C/015/018 Incoming

#4873

RECEIVED
APR 13 2015
DIV. OF OIL, GAS & MINING

PACIFICORP
ENERGY WEST MINING COMPANY
DEER CREEK MINE MSHA ID NO. 42-00121

Mill Fork Access #2 Mains Rilda Canyon Portals 1st Right Submains Proposed Bulkheads – Installation and Monitoring Plan

DOGM

State Office

PACIFICORP
ENERGY WEST MINING COMPANY
DEER CREEK MINE MSHA ID NO. 42-00121

Mill Fork Access #2 Mains
Rilda Canyon Portals 1st Right Submains
Proposed Bulkheads – Installation and Monitoring Plan

Insert Addendum #4 Cover Letter

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

Energy West Mining Company
P. O. Box 310
15 No Main Street
Huntington, UT 84528

April 10, 2015

Russell Riley
District Manager (9)
Mine Safety and Health Administration, District 9
U.S. Department of Labor
P.O. Box 25367
Denver, Colorado 80225

RECEIVED
APR 13 2015
DIV. OF OIL, GAS & MINING

RE: Proposed Bulkhead Installation and Monitoring Plan, Addendum #4, Revised Emergency Response Plan due to Installation of the Mine Separation Seals at 3rd North Deer Creek Mine 42-00121

Dear Mr. Riley:

PacifiCorp, by and through its wholly-owned subsidiaries, Interwest Mining Company as managing agent and Energy West Mining Company ("Energy West") as mine operator formally announced on December 15, 2014 that the Deer Creek Mine would be permanently closed in its entirety. Since the announcement, Energy West has effectively recovered all the mine equipment from the entire mine. Energy West has been engaged in the closure process since the announcement with periodic reviews, inspections and updates with all regulatory agencies.

As a function of the mine closure, Energy West has elected to systematically seal portions of the mine to reduce exposure. The first set of seals, located in 7th North XC-39, isolated the extreme northern extent of the mine. The second set of seals at 3rd North B XC-138, separated the mine into two distinct districts. The southern district will be sealed immediately by completion of the mine isolation seals located at 3rd North B XC-138, Meetinghouse Canyon breakouts, and the Deer Creek portals. The northern district (north of 3rd North B XC-138), is where bulkhead construction will take place. The northern district will be sealed after the completion of the bulkheads, horizontal drain hole, concrete plugs and sealing of the Rilda Canyon Left Fork portals. With the mine separation seals in-place, access to the bulkhead locations in the north district (primary set located in Mill Fork Access #2 and the secondary set in 1st Right) for construction and post construction monitoring is possible through the Left Fork Portals.

During discussions with Pittsburgh Safety and Health Technology Center Mine Emergency Operations personnel (John Urosek, Stephen Sawyer, Chris Snyder on March 9, 2015) several issues regarding Energy Wests original proposed bulkhead installation plan were raised, mainly that MSHA does not consider any structure inby a new (proposed secondary bulkheads located at 1st Right) set of seals or bulkheads as a functioning structure. Energy West would be required to breach/open valves of the inby bulkheads (Mill Fork Access #2) prior to constructing the secondary set. Lack of monitoring access to the primary set of bulkheads during the construction of the secondary set of bulkheads conflicted with MSHA regulations. Energy West pointed out

that, as outlined in the plan, construction and installation of the bulkheads will explicitly follow the installation procedures outlined in MSHA Approval Number 120M-15.0 (Appendix D), except for item I – Water Drainage System. Energy West proposes not to install water drainage systems through the bulkheads as an effort to minimize potential leakage of the bulkheads, since drainage systems would negate the benefit of the primary set of bulkheads.. Energy West committed to monitoring the primary set during construction of the secondary to confirm that the primary set did not retain water. With the mine separation seals in-place at 3rd North B Mains crosscut #138, access for construction and monitoring of both the primary and secondary bulkheads in the north district no longer is restricted. The construction sequence has now been modified to allow access for monitoring both sets of bulkheads.

After the completion of the Mill Fork Bulkheads, the next phase will be the installation of the portals plugs at the Rilda Canyon 1st Right portals followed by the 1st Right Bulkheads and seals at the Left Fork portals. Addendum #4 outlines changes in the bulkhead plan construction sequence and the emergency response plan as a result of the mine separation seals.

Energy West apologizes for the inconveniences related to the bulkhead addendums. Addendum #1 (vent tube through the bulkheads) and #2 (commitment to monitor the potential static head inby the primary set of bulkheads during the construction of the secondary set) modified the plan to satisfy concerns identified during the Emergency Mine Operations review process. Addendum #3, relocation of the secondary set of bulkheads, was an effort to reduce potential static water pressure and decrease the potential water leakage. Relocation of the secondary set of bulkheads in itself was straightforward, but the maps, drawings, tables, etc., that describe the addendum required substantial revision. Therefore a complete new bulkhead submittal package was prepared in order to adequately convey the intended change. It was not intended to confuse or delay the process, amending the application was an effort to provide a comprehensive plan to address effective mine closure. Addendum #4 does not alter the overall concept of the bulkhead construction and mine closure, including the two sets of bulkheads. However, the inclusion of the mine separation seals allows Energy West to access both sets of bulkheads during construction and for post construction monitoring.

To simplify the review process, Energy West has provided:

- a redline/strikeout document to confirm the alterations from the previous bulkhead document
- revised text section to insert into the booklet
- two additional maps illustrating changes to the mine as a result of the mine separation sealing
- Figure 14 - Bulkhead Inspection Form
- Addendum #4: Revised Emergency Response Plan due to Installation of the Mine Separation Seals at 3rd North

Deer Creek mine closure has been a dynamic process, encountering many unanticipated hurdles. Energy West appreciates MSHA's willingness to provide input to facilitate Deer Creek's mine closure. District 9 has been instrumental in approving applications allowing the mine to alter ventilation systems and seal portions of the mine reducing overall exposure. As discussed with District 9 and Mine Emergency Operations, it is imperative to construct the primary bulkheads in

Mill Fork Access #2 prior to the area north of 7th North Seals inundating with intercepted groundwater. Power to the dewatering pumps inby the 7th North seals was terminated during the last week of February 2015. Energy West projects approximately three to four months for the area north of the seals to inundate with groundwater. Prior to this "deadline", the bulkheads at Mill Fork Access #2 could be constructed without the potential to impound water before the bulkheads are fully cured and grouted.

Again, we appreciate your efforts in reviewing and providing input into this application.

Should you have any questions regarding this submittal, or if you require additional information please feel free to contact me at 1-435-687-6637, or in my absence, Andy Wall at 1-435-687-6642.

Sincerely,

Louie Tonc

Louie Tonc
Senior Mining Engineer

Miner's Representative

PACIFICORP
ENERGY WEST MINING COMPANY
DEER CREEK MINE MSHA ID NO. 42-00121

Mill Fork Access #2 Mains
Rilda Canyon Portals 1st Right Submains
Proposed Bulkheads – Installation and Monitoring Plan

Redline Text
For Review Purposes

PACIFICORP

ENERGY WEST MINING COMPANY

DEER CREEK MINE MSHA ID NO. 42-00121

Mill Fork Access #2 Mains

Rilda Canyon Portals 1st Right Submains

Proposed Bulkheads – Installation and Monitoring Plan

Originally Submitted January 20, 2015

Revised ~~March 23~~April 10, 2015

Table of Contents

APPENDICES

Appendix A	Mayo & Associates Deer Creek Mine – Mill Fork Area Geochemical Evaluation of Groundwater with Elevated Iron
Appendix B	Geologic Stratigraphic Column – Surface Exploration Drill Holes EM-187 – Located Near Mill Fork Access #2 Bulkhead Location Site B-874 – Located Near 1st Right Bulkhead Location Site
Appendix C	ARMPS Analysis of Coal Pillars
Appendix D	J-Seal 120 psi Main Line Ventilation Seal Installation Procedure
Appendix E	Photos of the Proposed Bulkhead Locations

FIGURES

Formatted: Double underline

MAPS

Map 1: Deer Creek Mine Mill Fork Hydrology Map

Map 2: Deer Creek Mine Mill Fork Blind Canyon Seam ~~Working~~Workings

Map 3: Deer Creek Mine Separation Prior to Bulkhead Construction

Map 4: Deer Creek Mine Separation Post Bulkhead Construction

TABLES

Table 1: Deer Creek Mine In-Mine Water Sampling Results: Sealed Areas Hiawatha and Blind Canyon

Table 2: Bulkhead Dimensions and Safety Factors

Table 3: Deer Creek Mine Water Sampling Results: Impounded Area Bulkhead Dimensions

Table 4: Impoundment Area Details – Mill Fork Access #2 (values are approximated)

Table 5: Impoundment Area Details – 1st Right (values are approximated)

ADDENDUMS

Addendum 1: Atmospheric Gas Sampling Tube, March 2, 2015

Addendum 2: Summary of Phone Conversation with Steve Sawyer of MSHA concerning Mine Emergency Operations Review of Energy West Bulkhead Submittal, March 12, 2015 (sections of the Addendum 2 have been modified due to the installation of the mine separation seals at 3rd North B allowing post bulkhead construction inspection)

Addendum 3: Relocation of Secondary Bulkheads from 1st Right XC – 28.5 to 1st Right XC – 4.5, March 30, 2015

Addendum 4: Revised Emergency Response Plan due to Installation of the Mine Separation Seals at 3rd North

Introduction:

Mine Name: Deer Creek

Location: 8 miles west of Huntington, Emery County Utah

MSHA ID No: 42-00121

In an effort to maintain acceptable compliance quality discharge water from the Deer Creek Mine after mine closure, Energy West is proposing the construction of eleven (11) water impounding bulkheads. Six (6) primary bulkheads are proposed for the Mill Fork Access #2 mains, and five (5) secondary bulkheads are proposed for the 1st Right mains inby the Rilda Canyon Right Fork portals. Primary bulkheads located in Mill Fork Access #2 will provide a water tight barrier to segregate potentially iron-contaminated ground waters that could propagate from the Mill Fork Area from higher quality compliant groundwater elsewhere in the mine. It is essential to keep these contaminated waters from entering the permanent water discharge system planned for the Deer Creek portals or from seeping out the Rilda Canyon Right Fork portals. If discharged, these waters will likely have a negative effect on the stream as well as the North Emery Water Users Special Services District (NEWUSSD) spring collection system, both in Rilda Canyon.

Each bulkhead site will be ring grouted with Jennchem 70 pcf polyurethane grout after the J-SEAL foamed cement has fully cured and has met the quality control specifications prescribed by MSHA Approval Number 120M-15.0.

Bulkhead installation is a facet of the overall Deer Creek mine closure plan. Mining at the Deer Creek Mine was completed (27th West Outby longwall panel) on January 7, 2015. All equipment will be removed from the mine in a systematic manner from 27th West to outby the bulkhead area. ~~After completion of the bulkheads, no personnel will be traveling inby or working down gradient of the bulkheads.~~In preparation for bulkhead construction, the mine closure will effectively split the mine into two distinct districts: The southern district, which will be sealed immediately by completion of the mine isolation seals located at 3rd North B XC-138, Meetinghouse Canyon breakouts, and the Deer Creek portals and the northern district, where bulkhead construction will take place. The northern district will be sealed with the completion of the bulkheads, concrete plugs and sealing of the Left Fork portals. After completion of the bulkheads, Energy West will strictly comply with the bulkhead monitoring plan and emergency procedures outlined in this document. The final phase of the Deer Creek Mine closure plan includes final reclamation of the portal sites in Rilda Canyon and Deer Creek Canyon.

Mill Fork Mining History:

PacifiCorp acquired the Mill Fork Lease Area effective April 1, 1999. Between 1999 and 2005, the mine operator, Energy West Mining Company, directed its mine planning obligations to

Formatted: Font: Times New Roman

access this newly acquired reserve. After developing a ventilation and portal access near the confluence of the Right and Left forks of Rilda Canyon, Energy West continued development from the existing mine to the west and north towards the Mill Fork Area. Access consisted of driving a set of six entries off the 6th North mains of the Hiawatha Seam to the northwest called the Mill Fork Access. Then development turned directly west through what was called the Mill Fork Access #2 (Map 1).

Once mining operations reached adequate reserves for longwall mining, development turned north developing a set of mains called the 7th North Mains. Panels 11th through 17th West were developed westward from 7th North and second mining of this district was completed in 2008. Also during this time, operations began developing a set of slopes to access the upper Blind Canyon seam (Map 2). Once the slopes were completed operations developed a set of five entries to the northwest called the 8th North #1 Mains. Exploration operations encountered a 1 foot rock split in the Blind Canyon seam that required revising the Resource Recovery and Protection Plan (R2P2) to remove the uneconomic reserves. Panels 1st through 7th Left were developed within the confines of the rock split and second mining of the Blind Canyon district was completed in 2010.

At the completion of mining to the extent of the Blind Canyon seam, operations were again concentrated in the Hiawatha seam. Energy West developed the 9th North mains to the northwest while necking off for panels 20th through 23rd West. During exploration drilling operations, geologic mapping, and coal seam sampling, Energy West discovered geologic occurrences similar to that of the adjacent Crandall Canyon Mine which revealed both elevated iron and sulfur concentrations in the Hiawatha Seam coal. The elevated iron concentrations are related to a carbonaceous mudstone in-seam split in the lower portion of the Hiawatha Seam containing pyritic iron. The elevated sulfur is likely in the form of gypsum and is found in the floor and the bottom two feet of the unmined pillars. Sulfur in coal may be in oxidized, reduced, and native forms. Oxidized sulfur includes minerals such as gypsum ($CaSO_4.nH_2O$) and anhydrite ($CaSO_4$) which form in evaporative environments and as secondary mineralization. Reduced forms include iron sulfide minerals such as pyrite and marcasite (FeS_2). The elevated iron and sulfur concentrations were quantified as the 20th through 23rd West panels were being developed. Mine maps obtained from Crandall Canyon allowed Energy West to define this zone extending to the north of the Mill Fork lease boundary.

The final mining in the Mill Fork Area consisted of the development of the 10th North Mains and the 24th through 27th West panels. Development of the panels encountered the continuation of the carbonaceous mudstone in-seam split containing the pyritic iron, as well as the elevated sulfur concentration in the coal. During panel extraction, these delineated zones, including the zones found in the 20th through 23rd West panels, were by-passed because of poor coal quality for use in the thermal generation of electricity.

Mining at the Deer Creek Mine was completed (27th West Outby longwall panel) on January 7,

Formatted: Font: Times New Roman

2015.

Document Preparation:
The following document was prepared under the guidance of the following qualified and licensed professionals:

Energy West Mining Company

Mark A. Reynolds, P.E.
State of Utah Licensed Professional Engineer
License Number 5049079-2202

Charles A. Semborski, P.G.
State of Utah Licensed Professional Geologist
License Number 5234167-2250

Kenneth C. Fleck, P.G.
State of Utah Licensed Professional Geologist
License Number 5224883-2250

Jennmar Corporation USA

Alan A. Campoli, Ph.D., P.E.
State of Utah Licensed Professional Engineer
License Number 8502943-2202

Water Source:
Waters entering the groundwater system are mostly from snow melt. The amount of water which enters the groundwater system is highly variable from one site to another. The low surface relief on the top of East Mountain encourages the infiltration of melting snow. Geology controls the movement of groundwater. Because of the low permeability of the consolidated sedimentary rocks in the East Mountain area, groundwater movement is primarily through fractures, through openings between beds, and, in the case of the Flagstaff Limestone, through solution openings.

Hydrologic data has been collected from numerous coal exploration drill holes, from within the adjacent mine workings, from surface drainages, and from the springs in the area. The data have identified two separate isolated aquifer systems on the East Mountain property; the first is localized perched water tables in the North Horn and the Price River formations, and the second is a combination of localized perched water tables in the Blackhawk Formation and the Star

Formatted: Font: Times New Roman

Point Sandstone which exhibit some limited potential as a regional aquifer. Stratigraphy is the main controlling factor restricting groundwater movement and development of regional and perched aquifer systems within the East Mountain property.

Several observations have been made concerning the Blackhawk water-bearing strata. The sandstone, which is semi-permeable and porous, affords an effective route of water transport; while relatively impervious shale in the Blackhawk Formation prevents significant downward movement of the percolating water. Of the water-producing areas, those closest to the active mining face exhibit the greatest flows. As mining advances the area adjacent to the active face continues to be the wettest, and previously mined wet areas experience a decrease in flow. The water source is being dewatered since mined out areas of the mine do not continue to produce water indefinitely. The water source must be either of limited extent, e.g., a perched aquifer, or have a limited recharge capacity.

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes.

Active zone groundwater flow systems contain abundant tritium, have excellent hydraulic communication with the surface, are dependent on annual recharge events, and are affected by short term climatic variability. Tritium and carbon-14 "age" dating of spring waters demonstrate that most springs issue from active zone groundwater systems and are of modern origin. Groundwater in the active zone generally circulates shallowly and has short flow paths.

Inactive zone groundwater systems contain old groundwater, have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates. Groundwater in these systems tends to occur in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). These sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. The blanket sands of the Star Point Sandstone are also largely in the inactive zone.

Identified Hydrologic Concerns:

In the Mill Fork area, all longwall panels trend east and west. On the west side of these panels is the Joes Valley Fault system. The north is restricted by the Crandall Canyon mine workings. A barrier of unmined coal separates the longwall panels from both the Joes Valley Fault and the Crandall Canyon mine workings. The northeastern portion of the Mill Fork Area gently dips toward the Joes Valley Fault. The eastern portion of the Mill Fork Area slopes toward the east.

Formatted: Font: Times New Roman

Groundwater from the active mining area and the eastern portions of the tract flow to the east and are collected at the 10th North, 17th West, and 11th West sumps (Figure 1). Groundwaters collected in these sumps have contact with the zones of coal that contain the elevated sulfur concentrations and the discharge water from the sumps has elevated concentrations of total iron (Table 1). Because the eastern portion of the Mill Fork Area slopes dips downward to the east, Energy West projects that these waters will discharge from the Rilda Canyon portals if not contained within the mine.

PacifiCorp initiated an underground hydrologic monitoring program in May 2012 to access the potential impacts of groundwater with elevated iron from sealed areas in the Hiawatha seam. Water samples have been collected from two selected sites in the Hiawatha seam and one site from the Blind Canyon seam, (Figure 2). Elevated iron in excess of the State of Utah Department of Environmental Health - Utah Pollutant Discharge Elimination (UPDES) limitation of 1.0 mg/l has been detected from the Hiawatha sampling sites. The values are similar to those recorded during the high-iron situation experienced at the adjacent Crandall Canyon Mine.

Formatted: Font: Times New Roman

Table 1: Deer Creek Mine In-Mine Water Sampling Results: Sealed Areas Hiawatha and Blind Canyon

Deer Creek Mine
In-Mine Water Sampling
Sealed Areas of Hiawatha and Blind Canyon

	1-May-12	27-Jun-12	27-Sep-12	26-Oct-12	27-Nov-12	17-Dec-12	23-Jan-13	21-Feb-13	21-Mar-13
Hiawatha 11th West Seals									
pH, units	7.15	7.19	7.13	7.53	7.2	7.12	7.24	7.12	7.14
Sulfate mg/L	41	40	38	37	38	39	38	37	39
Iron, Fe Total mg/l	3.09	1.56	2.29	0.57	1.04	3.96	0.51	2.36	1.06
Iron, Fe Dissolved mg/l	1.19	<0.03	0.44	<0.03	<0.03	0.11	<0.03	<0.03	0.11
Hiawatha 17th West Seals									
pH, units	7.45	7.47	7.52	7.43	7.26	7.36	7.26	7.34	7.47
Sulfate mg/L	153	147	138	134	142	138	133	132	130
Iron, Fe Total mg/l	3.24	3.25	3.47	2.86	3.08	3.95	3.10	2.99	3.63
Iron, Fe Dissolved mg/l	<0.03	<0.03	<0.03	<0.03	0.09	<0.03	<0.03	<0.03	<0.03
Blind Canyon 10th North XC-5 Borehole									
pH, units	7.61	7.62	7.6	7.55	7.47	7.51	7.37	7.39	7.42
Sulfate mg/L	210	226	189	190	197	202	193	198	181
Iron, Fe Total mg/l	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Iron, Fe Dissolved mg/l	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03

	26-Apr-13	21-May-13	27-Jun-13	25-Jul-13	21-Aug-13	18-Sep-13	11-Oct-13	6-Nov-13
Hiawatha 11th West Seals								
pH, units	7.48	7.18	7.5	7.12	7.13	7.17	7.17	7.47
Sulfate mg/L	36	38	35	35	34	34	35	35
Iron, Fe Total mg/l	0.54	1.44	0.78	1.76	3.42	2.58	0.97	0.62
Iron, Fe Dissolved mg/l	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Hiawatha 17th West Seals								
pH, units	7.4	7.34	7.3	7.25	7.51	7.49	7.33	7.51
Sulfate mg/L	133	132	128	128	125	125	123	125
Iron, Fe Total mg/l	4.02	3.17	3.1	Sampling Problem	2.83	2.72	2.54	2.48
Iron, Fe Dissolved mg/l	<0.03	<0.03	0.14	<0.03	<0.03	<0.03	<0.03	<0.03
Blind Canyon 10th North XC-5 Borehole								
pH, units	7.46	7.37	7.32	7.34	7.36	7.41	7.46	7.44
Sulfate mg/L	179	183	173	173	172	176	180	179
Iron, Fe Total mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Iron, Fe Dissolved mg/l	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03

Formatted: Font: Times New Roman

Water Chemistry:

Mayo and Associates LLC was contracted by Energy West to conduct a geochemical investigation of the elevated concentrations of sulfur in the coal and the elevated total iron concentrations found in the discharge from the Mill Fork Area of the mine. Energy West has concerns that with these high mineral concentrations in the mine water from the Mill Fork Area, it would not be able to comply with the effluent limitations of the Utah Pollution Discharge Elimination System (UPDES) for total iron should this water discharge to the surface.

The Mayo Report concludes the following:

1. Zones of elevated sulfur and iron occur in the Hiawatha seam coal in the Mill Fork Area workings.
2. Several factors suggest that gypsum and $MgSO_4$ dissolution are the primary sources of the elevated concentrations of SO_4^{2-} in both the Hiawatha 17th West seals and the Blind Canyon borehole groundwaters. The factors are: 1) the very positive $\delta^{34}S$ values of all sampled groundwaters, 2) the SO_4^{2-} concentrations in mine water greatly exceed the concentration available from iron sulfide oxidation, and 3) laboratory leaching experiments demonstrate that almost all of the SO_4^{2-} is from the dissolution of oxidized sulfate minerals.
3. Groundwaters discharged from the Hiawatha seam mine workings in the Mill Fork Area contain elevated concentrations of total iron which makes the water rust colored when oxygenated. This elevated total iron is associated with groundwater that has contact with the elevated sulfur zone Hiawatha seam coal.
4. Based on a 1st order calculation, approximately 958 tons of iron sulfide minerals (pyrite and marcasite) will be potentially available in the elevated sulfur zones to interact with in-mine groundwater at the time of projected mine closure.
5. Approximately 600 tons of iron would also be available for oxidization from the conveyor belt components if the beltlines are abandoned in the mine workings.
6. Chemical interaction with between water containing oxygen and the elevated sulfur zone results in iron sulfide oxidization and is responsible for the formation of rust colored iron hydroxide which is reported as total iron in laboratory analysis.
7. Assuming that all of the potentially available iron sulfide mineralization will have contact with oxygen rich water it would take about 75 years to exhaust the total supply of iron sulfide. If the beltline iron is included the time to exhaustion would exceed 100 years.

Formatted: Font: Times New Roman

When realistic in-mine conditions are considered it is likely that supply of readily available iron sulfide would be exhausted in a few to tens of years under present conditions.

8. Water quality associated with two future mine closure options have been evaluated:
   a) The first condition, call herein the Open System, envisions groundwater discharging to the surface from the Rilda Canyon Portals via Mill Fork Access workings. This discharge water would be continually oxidized and would contain elevated concentrations of total iron for an indefinite period of time. Total iron concentration in the range of 1-3.5 mg/l would continue for several years. The water will also contain elevated SO_4^{2-}.
   b) The second condition, called herein the Closed System, envisions no surface groundwater discharge at Rilda Canyon due to the construction of bulkheads in the Mill Fork Access workings. The water impounded in the workings behind the bulkheads would become reducing and will attain elevated and steady state concentrations of total ion and SO_4^{2-}.

For the full description of the water chemistry of the Mill Fork Area, refer to the geochemical evaluation conducted by Mayo and Associates for Energy West Mining in 2014. This document is found in Appendix A.

Remedial Approaches to Containing Potentially Elevated Iron Water:

In an effort to maintain acceptable compliance quality discharge water from the Deer Creek Mine, Energy West is proposing the construction of eleven (11) water impounding bulkheads. Six (6) primary bulkheads are proposed for the Mill Fork Access #2 mains, and five (5) secondary bulkheads are proposed for the 1st Right mains inby the Rilda Canyon Right Fork portals. Primary bulkheads located in Mill Fork Access #2 will provide a water barrier to segregate potentially iron-contaminated ground waters that could propagate from the Mill Fork Area from higher quality compliant groundwater elsewhere in the mine. It is essential to keep these contaminated waters from entering the permanent water discharge system planned for the Deer Creek portals or from seeping out the Rilda Canyon Right Fork portals. If discharged, these waters will likely have a negative effect on the stream as well as the North Emery Water Users Special Services District (NEWUSSD) spring collection system, both in Rilda Canyon.

The amount of groundwater that could potentially be impounded by the bulkheads is unknown. Therefore, a worst case scenario is assumed. The elevation of the planned bulkhead location in the Mill Fork Access #2 is 7,977 feet (Map 1 – Mill Fork Hydrology). The mined area behind the bulkheads reaches an elevation of 8,124 feet at the top of the Blind Canyon seam workings

Formatted: Font: Times New Roman

(Map 2 – Mill Fork Area Blind Canyon Seam). In other words, the area behind the bulkheads has a potential head of approximately 147 feet or 63.7 psi (each foot of head equates to 0.433 psi).

Secondary bulkheads proposed for the 1st Right Mains XC – 4.5 will retain intercepted groundwater produced from the proposed Mill Access #2 bulkheads, if any, in the 1st Right area. Elevation of the proposed 1st Right XC – 4.5 bulkheads is 7,884 ft. The area behind the bulkheads reaches an elevation of 8,010 feet at the top of the 4th North/6th North slope (rock slopes from the Blind Canyon [upper seam] to the Upper Hiawatha [lower seam]). Intercepted groundwater that rises to this point will drain to the south toward the Deer Creek portals located in Deer Creek canyon. The potential head at 1st Right XC – 4.5 is 126 feet or 54.6 psi.

The eleven (11) bulkheads will be Jennchem 120 psi Main Line seals (MSHA approval number 120M-15.0) reinforced with keyway notches and polyurethane ring grouting. Appendix D contains the summary of installation procedures for the Jennchem 120 psi Main Line seals.

Existing Conditions:

The pillars on either side of the bulkheads and surrounding the impounded water area were physically inspected on July 15, 2014 by Alan A. Campoli (Jennmar), Utah PE 8502943-2202. No geologic anomalies were found in either the Mill Fork Access #2 and 1st Right Submains bulkhead locations.

The pillars in both locations are stable and with ARMPS stability factors of 2.15 and 2.87 in the Mill Fork Access #2 and 1st Right Submains (ARMPS output is contained in Appendix C and Figure 10 Hiawatha Overburden).

As the mine is closing, there will be no changes to the mine geometry. The resistance to water pressure or mine gas explosion induced horizontal displacement of the Upper Hiawatha Seam pillars is underestimated by ARMPS. ARMPS assumes a coal bed compressive strength of 900 psi. NIOSH published coal seam strength data (IC 9446 by Mark and Barton) reports an average Upper Hiawatha unconfined compressive strength of 5,446 psi for 20 tests. Theoretically, coalbed shear strength is 25% of the unconfined compressive strength or over 1,300 psi for the Upper Hiawatha. This is 16 times the shear strength of the J-Seal bulkhead material.

The primary Mill Fork Access #2 bulkheads have no multiple seam or nearby mining considerations, as the nearest second mining is at least 3,148 feet away (Figure 8). The secondary 1st Right Submain bulkheads are a minimum of 1,594 feet from second mining in the Hiawatha Seam, providing a solid barrier pillar adjacent to the bulkheads (Figures 3 and 8). The secondary 1st Right Submain bulkheads are a minimum of 1,430 feet or 188 times the mining height to the nearest secondary mining in the Blind Canyon Seam (Figures 3 and 8). It is generally assumed that if the interburden thickness is greater than 12 times the mining height minimal and negligible multiple seam mining effects will result. The no multiple seam mining

Formatted: Font: Times New Roman

effects assumption is reinforced by the 50 feet thick sandstone member directly above the Hiawatha workings, see core log B-874 in Appendix B.

Jennchem installation procedures call for a professional engineer to inspect the seal area should convergence in excess of 5% occur. As the mine is closing, there will be no changes to the mine geometry. Thus, the occurrence of mine convergence over 5% is very unlikely.

Bulkhead Stability:

The stability of the bulkhead is estimated by dividing the shear resistance of the bulkhead perimeter by the lateral force applied by the maximum head. The shear resistance is controlled by the 81 psi shear strength of J-Seal. Table 2 assumes the bulkhead thickness will be determined by Jennchem 120 psi Mine Line seal installation procedures (Appendix D).

Table 2 Bulkhead Safety Factors

Bulkhead #	Height , ft	Width, ft	Thickness, ft	Pressure, psi	Shear, psi	Safety Factor
MFA2 #1	7.6	25.0	14	63.6	81	6.1
MFA2 #2	8.4	24.4	15.2	63.6	81	6.2
MFA2 #3	7.5	25.8	13.4	63.6	81	5.9
MFA2 #4	7.5	25.3	13.4	63.6	81	5.9
MFA2 #5	8.9	25.0	15.2	63.6	81	5.9
MFA2 #6	9.3	22.9	16	63.6	81	6.2
1st Right #1	6.8	19.3	12.0	55.0	81	7.0
1st Right #2	6.4	24.2	11.9	55.0	81	6.9
1st Right #3	7.2	21.0	12.0	55.0	81	7.0
1st Right #0	10.0	19.2	15.3	55.0	81	6.9
1st Right #-1	6.9	21.3	12.3	55.0	81	7.0

The bulkhead safety factors above do not consider the significant increase to lateral resistance provided by the polyurethane ring grouting and 2 foot wide and 2 foot deep floor and rib keyway notches (Figure 7). Each bulkhead site will be ring grouted with Jennchem 70 pcf polyurethane grout after the J-SEAL foamed cement has fully cured and has met the quality control specifications prescribed by MSHA Approval Number 120M-15.0 (Appendix D). This proprietary procedure has recently been approved for bulkhead construction at other locations. Prior to pouring the J-SEAL, a minimum of twenty holes will be drilled into perimeter. A non-conductive hose will be inserted into each hole and secured with hydraulic cement at the borehole collar. The free hose end will be marked to indicate the associated borehole location and run through the fresh air side of the bulkhead form. Jennchem PUR70 polyurethane grout will be pumped into each hose until refusal or consumption of 500 lbs. Historically, the grouting of J-SEAL ventilation seals with this method has consumed a total of 3,000 lbs of polyurethane

Formatted: Font: Times New Roman

per seal. Actual consumption will vary with the integrity of the seal perimeter.

J-SEAL's superior sulfate resistance reduces water quality concerns (see Table 3 for results of water quality for the impounded area). With more than 50% slag cement content, J-SEAL grout exhibits a high sulfate resistance against acidic mine water. Laboratory tests per ASTM C1012 indicate that, J-SEAL grout does not expand/shrink and degrade over 3-year period of exposure to acidic or plain water. In addition, UCS test results show that the submerged samples gained 29% - 43% of strength over the period. It is concluded that submerging J-SEAL grout in plain, mild acidic (pH 6 - 8), or acidic (pH 3) water does not compromise its material strength as a function of time.

Submerged J-Seal samples

Formatted: Font: Times New Roman

Table 3: Deer Creek Mine Water Sampling Results: Impounded Area

SGS

Analysis Report

December 23, 2014

PACIFICORP
FIELD OFFICE
PO BOX 1005
HUNTINGTON UT 84528

Client Sample ID:	Deer Creek Mine	Sample ID By:	PacifiCorp
Date Sampled:	Dec 17, 2014	Sample Taken By:	KSF
Date Received:	Dec 17, 2014	Time Received:	1425
Product Description:	WATER	Time Sampled:	1115
		Location:	7th North Sump
		Mine:	4
		Field - pH:	7.23 pH units
		Field - Flow:	1066 GPM
		Field - Conductivity:	775 UMHOS/CM
		Field - Temperature:	13.2 DEG. C

Comments: Dissolved Metals Filtered at Lab

SGS Minerals Sample ID: 782-1427422-001

TESTS	RESULT	UNIT	METHOD	REPORTING LIMIT	ANALYZED DATE	TIME	ANALYST
Hardness, mg equivalent CaCO3/L	384	mg/L	SM2340-B	1	2014-12-23	10:00:00	DI
Acidity	17	mg/L	D1067	5	2014-12-17	14:45:00	AL
Anions	11.10	meq/L	SM1030E	0	2014-12-23	10:00:00	DI
Balance	-4.67	%	SM1030E	-10	2014-12-23	10:00:00	DI
Cations	10.11	meq/L	SM1030E	0	2014-12-23	10:00:00	DI
Oxygen, Dissolved	4.6	mg/L	SM 4500-O G	0.1	2014-12-17	14:55:00	AL
Alkalinity, mg CaCO3/L (pH 4.5)	282	mg/L	SM2320-B	5	2014-12-19	14:24:00	HF
Bicarbonate Alkalinity as CaCO3	282	mg/L	SM2320-B	5	2014-12-19	14:24:00	HF
Carbonate Alkalinity as CaCO3	<5	mg/L	SM2320-B	5	2014-12-19	14:24:00	HF
pH	7.33		SM4500-H	0.01	2014-12-17	14:50:00	AL
pH Temperature	14.60	°C	SM4500-H	0.01	2014-12-17	14:50:00	AL
Conductivity	1028	µmhos/cm	SM2510	0.1	2014-12-19	14:50:00	AL
Total Dissolved Solids	635	mg/L	SM2540-C	30	2014-12-19	13:00:00	AL
Chloride, Cl	14	mg/L	EPA 300.0	1	2014-12-22	15:00:00	AL
Sulfate, SO4	233	mg/L	EPA 300.0	1	2014-12-22	15:00:00	AL
METALS BY ICP							
Calcium, Ca - Dissolved	71.79	mg/L	EPA 200.7	0.03	2014-12-18	20:47:00	DI
Iron, Fe - Total	0.77	mg/L	EPA 200.7	0.05	2014-12-22	12:00:00	DI
Iron, Fe - Dissolved	0.07	mg/L	EPA 200.7	0.03	2014-12-18	20:47:00	DI

Lab Supervisor

Domenic Ibanez
Lab Supervisor

SGS North America Inc. | Minerals Services Division
2036 North Airport Road Huntington UT 84528 t (435) 653-2311 f (435) 653-2436 www.sgs.com/minerals

Formatted: Font: Times New Roman

SGS

Analysis Report

December 23, 2014

PACIFICORP
FIELD OFFICE
PO BOX 1005
HUNTINGTON UT 84528

Client Sample ID:	Deer Creek Mine	Sample ID By:	PacifiCorp
Date Sampled:	Dec 17, 2014	Sample Taken By:	KSF
Date Received:	Dec 17, 2014	Time Received:	1425
Product Description:	WATER	Time Sampled:	1115
		Location:	7th North Sump
		Mine:	4
		Field - pH:	7.23 pH units
		Field - Flow:	1068 GPM
		Field - Conductivity:	775 UMHOS/CM
		Field - Temperature:	13.2 DEG. C

Comments: Dissolved Metals Filtered at Lab

SGS Minerals Sample ID: 782-1427422-001

TESTS	RESULT	UNIT	METHOD	REPORTING LIMIT	ANALYZED DATE	TIME	ANALYST
METALS BY ICP (continued)							
Magnesium, Mg - Dissolved	49.79	mg/L	EPA 200.7	0.01	2014-12-18	20:47:00	DI
Manganese, Mn - Total	0.017	mg/L	EPA 200.7	0.002	2014-12-22	12:00:00	DI
Manganese, Mn - Dissolved	0.014	mg/L	EPA 200.7	0.002	2014-12-18	20:47:00	DI
Potassium, K - Dissolved	8.83	mg/L	EPA 200.7	0.14	2014-12-18	20:47:00	DI
Sodium, Na - Dissolved	50.66	mg/L	EPA 200.7	0.09	2014-12-18	20:47:00	DI

Lab Supervisor

Domenic Ibanez
Lab Supervisor

SGS North America Inc. | Minerals Services Division
2035 North Airport Road Huntington UT 84528 t (435) 653-2311 f (435)-653-2436 www.sgs.com/minerals

Formatted: Font: Times New Roman

Construction Location and Impoundment Area:

The bulkheads will be constructed in two areas of the Deer Creek Mine; 1) Mill Fork Access #2 mains in the six entries between XC-61 and 62, and 2) 1st Right submains between XC-4 and 5 (originally proposed to be located at XC-28.5, relocated to XC-4.5, see Addendum 3). Figure 3 contains a map of Deer Creek Mine and details the impoundment areas. Figures 4 and 5 contain a detailed map of the proposed installation locations. The installation locations were chosen based on geologic and geotechnical factors establishing safe static head pressure limits against the bulkheads. The following Table 4 and 5 contains approximated details of the impoundment area.

Table 4: Impoundment Area Details – Mill Fork Access #2 (values are approximated)

Dead Storage Volume: Mill Fork Area	1.22 Billion Gallons
Estimated Inflow Rate	1000 GPM
Estimated Time to Fill	3.9 Years

Table 5: Impoundment Area Details – 1st Right (values are approximated)

Dead Storage Volume: 1st Right Area	110 Million Gallons
Estimated Inflow Rate	<50 GPM
Estimated Time to Fill	4 Years

Project Timeline:

It is anticipated that construction of the bulkheads will commence immediately upon completion of mining of the 27th West Outby panel and withdrawal of mining equipment inby the bulkhead locations. It is estimated that construction of all eleven bulkheads will not exceed three months. Tentatively, shipping of material shall begin on April 2015. On-site training of contractors shall be during April 2015. Keeping with this schedule, construction of the first bulkhead shall commence in April, 2015. The MSHA Price Field Office will be notified upon completion of the final bulkhead.

Bulkhead Construction Sequence:

Isolation of the northern portion of the mine during the bulkhead construction will be accomplished by systematically constructing the bulkheads and sealing the remaining portals in Rilda Canyon as follows:

Formatted: Font: Bold

Formatted: Font: Times New Roman

- Mill Fork Access #2 Bulkheads
- Concrete Plugs at 1st Right Portals
- 1st Right Bulkheads XC-4
- Left Fork Breakouts Portal Seals

Mill Fork Access #2 Bulkheads:

The bulkheads shall be constructed in a specific sequence in the Mill Fork Access #2 area in order to keep groundwater from impounding against the structures while under construction. Inby mine dewatering systems will be left intact during the initial construction allowing sufficient time to build the remaining seals without impounding water. The first bulkhead will be built in entry #1. The next bulkhead shall be constructed in entry #6, then entry #5, followed by entry 3, 2 and 4.

~~**1st Right:**~~

~~Bulkheads in 1st Right will be constructed simultaneously with the construction of the Mill Fork Access #2 bulkheads and mining equipment removal from Mill Fork Access #2 and #1.~~ With the completion of the mine separation seals at 3rd North B XC-138 (Map 3 and 4), the northern portion of the Deer Creek Mine will be ventilated with the exhausting fan located at the Left Fork Portals in Rilda Canyon (Deer Creek mine separation amendment was approved by MSHA district 9, 4/1/2015. Ventilation changes in the mine made were effective 4/2/2015. Construction and pumping of 120 psi rated seals at the 3rd North B Mains crosscut #138 location commenced on April 6th, 2015). Access to the northern district during the construction of the Mill Fork bulkheads will be through either the Rilda Canyon Left Fork or the 1st Right portals. The approved separation of the mine ventilation system provides physical access to the bulkheads post construction for monitoring prior to final sealing of the Left Fork Portals. Energy West's original application dated January 20, 2015 included constructing to the extent possible both sets of bulkheads with no access to monitor the primary set during the construction of the secondary set.

During discussions with Pittsburgh Safety and Health Technology Center Mine Emergency Operations personnel (John Urosek, Stephen Sawyer, Chris Snyder on March 9, 2015) several issues regarding Energy Wests original proposed bulkhead installation plan were raised, mainly that MSHA does not consider any structure inby a new (proposed secondary bulkheads located at 1st Right) set of seals or bulkheads as a functioning structure. Energy West would be required to breach/open valves of the inby seals (Mill Fork Access #2) prior to constructing the secondary set. Lack of monitoring access of the primary set of bulkheads during the construction of the secondary set of bulkheads conflicted with MSHA regulations. Energy West pointed out that, as outlined in the plan, construction and installation of the bulkheads will explicitly follow the installation procedures outlined in MSHA Approval Number 120M-15.0 (Appendix D), except for item I – Water Drainage System. Energy West proposes not to install water drainage systems through the bulkheads as an effort to minimize potential leakage of the bulkheads. The benefit on the primary set of bulkheads would be negated. Energy West committed to monitoring the

Formatted: No underline

Formatted: Left

Formatted: Font: +Body (Calibri), 11 pt

Formatted: Font: Times New Roman

primary set during construction of the secondary to confirm that the primary set did not retain water. With the mine separation seals in-place at 3rd North B Mains crosscut #138, access for construction and monitoring of both the primary and secondary bulkheads no longer is restricted. The construction sequence has been modified to allow access for monitoring both sets of bulkheads. After the completion of the Mill Fork Bulkheads, the next phase will be the installation of the portals plugs at the Rilda Canyon 1st Right portals. Ventilation circuits will be modified to ventilate 1st Right Submains utilizing the Left Fork exhausting fan during the installation of the plugs.

Rilda Canyon Concrete Plugs:

Upon completion of the bulkhead seals (Mill Fork Access #2 a set of concrete plugs in will installed at the Rilda Canyon portals (Figure 5). Containment forms will be built at the inby and outby ends of the plugs. A series of holes were drilled from the surface into the plug forms for pumping of concrete and venting during the filling process. Design of the concrete plugs was based on the following formula[1]:

Formatted: Not Superscript/ Subscript

$L = pab/(a+b)f_c$, where;

- L= length of plug (ft)
- p = estimated pressure (55 psi, difference between 1st Right XC-4.5 and top-of-slope, elevation difference = 126')
- a = entry width (20')
- b = entry height (10')
- f_c = allowable compressive strength of rock [lowest value of either plug material or surrounding strata] (4,000 psi – estimated cured strength of concrete)
- Safety Factor = (Constructed Thickness/L) 167[2]

[1] Chekan, G., Design of Bulkheads for Controlling Water in Underground Mines

[2] Safety factor using Garrett and Campbell Pitt compressive strength of concrete at 600 psi = 24.5

1st Right Bulkheads XC-4:

Bulkheads in 1st Right will be constructed after the completion of the Mill Fork Access #2 bulkheads. Access to the 1st Right Bulkheads will be from the Left Fork portals. The bulkheads shall be constructed in a specific sequence in the 1st Right area in order to keep groundwater from impounding against the structure while under construction. Inby mine dewatering systems will be left intact during the initial construction allowing sufficient time to build the remaining seals without impounding water. The first bulkhead will be built in entry #-1. The next bulkheads shall be constructed in entry #0, #3, #1 then entry #2.

Left Fork Breakouts Portal Seals:

After the completion of the 1st Right Bulkheads and development of the horizontal drain hole, solid concrete portals seals will be installed at the Left Fork Portals (Intake and Fan portals).

Formatted: Font: Times New Roman

With the completion of the Left Fork portal seals, all portal openings at the Deer Creek Mine will be effectively sealed completing final closure of the mine. Installation of the portal seals will comply with stipulations in the Deer Creek Mine Permit and Bureau of Land Management Resource Recovery Protection Plan.

Construction Details:

Each bulkhead site will be ring grouted with Jennchem 70 pcf polyurethane grout after the J-SEAL foamed cement has fully cured and has met the quality control specifications prescribed by MSHA Approval Number 120M-15.0 (Appendix D). This proprietary procedure has recently been approved for bulkhead construction at other locations. Prior to pouring the J-SEAL, a minimum of twenty holes will be drilled into the perimeter (Figure 7). A non-conductive hose will be inserted into each hole and secured with hydraulic cement at the borehole collar. The free hose end will be marked to indicate the associated borehole location and run through the fresh air side of the bulkhead form. Jennchem PUR70 polyurethane grout will be pumped into each hose until refusal or consumption of 500 lbs. Historically, the grouting of J-SEAL ventilation seals with this method has consumed a total of 3,000 lbs of polyurethane per seal. Actual consumption will vary with the integrity of the seal perimeter.

Energy West is aware of potential for the bulkheads to leak. The proposed plan includes the installation of Jennchem 120 psi Main Line seals (MSHA approval number 120M-15.0) reinforced with keyway notches and polyurethane ring grouting. In addition to the grouted ring specified in the approval 120M-15.0, Energy West will install an additional grout ring at the inby edge of each bulkhead, (Figure 12). Additional inby grout ring installation at the Mill Fork Access Bulkheads will be installed prior to the installation of the bulkheads. At the 1st Right bulkheads, the additional inby grout ring will be installed after the completion of the bulkheads. The secondary set of bulkheads located at 1st Right will provide an additional measure to prevent leakage at the Rilda Canyon portals. The concrete plugs at the Rilda Canyon portals provide a tertiary protection to prevent leakage.

In a continued effort to mitigate and limit impacts of hydrology to Rilda Canyon, Energy West has contracted REI drilling, a company specializing in horizontal drilling techniques, to drill a horizontal hole in the Rilda Canyon area from the Left Fork mine workings to the Right Fork mine workings (Maps 3 and 4). The purpose of the hole is to drain by gravity, potential water leakage from the primary set of bulkheads located in the Mill Fork/Rilda Canyon area to the southern portion of the Deer Creek Mine. From the outflow end of the hole, intercepted groundwater will flow by gravity to the Deer Creek portals. The horizontal hole will be started in the Blind Canyon seam in 10th West Mains near the Left Fork portals drilled in a 5,000' radius arc trending slightly upward connecting to the Hiawatha seam in 1st Right Submains. Energy West is confident in its efforts to install bulkheads at strategic locations to mitigate potential hydrologic impacts to Rilda Canyon. If the horizontal hole is successful, static pressures at the 1st Right bulkheads would be reduced dramatically.

Formatted: Font: Times New Roman

With the mine separation seals in-place at 3rd North B Mains crosscut #138, access for drilling operations will be from the Left Fork portals. The construction sequence of the bulkheads outlined above will allow access to the drill site area (10th West Mains) and the breakthrough point in 1st Right. After the completion of the horizontal drilling operations, the final phase of Deer Creek closure will conclude with the construction of portal seals at the Left Fork portals.

After all phases of bulkhead construction and installation of the concrete plugs, Energy West will continue to monitor pressure at each bulkhead location. Monitoring will allow Energy West to assess:

- Head pressure build-up
- Water quality of the impounded areas.
- Provide time for Energy West to assess water quality treatment options

If leakage occurs at the Rilda Canyon Portals, Energy West will be required to treat the effluent to comply with all State and Federal regulations. Energy West is not requesting MSHA to concur that the bulkheads will be a water tight barrier; simply that, Energy West will be allowed to construct the bulkheads to minimize potential hydrologic impacts.

Two rows of Burrell cans will be placed so that the distance from can-to-can does not exceed 36 inches inby and outby each bulkhead. The first row will be placed 5 ft away from the faces of the bulkhead and the second row placed 10 ft away from the faces of the bulkhead.

Construction and installation of the bulkheads will explicitly follow the installation procedures outlined in MSHA Approval Number 120M-15.0 (Appendix D), except for item I – Water Drainage System. The intended purpose of these bulkheads is to provide a water tight barrier to segregate potentially iron-contaminated ground waters that could propagate from the Mill Fork Area from better quality compliant groundwater elsewhere in the mine. It is essential to keep these contaminated waters from entering the permanent water discharge system planned for the Deer Creek portals or from seeping out the Rilda Canyon Right Fork. As outlined above, the bulkheads in Mill Fork Access and 1st Right will be constructed ~~simultaneously to the extent possible allowing for the specified curing time. Water drainage and gas monitoring will be precluded upon completion of the bulkheads. As stated previously, after completion of the bulkheads, all equipment and personnel will be evacuated from the mine.~~as outlined above

To be compliant with inspection and monitoring criteria of MSHA Approval Number 120M-15.0, specifically the hydrologic pressure inby the bulkhead locations, Energy West installed two monitoring boreholes from the surface to the mine workings just inby each set of bulkheads (Figures 6, 7 and 13). Two additional holes were completed in 1st Right at XC-28 (located between the secondary set of bulkheads and the concrete plugs at the Rilda Canyon portals) to monitor potential water leakage from the secondary set of bulkheads (Figure 13). At the primary set of bulkheads (Mill Fork Access #2), a pressure transducer and telemetry equipment will be installed in one of the boreholes prior to the completion of the bulkheads to monitor

Formatted: Font: Times New Roman

environmental data that will be relayed to computer equipment monitored by Energy West. The second hole will serve as a backup and allow for monitoring of air and water quality. To comply with atmospheric gas sampling requirements, Energy West will install one atmospheric sampling pipe in each seal as specified in Figure 11 – Atmospheric Gas Sampling Tube. Sampling will be conducted until the design strength of each seal has been reached and each has been approved to serve as a bulkhead.

To alleviate MSHA's concern of potential water impoundment inby the primary bulkheads (Mill Fork Access #2) prior to completing the secondary set at 1st Right, Energy West will commit to the following ~~(Addendum 2):~~ :

- Measure ~~the potential~~any impounded water utilizing the boreholes located inby the Mill Fork bulkheads;
  - As stated above, Energy West will utilize a pressure transducer and telemetry equipment ~~will be~~ installed in one of the boreholes prior to the completion of the bulkheads. The pressure transducer will be positioned within two feet of the base of the lowest bulkhead.
    - **Energy West commits to the emergency procedures outlined in the following section:**
      - **If the pressure at the Mill Fork Access #2 bulkheads exceeds 2 feet of head pressure ,< less than 1 psi, (equates to a one hundred twenty fold safety factor of the approved 120M-15.0 seal~~),~~) during the Jennmar curing/grout ring process, Energy West will immediately ~~halt construction activities on the 1st Right bulkhead, and immediately commence portal sealing (concrete plugs).~~institute the emergency response plan**

Formatted

In addition to the installation of the bulkheads, Energy West ~~will install~~installed a set of seals in 3rd North B XC-138.5 to further isolate the northern portion of the mine (Figure 9~~). Seals at 3rd North B XC-138.5 will be constructed simultaneously with the construction of the Mill Fork Access #2 and 1st Right bulkheads.~~, Maps 3 and 4). Seals at 3rd North B XC-138.5 were approved by MSHA District 9, 4/1/2015. Ventilation changes in the mine were made effective 4/2/2015. Construction and pumping of 120 psi rated seals at the 3rd North B Mains crosscut #138 location commenced on April 6th. Energy West projects final portal sealing at the Deer Creek portals by the end of April 2015. Elevation of 4th North/6th North top-of-slope is approximately 8,010' compared to the 1st Right bulkheads elevation of approximately 7,884' (difference of 126 feet). In the event that water accumulates inby the 1st Right bulkheads (between the 1st Right and Mill Fork Access bulkheads) or if the Mill Fork Access #2 bulkheads fail, the 3rd North B seals ~~will be built~~are equipped with water drains to allow the water to migrate downdip towards the Deer Creek portals. ~~Installation of the 3rd North B XC-138.5 seals will comply MSHA Approval Number 120M-15.0.~~

Formatted: Font: Times New Roman

~~**Rilda Canyon Concrete Plugs**~~

~~Upon completion of the bulkhead containments (Mill Fork Access #2 and 1st Right) and the seals in 3rd North B, a set of concrete plugs in will installed at the Rilda Canyon portals (Figure 5).~~Emergency ~~Containment forms will be built at the inby and outby ends of the plugs. A series of holes were drilled from the surface into the plug forms for pumping of concrete and venting during the filling process. Design of the concrete plugs was based on the following formula1:~~

~~$L = pab/(a+b)f_e$, where;~~

- ~~L = length of plug (ft)~~
- ~~p = estimated pressure (55 psi, difference between 1st Right XC 4.5 and top of slope, elevation difference = 126')~~
- ~~a = entry width (20')~~
- ~~b = entry height (10')~~
- ~~f_e = allowable compressive strength of rock [lowest value of either plug material or surrounding strata] (4,000 psi – estimated cured strength of concrete)~~
- ~~Safety Factor = (Constructed Thickness/L) 167[2]~~

~~[1] Chekan, G., Design of Bulkheads for Controlling Water in Underground Mines~~

~~[2] Safety factor using Garrett and Campbell Pitt compressive strength of concrete at 600 psi = 21.5~~

~~Emergence~~ **Response Plan:**

General Overview: Bulkhead installation is a facet of the overall Deer Creek mine closure plan. Mining at the Deer Creek Mine was completed (27th West Outby longwall panel) on January 7, 2015. All equipment ~~will be~~has been removed from the mine in a systematic manner from 27th West to outby the bulkhead area. After completion of the bulkheads, no personnel will be traveling inby or working down gradient of the bulkheads except for personnel directly involved with the construction activities related to the bulkheads and the ~~installation of the concrete plugs~~horizontal drain hole project. The final phase of the Deer Creek Mine closure plan includes final reclamation of the portal sites in Rilda Canyon. Additional safety measures will be incorporated in the reclamation plan of the Rilda Canyon portals to include the installation of the concrete plugs at the portals (Figure 5). Before and during the construction of the bulkheads all mine personnel will be trained on the emergency response plan and bulkhead monitoring.

With the assistance of Jennmar Corporation, Energy West Mining Company has made a concerted effort to design the bulkhead/fluid retention system in such manner to limit potential failure. However, several factors could trigger an emergency response. The Emergency Response Plan outlines the detail actions taken if certain criteria occur, failure of head pressure, monitoring equipment, rapid changes in head pressure, seismic activity, excessive leakage or increase in leakage without increase in head pressure.

Monitoring: After completion of the bulkheads and horizontal drain hole, all equipment and personnel will be evacuated from the mine. To monitor head pressure at the primary bulkheads

Formatted: Not Superscript/ Subscript

Formatted: Widow/Orphan control, Keep with next

Formatted: Underline

Formatted: Font: Times New Roman

(Mill Fork Access #2), Energy West installed two monitoring holes inby the bulkhead (Figure 6). A pressure transducer and telemetry equipment will be installed to monitor head pressure and the data will be relayed to computer equipment monitored by Energy West. The second hole will serve as a backup and allow for monitoring of air and water quality.

With the completion of the bulkheads, prior to final mine closure, Energy West will inspect each of the completed bulkheads using the bulkhead inspection form, Figure 14.

Monitoring Plan: Energy West will monitor head pressure at the primary bulkhead (Mill Fork Access #2), on a daily basis and generate a report on a monthly basis which will be available to review by ~~the~~ mine management and governmental agencies. Table 6 outlines the monitoring plan for the Mill Fork Bulkheads:

Formatted: Underline

Formatted: Font: Times New Roman

Table 6: Mill Fork Access #2 Bulkhead Monitoring Plan

Pressure Reading (psi)	Estimated Time to Pressure (years)	Type of Monitoring	Frequency of Monitoring	Action Plan	Safety Factor
0 - 15	1[1]	Static Head[3]	Daily[4]	Structural Integrity/Leakage[5]	8.0
15 - 30	2	Static Head[3]	Daily[4]	Structural Integrity/Leakage[5]	4.0 – 8.0
30 - 45	3	Static Head[3]	Each Shift[4]	Structural Integrity/Leakage[5]	4 – 2.7
45- 60[2]	4	Static Head[3]	Each Shift[4]	Structural Integrity/Leakage[5]	2.7 – 2.0

[1] Energy West projects final closure of the Deer Creek Mine which includes bulkhead construction, development of a horizontal drain hole, and sealing of all portals by the end of 2015

[2] Estimated long term stabilized maximum pressure at the Mill Fork Bulkhead = 64 psi

[3] Type of Monitoring – pressure transducer located inby the bulkhead. Pressure calibration verified monthly with adjacent piezometer well.

[4] See Figure 14 – Bulkhead Inspection Form

[5] Structural Integrity/Leakage

Changes of rib, roof or floor conditions

- Sloughing of the ribs
- Fracturing of the ribs, roof and floor
- Deflection of the ribs, roof and floor
- Leakage Observations:
  - Identify areas of wetness and or areas of leakage
  - Estimate volume of leakage
  - Note color of leakage

If monitoring detects rapid changes in head pressure (+15 psi) mine management will be notified immediately and the following plan will be instituted:

- Field verify the calibration of the pressure transducer
- Review of bulkheads will be performed by a licensed engineer or geologist
- Institute plan recommended by licensed engineer or geologist

Leakage: If the primary bulkheads at Mill Fork Access #2 leak, this groundwater will drain to the secondary set installed at 1st Right. Final protection for bulkhead leakage/failure is afforded by the concrete plugs at the Rilda Canyon portals.–

- Mill Fork Bulkheads – if significant water accumulates due to leakage around the bulkhead on the outby face the steps listed will be followed:

Formatted: List Paragraph, Indent: Left: 0.25"

Formatted: Underline

Formatted: Font: Times New Roman

- Each shift will be notified before entering the mine
- A pump will be setup immediately outby the bulkhead
- Site examination will be performed by a licensed engineer or geologist
- Application of the additional grouting will be installed to the depths recommended by the licensed engineer or geologist

- 1st Right Bulkheads – due to the regional dip of the formations, water will not accumulate or build pressure outby the bulkheads (i.e., water will flow to the east downdip of the bulkhead). If water accumulates along the inby face of the bulkheads due to leakage of the Mill Fork Bulkheads the following steps listed will be followed:
  - Each shift will be notified before entering the mine
  - A pump will be setup immediately inby the bulkhead

Formatted: List Paragraph, Indent: Left: 1"

Formatted: Underline

Minor Failure: In the event of a minor failure where water is leaking through the primary and secondary bulkheads and ultimately leaking through at the concrete plug, Energy West will install a grout ring at the concrete plugs and nearby surface outcrop to minimize leakage.

Post Mine Closure:

Warning signs and events that could pose threat of bulkhead failure – The following list provides observable events which may impact the normal operations of bulkhead(s):

1. Fluid level fluctuations – measured with a pressure transducer installed inby the proposed bulkhead
2. Seismic activity – monitored by the University of Utah seismic network
3. Physical inspections – monitor outcrops down gradient of the proposed bulkheads
4. Miscellaneous

Although monitoring of the impounded water level is planned, it is not in this case a critical indicator of potential problems with bulkhead performance. The factors of safety given clearly indicate that the bulkheads would be stable structures at impounded heads much greater than those possible at this site. As a facet of mine closure and abandonment, safety of the workforce is not dependent upon fluid level fluctuation, electrical interruptions and/or mechanical system failures. Rather, the critical warning signs are practically limited to the strata surrounding the bulkhead structure. Energy West selected the sites for the bulkheads based on geologic and geotechnical factors (see figures 4 and 5). Floor rock consists of competent sandstone in excess of fifty (50) feet in thickness. Roof lithology consists of a fluvial sandstone unit in entries 4, 5 and 6 and mudstone/siltstone strata in entries 1 through 3. No mining has taken place adjacent to the Mill Fork Access #2 mains, thereby, minimizing side abutment pressures. However, seepage around the bulkhead is still possible through the roof, ribs and floor. Energy West will monitor the bulkheads daily

Formatted: Font: Times New Roman

after hydraulic head is applied with pressure transducer installed in a borehole located inby the Mill Fork Access #2 bulkheads. Although the bulkhead design includes a grout ring to prevent seepage, it is anticipated that some wetness/seepage may occur. A secondary set of bulkheads will be installed down gradient of Mill Fork Access #2 in 1st Right to mitigate potential seepage. In addition to the secondary set of bulkheads, concrete plugs will be installed in the Rilda Canyon portals. Outcrops near the Rilda Canyon portals will be examined for potential seepage. Should wetness/seepage occur, an estimated flow rate and color of the discharge will be recorded. Given the characteristics reported for the discharge, Mine Management will decide the appropriate level of response. A response by Mine Management will also be triggered by rapid fluctuations head levels indicating potential movement of the bulkhead or deterioration of the surrounding strata that could impact the structural integrity of the bulkhead and/or a seismic event of significant magnitude and duration that the structural integrity of the bulkhead may be affected. All wetness/seepage will be reported to the governmental agencies within 24 hours of discovery.

After mine closure and reclamation responsibilities are met, Mine Management has at its disposal monitoring, notification, and mitigation measures that include:

- Increased monitoring of bulkheads pressure transducer - primary set of bulkheads located at Mill Fork Access #2
- Monitoring of bulkheads static water level – 1st Right bulkheads
- Increased monitoring of outcrops ~~a~~at the Rilda Canyon portals
- Notification of mine management officials
- Notification of mine personnel
- Notification of regulatory agencies
- Installation of grout ring along the outcrops at the Rilda Canyon portals

Should conditions warrant notification of Mine Management or Regulatory Agencies, the following lists provide contact information.

- Mine Management
  - Mine Manager – Rick Poulson, 435-687-6610
  - Chief Engineer – Louie Tonc, 435-687-6637
  - Geology and Exploration Manager – Chuck Semborski, 435-687-4720
  - Geology and Environmental Manager – Ken Fleck, 435-687-4712
- Regulatory Agencies
  - MSHA – District 9 – 435-637-3051
  - Utah Division of Oil, Gas and Mining – 801-538-5340
- Emergency Agencies
  - Emery County Sheriff – 435-381-2404
  - Emery County Ambulance – 911
  - Castle View General Hospital- 435-637-4800

Formatted: Font: Times New Roman

Prior to hydraulic head being applied to the bulkheads, a training program will be implemented at the mine. This program will, at a minimum, be included as a part of annual re-training, and also be routinely discussed in daily safety talks throughout the year. Training will make the workforce aware of the operation of the bulkheads, including:

- Bulkhead locations and anticipated function
- Inspection and examination requirements
- Procedures to follow in an emergency
- Areas of responsibility
- Evacuation plans and travel routes

Formatted: Font: Times New Roman

PACIFICORP
ENERGY WEST MINING COMPANY
DEER CREEK MINE MSHA ID NO. 42-00121

Mill Fork Access #2 Mains
Rilda Canyon Portals 1st Right Submains
Proposed Bulkheads – Installation and Monitoring Plan

Replace Text Section

PACIFICORP

ENERGY WEST MINING COMPANY

DEER CREEK MINE MSHA ID NO. 42-00121

Mill Fork Access #2 Mains

Rilda Canyon Portals 1st Right Submains

Proposed Bulkheads – Installation and Monitoring Plan

Originally Submitted January 20, 2015

Revised April 10, 2015

Table of Contents

APPENDICES

FIGURES

MAPS

Map 1: Deer Creek Mine Mill Fork Hydrology Map

Map 2: Deer Creek Mine Mill Fork Blind Canyon Seam Workings

Map 3: Deer Creek Mine Separation Prior to Bulkhead Construction

Map 4: Deer Creek Mine Separation Post Bulkhead Construction

TABLES

Table 1: Deer Creek Mine In-Mine Water Sampling Results: Sealed Areas Hiawatha and Blind Canyon

Table 2: Bulkhead Dimensions and Safety Factors

Table 3: Deer Creek Mine Water Sampling Results: Impounded Area Bulkhead Dimensions

Table 4: Impoundment Area Details – Mill Fork Access #2 (values are approximated)

Table 5: Impoundment Area Details – 1st Right (values are approximated)

ADDENDUMS

Addendum 1: Atmospheric Gas Sampling Tube, March 2, 2015

Addendum 2: Summary of Phone Conversation with Steve Sawyer of MSHA concerning Mine Emergency Operations Review of Energy West Bulkhead Submittal, March 12, 2015 (sections of the Addendum 2 have been modified due to the installation of the mine separation seals at 3rd North B allowing post bulkhead construction inspection)

Addendum 3: Relocation of Secondary Bulkheads from 1st Right XC – 28.5 to 1st Right XC – 4.5, March 30, 2015

Addendum 4: Revised Emergency Response Plan due to Installation of the Mine Separation Seals at 3rd North

Introduction:
Mine Name: Deer Creek

Location: 8 miles west of Huntington, Emery County Utah

MSHA ID No: 42-00121

In an effort to maintain acceptable compliance quality discharge water from the Deer Creek Mine after mine closure, Energy West is proposing the construction of eleven (11) water impounding bulkheads. Six (6) primary bulkheads are proposed for the Mill Fork Access #2 mains, and five (5) secondary bulkheads are proposed for the 1st Right mains inby the Rilda Canyon Right Fork portals. Primary bulkheads located in Mill Fork Access #2 will provide a water tight barrier to segregate potentially iron-contaminated ground waters that could propagate from the Mill Fork Area from higher quality compliant groundwater elsewhere in the mine. It is essential to keep these contaminated waters from entering the permanent water discharge system planned for the Deer Creek portals or from seeping out the Rilda Canyon Right Fork portals. If discharged, these waters will likely have a negative effect on the stream as well as the North Emery Water Users Special Services District (NEWUSSD) spring collection system, both in Rilda Canyon.

Each bulkhead site will be ring grouted with Jennchem 70 pcf polyurethane grout after the J-SEAL foamed cement has fully cured and has met the quality control specifications prescribed by MSHA Approval Number 120M-15.0.

Bulkhead installation is a facet of the overall Deer Creek mine closure plan. Mining at the Deer Creek Mine was completed (27th West Outby longwall panel) on January 7, 2015. All equipment will be removed from the mine in a systematic manner from 27th West to outby the bulkhead area. In preparation for bulkhead construction, the mine closure will effectively split the mine into two distinct districts: The southern district, which will be sealed immediately by completion of the mine isolation seals located at 3rd North B XC-138, Meetinghouse Canyon breakouts, and the Deer Creek portals and the northern district, where bulkhead construction will take place. The northern district will be sealed with the completion of the bulkheads, concrete plugs and sealing of the Left Fork portals. After completion of the bulkheads, Energy West will strictly comply with the bulkhead monitoring plan and emergency procedures outlined in this document. The final phase of the Deer Creek Mine closure plan includes final reclamation of the portal sites in Rilda Canyon and Deer Creek Canyon.

Mill Fork Mining History:
PacifiCorp acquired the Mill Fork Lease Area effective April 1, 1999. Between 1999 and 2005, the mine operator, Energy West Mining Company, directed its mine planning obligations to access this newly acquired reserve. After developing a ventilation and portal access near the

confluence of the Right and Left forks of Rilda Canyon, Energy West continued development from the existing mine to the west and north towards the Mill Fork Area. Access consisted of driving a set of six entries off the 6th North mains of the Hiawatha Seam to the northwest called the Mill Fork Access. Then development turned directly west through what was called the Mill Fork Access #2 (Map 1).

Once mining operations reached adequate reserves for longwall mining, development turned north developing a set of mains called the 7th North Mains. Panels 11th through 17th West were developed westward from 7th North and second mining of this district was completed in 2008. Also during this time, operations began developing a set of slopes to access the upper Blind Canyon seam (Map 2). Once the slopes were completed operations developed a set of five entries to the northwest called the 8th North #1 Mains. Exploration operations encountered a 1 foot rock split in the Blind Canyon seam that required revising the Resource Recovery and Protection Plan (R2P2) to remove the uneconomic reserves. Panels 1st through 7th Left were developed within the confines of the rock split and second mining of the Blind Canyon district was completed in 2010.

At the completion of mining to the extent of the Blind Canyon seam, operations were again concentrated in the Hiawatha seam. Energy West developed the 9th North mains to the northwest while necking off for panels 20th through 23rd West. During exploration drilling operations, geologic mapping, and coal seam sampling, Energy West discovered geologic occurrences similar to that of the adjacent Crandall Canyon Mine which revealed both elevated iron and sulfur concentrations in the Hiawatha Seam coal. The elevated iron concentrations are related to a carbonaceous mudstone in-seam split in the lower portion of the Hiawatha Seam containing pyritic iron. The elevated sulfur is likely in the form of gypsum and is found in the floor and the bottom two feet of the unmined pillars. Sulfur in coal may be in oxidized, reduced, and native forms. Oxidized sulfur includes minerals such as gypsum ($CaSO_4.nH_2O$) and anhydrite ($CaSO_4$) which form in evaporative environments and as secondary mineralization. Reduced forms include iron sulfide minerals such as pyrite and marcasite (FeS_2). The elevated iron and sulfur concentrations were quantified as the 20th through 23rd West panels were being developed. Mine maps obtained from Crandall Canyon allowed Energy West to define this zone extending to the north of the Mill Fork lease boundary.

The final mining in the Mill Fork Area consisted of the development of the 10th North Mains and the 24th through 27th West panels. Development of the panels encountered the continuation of the carbonaceous mudstone in-seam split containing the pyritic iron, as well as the elevated sulfur concentration in the coal. During panel extraction, these delineated zones, including the zones found in the 20th through 23rd West panels, were by-passed because of poor coal quality for use in the thermal generation of electricity.

Mining at the Deer Creek Mine was completed (27th West Outby longwall panel) on January 7, 2015.

Document Preparation:

The following document was prepared under the guidance of the following qualified and licensed professionals:

Energy West Mining Company

Mark A. Reynolds, P.E.
State of Utah Licensed Professional Engineer
License Number 5049079-2202

Charles A. Semborski, P.G.
State of Utah Licensed Professional Geologist
License Number 5234167-2250

Kenneth C. Fleck, P.G.
State of Utah Licensed Professional Geologist
License Number 5224883-2250

Jennmar Corporation USA

Alan A. Campoli, Ph.D., P.E.
State of Utah Licensed Professional Engineer
License Number 8502943-2202

Water Source:

Waters entering the groundwater system are mostly from snow melt. The amount of water which enters the groundwater system is highly variable from one site to another. The low surface relief on the top of East Mountain encourages the infiltration of melting snow. Geology controls the movement of groundwater. Because of the low permeability of the consolidated sedimentary rocks in the East Mountain area, groundwater movement is primarily through fractures, through openings between beds, and, in the case of the Flagstaff Limestone, through solution openings.

Hydrologic data has been collected from numerous coal exploration drill holes, from within the adjacent mine workings, from surface drainages, and from the springs in the area. The data have identified two separate isolated aquifer systems on the East Mountain property; the first is localized perched water tables in the North Horn and the Price River formations, and the second is a combination of localized perched water tables in the Blackhawk Formation and the Star Point Sandstone which exhibit some limited potential as a regional aquifer. Stratigraphy is the main controlling factor restricting groundwater movement and development of regional and perched aquifer systems within the East Mountain property.

Several observations have been made concerning the Blackhawk water-bearing strata. The sandstone, which is semi-permeable and porous, affords an effective route of water transport; while relatively impervious shale in the Blackhawk Formation prevents significant downward movement of the percolating water. Of the water-producing areas, those closest to the active mining face exhibit the greatest flows. As mining advances the area adjacent to the active face continues to be the wettest, and previously mined wet areas experience a decrease in flow. The water source is being dewatered since mined out areas of the mine do not continue to produce water indefinitely. The water source must be either of limited extent, e.g., a perched aquifer, or have a limited recharge capacity.

The overall pattern of groundwater flow and surface water-groundwater interactions in the Mill Fork Area and adjacent areas can be described by a fairly simple conceptual model involving both active and inactive groundwater flow regimes.

Active zone groundwater flow systems contain abundant tritium, have excellent hydraulic communication with the surface, are dependent on annual recharge events, and are affected by short term climatic variability. Tritium and carbon-14 "age" dating of spring waters demonstrate that most springs issue from active zone groundwater systems and are of modern origin. Groundwater in the active zone generally circulates shallowly and has short flow paths.

Inactive zone groundwater systems contain old groundwater, have very limited hydraulic communication with the surface and with other active groundwater flow systems, and are not influenced by either annual recharge events or short term climatic variability as evidenced by the decline in roof drip rates. Groundwater in these systems tends to occur in sandstone channels in the North Horn, Price River, and Blackhawk Formations which are not in direct hydraulic communication with the surface (i.e. greater than about 500 to 1,000 feet from cliff faces). These sandstone channels are vertically and horizontally isolated from each other and when encountered in mine workings are usually drained quickly. The blanket sands of the Star Point Sandstone are also largely in the inactive zone.

Identified Hydrologic Concerns:

In the Mill Fork area, all longwall panels trend east and west. On the west side of these panels is the Joes Valley Fault system. The north is restricted by the Crandall Canyon mine workings. A barrier of unmined coal separates the longwall panels from both the Joes Valley Fault and the Crandall Canyon mine workings. The northeastern portion of the Mill Fork Area gently dips toward the Joes Valley Fault. The eastern portion of the Mill Fork Area slopes toward the east.

Groundwater from the active mining area and the eastern portions of the tract flow to the east and are collected at the 10th North, 17th West, and 11th West sumps (Figure 1). Groundwaters collected in these sumps have contact with the zones of coal that contain the elevated sulfur

concentrations and the discharge water from the sumps has elevated concentrations of total iron (Table 1). Because the eastern portion of the Mill Fork Area slopes dips downward to the east, Energy West projects that these waters will discharge from the Rilda Canyon portals if not contained within the mine.

PacifiCorp initiated an underground hydrologic monitoring program in May 2012 to access the potential impacts of groundwater with elevated iron from sealed areas in the Hiawatha seam. Water samples have been collected from two selected sites in the Hiawatha seam and one site from the Blind Canyon seam, (Figure 2). Elevated iron in excess of the State of Utah Department of Environmental Health - Utah Pollutant Discharge Elimination (UPDES) limitation of 1.0 mg/l has been detected from the Hiawatha sampling sites. The values are similar to those recorded during the high-iron situation experienced at the adjacent Crandall Canyon Mine.

Table 1: Deer Creek Mine In-Mine Water Sampling Results: Sealed Areas Hiawatha and Blind Canyon

Deer Creek Mine
In-Mine Water Sampling
Sealed Areas of Hiawatha and Blind Canyon

	1-May-12	27-Jun-12	27-Sep-12	26-Oct-12	27-Nov-12	17-Dec-12	23-Jan-13	21-Feb-13	21-Mar-13
Hiawatha 11th West Seals									
pH, units	7.15	7.19	7.13	7.53	7.2	7.12	7.24	7.12	7.14
Sulfate mg/L	41	40	38	37	38	39	38	37	39
Iron, Fe Total mg/l	3.09	1.56	2.29	0.57	1.04	3.96	0.51	2.36	1.06
Iron, Fe Dissolved mg/l	1.19	<0.03	0.44	<0.03	<0.03	0.11	<0.03	<0.03	0.11
Hiawatha 17th West Seals									
pH, units	7.45	7.47	7.52	7.43	7.26	7.36	7.26	7.34	7.47
Sulfate mg/L	153	147	138	134	142	138	133	132	130
Iron, Fe Total mg/l	3.24	3.25	3.47	2.86	3.08	3.95	3.10	2.99	3.63
Iron, Fe Dissolved mg/l	<0.03	<0.03	<0.03	<0.03	0.09	<0.03	<0.03	<0.03	<0.03
Blind Canyon 10th North XC-5 Borehole									
pH, units	7.61	7.62	7.6	7.55	7.47	7.51	7.37	7.39	7.42
Sulfate mg/L	210	226	189	190	197	202	193	198	181
Iron, Fe Total mg/l	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Iron, Fe Dissolved mg/l	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03

	26-Apr-13	21-May-13	27-Jun-13	25-Jul-13	21-Aug-13	18-Sep-13	11-Oct-13	6-Nov-13
Hiawatha 11th West Seals								
pH, units	7.48	7.18	7.5	7.12	7.13	7.17	7.17	7.47
Sulfate mg/L	36	38	35	35	34	34	35	35
Iron, Fe Total mg/l	0.54	1.44	0.78	1.76	3.42	2.58	0.97	0.62
Iron, Fe Dissolved mg/l	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Hiawatha 17th West Seals								
pH, units	7.4	7.34	7.3	7.25	7.51	7.49	7.33	7.51
Sulfate mg/L	133	132	128	128	125	125	123	125
Iron, Fe Total mg/l	4.02	3.17	3.1	Sampling Problem	2.83	2.72	2.54	2.48
Iron, Fe Dissolved mg/l	<0.03	<0.03	0.14	<0.03	<0.03	<0.03	<0.03	<0.03
Blind Canyon 10th North XC-5 Borehole								
pH, units	7.46	7.37	7.32	7.34	7.36	7.41	7.46	7.44
Sulfate mg/L	179	183	173	173	172	176	180	179
Iron, Fe Total mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Iron, Fe Dissolved mg/l	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03

Water Chemistry:

Mayo and Associates LLC was contracted by Energy West to conduct a geochemical investigation of the elevated concentrations of sulfur in the coal and the elevated total iron concentrations found in the discharge from the Mill Fork Area of the mine. Energy West has concerns that with these high mineral concentrations in the mine water from the Mill Fork Area, it would not be able to comply with the effluent limitations of the Utah Pollution Discharge Elimination System (UPDES) for total iron should this water discharge to the surface.

The Mayo Report concludes the following:

1. Zones of elevated sulfur and iron occur in the Hiawatha seam coal in the Mill Fork Area workings.
2. Several factors suggest that gypsum and $MgSO_4$ dissolution are the primary sources of the elevated concentrations of SO_4^{2-} in both the Hiawatha 17th West seals and the Blind Canyon borehole groundwaters. The factors are: 1) the very positive $\delta^{34}S$ values of all sampled groundwaters, 2) the SO_4^{2-} concentrations in mine water greatly exceed the concentration available from iron sulfide oxidation, and 3) laboratory leaching experiments demonstrate that almost all of the SO_4^{2-} is from the dissolution of oxidized sulfate minerals.
3. Groundwaters discharged from the Hiawatha seam mine workings in the Mill Fork Area contain elevated concentrations of total iron which makes the water rust colored when oxygenated. This elevated total iron is associated with groundwater that has contact with the elevated sulfur zone Hiawatha seam coal.
4. Based on a 1st order calculation, approximately 958 tons of iron sulfide minerals (pyrite and marcasite) will be potentially available in the elevated sulfur zones to interact with in-mine groundwater at the time of projected mine closure.
5. Approximately 600 tons of iron would also be available for oxidization from the conveyor belt components if the beltlines are abandoned in the mine workings.
6. Chemical interaction with between water containing oxygen and the elevated sulfur zone results in iron sulfide oxidization and is responsible for the formation of rust colored iron hydroxide which is reported as total iron in laboratory analysis.
7. Assuming that all of the potentially available iron sulfide mineralization will have contact with oxygen rich water it would take about 75 years to exhaust the total supply of iron sulfide. If the beltline iron is included the time to exhaustion would exceed 100 years.

When realistic in-mine conditions are considered it is likely that supply of readily available iron sulfide would be exhausted in a few to tens of years under present conditions.

8. Water quality associated with two future mine closure options have been evaluated:
   a) The first condition, call herein the Open System, envisions groundwater discharging to the surface from the Rilda Canyon Portals via Mill Fork Access workings. This discharge water would be continually oxidized and would contain elevated concentrations of total iron for an indefinite period of time. Total iron concentration in the range of 1-3.5 mg/l would continue for several years. The water will also contain elevated SO_4^{2-}.
   b) The second condition, called herein the Closed System, envisions no surface groundwater discharge at Rilda Canyon due to the construction of bulkheads in the Mill Fork Access workings. The water impounded in the workings behind the bulkheads would become reducing and will attain elevated and steady state concentrations of total ion and SO_4^{2-}.

For the full description of the water chemistry of the Mill Fork Area, refer to the geochemical evaluation conducted by Mayo and Associates for Energy West Mining in 2014. This document is found in Appendix A.

Remedial Approaches to Containing Potentially Elevated Iron Water:

In an effort to maintain acceptable compliance quality discharge water from the Deer Creek Mine, Energy West is proposing the construction of eleven (11) water impounding bulkheads. Six (6) primary bulkheads are proposed for the Mill Fork Access #2 mains, and five (5) secondary bulkheads are proposed for the 1st Right mains inby the Rilda Canyon Right Fork portals. Primary bulkheads located in Mill Fork Access #2 will provide a water barrier to segregate potentially iron-contaminated ground waters that could propagate from the Mill Fork Area from higher quality compliant groundwater elsewhere in the mine. It is essential to keep these contaminated waters from entering the permanent water discharge system planned for the Deer Creek portals or from seeping out the Rilda Canyon Right Fork portals. If discharged, these waters will likely have a negative effect on the stream as well as the North Emery Water Users Special Services District (NEWUSSD) spring collection system, both in Rilda Canyon.

The amount of groundwater that could potentially be impounded by the bulkheads is unknown. Therefore, a worst case scenario is assumed. The elevation of the planned bulkhead location in the Mill Fork Access #2 is 7,977 feet (Map 1 – Mill Fork Hydrology). The mined area behind the bulkheads reaches an elevation of 8,124 feet at the top of the Blind Canyon seam workings

(Map 2 – Mill Fork Area Blind Canyon Seam). In other words, the area behind the bulkheads has a potential head of approximately 147 feet or 63.7 psi (each foot of head equates to 0.433 psi).

Secondary bulkheads proposed for the 1st Right Mains XC – 4.5 will retain intercepted groundwater produced from the proposed Mill Access #2 bulkheads, if any, in the 1st Right area. Elevation of the proposed 1st Right XC – 4.5 bulkheads is 7,884 ft. The area behind the bulkheads reaches an elevation of 8,010 feet at the top of the 4th North/6th North slope (rock slopes from the Blind Canyon [upper seam] to the Upper Hiawatha [lower seam]). Intercepted groundwater that rises to this point will drain to the south toward the Deer Creek portals located in Deer Creek canyon. The potential head at 1st Right XC – 4.5 is 126 feet or 54.6 psi.

The eleven (11) bulkheads will be Jennchem 120 psi Main Line seals (MSHA approval number 120M-15.0) reinforced with keyway notches and polyurethane ring grouting. Appendix D contains the summary of installation procedures for the Jennchem 120 psi Main Line seals.

Existing Conditions:

The pillars on either side of the bulkheads and surrounding the impounded water area were physically inspected on July 15, 2014 by Alan A. Campoli (Jennmar), Utah PE 8502943-2202. No geologic anomalies were found in either the Mill Fork Access #2 and 1st Right Submains bulkhead locations.

The pillars in both locations are stable and with ARMPS stability factors of 2.15 and 2.87 in the Mill Fork Access #2 and 1st Right Submains (ARMPS output is contained in Appendix C and Figure 10 Hiawatha Overburden).

As the mine is closing, there will be no changes to the mine geometry. The resistance to water pressure or mine gas explosion induced horizontal displacement of the Upper Hiawatha Seam pillars is underestimated by ARMPS. ARMPS assumes a coal bed compressive strength of 900 psi. NIOSH published coal seam strength data (IC 9446 by Mark and Barton) reports an average Upper Hiawatha unconfined compressive strength of 5,446 psi for 20 tests. Theoretically, coalbed shear strength is 25% of the unconfined compressive strength or over 1,300 psi for the Upper Hiawatha. This is 16 times the shear strength of the J-Seal bulkhead material.

The primary Mill Fork Access #2 bulkheads have no multiple seam or nearby mining considerations, as the nearest second mining is at least 3,148 feet away (Figure 8). The secondary 1st Right Submain bulkheads are a minimum of 1,594 feet from second mining in the Hiawatha Seam, providing a solid barrier pillar adjacent to the bulkheads (Figures 3 and 8). The secondary 1st Right Submain bulkheads are a minimum of 1,430 feet or 188 times the mining height to the nearest secondary mining in the Blind Canyon Seam (Figures 3 and 8). It is generally assumed that if the interburden thickness is greater than 12 times the mining height minimal and negligible multiple seam mining effects will result. The no multiple seam mining

effects assumption is reinforced by the 50 feet thick sandstone member directly above the Hiawatha workings, see core log B-874 in Appendix B.

Jennchem installation procedures call for a professional engineer to inspect the seal area should convergence in excess of 5% occur. As the mine is closing, there will be no changes to the mine geometry. Thus, the occurrence of mine convergence over 5% is very unlikely.

Bulkhead Stability:

The stability of the bulkhead is estimated by dividing the shear resistance of the bulkhead perimeter by the lateral force applied by the maximum head. The shear resistance is controlled by the 81 psi shear strength of J-Seal. Table 2 assumes the bulkhead thickness will be determined by Jennchem 120 psi Mine Line seal installation procedures (Appendix D).

Table 2 Bulkhead Safety Factors

Bulkhead #	Height , ft	Width, ft	Thickness, ft	Pressure, psi	Shear, psi	Safety Factor
MFA2 #1	7.6	25.0	14	63.6	81	6.1
MFA2 #2	8.4	24.4	15.2	63.6	81	6.2
MFA2 #3	7.5	25.8	13.4	63.6	81	5.9
MFA2 #4	7.5	25.3	13.4	63.6	81	5.9
MFA2 #5	8.9	25.0	15.2	63.6	81	5.9
MFA2 #6	9.3	22.9	16	63.6	81	6.2
1st Right #1	6.8	19.3	12.0	55.0	81	7.0
1st Right #2	6.4	24.2	11.9	55.0	81	6.9
1st Right #3	7.2	21.0	12.0	55.0	81	7.0
1st Right #0	10.0	19.2	15.3	55.0	81	6.9
1st Right #-1	6.9	21.3	12.3	55.0	81	7.0

The bulkhead safety factors above do not consider the significant increase to lateral resistance provided by the polyurethane ring grouting and 2 foot wide and 2 foot deep floor and rib keyway notches (Figure 7). Each bulkhead site will be ring grouted with Jennchem 70 pcf polyurethane grout after the J-SEAL foamed cement has fully cured and has met the quality control specifications prescribed by MSHA Approval Number 120M-15.0 (Appendix D). This proprietary procedure has recently been approved for bulkhead construction at other locations. Prior to pouring the J-SEAL, a minimum of twenty holes will be drilled into perimeter. A non-conductive hose will be inserted into each hole and secured with hydraulic cement at the borehole collar. The free hose end will be marked to indicate the associated borehole location and run through the fresh air side of the bulkhead form. Jennchem PUR70 polyurethane grout will be pumped into each hose until refusal or consumption of 500 lbs. Historically, the grouting of J-SEAL ventilation seals with this method has consumed a total of 3,000 lbs of polyurethane

per seal. Actual consumption will vary with the integrity of the seal perimeter.

J-SEAL's superior sulfate resistance reduces water quality concerns (see Table 3 for results of water quality for the impounded area). With more than 50% slag cement content, J-SEAL grout exhibits a high sulfate resistance against acidic mine water. Laboratory tests per ASTM C1012 indicate that, J-SEAL grout does not expand/shrink and degrade over 3-year period of exposure to acidic or plain water. In addition, UCS test results show that the submerged samples gained 29% - 43% of strength over the period. It is concluded that submerging J-SEAL grout in plain, mild acidic (pH 6 - 8), or acidic (pH 3) water does not compromise its material strength as a function of time.

Submerged J-Seal samples

Table 3: Deer Creek Mine Water Sampling Results: Impounded Area

SGS

Analysis Report

December 23, 2014

PACIFICORP
FIELD OFFICE
PO BOX 1005
HUNTINGTON UT 84528

Client Sample ID:	Deer Creek Mine	Sample ID By:	PacifiCorp
Date Sampled:	Dec 17, 2014	Sample Taken By:	KSF
Date Received:	Dec 17, 2014	Time Received:	1425
Product Description:	WATER	Time Sampled:	1115
		Location:	7th North Sump
		Mine:	4
		Field - pH:	7.23 pH units
		Field - Flow:	1066 GPM
		Field - Conductivity:	775 UMHOS/CM
		Field - Temperature:	13.2 DEG. C

Comments: Dissolved Metals Filtered at Lab

SGS Minerals Sample ID: 782-1427422-001

TESTS	RESULT	UNIT	METHOD	REPORTING LIMIT	ANALYZED DATE	TIME	ANALYST
Hardness, mg equivalent CaCO3/L	384	mg/L	SM2340-B	1	2014-12-23	10:00:00	DI
Acidity	17	mg/L	D1067	5	2014-12-17	14:45:00	AL
Anions	11.10	meq/L	SM1030E	0	2014-12-23	10:00:00	DI
Balance	-4.67	%	SM1030E	-10	2014-12-23	10:00:00	DI
Cations	10.11	meq/L	SM1030E	0	2014-12-23	10:00:00	DI
Oxygen, Dissolved	4.5	mg/L	SM 4500-O G	0.1	2014-12-17	14:55:00	AL
Alkalinity, mg CaCO3/L (pH 4.5)	292	mg/L	SM2320-B	5	2014-12-19	14:24:00	HF
Bicarbonate Alkalinity as CaCO3	292	mg/L	SM2320-B	5	2014-12-19	14:24:00	HF
Carbonate Alkalinity as CaCO3	<5	mg/L	SM2320-B	5	2014-12-19	14:24:00	HF
pH	7.33		SM4500-H	0.01	2014-12-17	14:50:00	AL
pH Temperature	14.50	°C	SM4500-H	0.01	2014-12-17	14:50:00	AL
Conductivity	1028	µmhos/cm	SM2510	0.1	2014-12-19	14:50:00	AL
Total Dissolved Solids	635	mg/L	SM2540-C	30	2014-12-19	13:00:00	AL
Chloride, Cl	14	mg/L	EPA 300.0	1	2014-12-22	15:00:00	AL
Sulfate, SO4	233	mg/L	EPA 300.0	1	2014-12-22	15:00:00	AL
METALS BY ICP							
Calcium, Ca - Dissolved	71.79	mg/L	EPA 200.7	0.03	2014-12-18	20:47:00	DI
Iron, Fe - Total	0.77	mg/L	EPA 200.7	0.05	2014-12-22	12:00:00	DI
Iron, Fe - Dissolved	0.07	mg/L	EPA 200.7	0.03	2014-12-18	20:47:00	DI

Lab Supervisor

Domenic Ibanez
Lab Supervisor

SGS North America Inc. | Minerals Services Division
2035 North Airport Road Huntington UT 84528 t (435) 653-2311 f (435)-653-2436 www.sgs.com/minerals

SGS

Analysis Report

December 23, 2014

PACIFICORP
FIELD OFFICE
PO BOX 1005
HUNTINGTON UT 84528

Client Sample ID:	Deer Creek Mine	Sample ID By:	PacifiCorp
Date Sampled:	Dec 17, 2014	Sample Taken By:	KSF
Date Received:	Dec 17, 2014	Time Received:	1425
Product Description:	WATER	Time Sampled:	1115
		Location:	7th North Sump
		Mine:	4
		Field - pH:	7.23 pH units
		Field - Flow:	1086 GPM
		Field - Conductivity:	775 UMHOS/CM
		Field - Temperature:	13.2 DEG. C

Comments: Dissolved Metals Filtered at Lab

SGS Minerals Sample ID: 782-1427422-001

TESTS	RESULT	UNIT	METHOD	REPORTING LIMIT	ANALYZED DATE	TIME	ANALYST
METALS BY ICP (continued)							
Magnesium, Mg - Dissolved	49.79	mg/L	EPA 200.7	0.01	2014-12-18	20:47:00	DI
Manganese, Mn - Total	0.017	mg/L	EPA 200.7	0.002	2014-12-22	12:00:00	DI
Manganese, Mn - Dissolved	0.014	mg/L	EPA 200.7	0.002	2014-12-18	20:47:00	DI
Potassium, K - Dissolved	8.83	mg/L	EPA 200.7	0.14	2014-12-18	20:47:00	DI
Sodium, Na - Dissolved	50.66	mg/L	EPA 200.7	0.09	2014-12-18	20:47:00	DI

Lab Supervisor

Domenic Ibanez
Lab Supervisor

SGS North America Inc. | Minerals Services Division
2035 North Airport Road Huntington UT 84528 t (435) 653-2311 f (435)-653-2436 www.sgs.com/minerals

Construction Location and Impoundment Area:

The bulkheads will be constructed in two areas of the Deer Creek Mine; 1) Mill Fork Access #2 mains in the six entries between XC-61 and 62, and 2) 1st Right submains between XC-4 and 5 (originally proposed to be located at XC-28.5, relocated to XC-4.5, see Addendum 3). Figure 3 contains a map of Deer Creek Mine and details the impoundment areas. Figures 4 and 5 contain a detailed map of the proposed installation locations. The installation locations were chosen based on geologic and geotechnical factors establishing safe static head pressure limits against the bulkheads. The following Table 4 and 5 contains approximated details of the impoundment area.

Table 4: Impoundment Area Details – Mill Fork Access #2 (values are approximated)

Dead Storage Volume: Mill Fork Area	1.22 Billion Gallons
Estimated Inflow Rate	1000 GPM
Estimated Time to Fill	3.9 Years

Table 5: Impoundment Area Details – 1st Right (values are approximated)

Dead Storage Volume: 1st Right Area	110 Million Gallons
Estimated Inflow Rate	<50 GPM
Estimated Time to Fill	4 Years

Project Timeline:

It is anticipated that construction of the bulkheads will commence immediately upon completion of mining of the 27th West Outby panel and withdrawal of mining equipment inby the bulkhead locations. It is estimated that construction of all eleven bulkheads will not exceed three months. Tentatively, shipping of material shall begin on April 2015. On-site training of contractors shall be during April 2015. Keeping with this schedule, construction of the first bulkhead shall commence in April, 2015. The MSHA Price Field Office will be notified upon completion of the final bulkhead.

Bulkhead Construction Sequence:

Isolation of the northern portion of the mine during the bulkhead construction will be accomplished by systematically constructing the bulkheads and sealing the remaining portals in Rilda Canyon as follows:

- Mill Fork Access #2 Bulkheads
- Concrete Plugs at 1st Right Portals
- 1st Right Bulkheads XC-4
- Left Fork Breakouts Portal Seals

Mill Fork Access #2 Bulkheads:

The bulkheads shall be constructed in a specific sequence in the Mill Fork Access #2 area in order to keep groundwater from impounding against the structures while under construction. Inby mine dewatering systems will be left intact during the initial construction allowing sufficient time to build the remaining seals without impounding water. The first bulkhead will be built in entry #1. The next bulkhead shall be constructed in entry #6, then entry #5, followed by entry 3, 2 and 4.

With the completion of the mine separation seals at 3rd North B XC-138 (Map 3 and 4), the northern portion of the Deer Creek Mine will be ventilated with the exhausting fan located at the Left Fork Portals in Rilda Canyon (Deer Creek mine separation amendment was approved by MSHA district 9, 4/1/2015. Ventilation changes in the mine made were effective 4/2/2015. Construction and pumping of 120 psi rated seals at the 3rd North B Mains crosscut #138 location commenced on April 6th, 2015). Access to the northern district during the construction of the Mill Fork bulkheads will be through either the Rilda Canyon Left Fork or the 1st Right portals. The approved separation of the mine ventilation system provides physical access to the bulkheads post construction for monitoring prior to final sealing of the Left Fork Portals. Energy West's original application dated January 20, 2015 included constructing to the extent possible both sets of bulkheads with no access to monitor the primary set during the construction of the secondary set.

During discussions with Pittsburgh Safety and Health Technology Center Mine Emergency Operations personnel (John Urosek, Stephen Sawyer, Chris Snyder on March 9, 2015) several issues regarding Energy Wests original proposed bulkhead installation plan were raised, mainly that MSHA does not consider any structure inby a new (proposed secondary bulkheads located at 1st Right) set of seals or bulkheads as a functioning structure. Energy West would be required to breach/open valves of the inby seals (Mill Fork Access #2) prior to constructing the secondary set. Lack of monitoring access of the primary set of bulkheads during the construction of the secondary set of bulkheads conflicted with MSHA regulations. Energy West pointed out that, as outlined in the plan, construction and installation of the bulkheads will explicitly follow the installation procedures outlined in MSHA Approval Number 120M-15.0 (Appendix D), except for item I – Water Drainage System. Energy West proposes not to install water drainage systems through the bulkheads as an effort to minimize potential leakage of the bulkheads. The benefit on the primary set of bulkheads would be negated. Energy West committed to monitoring the primary set during construction of the secondary to confirm that the primary set did not retain water. With the mine separation seals in-place at 3rd North B Mains crosscut #138, access for construction and monitoring of both the primary and secondary bulkheads no longer is restricted.

The construction sequence has been modified to allow access for monitoring both sets of bulkheads. After the completion of the Mill Fork Bulkheads, the next phase will be the installation of the portals plugs at the Rilda Canyon 1st Right portals. Ventilation circuits will be modified to ventilate 1st Right Submains utilizing the Left Fork exhausting fan during the installation of the plugs.

Rilda Canyon Concrete Plugs:

Upon completion of the bulkhead seals (Mill Fork Access #2 a set of concrete plugs in will installed at the Rilda Canyon portals (Figure 5). Containment forms will be built at the inby and outby ends of the plugs. A series of holes were drilled from the surface into the plug forms for pumping of concrete and venting during the filling process. Design of the concrete plugs was based on the following formula1:

$L = pab/(a+b)f_c$, where;

- L= length of plug (ft)
- p = estimated pressure (55 psi, difference between 1st Right XC-4.5 and top-of-slope, elevation difference = 126')
- a = entry width (20')
- b = entry height (10')
- f_c = allowable compressive strength of rock [lowest value of either plug material or surrounding strata] (4,000 psi – estimated cured strength of concrete)
- Safety Factor = (Constructed Thickness/L) 167[2]

[1] Chekan, G., Design of Bulkheads for Controlling Water in Underground Mines

[2] Safety factor using Garrett and Campbell Pitt compressive strength of concrete at 600 psi = 24.5

1st Right Bulkheads XC-4:

Bulkheads in 1st Right will be constructed after the completion of the Mill Fork Access #2 bulkheads. Access to the 1st Right Bulkheads will be from the Left Fork portals. The bulkheads shall be constructed in a specific sequence in the 1st Right area in order to keep groundwater from impounding against the structure while under construction. Inby mine dewatering systems will be left intact during the initial construction allowing sufficient time to build the remaining seals without impounding water. The first bulkhead will be built in entry #-1. The next bulkheads shall be constructed in entry #0, #3, #1 then entry #2.

Left Fork Breakouts Portal Seals:

After the completion of the 1st Right Bulkheads and development of the horizontal drain hole, solid concrete portals seals will be installed at the Left Fork Portals (Intake and Fan portals). With the completion of the Left Fork portal seals, all portal openings at the Deer Creek Mine will be effectively sealed completing final closure of the mine. Installation of the portal seals will comply with stipulations in the Deer Creek Mine Permit and Bureau of Land Management

Resource Recovery Protection Plan.

Construction Details:

Each bulkhead site will be ring grouted with Jennchem 70 pcf polyurethane grout after the J-SEAL foamed cement has fully cured and has met the quality control specifications prescribed by MSHA Approval Number 120M-15.0 (Appendix D). This proprietary procedure has recently been approved for bulkhead construction at other locations. Prior to pouring the J-SEAL, a minimum of twenty holes will be drilled into the perimeter (Figure 7). A non-conductive hose will be inserted into each hole and secured with hydraulic cement at the borehole collar. The free hose end will be marked to indicate the associated borehole location and run through the fresh air side of the bulkhead form. Jennchem PUR70 polyurethane grout will be pumped into each hose until refusal or consumption of 500 lbs. Historically, the grouting of J-SEAL ventilation seals with this method has consumed a total of 3,000 lbs of polyurethane per seal. Actual consumption will vary with the integrity of the seal perimeter.

Energy West is aware of potential for the bulkheads to leak. The proposed plan includes the installation of Jennchem 120 psi Main Line seals (MSHA approval number 120M-15.0) reinforced with keyway notches and polyurethane ring grouting. In addition to the grouted ring specified in the approval 120M-15.0, Energy West will install an additional grout ring at the inby edge of each bulkhead, (Figure 12). Additional inby grout ring installation at the Mill Fork Access Bulkheads will be installed prior to the installation of the bulkheads. At the 1st Right bulkheads, the additional inby grout ring will be installed after the completion of the bulkheads. The secondary set of bulkheads located at 1st Right will provide an additional measure to prevent leakage at the Rilda Canyon portals. The concrete plugs at the Rilda Canyon portals provide a tertiary protection to prevent leakage.

In a continued effort to mitigate and limit impacts of hydrology to Rilda Canyon, Energy West has contracted REI drilling, a company specializing in horizontal drilling techniques, to drill a horizontal hole in the Rilda Canyon area from the Left Fork mine workings to the Right Fork mine workings (Maps 3 and 4). The purpose of the hole is to drain by gravity, potential water leakage from the primary set of bulkheads located in the Mill Fork/Rilda Canyon area to the southern portion of the Deer Creek Mine. From the outflow end of the hole, intercepted groundwater will flow by gravity to the Deer Creek portals. The horizontal hole will be started in the Blind Canyon seam in 10th West Mains near the Left Fork portals drilled in a 5,000' radius arc trending slightly upward connecting to the Hiawatha seam in 1st Right Submains. Energy West is confident in its efforts to install bulkheads at strategic locations to mitigate potential hydrologic impacts to Rilda Canyon. If the horizontal hole is successful, static pressures at the 1st Right bulkheads would be reduced dramatically.

With the mine separation seals in-place at 3rd North B Mains crosscut #138, access for drilling operations will be from the Left Fork portals. The construction sequence of the bulkheads outlined above will allow access to the drill site area (10th West Mains) and the breakthrough

point in 1st Right. After the completion of the horizontal drilling operations, the final phase of Deer Creek closure will conclude with the construction of portal seals at the Left Fork portals.

After all phases of bulkhead construction and installation of the concrete plugs, Energy West will continue to monitor pressure at each bulkhead location. Monitoring will allow Energy West to assess:

- Head pressure build-up
- Water quality of the impounded areas.
- Provide time for Energy West to assess water quality treatment options

If leakage occurs at the Rilda Canyon Portals, Energy West will be required to treat the effluent to comply with all State and Federal regulations. Energy West is not requesting MSHA to concur that the bulkheads will be a water tight barrier; simply that, Energy West will be allowed to construct the bulkheads to minimize potential hydrologic impacts.

Two rows of Burrell cans will be placed so that the distance from can-to-can does not exceed 36 inches inby and outby each bulkhead. The first row will be placed 5 ft away from the faces of the bulkhead and the second row placed 10 ft away from the faces of the bulkhead.

Construction and installation of the bulkheads will explicitly follow the installation procedures outlined in MSHA Approval Number 120M-15.0 (Appendix D), except for item I – Water Drainage System. The intended purpose of these bulkheads is to provide a water tight barrier to segregate potentially iron-contaminated ground waters that could propagate from the Mill Fork Area from better quality compliant groundwater elsewhere in the mine. It is essential to keep these contaminated waters from entering the permanent water discharge system planned for the Deer Creek portals or from seeping out the Rilda Canyon Right Fork. As outlined above, the bulkheads in Mill Fork Access and 1st Right will be constructed as outlined above

To be compliant with inspection and monitoring criteria of MSHA Approval Number 120M-15.0, specifically the hydrologic pressure inby the bulkhead locations, Energy West installed two monitoring boreholes from the surface to the mine workings just inby each set of bulkheads (Figures 6, 7 and 13). Two additional holes were completed in 1st Right at XC-28 (located between the secondary set of bulkheads and the concrete plugs at the Rilda Canyon portals) to monitor potential water leakage from the secondary set of bulkheads (Figure 13). At the primary set of bulkheads (Mill Fork Access #2), a pressure transducer and telemetry equipment will be installed in one of the boreholes prior to the completion of the bulkheads to monitor environmental data that will be relayed to computer equipment monitored by Energy West. The second hole will serve as a backup and allow for monitoring of air and water quality. To comply with atmospheric gas sampling requirements, Energy West will install one atmospheric sampling pipe in each seal as specified in Figure 11 – Atmospheric Gas Sampling Tube. Sampling will be conducted until the design strength of each seal has been reached and each has been approved to serve as a bulkhead.

To alleviate MSHA's concern of potential water impoundment inby the primary bulkheads (Mill Fork Access #2) prior to completing the secondary set at 1st Right, Energy West will commit to the following: :

- Measure any impounded water utilizing the boreholes located inby the Mill Fork bulkheads;
    - As stated above, Energy West will utilize a pressure transducer and telemetry equipment installed in one of the boreholes prior to the completion of the bulkheads. The pressure transducer will be positioned within two feet of the base of the lowest bulkhead.
        - **Energy West commits to the emergency procedures outlined in the following section:**
            - **If the pressure at the Mill Fork Access #2 bulkheads exceeds 2 feet of head pressure ,< less than 1 psi, (equates to a one hundred twenty fold safety factor of the approved 120M-15.0 seal) during the Jennmar curing/grout ring process, Energy West will immediately institute the emergency response plan**

In addition to the installation of the bulkheads, Energy West installed a set of seals in 3rd North B XC-138.5 to further isolate the northern portion of the mine (Figure 9, Maps 3 and 4). Seals at 3rd North B XC-138.5 were approved by MSHA District 9, 4/1/2015. Ventilation changes in the mine were made effective 4/2/2015. Construction and pumping of 120 psi rated seals at the 3rd North B Mains crosscut #138 location commenced on April 6th, Energy West projects final portal sealing at the Deer Creek portals by the end of April 2015. Elevation of 4th North/6th North top-of-slope is approximately 8,010' compared to the 1st Right bulkheads elevation of approximately 7,884' (difference of 126 feet). In the event that water accumulates inby the 1st Right bulkheads (between the 1st Right and Mill Fork Access bulkheads) or if the Mill Fork Access #2 bulkheads fail, the 3rd North B seals are equipped with water drains to allow the water to migrate downdip towards the Deer Creek portals.

Emergency Response Plan:

General Overview: Bulkhead installation is a facet of the overall Deer Creek mine closure plan. Mining at the Deer Creek Mine was completed (27th West Outby longwall panel) on January 7, 2015. All equipment has been removed from the mine in a systematic manner from 27th West to outby the bulkhead area. After completion of the bulkheads, no personnel will be traveling inby or working down gradient of the bulkheads except for personnel directly involved with the construction activities related to the bulkheads and the horizontal drain hole project. The final phase of the Deer Creek Mine closure plan includes final reclamation of the portal sites in Rilda Canyon. Additional safety measures will be incorporated in the reclamation plan of the Rilda Canyon portals to include the installation of the concrete plugs at the portals (Figure 5). Before

and during the construction of the bulkheads all mine personnel will be trained on the emergency response plan and bulkhead monitoring.

With the assistance of Jennmar Corporation, Energy West Mining Company has made a concerted effort to design the bulkhead/fluid retention system in such manner to limit potential failure. However, several factors could trigger an emergency response. The Emergency Response Plan outlines the detail actions taken if certain criteria occur, failure of head pressure, monitoring equipment, rapid changes in head pressure, seismic activity, excessive leakage or increase in leakage without increase in head pressure.

Monitoring: After completion of the bulkheads and horizontal drain hole, all equipment and personnel will be evacuated from the mine. To monitor head pressure at the primary bulkheads (Mill Fork Access #2), Energy West installed two monitoring holes inby the bulkhead (Figure 6). A pressure transducer and telemetry equipment will be installed to monitor head pressure and the data will be relayed to computer equipment monitored by Energy West. The second hole will serve as a backup and allow for monitoring of air and water quality.

With the completion of the bulkheads, prior to final mine closure, Energy West will inspect each of the completed bulkheads using the bulkhead inspection form, Figure 14.

Monitoring Plan: Energy West will monitor head pressure at the primary bulkhead (Mill Fork Access #2), on a daily basis and generate a report on a monthly basis which will be available to review by mine management and governmental agencies. Table 6 outlines the monitoring plan for the Mill Fork Bulkheads:

Table 6: Mill Fork Access #2 Bulkhead Monitoring Plan

Pressure Reading (psi)	Estimated Time to Pressure (years)	Type of Monitoring	Frequency of Monitoring	Action Plan	Safety Factor
0 - 15	1[1]	Static Head[3]	Daily[4]	Structural Integrity/Leakage[5]	8.0
15 - 30	2	Static Head[3]	Daily[4]	Structural Integrity/Leakage[5]	4.0 – 8.0
30 - 45	3	Static Head[3]	Each Shift[4]	Structural Integrity/Leakage[5]	4 – 2.7
45- 60[2]	4	Static Head[3]	Each Shift[4]	Structural Integrity/Leakage[5]	2.7 – 2.0

[1] Energy West projects final closure of the Deer Creek Mine which includes bulkhead construction, development of a horizontal drain hole, and sealing of all portals by the end of 2015

[2] Estimated long term stabilized maximum pressure at the Mill Fork Bulkhead = 64 psi

[3] Type of Monitoring – pressure transducer located inby the bulkhead. Pressure calibration verified monthly with adjacent piezometer well.

[4] See Figure 14 – Bulkhead Inspection Form

[5] Structural Integrity/Leakage

Changes of rib, roof or floor conditions

- Sloughing of the ribs
- Fracturing of the ribs, roof and floor
- Deflection of the ribs, roof and floor
- Leakage Observations:
  - Identify areas of wetness and or areas of leakage
  - Estimate volume of leakage
  - Note color of leakage

If monitoring detects rapid changes in head pressure (±15 psi) mine management will be notified immediately and the following plan will be instituted:

- Field verify the calibration of the pressure transducer
- Review of bulkheads will be performed by a licensed engineer or geologist
- Institute plan recommended by licensed engineer or geologist

Leakage: If the primary bulkheads at Mill Fork Access #2 leak, this groundwater will drain to the secondary set installed at 1st Right. Final protection for bulkhead leakage/failure is afforded by the concrete plugs at the Rilda Canyon portals.

- Mill Fork Bulkheads – if significant water accumulates due to leakage around the bulkhead on the outby face the steps listed will be followed:

- Each shift will be notified before entering the mine
- A pump will be setup immediately outby the bulkhead
- Site examination will be performed by a licensed engineer or geologist
- Application of the additional grouting will be installed to the depths recommended by the licensed engineer or geologist

- 1st Right Bulkheads – due to the regional dip of the formations, water will not accumulate or build pressure outby the bulkheads (i.e., water will flow to the east downdip of the bulkhead). If water accumulates along the inby face of the bulkheads due to leakage of the Mill Fork Bulkheads the following steps listed will be followed:
  - Each shift will be notified before entering the mine
  - A pump will be setup immediately inby the bulkhead

Minor Failure: In the event of a minor failure where water is leaking through the primary and secondary bulkheads and ultimately leaking through at the concrete plug, Energy West will install a grout ring at the concrete plugs and nearby surface outcrop to minimize leakage.

Post Mine Closure:

Warning signs and events that could pose threat of bulkhead failure – The following list provides observable events which may impact the normal operations of bulkhead(s):

1. Fluid level fluctuations – measured with a pressure transducer installed inby the proposed bulkhead
2. Seismic activity – monitored by the University of Utah seismic network
3. Physical inspections – monitor outcrops down gradient of the proposed bulkheads
4. Miscellaneous

Although monitoring of the impounded water level is planned, it is not in this case a critical indicator of potential problems with bulkhead performance. The factors of safety given clearly indicate that the bulkheads would be stable structures at impounded heads much greater than those possible at this site. As a facet of mine closure and abandonment, safety of the workforce is not dependent upon fluid level fluctuation, electrical interruptions and/or mechanical system failures. Rather, the critical warning signs are practically limited to the strata surrounding the bulkhead structure. Energy West selected the sites for the bulkheads based on geologic and geotechnical factors (see figures 4 and 5). Floor rock consists of competent sandstone in excess of fifty (50) feet in thickness. Roof lithology consists of a fluvial sandstone unit in entries 4, 5 and 6 and mudstone/siltstone strata in entries 1 through 3. No mining has taken place adjacent to the Mill Fork Access #2 mains, thereby, minimizing side abutment pressures. However, seepage around the bulkhead is still possible through the roof, ribs and floor. Energy West will monitor the bulkheads daily after hydraulic head is applied with pressure transducer installed in a borehole located inby the

Mill Fork Access #2 bulkheads. Although the bulkhead design includes a grout ring to prevent seepage, it is anticipated that some wetness/seepage may occur. A secondary set of bulkheads will be installed down gradient of Mill Fork Access #2 in 1st Right to mitigate potential seepage. In addition to the secondary set of bulkheads, concrete plugs will be installed in the Rilda Canyon portals. Outcrops near the Rilda Canyon portals will be examined for potential seepage. Should wetness/seepage occur, an estimated flow rate and color of the discharge will be recorded. Given the characteristics reported for the discharge, Mine Management will decide the appropriate level of response. A response by Mine Management will also be triggered by rapid fluctuations head levels indicating potential movement of the bulkhead or deterioration of the surrounding strata that could impact the structural integrity of the bulkhead and/or a seismic event of significant magnitude and duration that the structural integrity of the bulkhead may be affected. All wetness/seepage will be reported to the governmental agencies within 24 hours of discovery.

After mine closure and reclamation responsibilities are met, Mine Management has at its disposal monitoring, notification, and mitigation measures that include:

- Increased monitoring of bulkheads pressure transducer - primary set of bulkheads located at Mill Fork Access #2
- Monitoring of bulkheads static water level – 1st Right bulkheads
- Increased monitoring of outcrops at the Rilda Canyon portals
- Notification of mine management officials
- Notification of mine personnel
- Notification of regulatory agencies
- Installation of grout ring along the outcrops at the Rilda Canyon portals

Should conditions warrant notification of Mine Management or Regulatory Agencies, the following lists provide contact information.

- Mine Management
  - Mine Manager – Rick Poulson, 435-687-6610
  - Chief Engineer – Louie Tonc, 435-687-6637
  - Geology and Exploration Manager – Chuck Semborski, 435-687-4720
  - Geology and Environmental Manager – Ken Fleck, 435-687-4712
- Regulatory Agencies
  - MSHA – District 9 – 435-637-3051
  - Utah Division of Oil, Gas and Mining – 801-538-5340
- Emergency Agencies
  - Emery County Sheriff – 435-381-2404
  - Emery County Ambulance – 911
  - Castle View General Hospital- 435-637-4800

Prior to hydraulic head being applied to the bulkheads, a training program will be implemented at the mine. This program will, at a minimum, be included as a part of annual re-training, and also be routinely discussed in daily safety talks throughout the year. Training will make the workforce aware of the operation of the bulkheads, including:

- Bulkhead locations and anticipated function
- Inspection and examination requirements
- Procedures to follow in an emergency
- Areas of responsibility
- Evacuation plans and travel routes

PACIFICORP
ENERGY WEST MINING COMPANY
DEER CREEK MINE MSHA ID NO. 42-00121

Mill Fork Access #2 Mains
Rilda Canyon Portals 1st Right Submains
Proposed Bulkheads – Installation and Monitoring Plan

Insert Addendum #4

Addendum Tab

PACIFICORP

ENERGY WEST MINING COMPANY

DEER CREEK MINE MSHA ID NO. 42-00121

Mill Fork Access #2 Mains

Rilda Canyon Portals 1st Right Submains

Proposed Bulkheads – Installation and Monitoring Plan

Addendum #4

Revised Emergency Response Plan due to Installation of the Mine Separation Seals at 3rd North

Addendum Submittal April 10, 2015

Addendum #4

Revised Emergency Response Plan due to

Installation of the Mine Separation Seals at 3rd North

In preparation for bulkhead construction, mine closure will effectively split the mine into two distinct districts: the southern district, which will be sealed immediately by completion of the mine isolation seals located at 3rd North B XC-138, Meetinghouse Canyon breakouts, and the Deer Creek portals and the northern district, where bulkhead construction will take place. The northern district will be sealed with the completion of the bulkheads, concrete plugs and sealing of the Rilda Canyon Left Fork portals.

With the completion of the mine separation seals at 3rd North B XC-138, the northern portion of the Deer Creek Mine will be ventilated with the exhausting fan located at the Left Fork Portals in Rilda Canyon (Deer Creek mine separation amendment was approved by MSHA District 9, 4/1/2015. Ventilation changes in the mine were made effective 4/2/2015. Construction and pumping of 120 psi rated seals at the 3rd North B Mains crosscut #138 location commenced on April 6th, 2015). Access to the northern district during the construction of the Mill Fork bulkheads will be through either the Rilda Canyon Left Fork or the 1st Right portals. The approved separation of the mine ventilation system provides physical access to the bulkheads post construction for monitoring prior to final sealing of the Left Fork Portals (Energy West's original application dated January 20, 2015 included constructing to the extent possible both sets of bulkheads with no access to monitor the primary set during the construction of the secondary set).

With the mine separation seals in-place at 3rd North B Mains crosscut #138, access for construction and monitoring of both the primary and secondary bulkheads no longer is restricted. The construction sequence has been modified to allow access for monitoring both sets of bulkheads. After the completion of the Mill Fork Bulkheads, the next phase will be the installation of the portals plugs at the Rilda Canyon 1st Right portals. Ventilation circuits will be modified to ventilate 1st Right Submains utilizing the Left Fork exhausting fan during the installation of the plugs.

In a continued effort to mitigate and limit impacts of hydrology to Rilda Canyon, Energy West has contracted REI drilling, a company specializing in horizontal drilling techniques, to drill a horizontal hole in the Rilda Canyon area from the Left Fork mine workings to the Right Fork mine workings. The purpose of the hole is to drain by gravity, potential water leakage from the

primary set of bulkheads located in the Mill Fork/Rilda Canyon area to the southern portion of the Deer Creek Mine. From the outflow end of the hole, intercepted groundwater will flow by gravity to the Deer Creek portals. The horizontal hole will be started in the Blind Canyon seam in 10th West Mains near the Left Fork portals drilled in a 5,000' radius arc trending slightly upward connecting to the Hiawatha seam in 1st Right Submains. Energy West is confident in its efforts to install bulkheads at strategic locations to mitigate potential hydrologic impacts to Rilda Canyon. If the horizontal hole is successful, static pressures at the 1st Right bulkheads would be reduced dramatically.

With the mine separation seals in-place at 3rd North B Mains crosscut #138, access for drilling operations will be from the Left Fork portals. The construction sequence of the bulkheads outlined above will allow access to the drill site area (10th West Mains) and the breakthrough point in 1st Right. After the completion of the horizontal drilling operations, the final phase of Deer Creek closure will conclude with the construction of portal seals at the Left Fork portals.

The Emergency Response Plan section of the plan was enhanced and outlines the detail actions taken if certain criteria occur, such as failure of head pressure monitoring equipment, rapid changes in head pressure, seismic activity, excessive leakage or increase in leakage without increase in head pressure.

PACIFICORP
ENERGY WEST MINING COMPANY
DEER CREEK MINE MSHA ID NO. 42-00121

Mill Fork Access #2 Mains
Rilda Canyon Portals 1st Right Submains
Proposed Bulkheads – Installation and Monitoring Plan

Insert Figure 14

PACIFICORP

ENERGY WEST MINING COMPANY

DEER CREEK MINE MSHA ID NO. 42-00121

Mill Fork Access #2 Mains

Rilda Canyon Portals 1st Right Submains

Figure 14

Bulkhead Inspection Form

Name of Examiner: _____

Date of Examination: _____

Shift (circle one): Day, Afternoon, Graveyard

Bulkhead Location: _____

Bulkhead Number	Time of Examination	Static Head Pressure	% Oxygen	% Methane	% Carbon Monoxide	Leakage (gpm)	Extensometer Reading
1							
2							
3							
4							
5							
6							

Condition of Bulkhead and Surrounding Strata:

- Note
  - Changes of rib, roof or floor conditions
    - Sloughing
    - Fracturing
    - Deflection
  - Leakage observations
  - Identify areas of wetness and or leakage
  - Color of leakage

Shift Foreman Signature:_____

PACIFICORP
ENERGY WEST MINING COMPANY
DEER CREEK MINE MSHA ID NO. 42-00121

Mill Fork Access #2 Mains
Rilda Canyon Portals 1st Right Submains
Proposed Bulkheads – Installation and Monitoring Plan

Insert Maps 3 and 4

RECEIVED
APR 13 2015
DIV. OF OIL, GAS & MINING

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

DEER CREEK MINE
MINE SEPERATION PRIOR TO BULKHEAD CONSTRUCTION

DRAWN BY:	K. LARSEN	MAP 3	
SCALE:	1"=800'	DRAWING #:	
DATE:	APRIL 6, 2015	SHEET 1 OF 1	REV. ___

7th North X-Cut 39 Seals

Mill Fork Access #2
Bulkheads X-Cut 62

1st Right
Bulkheads X-Cut 4

Directional Water Drain
Hole Approx. 4879'

Concrete Plugs

1st Right
Rilda Canyon Portals

Left Fork
Rilda Canyon Portals

3rd North X-Cut 138
Mine Separation Seals

9th East
Breakouts

Deer Creek Portals

Seals

Legend

- Blind Canyon Seam
- Hiawatha Seam
- Evacuation Travelway
- Seals
- North of Isolation Seals (Mill Fork/Rilda)
- South of Isolation Seals (Deer Creek Blind Canyon Workings)

N

Scale: 1"=800'

RECEIVED
APR 13 2015
DIV. OF OIL, GAS & MINING

ENERGY WEST MINING COMPANY
A SUBSIDIARY OF PACIFICORP

DEER CREEK MINE
MINE SEPERATION POST
BULKHEAD CONSTRUCTION

DRAWN BY:	K. LARSEN	MAP 4	
SCALE:	1"=600'	DRAWING #:	
DATE:	APRIL 6, 2015	SHEET 1 OF 1	REV. ___

Seals
Seals
Seals
Seals
Seals
Seals
Seals
7th North Rockrooms
7th North Mains
7th North Bypass #2
7th North Bypass #1
Mill Fork Access #2
Bulkheads X-Cut 62
Mill Fork Access #2
Mill Fork Access #1
6th North
Seals
5th Right
Seals
4th Right
1st Right
Bulkheads X-Cut 4
Seals
3rd Right
1st Right Submains
Seals
1st Right Breakout
2nd Right
Directional Water Drain
Hole Approx. 4879'
Concrete Plugs
1st Right
Rilda Canyon Portals
4th North
Left Fork
Rilda Canyon Portals
10th West Mains
3rd North X-Cut 138
Mine Separation Seals
9th West
Seals
7th East
Seals
6th North #3
8th Right
7th Right
6th Right

Legend

- Blind Canyon Seam
- Hiawatha Seam
- Evacuation Travelway
- Seals
- North of Isolation Seals (Mill Fork/Rilda)

N

Scale: 1"=600'