spillway in order to prevent any oil sheens that may occur from discharging. This impoundment will be incised into the existing ground. Part of the excavated material will be utilized to construct an embankment on the down grade side to provide a minimum of 2 feet freeboard. This pond will control storm water from a watershed of approximately 5 acres. The cleanout and spillway elevation are 6894' and 6906', respectively. The top of the embankment is at elevation 6908'. Details for the design can be viewed on Drawing 5-28B.

Structure 2 is a rectangular impoundment approximately 188 feet long by 36 feet wide and 9 feet in depth. This impoundment will control storm water runoff from the disturbed areas immediately south of Lower Robinson Creek. The impoundment will be constructed with a 24" drop pipe spillway. Part of the excavated material will be utilized to construct an embankment on the down grade side to provide a minimum 3 feet freeboard. This pond will control storm water runoff from a watershed of approximately 74 acres. The cleanout and spillway elevation are 6891' and 6900', respectively. Top of the embankment is at elevation 6903'. Details for the design can be viewed on Drawing 5-29.

Structure 3 is a valley fill impoundment that will impound an area approximately 472 feet long by 229 feet wide and 9 feet deep. The fill for the impoundment will be constructed from an excavation 198 feet wide by 229 feet long and 8 feet deep. The embankment will be constructed in 2 foot lifts utilizing a dozer. The top of the embankment will be a minimum 12 feet wide. This pond will have a decant pipe install at the 6808' elevation that allows for the pond level to be managed and to still be able to contain the 10-year 24-hour event. Also, this pond has a secondary open channel spillway that will have rip-rap min. 6 underlain with erosion control fabric. This pond will control storm water runoff from a watershed of approximately 388 acres post mining, it will also be capable of receiving ground water from the underground in the event it cannot be managed at the underground operation (not considered likely). The cleanout and spillway elevation are 6801' and 6810', respectively. Top of the embankment is at 6814'. Details for the design can be viewed on Drawing 5-30.

Structure 4 is a rectangular pond located at the south end of the permit area that is approximately 90 feet wide by 582 feet long and 12 feet deep. This impoundment will be incised into the existing ground. Part of the excavation will be used to construct a 12-foot-wide embankment. The spillway will be an open channel that will have rip-rap min. 6. This pond will control storm water runoff from a watershed of approximately 96 acres. The cleanout and spillway elevation are 6822' and 6834', respectively. Top of the embankment is at elevation 6838'. Details for the design can be viewed on Drawing 5-31.

Open channel spillway details for impoundments 3 and 4 are provided in Drawing 5-32. These spillways are designed for emergencies and are not expected to be used during normal operations.

Four impoundments (one temporary for Area 1 expanded) are proposed to control storm water runoff and sediment from disturbed areas of the North Private Lease. Prior to removal of topsoil and construction of these impoundments, silt fences will be installed at the down gradient disturbance boundary for each impoundment. Once construction has been completed these silt fences can be replaced with excelsior logs for long term sediment control. Each impoundment is designed to contain at minimum the run off from a 10-year, 24-hour duration storm event. The locations of the impoundments and the associated watersheds can be viewed on Drawing 5-65 and 5-65A. Additionally, as depicted on drawings 5-47, 5-48, 5-48A and 5-65, a silt fence or berm will be constructed along the eastern boarder of Area 1.

The following table summarizes the final capacity results for each impoundment:

	North Private Lease Sedimentation Impoundment Capacities				
Structure	Storage Required (ac/ft)	Design Storage (ac/ft)	As-built Storage (ac/ft)	Percent of requirement	Additional Storage (ac/ft)
5	1.28	1.55	1.43	122	0.28

6	1.43	3.15	3.36	220	1.71
7	8.07	19.26	12.97	239	11.19
T1	0.81	1.85	Mined out	139	0.69

Structure 5 is a trapezoid impoundment 8 feet in depth. This impoundment will control storm water runoff from the western side of the permit area were mining will begin. The impoundment will be constructed with an 18" primary spillway with an oil skimmer and an open channel secondary spillway that will have 6" D50 rip-rap. This impoundment will be incised into the existing ground. Part of the excavated material will be utilized to construct an embankment on the down grade side to provide a minimum of 2 feet freeboard. This pond will control storm water from a watershed of approximately 18.8 acres. The cleanout and spillway elevation are 6840' and 6848' respectively. The top of the embankment is at elevation 6850'. Details for the design can be viewed on Drawing 5-67.

Structure 6 is a trapezoid impoundment 8 feet in depth. This impoundment will control storm water runoff from the western side of the permit area were mining will begin. The impoundment will be constructed with an 18" primary spillway with an oil skimmer and an open channel secondary spillway that will have 6" D50 rip-rap. This impoundment will be incised into the existing ground. Part of the excavated material will be utilized to construct an embankment on the down grade side to provide a minimum of 2 feet freeboard. This pond will control storm water from a watershed of approximately 24.0 acres. The cleanout and spillway elevation are 6858' and 6866' respectively. The top of the embankment is at elevation 6868'. Details for the design can be viewed on Drawing 5-68.

Structure 7 is a square impoundment 8 feet in depth. This impoundment will control storm water runoff from the western side of the permit area were mining will begin. The impoundment will be constructed with a 24" primary spillway with an oil skimmer and an open channel secondary spillway that will have 9" D50 rip-rap. This impoundment will be incised into the existing ground. Part of the excavated material will be utilized to construct an embankment on the down grade side to provide a minimum of 2 feet freeboard. This pond will control storm water from a watershed of approximately 133.9 acres. The cleanout and spillway elevation are 6840' and 6848' respectively. The top of the embankment is at elevation 6850'. Details for the design can be viewed on Drawing 5-69.

Structure T1 is a trapezoid impoundment 8 feet in depth. This temporary impoundment will control storm water runoff from Area 1 expanded for pits 7, 8, and 9. The impoundment will not be equipped with a spillway. Instead, the impoundment will be drained as necessary via an engineered pump and pipeline system, and discharged into existing structure 6. This impoundment will be incised into the existing ground. Part of the excavated material will be utilized to construct an embankment on the down grade side to provide a minimum of 2 feet freeboard. This pond will control storm water from a watershed of approximately 14.4 acres. The top of the embankment is at elevation 6874'. Details for the design can be viewed on Drawing 5-71A.

The outer slopes of the impoundments will be sloped to a maximum grade of 3h:1v. Inside slopes will be graded to a maximum 2h:1v. The slopes will be graded and revegetated for erosion control.

No underground mine workings exist near or under the impoundment structures; therefore, subsidence surveys are not provided.

Geologic data for the area where impoundments will be located consists of mainly fine grained alluvium with high clay content. Seepage from the impoundments is expected to be minimal based on the high clay content of the existing materials. Characterization of the soils is contained in Chapter 2. Acid and Toxic analysis of the soils indicates that water seeping through the alluvium layer will not result in reducing water quality. The acid and toxic analysis for the alluvium can be viewed in Appendix 6-2.

Hydrologic data for the permit area is provided in Appendix 7-1. This data indicates that there will be some seepage through the subsurface that may travel to adjacent drainages. The quantities for this seepage are expected to be minimal and will have minimal impact to the overall hydrologic balance. Even though seepage may occur, analysis of the soils indicates that water quality will not be diminished.

Sedimentation ponds have been designed in compliance with the requirements of R645-301-356.300, R645-301-356.400, R645-301-513.200, R645-301-742.200 through R645-301-742.240, and R645-301-763.

No sedimentation ponds or earthen structures that will remain open are planned.

The sedimentation plan has been designed to comply with the MSHA requirements given under R645-301-513.100 and R645-301-513.200.

The diversions ditches for the Coal Hollow Mine will be utilized to direct runoff from disturbed areas to the sediment impoundments. The channel sizing for the four diversion ditches has been evaluated using the TR-55 method to determine peak flows and the Manning's Equation (ME) to determine appropriate dimensions. The TR-55 method of analysis is the same method used to size impoundments and was utilized in this case to provide a peak flow for each diversion during a 10-year, 6-hour storm event. This peak flow was then input into the ME to determine an appropriate open channel design for minimizing the effects of erosion during peak flows. Similar to the impoundment sizing, the Carlson Software Hydrology module was utilized to perform these calculations. The ditch locations, designs and cross sections can be viewed on Drawings 5-33 and 5-34.

The following table summarizes the inputs and results for each diversion based on flows during a 10-year, 6-hour storm event:

Coal Hollow Mine Diversion Ditch Summary

Ditch	*Base (ft)	Manning's n	Average Slope (%)	Peak Flow (cfs)	Flow Depth (ft)	Velocity (fps)	Freeboard (ft)
1	0.0	0.025	2.33	0.72	0.11	2.00	0.5
2	2.5	0.020	3.5	6.9	0.4	6.0	0.3
3	0.0	0.025	2.4	0.48	0.07	1.51	0.5
4	0.0	0.025	3.09	3.30	0.19	3.26	0.5
4-A-D	0.0	0.025	2.86	3.25	0.62	4.27	0.5
4-A-R	0.0	0.025	1.18	0.84	0.44	2.19	0.5
4-A-U	0.0	0.025	1.41	0.37	0.31	1.90	0.5
B-1T-U	0.0	0.025	1.0	2.87	0.75	2.87	0.5
B-1T-L	0.0	0.025	4.8	**6.68	0.82	6.68	0.5

*All side slopes are 2h:1v
**Total flow from both watersheds

The diversions ditches for the North Private Lease will be utilized to direct runoff from disturbed areas to the sediment impoundments. The channel sizing for the ten diversion ditches, with two temporary diversion ditches that will be mined through in Area 1 once Area 2 is approved, has been evaluated using the TR-55 method to determine peak flows and the Manning's Equation (ME) to determine appropriate dimensions. The TR-55 method of analysis is the same method used to size impoundments and was utilized in this case to provide a peak flow for each diversion during a 10-year, 6-hour storm event. This peak flow was then input into the ME to determine an appropriate open channel design for minimizing the effects of erosion during peak flows. The ditch locations, designs and cross sections can be viewed on Drawings 5-65, 5-65A, 5-72 and 5-73. Of special note, the evacuated material for UD-14 will be placed on the disturbed area side of the ditch to form a berm which will provide a distinct boundary between disturbed and undisturbed.

The following table summarizes the inputs and results for each diversion based on flows during a 10-year, 6-hour storm event:

North Private Lease Diversion Ditch Summary							
Ditch	*Base (ft)	Manning's n	Average Slope (%)	Peak Flow (cfs)	Flow Depth (ft)	Velocity (fps)	Freeboard (ft)
DD-5	0.0	0.025	5.21	0.60	0.29	3.50	0.71
DD-6	0.0	0.025	6.22	0.20	0.19	2.85	0.81
DD-7	0.0	0.025	4.84	0.28	0.22	2.82	0.78
DD-8	0.0	0.025	5.16	0.28	0.22	2.89	0.78
DD-9	0.0	0.025	8.42	0.80	0.30	4.51	0.70
DD-10	0.0	0.025	2.67	0.80	0.37	2.93	0.63
DD-11	0.0	0.025	6.07	0.51	0.27	3.56	0.83
DD-12	0.0	0.025	7.00	1.15	0.35	4.61	0.65
DD-13	0.0	0.025	2.23	3.77	0.68	4.04	0.82
UD-14	0.0	0.025	0.27	1.07	0.63	1.34	0.87
DD-T1-01	0.0	0.025	4.00	0.17	0.19	2.32	0.69

DD-T1-02	0.0	0.025	2.86	0.35	0.27	2.45	0.77

*All side slopes are 2h:1v

The sedimentation plan has been designed to comply with the MSHA requirements given under R645-301-513.100 and R645-301-513.200.

These structures will retain sediment within the disturbed area. The diversion ditches are designed in manner that will minimize erosion of the channels and will divert runoff from disturbed areas to the impoundments. These sediment control measures are designed to meet the effluent limitations under R645-301-751.

742.126

Water encountered underground will be stored and treated as needed in underground sumps. It is anticipated most or all of such water would be utilized in the underground mining operation. Excess water would only be discharged after meeting applicable UPDES standards.

742.200 Siltation Structures

Siltation structures have been designed in compliance with the requirements of R645-301-742.

Miscellaneous controls such as silt fence and berms are proposed for specific areas. The proposed locations for these structures are shown on Drawing 5-26. Details associated with these structures can be viewed on Drawings 5-25 through 5-34 and Appendix 5-2 for the Coal Hollow Mine. The proposed locations for these structures are shown on Drawing 5-47. Details associated with these structures can be viewed in Appendix 5-13 for the North Private Lease.

742.210 General Requirements

Additional contributions of suspended solids and sediment to streamflow or runoff outside the permit area will be prevented to the extent possible using the best technology currently available. Siltation structures for an area will be constructed before beginning any coal mining and reclamation operations in that area and, upon construction, will be certified by a qualified registered professional engineer to be constructed as designed and as approved in the reclamation plan. Any siltation structures which impounds water will be designed, constructed and maintained in accordance with R645-301-512.240, R645-301-514.300, R645-301-515.200, R645-301-533.100 through R645-301-533.600, R645-301-733.220 through R645-301-733.224, and R645-301-743.

The primary controls for limiting suspended solids and sediment to stream flow and runoff outside the permit area is sediment impoundments and diversions ditches. The

proposed system described in section 742.110 is designed to control storm water/runoff discharges from the disturbed areas. Discharges from this system are expected to be minimal and infrequent. Discharges that may occur will comply with R645-301-751.

The impoundment and ditch system will be inspected regularly and discharges will be sampled for water quality purposes.

742.212

Siltation structures including ponds and ditches will be the first features built when beginning a new area.

742.214

Water encountered underground will be stored and treated as needed in underground sumps. It is anticipated most or all of such water would be utilized in the underground mining operation. Excess water would only be discharged after meeting applicable UPDES standards.

742.220 Sedimentation Ponds.

742.221.1 The proposed sediment ponds are designed to be used individually

742.221.2 The locations for the sediment ponds were selected to be as near as possible to the disturbed areas and are not located in perennial streams

742.221.3 The ponds are designed and will be constructed and maintained to:

742.221.31 The ponds for the Coal Hollow Mine have been designed with excess capacity for at least 3 years calculated sediment storage volume. The following table provides the design capacities in relation to a 24-hour duration, 10-year storm event:

	Coal Hollow Mine Sedimentation Impoundment Capacities				
Structure	Storage Required (ac/ft)	Design Storage (ac/ft)	As-built Storage (ac/ft)	Percent of requirement	Additional Storage (ac/ft)
1	2.86	3.1	3.1	108	0.62
2	1.7	2.3	2.3	135	0.6
3	14.89	15.0	18.03	101	0.1
4	4.83	5.5	5.5	114	0.7
1B	0.66	0.8	0.8	121	0.1

The ponds for the North Private Lease have been designed with excess capacity to allow for 3 years of sediment storage volume. The following table provides the design capacities in relation to a 24-hour duration, 10-year storm event:

	North Private Lease Sedimentation Impoundment Capacities				
Structure	Storage Required (ac/ft)	Design Storage (ac/ft)	As-built Storage (ac/ft)	Percent of requirement	Additional Storage (ac/ft)
5	1.28	1.55	1.43	122	0.28
6	1.43	3.15	3.36	220	1.71
7	8.07	19.26	12.97	239	11.19
T1	0.81	1.50	Mined out	185	0.69

These sedimentation ponds will be surveyed at least annually to ensure that sufficient sediment storage is available in the impoundment. Sediment will be removed from the ponds as required based on results from the surveys. Calculations related to these design capacities can be viewed in Appendix 5-2 for the Coal Hollow Mine and in Appendix 5-12 &5-12A for the North Private Lease. Stage-Storage curves for each pond can be viewed on Drawings 5-28 through 5-31 and 5-67 through 5-71A.

742.221.32 The sedimentation ponds in the Coal Hollow Mine are designed to provide detention for a 10-year, 24-hour duration storm event. Calculations for this design can be viewed in Appendix 5-2. The sedimentation ponds in the North Private Lease are designed to provide detention for a 10-year, 24-hour duration storm event. Calculations for this design can be viewed in Appendix 5-12 & 5-12A. This design standard is expected to keep discharges from the structure at a minimum and allow adequate settlement time to meet Utah and federal effluent limitations. In the event it becomes necessary to decant water to satisfy the required storage volumes, ACD will use a 4" gasoline driven pump to decant excess water. Temporary Pond T1 has additional specifications for the pumping system; the pipeline will be 4" black polyethylene pipe approximately 1760' in length, pump will be capable of moving a minimum of 0.5 cfs of water at a total head of 75' and pipe will discharge onto existing rip-rap in Sediment Pond 6 as found in Appendix 5-12A. Water will be required to remain in the pond for a minimum of 24 hours prior to the beginning of decant operations and be discharged through the discharge point approved under UPEDES permit No. UTG25992 following all applicable monitoring protocol under this permit.

742.221.33 The sedimentation ponds at the Coal Hollow Mine are designed for a 10-year, 24-hour storm event. The sedimentation ponds at the North Private Lease are designed for a 10-year, 24-hour storm event. The 10-year, 24-hour precipitation event in this same location is approximately 2.39 inches of precipitation.

742.221.34 Each pond will be constructed with an emergency spillway, should the capacities of the ponds ever be exceeded with the exception of temporary pond T1A which will be equipped with a pumping system (Appendix 5-12A). These spillways will provide a nondestructive route for storm water discharge, though the capacities of the ponds are not expected to be exceeded. The design capacities of the ponds are expected to contain each storm event and therefore will provide sufficient detention time to meet Utah and federal effluent limitations. The following is a description of each spillway:

Impoundments 3 and 4 will be constructed with open channel spillways. These spillways are designed to discharge a 24-hour duration, 100-year storm event even though they are not expected to be used during normal operations. They will have rip-rap min. 6" to minimize erosion and spillway slopes will not exceed 3h:1v. Drawing 5-32 provides the details for the open channel spillways.

Impoundments 1, 1B, and 2 will be constructed with a drop pipe spillway system. Storm water and snow melt that occurs within the associated watersheds will be routed to these impoundments to contain sediment. These impoundments will have the drop-pipe spillways installed which will allow removal of any oil sheens that may result from parking lots, primary roads or maintenance activities by using absorbent materials to remove the sheen. The drop-pipe spillways are 24" diameter pipes that are vertical in the impoundment. These pipes have a metal cover over the end. This cover is recessed over the pipe by at least an inch, with a gap between the cover and the pipe. This leaves a route for water to discharge once the impoundment is full but prevents debris or pollutants located on the water surface from discharging. This system was chosen for these two impoundments based on their locations in relation to the facilities and primary roads. This discharge system will be constructed for precautionary measures only since pollutants are not expected in the impoundments during normal operations.

Impoundments 5, 6 and 7will be constructed with a drop pipe primary spillway and an open channel emergency spillways system. Storm water and snow melt that occurs within the associated watersheds will be routed to these impoundments to contain sediment. The drop-pipe spillways are 18" diameter pipes for impoundments 5 and 6 and a 24" diameter pipe for impoundment 7 that are vertical in the impoundment. These pipes have a metal cover over the end. This cover is recessed over the pipe by at least an inch, with a gap between

the cover and the pipe. This leaves a route for water to discharge once the impoundment is full but prevents debris or pollutants located on the water surface from discharging. The open channel emergency spillways are designed to discharge a 6-hour duration, 25-year storm event even though they are not expected to be used during normal operations. Impoundments 5 and 6 will have 6" rip-rap (D-50) and impoundment 7 will have 9" rip-rap (D-50) with erosion control fabric beneath to minimize erosion and spillway slopes will not exceed 3h:1v

Impoundment T1 will not be equipped with a spillway. Instead, the impoundment will be drained as necessary via an engineered pump and pipeline system, and discharged into existing structure 6. Details can be found in Appendix 5-12A.

742.221.35 Regular inspections of the sediment pond system during construction and operations will identify any deficiencies that could cause short circuiting. Design standards for the system will ensure proper functioning during extreme storm events which makes it highly unlikely that issues related to short circuiting could occur during normal operations.

742.221.36 Surveys of the pond system will be conducted at least annually. These surveys will be compared against the required "design event" capacity for each pond. Sediment removal will occur as needed to maintain the required capacity.

742.221.37 Geologic conditions in the areas where sediment ponds will be constructed are suitable to the proposed use. Excessive settling of the ponds is not expected based on the high clay content of the soils. Embankments will be constructed in maximum two foot lifts to promote compaction during the construction process, reducing settling during operations. Supporting data for compaction can be viewed in Appendix 5-1.

742.221.38 Any sod, large roots, and/or frozen soil will be removed from sedimentation ponds. No coal processing will be conducted as part of the Coal Hollow Project; therefore wastes from this type of process will not be present.

742.221.39 Embankments will be constructed in maximum two foot lifts to promote compaction during the construction process, reducing settling during operations. Supporting data for this compaction method can be viewed in Appendix 5-1.

742.222 Sedimentation ponds for the Coal Hollow Mine or the North Private Lease do not meet the size or other qualifying standard for MSHA, 30 CFR 77.216(a).

742.223 Each sedimentation pond at the Coal Hollow Mine will be constructed with a spillway that will function as both the emergency and principle spillway. Each of these spillways will safely discharge a 25-year, 6-hour precipitation event. The following table summarizes the spillway discharge designs in relation to the 25-year, 6-hour precipitation event:

Sediment Impoundment – Spillway Flow Capacities		
Impoundment	Required Spillway Discharge (cfs)	Designed Spillway Discharge (cfs)
1	30.4	37.4
2	0.8	30.5
3	2.8	11.5
4	2.4	11.5
1B	6.06	23.9

The drop pipe spillways for impoundments 1, 1B, and 2 will be of nonerodible construction. The open channel spillways for impoundments 3 and 4 will be rip-rap min. 6" and are designed to carry short-term, infrequent flows at non erosive velocities where sustained flows are not expected.

742.224 Each sedimentation pond at the North Private Lease will be constructed with a principle spillway and an emergency spillway with the exception of T1 which will have a pumping system (Appendix 5-12A). Each of these spillways will safely discharge a 25-year, 6-hour precipitation event. The following table summarizes the spillway discharge designs in relation to the 25-year, 6-hour precipitation event:

Sediment Impoundment – Primary Spillway Flow Capacities		
Impoundment	Required Spillway Discharge (cfs)	Designed Spillway Discharge (cfs)
5	2.23	9.66
6	2.85	9.66
7	10.11	20.80

The drop pipe spillways for all impoundments will be of nonerodable construction. The open channel spillways for impoundments 5 and 6 will be rip-rap (D50) 6" underlain with erosion fabric and are designed to carry sustained flows. The open channel spillways for impoundment 7 will be rip-rap (D50) 9" underlain with erosion fabric and is designed to carry sustained flows. Impoundment T1 will not be equipped with a spillway. Instead, the impoundment will be drained as necessary via an engineered pump and pipeline system, and discharged into existing structure 6. Details can be found in Appendix 5-12A.

742.225 Either the requirements of 742.223.1 or 742.223.2 will be met for each sediment impoundment.

742.226 No exceptions to the sediment pond location guidance are requested

742.230 Other Treatment Facilities

If other treatment facilities become necessary, they will be designed to treat the 10-year, 24-hour precipitation event unless a lesser design event is approved by the Division based on terrain, climate, other site-specific conditions and a demonstration by the operator that the effluent limitations of R645-301-751 will be met.

No other treatment facilities are planned for the Coal Hollow Project.

742.240 Exemptions

Not Applicable

742.300 Diversions

742.310 General Requirements

742.311 There are no flows from mined areas that have been abandoned prior to May 3, 1978 at the Coal Hollow Project. Diversions at the Coal Hollow Project are planned to minimize water from disturbed areas from directly discharging into drainages without first being treated and to also prevent water from upland, adjacent areas from entering the project area. Four temporary diversion ditches are planned and one temporary diversion of Lower Robinson Creek. Two diversions will be primarily used to route water from upland, undisturbed areas away from the planned disturbed areas. Diversion ditch 2 has been split to minimize the amount of water from upland routed to Pond 2 (see drawing 5-34), 2B will route water from upland to Lower Robinson Creek and 2A will route water from disturbed area to Pond 2. Diversion ditch 4 is planned to direct water from disturbed areas into sediment impoundment Pond 4. The temporary diversion of Lower Robinson Creek is for maximum recovery of coal and will route flows around the mining area. Each temporary diversion has been designed to only carry runoff from areas that will or potentially could be affected by the mining operations, except Lower Robinson Creek diversion which will carry intermittent flows from the upstream watershed. Diversion locations were selected to generally carry runoff to the drainage paths that the precipitation would originally follow. These parameters were followed in the designs to minimize impacts to the overall hydrological balance within the permit and adjacent areas. Diversions will not be used to route water into

underground mines. Specific design parameters are discussed in the following sections (R645-301-742.312.1 to 742.314). There are no flows from mined areas that have been abandoned prior to May 3, 1978 at the North Private Lease. Diversions at the North Private Lease are planned to minimize water from disturbed areas from directly discharging into drainages without first being treated and to also prevent water from upland, adjacent areas from entering the project area. Ten temporary diversion ditches are planned. One diversion will be primarily used to route water from upland, undisturbed areas away from the planned disturbed areas. Each temporary diversion has been designed to only carry runoff from areas that will or potentially could be affected by the mining operations. Diversion locations were selected to generally carry runoff to the drainage paths that the precipitation would originally follow. These parameters were followed in the designs to minimize impacts to the overall hydrological balance within the permit and adjacent areas. Diversions will not be used to route water into underground mines. Specific design parameters are discussed in the following sections (R645-301-742.312.1 to 742.314).

742.312

The construction of and the operational activities at the proposed alluvial groundwater interceptor trench systems will be performed according to good engineering practices and in compliance with all applicable State and Federal rules. To ensure the safety of construction personnel during construction of the drain systems, work will be performed primarily by the equipment operators from within the operator compartments of the employed equipment. Equipment operators will be adequately trained on the hazards associated with the excavation work at the drain sites. Construction personnel will not be allowed to enter excavated trench areas during the drain construction operations other than as allowed by applicable State and Federal laws and regulations. Where necessary, work outside of equipment operator compartments will be performed in a prudent and safe manner. The excavated drain areas will be promptly backfilled after the drain construction materials have been emplaced.

A physical barrier will be constructed and maintained at alluvial groundwater interceptor drain discharge structures to prevent mine personnel from falling into the discharge structure.

742.312 Each diversion in the Coal Hollow Mine was designed to ensure stability and to minimize erosion. In order to accomplish this standard, the diversions were each designed for peak flows during a 10-year, 24-hour storm event. The following summarizes the steps used:

The channel sizing for the nine proposed temporary diversion ditches has been evaluated using the TR-55 method to determine peak flows and the Manning's Equation (ME) to determine appropriate dimensions. The TR-55 method of analysis is the same method used to size impoundments and was utilized in this case to provide a peak flow for each diversion during a 10-year, 6-hour storm event. This peak flow was then input into the ME to determine an appropriate open channel design for minimizing the effects of erosion during peak flows. Similar to the impoundment sizing, the Carlson Software Hydrology module was utilized to perform these calculations. The ditch locations, designs and cross sections can be viewed on Drawings 5-33 and 5-34.

The following table summarizes the inputs and results for each diversion based on flows during a 10-year, 6-hour storm event:

Diversion Ditch Summary							
Ditch	*Base (ft)	Manning's n	Average Slope (%)	Peak Flow (cfs)	Flow Depth (ft)	Velocity (fps)	Freeboard (ft)
1	0.0	0.025	2.33	0.72	0.11	2.00	0.5
2	2.5	0.020	3.5	6.9	0.4	6.0	0.5
3	0.0	0.025	2.4	0.48	0.07	1.51	0.5
4	0.0	0.025	3.09	3.30	0.19	3.26	0.5
4-A-D	0.0	0.025	2.86	3.25	0.62	4.27	0.5
4-A-R	0.0	0.025	1.18	0.84	0.44	2.19	0.5
4-A-U	0.0	0.025	1.41	0.37	0.31	1.90	0.5
B-1T-U	0.0	0.020	1.0	2.87	0.75	2.87	0.5
B-1T-L	0.0	0.020	4.8	**6.68	0.82	6.68	0.5

*All side slopes are 2h:1v
**Total flow from both watersheds.

The diversions ditches for the North Private Lease will be utilized to direct runoff from disturbed areas to the sediment impoundments. The channel sizing for the ten diversion ditches, with two temporary diversion ditches that will be mined through in Area 1 once Area 2 is approved, has been evaluated using the TR-55 method to determine peak flows and the Manning's Equation (ME) to determine appropriate dimensions. The TR-55 method of analysis is the same method used to size impoundments and was utilized in this case to provide a peak flow for each diversion during a 10-year, 6-hour storm event. This peak flow was then input into the ME to determine an appropriate open channel design for minimizing the effects of erosion during peak flows. The ditch locations, designs and cross sections can be viewed on Drawings 5-65, 5-72 and 5-73. Of special note, the evacuated material for UD-14 will be placed on the disturbed area side of the ditch to form a berm which will provide a distinct boundary between disturbed and undisturbed.

The following table summarizes the inputs and results for each diversion based on flows during a 10-year, 6-hour storm event:

North Private Lease Diversion Ditch Summary							
Ditch	*Base (ft)	Manning's n	Average Slope (%)	Peak Flow (cfs)	Flow Depth (ft)	Velocity (fps)	Freeboard (ft)
DD-5	0.0	0.025	5.21	0.60	0.29	3.50	0.71
DD-6	0.0	0.025	6.22	0.20	0.19	2.85	0.81
DD-7	0.0	0.025	4.84	0.28	0.22	2.82	0.78
DD-8	0.0	0.025	5.16	0.28	0.22	2.89	0.78
DD-9	0.0	0.025	8.42	0.80	0.30	4.51	0.70
DD-10	0.0	0.025	2.67	0.80	0.37	2.93	0.63
DD-11	0.0	0.025	6.07	0.51	0.27	3.56	0.83
DD-12	0.0	0.025	7.00	1.15	0.35	4.61	0.65
DD-13	0.0	0.025	2.23	3.77	0.68	4.04	0.84
UD-14	0.0	0.025	0.27	1.07	0.63	1.34	0.87
DD-T1-01	0.0	0.025	4.00	0.17	0.19	2.32	0.69
DD-T1-02	0.0	0.025	2.86	0.35	0.27	2.45	0.77

*All side slopes are 2h:1v

As shown in the above tables, flow depths will be shallow, flow velocity will be manageable for temporary flow conditions and sufficient freeboard will be present during a flood event. These conditions will provide diversion stability, protection against flooding and prevent to the extent possible additional contributions of suspended solids to streamflow outside the permit area. These diversions are designed to comply with all applicable local, Utah and federal laws and regulations. Further details related to the temporary diversion designs can be viewed in Appendix 5-2, Appendix 5-12 and Appendix 5-12A.

Based on the size of the watershed for Lower Robinson Creek, a different method of analysis was used than the method used for the other diversions. The HEC-1 program was used for this analysis and extra erosion protection has been included as part of the design. The channel was designed to safely handle the flows from a 100-year, 6-hour storm event. This diversion will be further discussed in section 742.320 Diversion of Perennial and Intermittent Streams.

742.313 The nine temporary diversions at the Coal Hollow Mine will be reclaimed when they are no longer necessary. This will occur once final reclamation is determined to be sufficient within the project area and the sediment impoundments are no longer needed. This is anticipated to occur in the fourth year of operations.

The Lower Robinson Creek temporary diversion will be constructed in a responsible manner. This diversion will experience some erosion during flood events but erosion rates are expected to be generally less than those in the original channel above and below the diversion. The detailed design for this diversion can be viewed in Drawings 5-20 and 21. Calculations related to this diversion design can be viewed in Appendix 5-3.

The ten temporary diversions at the North Private Lease will be reclaimed when they are no longer necessary. This will occur once final reclamation is determined to be sufficient within the project area and the sediment impoundments are no longer needed. This is anticipated to occur in the sixth year of operations. Two temporary diversion ditches associated with Area 1 will be mined through when Area 2 is approved and pond 7 is established.

742.320 Diversion of Perennial and Intermittent Streams.

742.321 Temporary diversion of one intermittent stream is planned for the Coal Hollow Project. The planned diversion is in a length of the stream that appreciable flows only occur during storm events and snow melt periods. This diversion is necessary to recover coal located in the northwest corner of the project area. The diversion would provide mining in an area that is 22 acres and contains approximately 400,000 tons of recoverable coal. Without this diversion, most of this area could not be mined.

742.322 The original unmodified channel immediately upstream and downstream from the Lower Robinson Creek diversion has excessive erosion and is not in stable condition. The channel has incised deeply and has developed into a channel that has a capacity significantly greater than any anticipated storm events. Since these conditions are not desirable for the area, the diversion design instead has dimensions that are suitable to pass a 100-year, 6-hour storm event in compliance with R645-301-742.323.

742.323 The temporary Lower Robinson Creek diversion has been designed to safely pass a 100-year, 6-hour storm event. The watershed for this drainage is 3.64 square miles and has a peak flow of 83.5 cubic feet per second during a 100-year, 6-hour event. Minimum dimensions for carrying this flow was found to be a channel that has the following dimensions:

Bottom width: 2 feet
Side slopes: 3h:1v
Minimum slope height: 3 feet (1-foot freeboard added)

Details related to the design calculations are provided in Appendix 5-3. Rip-rap will be appropriately placed to minimize erosion of the channel.

Cross sections of the channel design are shown in Drawing 5-21. As shown in the drawing, all sections of the diversions exceed the minimum design standard. A plan view of the diversion design can be viewed in Drawing 5-20.

Design drawings for post-mining drainage channels in the North Private Lease area are shown on Drawing 5-79. Typical channel sections are shown on Drawings 5-72 and 5-73. Channel calculations are shown in Appendix 5-12. As shown on Drawing 5-79, engineered channels include minimum 6-inch D50 Rip-Rap placed over erosion control fabric in steep stream reaches that would be susceptible to erosion.

742.324 Design of the Lower Robinson Creek Diversion has been certified by a qualified registered professional engineer.

742.330 Diversion of Miscellaneous Flows.

742.323

As part of the reclamation process, Lower Robinson Creek will be reconstructed to its approximate original location. The design for this reconstruction is shown on Drawings 5-20A and 5-21A. This design includes considerable improvements to the channel compared to the channel's current condition. The current condition is such that less than 25% of the channel within the disturbed area has a flood plain present and most of the slopes are near the angle of repose with fair to poor vegetative cover. The reconstructed sides of the channel for the entire length reconstructed. Sharp corners in the original alignment have been rounded to sinuous curve shapes and rip-rap will be installed in the bottom section of the channel to minimize erosion. The flood plain will be seeded and covered with erosion matting to control erosion until natural vegetative condition can be attained.

742.331 Diversion of miscellaneous flows at the Coal Hollow Mine is planned using nine diversion ditches. Two diversions will be primarily used to route runoff from upland, undisturbed areas away from the planned disturbed areas. Diversion ditch 2 has been split to minimize the amount of water from upland routed to Pond 2 (see drawing 5-34), 2B will route water from upland to Lower Robinson Creek and 2A will route water from

disturbed area to Pond 2. Diversion ditch 4, B-1T-U and B-1T-L are planned to direct water from disturbed areas into sediment impoundment Pond 3. The locations of these diversions along with the associated watersheds can be viewed on Drawings 5-27, 5-33 and 5-34. Calculations related to the diversions can be viewed in Appendix 5-2.

Diversion of miscellaneous flows at the North Private Lease is planned using ten diversion ditches. One diversion will be primarily used to route runoff from upland, undisturbed areas away from the planned disturbed areas. The locations of these diversions along with the associated watersheds can be viewed on Drawings 5-63, and 5-64. Calculations related to the diversions can be viewed in Appendix 5-12.

742.332 Each diversion at the Coal Hollow Mine was designed for stability and to minimize erosion. In order to accomplish this standard, the diversions were each designed for peak flows during a 10-year, 6-hour storm event. The following summarizes the steps used:

The channel sizing for the nine proposed temporary diversion ditches has been evaluated using the TR-55 method to determine peak flows and the Manning's Equation (ME) to determine appropriate dimensions. The TR-55 method of analysis is the same method used to size impoundments and was utilized in this case to provide a peak flow for each diversion during a 10-year, 6-hour storm event. This peak flow was then input into the ME to determine an appropriate open channel design for minimizing the effects of erosion during peak flows. Similar to the impoundment sizing, the Carlson Software Hydrology module was utilized to perform these calculations. The ditch locations, designs and cross sections can be viewed on Drawings 5-33 and 5-34.

The following table summarizes the inputs and results for each diversion based on peak flows during a 10-year, 6-hour storm event:

Diversion Ditch Summary							
Ditch	*Base (ft)	Manning's n	Average Slope (%)	Peak Flow (cfs)	Flow Depth (ft)	Velocity (fps)	Freeboard (ft)
1	0.0	0.025	2.33	0.72	0.11	2.00	0.5
2	2.5	0.020	3.5	6.9	0.4	6.0	0.3
3	0.0	0.025	2.4	0.48	0.07	1.51	0.5
4	0.0	0.025	3.09	3.30	0.19	3.26	0.5
4-A-D	0.0	0.025	2.86	3.25	0.62	4.27	0.5
4-A-R	0.0	0.025	1.18	0.84	0.44	2.19	0.5
4-A-U	0.0	0.025	1.41	0.37	0.31	1.90	0.5
B-1T-U	0.0	0.025	1.0	2.87	0.75	2.87	0.5
B-1T-L	0.0	0.025	4.8	**6.68	0.82	6.68	0.5

*All side slopes are 2h:1v

** Total flow from both watersheds

The diversions ditches for the North Private Lease will be utilized to direct runoff from disturbed areas to the sediment impoundments. The channel sizing for the fifteen diversion ditches, with two temporary diversion ditches that will be mined through in Area 1 once Area 2 is approved, has been evaluated using the TR-55 method to determine peak flows and the Manning's Equation (ME) to determine appropriate dimensions. The TR-55 method of analysis is the same method used to size impoundments and was utilized in this case to provide a peak flow for each diversion during a 10-year, 6-hour storm event. This peak flow was then input into the ME to determine an appropriate open channel design for minimizing the effects of erosion during peak flows. The ditch locations, designs and cross sections can be viewed on Drawings 5-65, 5-72 and 5-73. Of special note, the evacuated material for UD-14 will be placed on the disturbed area side of the ditch to form a berm which will provide a distinct boundary between disturbed and undisturbed.

The following table summarizes the inputs and results for each diversion based on flows during a 10-year, 6-hour storm event:

North Private Lease Diversion Ditch Summary							
Ditch	*Base (ft)	Manning's n	Average Slope (%)	Peak Flow (cfs)	Flow Depth (ft)	Velocity (fps)	Freeboard (ft)
DD-5	0.0	0.025	5.21	0.60	0.29	3.50	0.71
DD-6	0.0	0.025	6.22	0.20	0.19	2.85	0.81
DD-7	0.0	0.025	4.84	0.28	0.22	2.82	0.78
DD-8	0.0	0.025	5.16	0.28	0.22	2.89	0.78
DD-9	0.0	0.025	8.42	0.80	0.30	4.51	0.70
DD-10	0.0	0.025	2.67	0.80	0.37	2.93	0.63
DD-11	0.0	0.025	6.07	0.51	0.27	3.56	0.83
DD-12	0.0	0.025	7.00	1.15	0.35	4.61	0.65
DD-13	0.0	0.025	2.23	3.77	0.68	4.04	0.84
UD-14	0.0	0.025	0.27	1.07	0.63	1.34	0.87
DD-T1-01	0.0	0.025	4.00	0.17	0.19	2.32	0.69
DD-T1-02	0.0	0.025	2.86	0.35	0.27	2.45	0.77

*All side slopes are 2h:1v

As shown in the above tables, flow depths will be shallow, flow velocity will be manageable for temporary flow conditions and sufficient freeboard will be present during a flood event. These conditions will provide diversion stability, protection against flooding and prevent to the extent possible additional contributions of suspended solids to stream

flow outside the permit area. These diversions are designed to comply with all applicable local, Utah and federal laws and regulations. Further details related to the temporary diversion designs can be viewed in Appendix 5-2 for the Coal Hollow Mine and Appendix 5-12 & 5-12A for the North Private Lease.

742.333 All nine miscellaneous flow diversions planned for the Coal Hollow Mine are temporary and will be reclaimed when no longer necessary for sediment and storm water control. Therefore, the channels must safely pass the peak runoff from a 2-year, 6-hour event. As previously described, these diversions have been designed to pass a 10-year, 6-hour storm event. Precipitation from a 10-year, 6-hour storm event for this area is 1.41 inches.

All ten miscellaneous flow diversions planned for the North Private Lease are temporary and will be reclaimed when no longer necessary for sediment and storm water control. Two temporary diversion ditches associated with Area 1 expanded will be mined through when Area 2 is approved and pond 7 is established. Therefore, the channels must safely pass the peak runoff from a 2-year, 6-hour event. As previously described, these diversions have been designed to pass a 10-year, 24-hour storm event which significantly exceeds this required design standard. Precipitation from a 10-year, 24-hour storm event for this area is 2.39 inches while precipitation for the 2-year, 6-hour event is less than 1 inch.

742.400 Road Drainage

742.410 All Roads

742.411 To ensure environmental protection and safety appropriate for the planned duration and use, limits have been incorporated in the road designs for the Coal Hollow Project and the North Private Lease. These limits are applied to drainage control and culvert placement/sizing. These limits take into consideration the type and size of equipment planned for the operation. The following is a description of roads along with the design limits and standards that will be incorporated into construction:

Three primary Mine Haul roads at the Coal Hollow Mine are planned within the permit area. The first road extends from the coal unloading area to the first series of pits along the west side of the property. This road will be utilized for access to pits (pits shown on Drawing 5-10). This road will be approximately 1,100 feet in length and will be utilized mainly during the first two years of mining. There will be four culverts

installed along this road all sized for a 100-year, 24-hour storm event. The first culvert will be across a tributary of Lower Robinson Creek and will be a 36-inch corrugated steel pipe. The second culvert is the main crossing over Lower Robinson Creek and is a 96-inch corrugated steel pipe. Both of these culverts have been sized based on analysis of the Lower Robinson Creek watershed. This analysis can be viewed in Appendix 5-3. The third culvert is a crossing over a diversion ditch that will route water mainly from disturbed areas along the south side of Lower Robinson Creek to a sediment impoundment. This culvert will be a 24-inch corrugated steel pipe.

The second road extends from the first road and proceeds southwest to join and run along a 1,200' section of the rebuilt County Road 136. This road is approximately 2,900 feet in total length. There are two culvert crossings along the County Road 136 portion of this road that are placed to match the original county specifications. These culverts will be 18 inch culverts sized to match the County Road 136 culverts originally in place.

The following specifications apply to these two Primary Mine Haul roads:

1) Roads will be approximately 80' in width
2) Approximately a 2% crown
3) Approximately one foot deep cut ditches along shoulders for controlling storm water
4) 18" of crushed rock or gravel for road surfacing, except for the section of the Pit B-1 access extending from County Road 136 to the pit. This section of road will utilize approximately 6" of crushed rock or gravel for road surfacing. This shallower depth of gravel will still provide the necessary benefits of dust control and sediment control for surface water runoff during a short usage life. For this section of road will be utilized for coal haulage for only around 2-3 months and the western half of it will be eventually mined out as part of the borrow area.
5) Cut and fill slopes of 1.5h:1v
6) Minimum fill over each culvert will be 2 times diameter of culvert
7) Berms placed as necessary along fills

The underground mine portal access and haul road will also be a primary road. This road is accessed from the main haul road from the coal unloading area. The underground access/haul road will be approximately 1,500' in length and will be constructed to the same specifications for the haul roads above, except that the road may be narrowed to a 40-foot width. A plan & profile of the as-built configuration for the underground access road is provided in Drawing 5-22I. This drawing

will be updated when the portal area is re-established in subsequent Federal Block pits.

The ancillary roads will have similar specifications except surfacing will occur only as needed and may be narrowed to a 40-foot road width.

The location and details for all these roads can be viewed on Drawings 5-3 and 5-22 through 5-24.

In addition to the two primary Mine Haul roads, the road located within the facilities area is also classified as a primary road. This road is planned to be 24 feet wide with 24 inches of compacted sub base and 8 inches of compacted 1 inch minus gravel as surfacing. This road system will have six culverts and selectively located berms to appropriately route water to the two sediment impoundments for the facilities area. The location of these culverts and berms is shown on Drawing 5-3. This road is referred to as "Facilities Roadway" and more details are described in 527.200 along with Drawings 5-22A and 5-22B.

The ramps, benches and equipment travel paths within the active surface mining area are temporary in nature and will be relocated frequently as mining progresses. These temporary travel ways are considered part of the pit due to their short-term use, and are not individually designed nor engineered. They will be built and maintained to facilitate safe and efficient mine and reclamation operations.

All roads will be maintained on an as needed basis using motor graders, water trucks for dust suppression, and other equipment as necessary. Crushed stone and/or gravel will be used as a surface course for primary roads outside the active mining area, and may be used as needed for ramps and travel ways within the pit. Should the roads be damaged by a catastrophic event, such as an earthquake or a flood, repairs will be made as soon as possible after the damage has occurred or the road will be closed and reclaimed.

Cut and fill slopes along the primary roads will be minimal and are not expected to cause significant erosion. The water from roads in the project area will not directly discharge to drainages outside the project area without first being treated by flowing through a sediment impoundment. In locations where there are culvert crossings (i.e. Lower Robinson Creek), the fills slopes will be stabilized by utilizing standard methods such as grass matting or straw wattles.

Transportation facilities for the North Private Lease will consist of one primary road, and miscellaneous ancillary/temporary roads. Drawings detail the designs and specifications for each one of the proposed

facilities. The following is a description of each facility and a reference for the associated drawings:

- Roads: A primary haul road will extend from the entrance to the permit area to the North end of Pit 6. This road is approximately 1755 feet in length. This road is referred as the "North Pits Haul Road".

The following specifications apply to these Primary mine haul roads:
1) Roads will be approximately 80' in width
2) Approximately a 2% crown
3) Approximately one foot deep cut ditches along shoulders for controlling storm water
4) 18" of crushed rock or gravel for road surfacing
5) Cut and fill slopes of 1.5 h:1v
6) Berms placed as necessary along fills

The ancillary roads will have similar specifications except surfacing will occur only as needed and may be narrowed to a 40-foot road width. A typical cross section for the ancillary roads can be viewed on Drawing 5-24.

The location and details for the Primary Mine Haul road can be viewed on Drawings 5-58, through 5-64.

The ramps, benches and equipment travel paths within the active surface mining area are temporary in nature and will be relocated frequently as mining progresses. These temporary travel ways are considered part of the pit due to their short-term use, and are not individually designed nor engineered. They will be built and maintained to facilitate safe and efficient mine and reclamation operations.

742.412 No roads will be located in the channel of an intermittent or perennial stream.

742.413 Primary roads constructed utilized during mining operations have been designed and located to route runoff from the roads to the sediment impoundment system. By routing the runoff to this system, sedimentation and flooding downstream resulting from the roads will be minimized. All other roads located within the active mining area will also follow this standard and runoff from the roads will not be directly discharged to drainages outside the permit area.

742.420 Primary Roads

742.421 To minimize erosion, primary roads will be constructed with a rock surface with minimal cut and fill slopes. These roads are located in the most practicable, stable areas within the permit boundary and mostly

outside of the designed pits. These locations can be reviewed on Drawing 5-22 through 5-22G. Further descriptions of these roads can be viewed in Section 742.423.1 and 742.111.

742.422 There are no stream fords by primary roads at the Coal Hollow Project.

742.423 Drainage Control

- 742.423.1 Three primary Mine Haul roads are planned within the permit area. The first road extends from the coal unloading area to the first series of pits along the west side of the property. This road will be utilized for access to pits (pits shown on Drawing 5-10). This road will be approximately 1,400 feet in length and will be utilized throughout mining. There will be three culverts installed along this road all sized for a 100-year, 24-hour storm event. The first culvert will be across a tributary of Lower Robinson Creek and will be a 36-inch corrugated steel pipe. The second culvert is the main crossing over Lower Robinson Creek and is a 96-inch corrugated steel pipe. Both of these culverts have been sized based on analysis of the Lower Robinson Creek watershed. This analysis can be viewed in Appendix A5-3. The third culvert is crossing over a diversion ditch that will route water mainly from disturbed areas along the south side of Lower Robinson Creek to a sediment impoundment. This culvert will be a 24-inch corrugated steel pipe.

  The second road extends from the first road and proceeds southwest to join and run along a 1,200’ section of the rebuilt County Road 136. This section of road will be single lane travel only for all production equipment. The road then continues to the southwest to provide access to Pit B-1. This road is approximately 4,750 feet in total. There are two culvert crossings along the County Road 136 portion of this road that are placed to match the original county. These culverts will be 18 inch culverts sized to match the County Road 136 culverts originally in.

  The following specifications apply to these Primary mine haul roads:

  1) Roads will be approximately 80’ in width
  2) Approximately a 2% crown
  3) Approximately one foot deep cut ditches along shoulders for controlling storm water
  4) 18” of crushed rock or gravel for road surfacing, except for the Pit B-1 access extending from County Road 136 to the pit. This section of the road will utilize approximately 6” of crushed rock or gravel for road surfacing. This shallower depth of gravel will still provide the necessary benefits of dust control and sediment control for surface water runoff during the short usage life. For this section of road will be utilized for coal haulage for only around 2-3 months and the western half of it will be eventually mined out as part of the borrow area.
  5) Cut and fill slopes of 1.5 h:1v
  6) Minimum fill over each culvert will be 2 times diameter of culvert
  7) Berms placed as necessary along fills

The location and details for Primary Mine Haul roads can be viewed on Drawings 5-3 and 5-22 and 5-23.

In addition to the two roads primary Mine Haul roads, the road located within the facilities area is also classified as a primary road. This road is planned to be 24-feet wide with 24 inches of compacted sub base and 8 inches of compacted 1 inch minus gravel as surfacing. This road system will have four culverts and selectively located berms appropriately placed to route water to the two sediment impoundments for the facilities area. The location of these culverts and berms is shown on Drawing 5-3. This road is referred to as "Facilities Roadway" and more details are described in 527.200 along with Drawings 5-22A and 5-22B.

In addition to the primary roads that will be present during active mining, four additional roads are planned to exist postmining and are also classified as primary roads for this reason.

Roads that will remain postmining are the following:

- Road to Water Well with details shown on Drawing 5-22D
- Road to east C. Burton Pugh property with details shown on Drawing 5-22C
- County Road 136 (K3900) with details on Drawing 5-22E, 5-22F and 5-22G. This County road will be reconstructed within the permit area by Kane County. This reconstruction will occur concurrently with the final stage of reclamation as scheduled on Drawing 5-38 and is expected to be completed by the end of Year 4.
- Road to Swapp Ranch (same specification as the Water Well Road)

The location of these roads is shown on Drawings 5-37 along with the post mining topography. With the exception of the County Road, each road will be graded to complement the surrounding topography and drainages. Details for these roads are provided in the above referenced drawings.

County Road 136 will have a cut ditch on the up-gradient side of the road as appropriate. The culvert located at the crossing of Lower Robinson Creek will remain. One culvert will be added at Station 21+66 as shown on Drawing 5-22E and two at Station 13+50 & 22+51 as shown on Drawing 5-22. For further details related to reestablishment of County Road 136, refer Drawings 5-22 through 5-22G and 5-35.

Transportation facilities for the North Private Lease will consist of two primary road, and miscellaneous ancillary/temporary roads. Drawings detail the designs and specifications for each one of the proposed facilities. The following is a description of each facility and a reference for the associated drawings:

- Roads: A primary haul road will extend from the entrance to the permit area to the North end of Pit 6. This road is approximately 1755 feet in length. This road is referred as the "North Pits Haul Road". The second primary haul road "Kanab Creek

Crossing" extends from an intersection with the North Pits Haul Road and cross to the East side of Kanab Creek. This road is approximately 700 feet in length. There is one culvert crossing along this road to cross Kanab Creek. This culvert will be a 172-inch culvert sized for maximum anticipated flows in Kanab Creek.

The following specifications apply to this Primary mine haul roads:

1) Roads will be approximately 80' in width
2) Approximately a 2% crown
3) Approximately one foot deep cut ditches along shoulders for controlling storm water
4) 18" of crushed rock or gravel for road surfacing
5) Cut and fill slopes of 1.5 h: 1v
6) Berms placed as necessary along fills

The location and details for the Primary Mine Haul road can be viewed on Drawings 5-56 thru 5-58.
The ramps, benches and equipment travel paths within the active surface mining area are temporary in nature and will be relocated frequently as mining progresses. These temporary travel ways are considered part of the pit due to their short term use, and are not individually designed nor engineered. They will be built and maintained to facilitate safe and efficient mine and reclamation operations.

In addition to the primary roads that will be present during active mining, two roads are planned to exist postmining and are also classified as primary roads for this reason.

Roads that will remain postmining are the following:

- County Road 136 (K3900) with details on Drawing 5-61. This County road will be reconstructed within the permit area by Kane County. This reconstruction will occur concurrently with the final stage of reclamation as scheduled on Drawing 5-76 and is expected to be completed by the end of Year 6.
- McDonalds Road (same specification as the County Road 136) with details on Drawing 5-62. This reconstruction will occur concurrently with the final stage of reclamation as scheduled on Drawing 5-76 and is expected to be completed by the end of Year 6.

The location of these roads is shown on Drawings 5-74 along with the post mining topography. With the exception of the County Road, each road will be graded to complement the surrounding topography and drainages. Details for these roads are provided in the above referenced drawings.

742.423.2 Drainage pipes and culverts will be constructed on a minimum 2% grade to avoid plugging. Minimum fill over culverts will be 2 times the diameter of the culvert itself to avoid collapsing. Grades going in and out of each culvert will be similar to the grade of the culvert itself to avoid erosion at the inlet and outlet.

742.423.3 Drainage ditches have been designed to pass a 100-year 24-hour storm event which will prevent uncontrolled drainage over the road surface and embankment. The watersheds associated with drainage in the project area are each relatively small (less than 400 acres) and are not expected to sustain flows that would carry significant debris through the project area. Therefore, trash racks and debris basins are not expected to be necessary at the Coal Hollow Project.

742.423.4 One natural intermittent stream channel is planned to be diverted. This channel is referred to as Lower Robinson Creek and this diversion will be temporary. A section of this stream runs across an area that is planned for mining.

The Lower Robinson Creek diversion has been designed to safely pass a 100-year, 6-hour storm event. The watershed for this drainage is 3.64 square miles and has a peak flow of 83.5 cubic feet per second during a 100-year, 6-hour event. Minimum dimensions for carrying this flow were found to be a channel that has the following dimensions:

Bottom width: 2 feet
Side slopes: 3h:1v
Minimum slope height: 3 feet (1-foot freeboard added)

Details related for the design calculations are provided in Appendix 5-3. Rip-rap will be appropriately placed to minimize erosion of the channel.

Cross sections of the channel design are shown in Drawing 5-21. As shown in the drawing, all sections of the diversions exceed the minimum design standard. A plan view of the diversion design can be viewed in Drawing 5-20. This diversion design is in accordance with R645-301-731.100 through R645-301-731.522, R645-301.600, R645-301-731.800, R645-301-742.300, and R645-301-751.

Design of the Lower Robinson Creek Diversion has been certified by a qualified registered professional engineer.

742.423.5 All stream crossings are planned to be culverts designed to pass the 100-year, 6-hour storm event. There are no plans to use fords as stream crossings. Calculations for culvert sizing can be found in Appendix 5-3 for the Coal Hollow Mine and in Appendix 5-12 for the North Private Lease.

743 IMPOUNDMENTS

743.100 General Requirements

Five temporary impoundments are planned at the Coal Hollow Project and nine temporary impoundments for the North Private Lease. Design for these structures are shown in Drawings 5-28 through 5-32 and 5-67 thru 5-71A. These impoundments do not meet the criteria for Class B or C dams as specified in the U.S. Department of Agriculture, Natural Resources Conservation Service Technical Release 60.

743.110 None of the impoundments meet the criteria of MSHA, 30 CFR 77.216(a).

743.120 A professional engineer experienced in the design and construction of impoundments with assistance from a geotechnical expert has used current, prudent, engineering practices to design the proposed impoundments.

The plans have been certified and a detailed geotechnical analysis has been provided in Appendix 5-1 for the Coal Hollow Mine and Appendix 5-11 for the North Private Lease. The certifications, drawings and cross sections can be viewed in Drawings 5-25 through 5-31for the Coal Hollow Mine and Drawings 5-67 through 5-71A and Appendices 5-1, 5-2, 5-11, 5-12 and 5-12A for each area.

Each impoundment is designed with a minimum freeboard of 2 feet. Based on the size of the impoundments and the relatively small size of the associated watersheds, this amount of freeboard will be sufficient to prevent overtopping from waves and/or storm events. These impoundments do not meet the criteria for Class B or C dams.

743.130

Each impoundment with the exception of T1, will be constructed with a spillway that will function as both the emergency and principle spillway. Each of these spillways will safely discharge a 25-year, 6-hour precipitation event. The following table summarizes the spillway discharge designs in relation to the 25-year, 6-hour precipitation event:

Sediment Impoundment – Spillway Flow Capacities		
Impoundment	Required Spillway Discharge (cfs)	Designed Spillway Discharge (cfs)
1	30.4	37.4
2	0.8	30.5
3	2.8	11.5
4	2.4	11.5
1B	6.06	23.9
5	2.23	9.66
6	2.85	9.66
7	10.11	20.80

The drop pipe spillways for impoundments 1, 1B, 2, 5, 6 and 7 will be of nonerodable construction. The open channel spillways for impoundments 3 and 4 will be 6” minimum Rip Rap lined and are designed to carry short-term, infrequent flows at non erosive velocities where sustained flows are not expected. Impoundment T1A will not be

equipped with a spillway. Instead, the impoundment will be drained as necessary via an engineered pump and pipeline system, and discharged into existing structure 6. Details can be found in Appendix 5-12A.

The impoundments at the Coal Hollow project do not meet the criteria for either Class B or C dams or MSHA CFR 77.216 (a).

743.140

A professional engineer or specialist experienced in the construction of impoundments will inspect impoundments. Inspections will be made regularly during construction, upon completion of construction, and at least yearly until removal of the structure or release of the performance bond. The qualified registered professional engineer will promptly, after each inspection, provide to the Division, a certified report that the impoundment has been constructed and maintained as designed and in accordance with the approved plan and the R645 Rules. The report will include discussion of any appearances of instability, structural weakness or other hazardous conditions, depth and elevation of any impounded waters, existing storage capacity, any existing or required monitoring procedures and instrumentation and any other aspects of the structure affecting stability. A copy of the report will be retained at or near the mine site.

The MRP does not contemplate construction of any impoundments meeting the NRCS Class B or C criteria for dams in TR-60, or the size or other criteria of 30 CFR Sec. 77.216.

743.200

No permanent impoundments are planned.

743.300

Design capacities for spillways exceed the 25-year, 6-hour event. The design capacities are provided in the table located in section R645-301-743.130.

744 DISCHARGE STRUCTURES

744.100

Each pond, with the exception of T1, will be constructed with an emergency spillway, should the capacities of the ponds ever be exceeded. These spillways will provide a nondestructive route for storm water discharge, though the capacities of the ponds are not expected to be exceeded. The design capacities of the ponds are expected to contain each storm event and therefore will provide sufficient detention time to meet Utah and federal effluent limitations. The following is a description of each spillway:

Impoundments 3 and 4 will be constructed with open channel spillways. These spillways are designed to discharge a 24-hour duration, 100-year storm event even though they are not expected to be used during normal operations. They will have rip-rap min. 6" to minimize erosion and spillway slopes will not exceed 3h:1v. Drawing 5-32 provides the details for the open channel spillways.

Impoundments 1, 1B, 2, 5, 6 and 7will be constructed with a drop pipe spillway system. Storm water and snow melt that occurs within the associated watersheds will be routed to these impoundments to contain sediment. These impoundments will have the drop-pipe spillways installed which will allow removal of any oil sheens that may result from parking lots, primary roads or maintenance activities by using absorbent materials to remove the sheen. The drop-pipe spillways are 24" diameter pipes for impoundments 1,1B, 2 & 7 and 18" for impoundments 5 and 6 that are vertical in the impoundment. These pipes have a metal cover over the end. This cover is recessed over the pipe by at least an inch, with a gap between the cover and the pipe. This leaves a route for water to discharge once the impoundment is full but prevents debris or pollutants located on the water surface from discharging. This system was chosen for these two impoundments based on their locations in relation to the facilities and primary roads. This discharge system will be constructed for precautionary measures only since pollutants are not expected in the impoundments during normal operations.

The drop pipe spillways for impoundments 1, 1B, 2, 5, 6 and 7 will be of nonerodable construction. The open channel spillways for impoundments 3 and 4 will be rip-rap min. 6" and are designed to carry short-term, infrequent flows at non erosive velocities where sustained flows are not expected. The open channel spillways for impoundments 5 and 6will be rip-rap (D50) 6", impoundment 7 will be rip-rap (D50) 9" and are designed to carry short-term, infrequent flows at non erosive velocities where sustained flows are not expected. These designs will minimize erosion and disturbance to the hydrologic balance.

Details related to these designs can be viewed in Drawings 5-28 through 5-32 for the Coal Hollow and Drawings 5-67 through 5-71 for the North Private Lease.

Impoundment T1 will not be equipped with a spillway. Instead, the impoundment will be drained as necessary via an engineered pump and pipeline system, and discharged into existing structure 6. Details can be found in Appendix 5-12A.

744.200

Standard engineering design procedures have been used in the design of the discharge structures along with standard mining industry best management practices that are commonly used at surface mining operations.

745 Disposal of Excess Spoil

745.100 General Requirements

Excess spoil will be placed in designated disposal areas within the permit area, in a controlled manner to minimize the adverse effects of leachate and surface water runoff from the fill on surface and ground waters; ensure permanent impoundments are not located on the completed fill. Small depressions may be created if approved by the Division if they are needed to retain moisture or minimize erosion, create and enhance wildlife habitat or assist revegetation, and if they are not incompatible with the stability of the fill; and adequately cover or treat excess spoil that is acid- and toxic-forming with nonacid nontoxic material to control the impact on surface and ground water is accordance with R645-301-731.300 and to minimize adverse effects on plant growth and the approved postmining land use.

If the disposal area contains springs, natural or manmade water courses or wet weather seeps, the fill design will include diversions and underdrains as necessary to control erosion, prevent water infiltration into the fill and ensure stability.

Details of proposed excess spoil disposal plans are presented in Chapter 5, Section 535 of this MRP and are summarized below.

A geotechnical analysis has been completed for the proposed excess spoil structure. This analysis estimates the long-term safety factor to be 1.6 to 1.7 based on the proposed design. Following proper construction practices of building the structure in maximum four foot lifts and meeting 85% compaction based on the standard Procter will ensure that the structure will be stable under all conditions of construction. This construction will occur only in the designated excess spoil area as shown on Drawing 5-3 and 5-35. The fill will be placed with end dump haul trucks and lifts will be constructed using dozers. High precision GPS systems will be regularly utilized to check grades and appropriate lift thickness. The geotechnical analysis for this structure can be viewed in Appendix 5-1.

The excess spoil is planned to be placed in an area where natural grades range from 0 to 5%. This is one of the most moderately sloping locations in the Permit Area. Stability of this structure is estimated to be 1.6 to 1.7 based on the Appendix 5-1.

Geotechnical borings were completed in the foundation of the proposed disposal area. Laboratory analysis of these borings has also been completed. Details of this analysis can be viewed in Appendix 5-1 for the Coal Hollow Mine and in Appendix 5-11 for the North Private Lease.

Permanent slopes for the proposed excess spoil will not exceed 3h:1v (33 percent), therefore no keyway cuts have been proposed in the design. Appendix 5-1 details the stability analysis for the proposed structure.

Excess spoil will not be disposed of in underground mine workings.

Horizontal lifts will not exceed four feet in thickness unless otherwise approved by the Division. The lifts will be concurrently compacted to meet 85% of the standard Procter. The geotechnical analysis (Appendix 5-1), provides information showing that these

construction standards will provide mass stability and will prevent mass movement during and after construction. The excess spoil will be graded to provide drainage similar to original flow patterns. Topsoil and subsoil as designated in Chapter 2 will be removed and separated from other materials prior to placement of spoil.

A description of the character of the bedrock and any adverse geologic conditions in presented in Appendix 5-1.

Spring and seep survey information is provided on Drawing 7-1. There are no springs or seeps identified in the excess spoil area.

There are no historical underground mining operations in the proposed excess spoil area. There are also no future underground operations proposed.

There are no rock chimneys or drainage blankets proposed.

A stability analysis including strength parameters, pore pressures and long-term seepage conditions is presented together with all supporting data in Appendix 5-1.

Neither rock-toe buttresses nor key-way cuts are required under R645-301-535.112 or R645-301-535.113.

No valley fills or head-of-hollow fills are proposed.

No durable rock fills are proposed.

No disposal of waste on preexisting benches is planned

The excess spoil structure and fill above approximate original contour are the only alternative specifications proposed. A geotechnical analysis has been completed for this proposal and can be viewed in Appendix 5-1. All other mined areas will be restored to approximate original contour.

745.200 Valley Fills and Head-of-Hollow Fills

Valley fills and head-of-hollow fills are not anticipated in the Coal Hollow Mine permit area.

745.300. Durable Rock Fills.

Durable rock fills are not anticipated in the Coal Hollow Mine permit area.

745.400. Preexisting Benches.

The disposal of excess spoil through placement on preexisting benches is not anticipated in the Coal Hollow Mine permit area.

746. COAL MINE WASTE

746.100. General Requirements.

No coal mine waste is anticipated.

746.200. Refuse Piles.

No refuse piles associated with coal mine waste are anticipated.

746.300. Impounding structures.

No impounding structures associated with coal mine waste are anticipated.

746.330. Drainage control.

No coal mine waste and associated drainage control is anticipated.

746.400. Return of Coal Processing Waste to Abandoned Underground Workings.

No coal mine processing waste is anticipated to be placed in underground workings.

747. DISPOSAL OF NONCOAL WASTE

747.100

Noncoal mine waste, including but not limited to grease, lubricants, paints, flammable liquids, garbage, machinery, lumber and other non-combustible materials generated during coal mining and reclamation operations will be temporarily placed in covered dumpsters. This waste will be regularly removed from the project area and disposed of at a state approved solid waste disposal site outside the project area.

747.200

Noncoal mine waste will be stored in a metal, covered dumpster which will prevent storm precipitation or runoff from coming in contact with the waste.

747.300

No noncoal mine waste will be disposed of within the permit area with the exception perforated piping used in the construction of Alluvial Ground Water Drains. This will be left in place as mining advances. This perforated piping will be covered in place approximately 20' to 30' below the final reclaimed surface. All other waste materials (ie. metal culvert) associated with the Alluvial Ground Water Drains will be removed and disposed of in a State-approved solid waste disposal site. Also, concrete pads for the generator and fan utilized in the underground operation will remain and will be covered with approximately 120' of overburden.

748. Casing and Sealing of Wells.

Wells constructed for monitoring groundwater conditions in the Coal Hollow Mine permit and adjacent area, including exploration holes and boreholes used for water wells or monitoring wells, will be designed to prevent contamination of groundwater and surface-water resources and to protect the hydrologic balance. A diagram depicting typical monitoring well construction methods is shown in Drawing 7-11. Monitoring wells will include a protective hydraulic seal immediately above the screened interval, an annular seal plugging the borehole above the hydraulic seal to near the ground surface, and a concrete surface seal extending from the top of the hydraulic seal to the ground surface which is sloped away from the well casing to prevent the entrance of surface flows into the borehole area. Well casings will protrude above the ground surface a sufficient height so as to minimize the potential for the entrance of surface water or other material into the well. A steel surface protector with a locking cover will be installed at monitoring wells to prevent access by unauthorized personnel. Where there is potential for damage to monitoring wells, the wells will be protected through the use of barricades, fences, or other protective devices. These protective devices will be periodically inspected and maintained in good operating conditions. Monitoring wells will be locked in a closed position between uses.

When no longer needed for monitoring or other use approved by the Division upon a finding of no adverse environmental or health and safety effects, or unless approved for transfer as a water well under R645-301-731.100 through R645-301-731.522 and R645-301-731.800, each well will be capped, sealed, backfilled, or otherwise properly managed, as required by the Division in accordance with R645-301-529.400, R645-301-631.100, and R645-301-748. Permanent closure measures will be designed to prevent access to the mine workings by people, livestock, fish and wildlife, machinery and to keep acid or other toxic drainage from entering ground or surface waters.

If a water well is exposed by coal mining and reclamation operations, it will be permanently closed unless otherwise managed in a manner approved by the Division.

Permanent closure and abandonment of water wells greater than 30 feet in depth will be in accordance with the requirements of "Administrative Rules for Water Well Drillers", State of Utah, Division of Water Rights or other applicable state regulations. Abandonment of

wells will be performed by a licensed water well driller. The wells to be abandoned will be completely filled using neat cement grout, sand cement grout, unhydrated bentonite, or bentonite grout, or other materials approved by the Utah State Engineer's office. Alternatively, the well may be abandoned using a different procedure upon approval from the Utah State Engineer's office.

Abandonment materials will be introduced at the bottom of the well or required sealing interval and placed progressively upward to the top of the well. The casing will be severed a minimum of 2 feet below the ground surface. A minimum of 2 feet of compacted native material will be placed above the abandoned well upon completion.

Within 30 days of the completion of well abandonment procedures, a report will be submitted to the State Engineer by the responsible licensed driller giving data related to the abandonment of the well. This shall include the name of the licensed driller or other person(s) performing abandonment procedures, name of well owner at the time of abandonment, the address or location of the well by section, township, and range, abandonment materials and equipment used, water right or file number covering the well, the final disposition of the well, and the date of completion.

Exploration holes and boreholes will be backfilled, plugged, cased, capped, sealed, or otherwise managed to prevent acid or toxic contamination of water resources and to minimize disturbance to the prevailing hydrologic balance. Exploration holes and boreholes will be managed to ensure the safety of people, livestock, fish and wildlife, and machinery.

If a water well is exposed by coal mining and reclamation operations, it will be permanently closed unless otherwise managed in a manner approved by the Division.

Five dewatering wells were drilled in the North Private Lease along the eastern edge (approximately 230' inside of the planned pit disturbance) of the pits in Area 2. Each well was completed with a 4" PVC casing and a 1hp pump capable of pumping up to 20 gpm. The configuration of wells are connected to a 4" poly pipe which discharges to Pond 7. At such time as the dewatering of the pits has been completed, the dewatering wells will be removed with the advancing pits, thus providing a bond for reclamation is not necessary. The location of the dewatering wells can be seen on drawing 7-10.

If any exploration boreholes are to be used as monitoring wells or water wells, these will meet the provisions of R645-301-731

Boreholes will be backfilled to within 1 foot of the land surface with concrete or other materials approved by the Division as necessary to prevent contamination of groundwater or surface-water resources or to protect the prevailing hydrologic balance. The upper approximately 1 foot will be backfilled with native materials to facilitate reclamation (see Drawing 6-11). Exploration holes and boreholes that may be uncovered during mining and reclamation activities will be permanently closed unless approved for water monitoring or otherwise managed in a manner approved by the Division.

750 PERFORMANCE STANDARDS

All coal mining and reclamation operations will be conducted to minimize disturbance to the hydrologic balance within the permit and adjacent areas, to prevent material damage to the hydrologic balance outside the permit area and support approved postmining land uses in accordance with the terms and conditions of the approved permit and the performance standards of R645-301 and R645-302. Mining operations will be conducted to assure the protection or replacement of water rights in accordance with the terms and conditions of the approved permit and the performance standards of R645-301 and R645-302.

751. Water Quality Standards and Effluent Limitations.

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 U.S. Environmental Protection Agency set forth in 40 CFR Part 434.

Discharges from the Coal Hollow project are expected to be minimal based on the storm water and runoff controls that are described in R645-301-740. These structures are designed to contain large storm events without discharging runoff. Any runoff that does discharge will be treated through the sediment pond system.

Discharges from the proposed alluvial groundwater interceptor drain systems will be made in compliance with all applicable Utah and federal water quality laws and regulations. The proposed drain systems have been designed to intercept and discharge natural, un-contaminated up-gradient alluvial groundwater. The water from the alluvial groundwater intercept drain system will be collected in a gravel-packed underground drainage collection system and conveyed through pipes to a steel/concrete discharge structure from which the water will be discharged via pumping through a discharge hose to the discharge location. By managing the water in this matter, the potential for contamination of the water will be minimized. Prior to the initial discharge of water from newly constructed alluvial groundwater interceptor trench systems to receiving waters, the system will be adequately developed/pumped to remove residual fine-grained sediments that might be present in the system prior to discharge to receiving waters. Only suitable, uncontaminated groundwater will be discharged to the outfall location. The water quality and discharge rates from the alluvial groundwater intercept system will be monitored as per the requirements of the UPDES permit.

752. Sediment Control Measures

Sediment control measures will be located, maintained, constructed and reclaimed according to the plans and designs given under sections R645-301-732, R645-301-742 and R645-301-760. Plans and designs are described in these sections.

752.100
Siltation structures and diversions will be located, maintained, constructed and reclaimed according to plans and designs given under R645-301-732, R645-301-742 and R645-301-763. Plans and designs are described in these sections.

752.200. Road Drainage

Roads will be located, designed, constructed, reconstructed, used, maintained and reclaimed according to R645-301-732.400, R645-301-742.400 and R645-301-762 and to achieve the following:

Control or prevent erosion, siltation and the air pollution attendant to erosion by vegetating or otherwise stabilizing all exposed surfaces in accordance with current, prudent engineering practices;

Control or prevent additional contributions of suspended solids to stream flow or runoff outside the permit area;

Neither cause nor contribute to, directly or indirectly, the violation of effluent standards given under R645-301-751;

Minimize the diminution to or degradation of the quality or quantity of surface- and ground-water systems; and

Refrain from significantly altering the normal flow of water in streambeds or drainage channels.

All plans and designs to meet these standards are described in the above referenced sections and on Drawings 5-22 through 5-24.

753**.** Impoundments and Discharge Structures

Impoundments and discharge structures will be located, maintained, constructed and reclaimed to comply with R645-301-733, R645-301-734, R645-301-743, R645-301-745 and R645-301-760. Plans and designs are described in these sections.

754**.** Disposal of Excess Spoil, Coal Mine Waste and Noncoal MineWaste.

Disposal areas for excess spoil, coal mine waste and noncoal mine waste will be located, maintained, constructed and reclaimed to comply with R645-301-735, R645-301-736,

R645-301-745, R645-301-746, R645-301-747 and R645-301-760. Plans and designs are described in these sections.

755. Casing and Sealing of Wells

All wells will be managed to comply with R645-301-748 and R645-301-765. Water monitoring wells will be managed on a temporary basis according to R645-301-738.

Wells constructed for monitoring groundwater conditions in the Coal Hollow Mine permit and adjacent area, including exploration holes and boreholes used for water wells or monitoring wells, will be designed to prevent contamination of groundwater and surface-water resources and to protect the hydrologic balance. A diagram depicting typical monitoring well construction methods is shown in Drawing 7-11. Monitoring wells will include a protective hydraulic seal immediately above the screened interval, an annular seal plugging the borehole above the hydraulic seal to near the ground surface, and a concrete surface seal extending from the top of the hydraulic seal to the ground surface which is sloped away from the well casing to prevent the entrance of surface flows into the borehole area. Well casings will protrude above the ground surface a sufficient height so as to minimize the potential for the entrance of surface water or other material into the well. A steel surface protector with a locking cover will be installed at monitoring wells to prevent access by unauthorized personnel. Where there is potential for damage to monitoring wells, the wells will be protected through the use of barricades, fences, or other protective devices. These protective devices will be periodically inspected and maintained in good operating conditions. Monitoring wells will be locked in a closed position between uses.

When no longer needed for monitoring or other use approved by the Division upon a finding of no adverse environmental or health and safety effects, or unless approved for transfer as a water well under R645-301-731.100 through R645-301-731.522 and R645-301-731.800, each well will be capped, sealed, backfilled, or otherwise properly managed, as required by the Division in accordance with R645-301-529.400, R645-301-631.100, and R645-301-748. Permanent closure measures will be designed to prevent access to the mine workings by people, livestock, fish and wildlife, machinery and to keep acid or other toxic drainage from entering ground or surface waters.
Water wells less than thirty feet deep are not regulated by the Utah Division of Water Rights. The permanent closure and abandonment of water wells less than 30 feet deep will be accomplished by filling the well casing with neat cement grout, sand cement grout, unhydrated bentonite, or bentonite grout, or other appropriate materials. The well casing will then be cut off below the ground surface and native materials placed over the abandoned well site.

If a water well is exposed by coal mining and reclamation operations, it will be permanently closed unless otherwise managed in a manner approved by the Division.

Permanent closure and abandonment of water wells greater than 30 feet in depth will be in accordance with the requirements of "Administrative Rules for Water Well Drillers", State of Utah, Division of Water Rights or other applicable state regulations. Abandonment of wells will be performed by a licensed water well driller. The wells to be abandoned will be completely filled using neat cement grout, sand cement grout, unhydrated bentonite, or bentonite grout, or other materials approved by the Utah State Engineer's office. Alternatively, the well may be abandoned using a different procedure upon approval from the Utah State Engineer's office.

Abandonment materials will be introduced at the bottom of the well or required sealing interval and placed progressively upward to the top of the well. The casing will be severed a minimum of 2 feet below the ground surface. A minimum of 2 feet of compacted native material will be placed above the abandoned well upon completion.

Within 30 days of the completion of well abandonment procedures, a report will be submitted to the State Engineer by the responsible licensed driller giving data related to the abandonment of the well. This shall include the name of the licensed driller or other person(s) performing abandonment procedures, name of well owner at the time of abandonment, the address or location of the well by section, township, and range, abandonment materials and equipment used, water right or file number covering the well, the final disposition of the well, and the date of completion.

Exploration holes and boreholes will be backfilled, plugged, cased, capped, sealed, or otherwise managed to prevent acid or toxic contamination of water resources and to minimize disturbance to the prevailing hydrologic balance. Exploration holes and boreholes will be managed to ensure the safety of people, livestock, fish and wildlife, and machinery.

If a water well is exposed by coal mining and reclamation operations, it will be permanently closed unless otherwise managed in a manner approved by the Division.

If any exploration boreholes are to be used as monitoring wells or water wells, these will meet the provisions of R645-301-731

Boreholes will be backfilled to within 1 foot of the land surface with concrete or other materials approved by the Division as necessary to prevent contamination of groundwater or surface-water resources or to protect the prevailing hydrologic balance. The upper approximately 1 foot will be backfilled with native materials to facilitate reclamation (see Drawing 6-11). Exploration holes and boreholes that may be uncovered during mining and reclamation activities will be permanently closed unless approved for water monitoring or otherwise managed in a manner approved by the Division.

760. RECLAMATION

761. GENERAL REQUIREMENTS

Before abandoning a permit area or seeking bond release, the mine will ensure that all temporary structures are removed and reclaimed, and that all permanent sedimentation ponds, diversions, impoundments and treatment facilities meet the requirements of R645-301 and R645-302 for permanent structures, have been maintained properly and meet the requirements of the approved reclamation plan for permanent structures and impoundments. The mine will renovate such structures if necessary to meet the requirements of R645-301 and R645-302 and to conform to the approved reclamation plan.

762. ROADS

A road not to be retained for use under an approved postmining land use will be reclaimed immediately after it is no longer needed for coal mining and reclamation operations, including restoring the natural drainage patterns, and reshaping all cut and fill slopes to be compatible with the postmining land use and to complement the drainage pattern of the surrounding terrain.

The post mining land configuration is shown on 5-37 for the Coal Hollow Mine and 5-74 along with postmining road locations. Cuts and fills for the reclaimed roads will be minimal which allows for minor construction to grade roads to the approximate landform that existed prior to disturbance.

763. SILTATION STRUCTURES

763.100.

Siltation structures will be maintained until removal is authorized by the Division and the disturbed area has been stabilized and revegetated. In no case will the structure be removed sooner than two years after the last augmented seeding.

All impoundments will be reclaimed at the end of operations. The estimated timeline for removal of these structures are shown on Drawing 5-38 for the Coal Hollow Mine and 5-76 for the North Private Lease. Expected removal is year seven for the Coal Hollow and year six at the North Private Lease, of the mining and reclamation process. In areas where soils are not stabilized following the removal of these sediment impoundments, silt fence will be appropriately installed and maintained to provide sediment control until stable conditions are met.

763.200.

When the siltation structure is removed, the land on which the siltation structure was located will be regraded and revegetated in accordance with the reclamation plan and R645-301-358, R645-301-356, and R645-301-357.

No permanent sedimentation impoundments are planned.

764. STRUCTURE REMOVAL

The application will include the timetable and plans to remove each structure, if appropriate.

All impoundments will be reclaimed at the end of operations. The estimated timeline for removal of these structures are shown on Drawing 5-38 for the Coal Hollow and Drawing 5-76 for the North Private Lease. In areas where soils are not stabilized following the removal of these sediment impoundments, silt fence will be appropriately installed and maintained to provide sediment control until stable conditions are met.

The facilities will be fully reclaimed at the end of mining operations with the exception of the water well shown on Drawing 5- 8B. The final contour for this area can be viewed on Drawing 5-37 for the Coal Hollow and Drawing 5-74 for the North Private Lease.

765. PERMANENT CASING AND SEALING OF WELLS

Wells constructed for monitoring groundwater conditions in the Coal Hollow Mine permit and adjacent area, including exploration holes and boreholes used for water wells or monitoring wells, will be designed to prevent contamination of groundwater and surface-water resources and to protect the hydrologic balance. A diagram depicting typical monitoring well construction methods is shown in Drawing 7-11. Monitoring wells will include a protective hydraulic seal immediately above the screened interval, an annular seal plugging the borehole above the hydraulic seal to near the ground surface, and a concrete surface seal extending from the top of the hydraulic seal to the ground surface which is sloped away from the well casing to prevent the entrance of surface flows into the borehole area. Well casings will protrude above the ground surface a sufficient height so as to minimize the potential for the entrance of surface water or other material into the well. A steel surface protector with a locking cover will be installed at monitoring wells to prevent access by unauthorized personnel. Where there is potential for damage to monitoring wells, the wells will be protected through the use of barricades, fences, or other protective devices. These protective devices will be periodically inspected and maintained in good operating conditions. Monitoring wells will be locked in a closed position between uses.

When no longer needed for monitoring or other use approved by the Division upon a finding of no adverse environmental or health and safety effects, or unless approved for transfer as a water well under R645-301-731.100 through R645-301-731.522 and R645-301-731.800, each well will be capped, sealed, backfilled, or otherwise properly managed, as required by the Division in accordance with R645-301-529.400, R645-301-631.100, and R645-301-748. Permanent closure measures will be designed to prevent access to the mine workings by people, livestock, fish and wildlife, machinery and to keep acid or other toxic drainage from entering ground or surface waters.

Water wells less than thirty feet deep are not regulated by the Utah Division of Water Rights. The permanent closure and abandonment of water wells less than 30 feet deep will be accomplished by filling the well casing with neat cement grout, sand cement grout, unhydrated bentonite, or bentonite grout, or other appropriate materials. The well casing

will then be cut off below the ground surface and native materials placed over the abandoned well site.

If a water well is exposed by coal mining and reclamation operations, it will be permanently closed unless otherwise managed in a manner approved by the Division.

Five dewatering wells were drilled in the North Private Lease along the eastern edge (approximately 230' inside of the planned pit disturbance) of the pits in Area 2. Each well was completed with a 4" PVC casing and a 1hp pump capable of pumping up to 20 gpm. The configuration of wells are connected to a 4" poly pipe which discharges to Pond 7. At such time as the dewatering of the pits has been completed, the dewatering wells will be removed with the advancing pits, thus providing a bond for reclamation is not necessary. The location of the dewatering wells can be seen on drawing 7-10.

Permanent closure and abandonment of water wells greater than 30 feet in depth will be in accordance with the requirements of "Administrative Rules for Water Well Drillers", State of Utah, Division of Water Rights or other applicable state regulations. Abandonment of wells will be performed by a licensed water well driller. The wells to be abandoned will be completely filled using neat cement grout, sand cement grout, unhydrated bentonite, or bentonite grout, or other materials approved by the Utah State Engineer's office. Alternatively, the well may be abandoned using a different procedure upon approval from the Utah State Engineer's office.

Abandonment materials will be introduced at the bottom of the well or required sealing interval and placed progressively upward to the top of the well. The casing will be severed a minimum of 2 feet below the ground surface. A minimum of 2 feet of compacted native material will be placed above the abandoned well upon completion.

Within 30 days of the completion of well abandonment procedures, a report will be submitted to the State Engineer by the responsible licensed driller giving data related to the abandonment of the well. This shall include the name of the licensed driller or other person(s) performing abandonment procedures, name of well owner at the time of abandonment, the address or location of the well by section, township, and range, abandonment materials and equipment used, water right or file number covering the well, the final disposition of the well, and the date of completion.

Exploration holes and boreholes will be backfilled, plugged, cased, capped, sealed, or otherwise managed to prevent acid or toxic contamination of water resources and to minimize disturbance to the prevailing hydrologic balance. Exploration holes and boreholes will be managed to ensure the safety of people, livestock, fish and wildlife, and machinery.

If a water well is exposed by coal mining and reclamation operations, it will be permanently closed unless otherwise managed in a manner approved by the Division.

If any exploration boreholes are to be used as monitoring wells or water wells, these will meet the provisions of R645-301-731

Boreholes will be backfilled to within 1 foot of the land surface with concrete or other materials approved by the Division as necessary to prevent contamination of groundwater or surface-water resources or to protect the prevailing hydrologic balance. The upper approximately 1 foot will be backfilled with native materials to facilitate reclamation (see Drawing 6-11). Exploration holes and boreholes that may be uncovered during mining and reclamation activities will be permanently closed unless approved for water monitoring or otherwise managed in a manner approved by the Division.

REFERENCES

Cordova, R. M., 1981, Ground-water conditions in the upper Virgin River and Kanab Creek basins area, Utah, with emphasis on the Navajo Sandstone: Utah Department of Natural Resources Technical Publication No. 70, 97p.

Goode, H. D., 1964, Reconnaissance of water resources of a part of western Kane County, Utah: Utah Geological and Mineralogical Survey Water Resources Bulletin 5, 63 p.

_____ 1966, Second reconnaissance of water resources in western Kane County, Utah" Utah Geological and Mineralogical Survey Water Resources Bulletin 8, 44 p.

Gregory, H. E., 1917, Geology of the Navajo country, a reconnaissance of parts of Arizona, New Mexico and Utah, United States Geological Survey Professional Paper 93.

Hereford, R, 2002, Valley-fill alluviation during the Little Ice Age (ca. AD 1400-1880), Paria River Basin and southern Colorado Plateau, United States, Geological Society of America Bulletin, v. 114, no. 12, p. 1550-1563.

OSM, 1998, A Handbook of Technologies for Avoidance and Remediation of Acid Mine Drainage, prepared by Acid Drainage Technology Initiative (ADTI) group, published by the National Mine Land Reclamation Center (NMLRC) at West Virginia University, http://www.techtransfer.osmre.gov/NTTMainSite/Library/hbmanual/hbtechavoid.htm

Petersen Hydrologic, 2007, Investigation of groundwater and surface-water systems in the 630-acre proposed Coal Hollow Mine permit and adjacent area; potential hydrologic consequences of coal mining; recommended monitoring plan, and alluvial valley floor determination; Kane County, Utah, unpublished consulting report for Alton Coal Development, LLC.

Petersen Hydrologic, 2011, Investigation of pit mine-water inflows at the Alton Coal Development, LLC Coal Hollow Mine; Evaluation of sediment pond design criteria, consulting report to Kirk Nicholes, Alton Coal Development, Cedar City, Utah.

Plantz, G. G., 1983, Selected hydrologic data, Kolob-Alton-Kaiparowits coal-fields area, south-central Utah, U. S. Geological Survey Open-File Report 83-871.

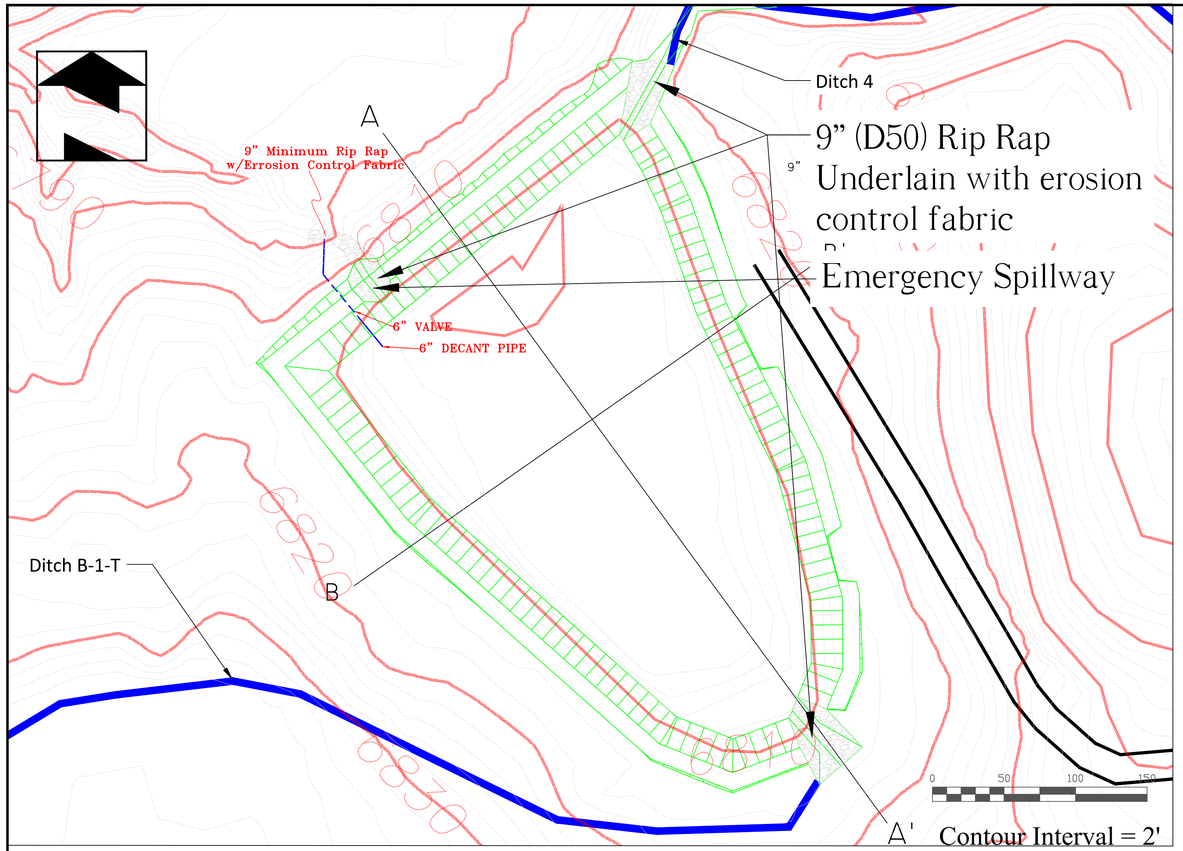
Sandberg, G. W., 1979, Hydrologic evaluation of the Alton coal field, Utah" U.S. Geological Survey Open-File Report 79-346, 53 p.

Stiff, A.H., Jr., 1951, The interpretation of chemical water analyses by means of patterns: Journal of Petroleum Techniques, Technical Note 84, p. 15-17.

UDOGM, 2007, 2008, Utah Division of Oil, Gas and Mining, Utah coal mine water quality database, on-line at http://ogm.utah.gov/coal/edi/wqdb.htm.

Vogt, B. J., 2008, The arroyo problem in the southwestern United States, U.S. Geological Survey: http://geochange.er.usgs.gov/sw/impacts/geology/arroyos/

Water Engineering & Technology, Inc., 1988, Geomorphological and sedimentological characteristics of Sink Valley, Kane County, Utah, unpublished consulting report for Nevada Electric Investment Company, 86 p. and appendices.



Pond #3

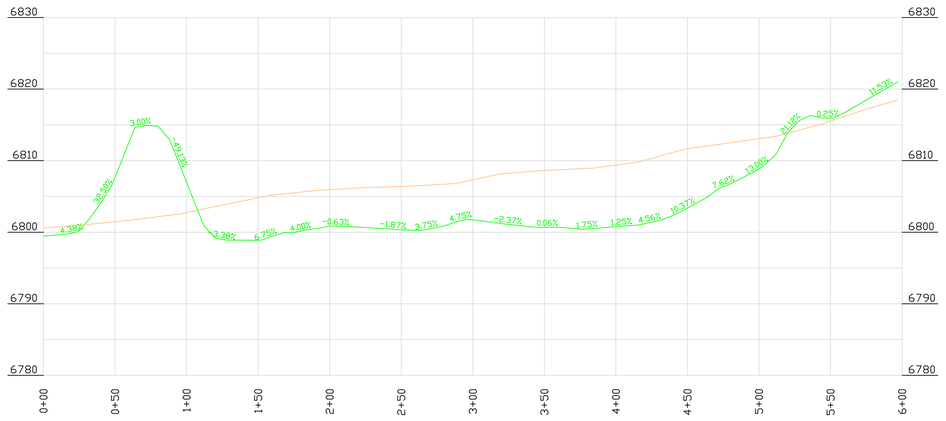
Required Storage for 10 year,
24 hr event = 14.89 acre/ft

As Built Pond Storage Volumes

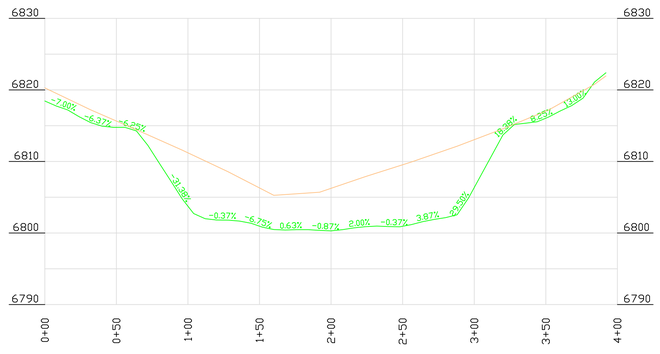
Sediment Control Structure No. 3

Water Elev (ft)	Area (Acres)	Average Area	Volume (Acre-Ft)	Accumulated Volume (Acre-Ft)	Stage
6796	0.004	-	-	-	Bottom Pond
6797	0.007	0.006	0.006	0.006	
6798	0.009	0.008	0.008	0.014	
6799	0.033	0.021	0.021	0.035	
6800	0.116	0.075	0.075	0.109	
6801	0.715	0.415	0.415	0.525	
6802	1.126	0.921	0.921	1.445	
6803	1.313	1.220	1.220	2.665	
6803.39	1.356	1.335	0.514	3.179	60% Sediment Cleanout
6804	1.399	1.356	1.356	4.021	
6804.90	1.439	1.419	1.277	5.299	Max Sediment Level
6805	1.479	1.439	1.439	5.461	
6806	1.563	1.521	1.521	6.982	
6807	1.659	1.611	1.611	8.593	
6808	1.758	1.708	1.708	10.301	Decant Pipe
6809	1.851	1.804	1.804	12.106	
6810	1.937	1.894	1.894	14.000	
6811	2.015	1.976	1.976	15.976	
6812	2.086	2.051	2.051	18.027	Emergency Spillway
6813	2.155	2.121	2.121	20.148	
6814	2.226	2.191	2.191	22.339	
6815	2.400	2.313	2.313	24.652	Top of Dike

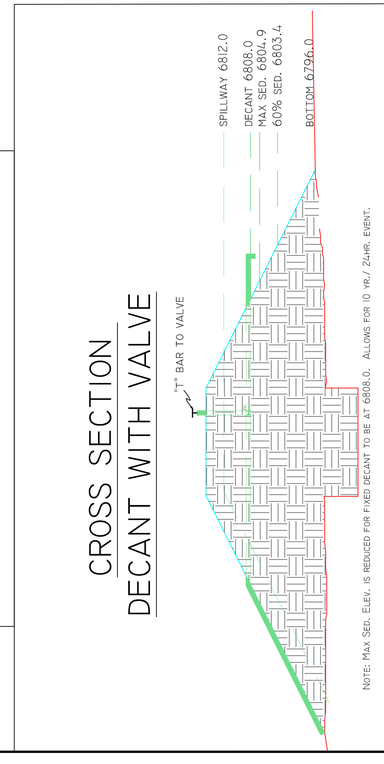
Pond 3 A - A'



Pond 3 B - B'



X-Section Scale
1"=10'
1"=50'



CROSS SECTION
DECANT WITH VALVE

New Coal Development
Coal Hollow Project
463 North 100 West, Suite 1
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Phone (435)867-5331
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PROFESSIONAL ENGINEER
10230818
ANDREW R. CHRISTENSEN
STATE OF UTAH

SEDIMENT IMPOUNDMENT 3
As-Built DETAILS

COAL HOLLOW
PROJECT
ALTON, UTAH

DRAWING: 5-30AB

REVISIONS		
DATE:	BY:	
X/X/X	XX	

DRAWN BY:	CHECKED BY:
ARC	BKN
DRAWING: 5-30AB	DATE: 9/16/19
	SCALE: 1" = 50'
	JOB NUMBER: 1400
	SHEET