GENWAL RESOURCES, INC
CRANDALL CANYON MINES
C/015/032

CHANGE TO
APPENDIX 7-65
MINE DISCHARGE WATER
IRON TREATMENT FACILITY

IN RESPONSE TO VARIOUS ITEMS
RELATED TO DIVISION ORDER DO-10
and
RESPONSE TO CITATION 10073

SUBMITTED: MAY 25, 2011

COVER LETTER.....C1/C2 FORMS

C/015/032 Incoming
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GENWAL™ RESOURCES, INC.

P.O. Box 910, East Carbon, Utah 84520 794 North "C" Canyon Rd, East Carbon, Utah 84520
Telephone (435) 888-4000 Fax (435) 888-4002

Dana Dean, P.E.
Associate Director
Utah Division of Oil, Gas and Mining
P.O. Box 145801
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801

May 16, 2011

File in:
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RECEIVED
MAY 26 2011
DIV. OF OIL, GAS & MINING

Re: Crandall Canyon Mines, C/015/032
Change to Appendix 7-65
Response to Citation 10073

Dear Ms. Dean:

Enclosed are six (6 ea) copies of a change to Appendix 7-65, "Crandall Canyon Mine, Mine Discharge Water Iron Treatment Facility". This submittal specifically addresses the requirements for abatement of Citation 10073, namely, the Company's estimated projected (future) annual cost of operating the treatment facility.

Please note that the revised language in the narrative of Appendix 7-65 acknowledges greater flexibility for the Division to grant verbal approval to the Company to utilize the existing Crandall Canyon Mine sediment pond for temporary storage of the iron sludge clean-out material during the time-period when the new "Burma" evaporation ponds are being permitted and constructed, now that the Wildcat Loadout sediment pond is no longer available for this purpose.

Also, in an attempt at house-keeping, this submittal also addresses certain other items relative to Division Order 10A requested previously by the Division, such as:

a) Deletion of any previously approved language, discussion or attachment that is no longer relevant or applicable based upon current conditions.
b) Revisions that reflect the design, as-built construction, operation, clean out and maintenance aspects of the Mine Discharge Water Iron Treatment System.
c) A summary/chronology of the experimental process that led to the final design.
d) A discussion of iron sludge disposal options as contingency in the event that the Wildcat Loadout facility is no longer available to receive the material.
e) An up to date summary of the operational costs for the operational water treatment system configuration including: chemical costs, labor costs, maintenance costs, clean-out costs and equipment repair/replacement costs.

Please note that the projected operating costs submitted herein are in line with those which were submitted to the Division by the company on May 11, 2011, as part of the Board-mandated negotiations aimed at resolving Division Order DO-10.

If you have any questions or comments regarding this response please contact me at 435 888-4017.

Sincerely,

David Shaver
Resident Agent

cc: Denise Dragoo, Esq.

Form DOGM - C1 (Last Revised May 11, 2011)

File Folder # 3

APPLICATION FOR PERMIT PROCESSING

Permit Change ☐	New Permit ☐	Renewal ☐	Transfer ☐	Exploration ☐	Bond Release ☐	Permit Number: 015/032
[redacted]f Proposal	Change to Appendix 7-65, and response to Citation 10073					Mine: Crandall Canyon Mines
						Permittee: **GENWAL Resources, Inc.**

Description, include reason for application and timing required to implement:.

Instructions: *If you answer yes to any of the first 8 questions (gray), submit the application to the Salt Lake Office. Otherwise, you may submit it to your reclamation specialist.*

☐ Yes	☒ No	1. Change in the size of the Permit Area? _____ acres Disturbed Area? _____ acres ☐ increase ☐ decrease.
☒ Yes	☐ No	2. Is the application submitted as a result of a Division Order?
☐ Yes	☒ No	3. Does application include operations outside a previously identified Cumulative Hydrologic Impact Area?
☐ Yes	☒ No	4. Does application include operations in hydrologic basins other than as currently approved?
☐ Yes	☒ No	5. Does application result from cancellation, reduction or increase of insurance or reclamation bond?
☐ Yes	☒ No	6. Does the application require or include public notice/publication?
☐ Yes	☒ No	7. Does the application require or include ownership, control, right-of-entry, or compliance information?
☐ Yes	☒ No	8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
☒ Yes	☐ No	9. Is the application submitted as a result of a Violation? 10073
☐ Yes	☒ No	10. Is the application submitted as a result of other laws or regulations or policies? Explain:
☐ Yes	☒ No	11. Does the application affect the surface landowner or change the post mining land use?
[redacted]s	☒ No	12. Does the application require or include underground design or mine sequence and timing?
☐ Yes	☒ No	13. Does the application require or include collection and reporting of any baseline information?
☐ Yes	☒ No	14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
☐ Yes	☒ No	15. Does application require or include soil removal, storage or placement?
☐ Yes	☒ No	16. Does the application require or include vegetation monitoring, removal or revegetation activities?
☐ Yes	☒ No	17. Does the application require or include construction, modification, or removal of surface facilities?
☐ Yes	☒ No	18. Does the application require or include water monitoring, sediment or drainage control measures?
☒ Yes	☐ No	19. Does the application require or include certified designs, maps, or calculations?
☐ Yes	☒ No	20. Does the application require or include subsidence control or monitoring?
☐ Yes	☒ No	21. Have reclamation costs for bonding been provided for?
☐ Yes	☒ No	22. Does application involve a perennial stream, a stream buffer zone or discharges to a stream?
☐ Yes	☒ No	23. Does the application affect permits issued by other agencies or permits issued to other entities?

☐ **Attach _3_ complete copies of the application.**

I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments, undertakings, and obligations herein. (R645-301-123)

Signed - Name - Position - Date 5/19/2011

[redacted]ed and sworn to before me this 20th day of May 2011.

Notary Public

My Commission Expires: March 27, 2013

Attest: STATE OF Utah COUNTY OF Carbon

Notary Public LINDA KERNS Commission #578211 My Commission Expires March 27, 2013 State of Utah

Received by Oil, Gas & Mining

RECEIVED MAY 26 2011 DIV. OF OIL, GAS & MINING

ASSIGNED TRACKING NUMBER

Form DOGM - C2 (Last Revised 6/93)

File Folder # 3

Application for Permit Processing
Detailed Schedule of Changes to the MRP

Title of Application:	Permit Number: 015/032
Change to Appendix 7-65, and response to Citation 10073	Mine: CRANDALL CANYON MINESA
	Permittee: GENWAL RESOURCES

Provide a detailed listing of all changes to the mining and reclamation plan which will be required as a result of this proposed permit application. Individually list all maps and drawings which are to be added, replaced, or removed from the plan. Include changes of the table of contents, section of the plan, pages, or other information as needed to specifically locate, identify and revise the existing mining and reclamation plan. Include page, section and drawing numbers as part of the description.

			DESCRIPTION OF MAP, TEXT, OR MATERIALS TO BE CHANGED
☐ ADD	☐ REPLACE	☐ REMOVE	Appendix 7-65:
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☒ REPLACE	☐ REMOVE	Discussion
☐ ADD	☐ REPLACE	☒ REMOVE	Attachment 2
☐ ADD	☐ REPLACE	☒ REMOVE	Attachment 4
☐ ADD	☐ REPLACE	☒ REMOVE	Attachment 5
☒ ADD	☐ REPLACE	☐ REMOVE	Attachment 8: As built drawings
☐ ADD	☐ REPLACE	☐ REMOVE	(add to existing drawings)
☒ ADD	☐ REPLACE	☐ REMOVE	Attachment 10 (MSDS Sheet)
☒ ADD	☐ REPLACE	☐ REMOVE	Attachment 11 (Chronology)
☒ ADD	☐ REPLACE	☐ REMOVE	Attachment 12 (Projected Operating Costs)
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
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Any other specific or special instructions required for insertion of this proposal into the Mining and Reclamation Plan?

RECEIVED
MAY 26 2011
DIV. OF OIL, GAS & MINING

APPENDIX 7-65.....DISCUSSION

NOTE TO REVIEWERS:

REPLACE THE EXISTING DISCUSSION IN APPENDIX 7-65 WITH THIS NEW DISCUSSION

APPENDIX 7-65

CRANDALL CANYON MINE

MINE DISCHARGE WATER IRON TREATMENT FACILITY

Discussion	
Attachment 1	Maelstrom Oxidizer Unit
Attachment 2	********DELETED, MAY, 2011********
Attachment 3	Pit Liner Information
Attachment 4	********DELETED, MAY, 2011********
Attachment 5	********DELETED, MAY, 2011********
Attachment 6	Drainage Information
Attachment 7	Safety Factor Determination
Attachment 8	Construction Specifications and Drawings
Attachment 9	Temporary Use of Crandall Sediment Pond
Attachment 10	MSDS Sheets for Nalco 7763 and Solve 3
Attachment 11	Chronology
Attachment 12	Projected Operating Costs

DISCUSSION

BACKGROUND

As a result of the Crandall Canyon Mine disaster of August 6, 2007, the mine has been de-activated and the portals have been sealed. Mine water inflow has built up to the extent that water is now discharging from the portals and is discharged through a 12" pipe into Crandall Creek under UPDES permit UT0024368. The mine is presently discharging approximately 500 gallons per minute, with the flow fluctuating with barometric pressure and seasons. In early 2009 the iron concentrations in the water began to exceed UPDES limits. By the summer of 2009, Crandall Creek below the mine began to display an orange discoloration from the iron staining, resulting in violations from both DOGM and Division of Water Quality. Because there is no way to treat the water underground the company has constructed an aeration treatment system located on the surface in the "old loadout" area, immediately below the portal bench. In concept, the facility consists of three basic components; 1) an aeration devise (a.k.a., "maelstrom" unit) which allows atmospheric oxygen to chemically react with the dissolved iron in the water, thereby creating iron particulates, 2) a chemical injection system which adds a coagulant (ahead of the maelstrom) and a flocculant (after the maelstrom), to enhance particle settling, 3) a sludge re-circulation system to provide additional seed particles for enhanced particle formation, 4) a settling basin which allows the iron particulates to settle out of the water, and 5) a series of suction tube located in the settling basin to aid in cleaning the sludge from the system. (See Attachment 8 for the construction specifications and engineering drawings for the facility. Attachment 8 also contains an as-built drawing of the treatment facility as of May, 2011. It should be noted that construction is on-going as new improvements continue to be added.)

INSTALLATION OF SETTLING BASIN

A new 12" HDPE pipeline has been tapped into the existing discharge line from the mine near the upper portals and extends to the new facility. It is equipped with shutoff valves, which allows the flow of mine water to be routed down to the treatment facility, or bypassed directly to the existing UPDES outfall. This line is supported by cables attached to bolts drilled into the ledgerock and epoxied in place.

The settling basin is contained on three sides by an earthen berm constructed from a structural granular borrow material. The berm was constructed in 8" lifts and compacted to 90% density using vibratory sheeps-foot mechanical compacting equipment, and the embankments do not exceed 2.5H/1V sideslopes. As shown in Attachment 7, the berm has been designed and constructed to achieve a 1.3 safety factor. Attachment 7 also includes geotechnical information about the granular borrow material used for construction of the berm. The settling basin and berm are constructed in the area previously referred to as the "Old Loadout Area". To make room for this old loadout, a large enclave was blasted out of the solid ledgerock in the past. This blasted rock was then used as fill material to extend the loadout area, and to construct the adjacent Forest Service road. This area was originally compacted for construction purposes, but

was also compacted even more through many years of loading operations involving loaded trucks and front-end loaders operating on the site. Prior to constructing the settling basin berm all loose material was removed from the site, revealing the underlying compacted rock subsurface. Therefore, the foundational material for the berm and basin is either the solid sandstone bedrock from the original ledge, or else the highly compacted rock material located next to it. Refer to Figure 1 of Attachment 8, which shows the extent of the solid bedrock underlying the basin and berm. It should also be noted that the inner portion of the basin containment is constructed from a pre-existing concrete wall. This wall is a massive 12" thick, reinforced concrete structure which was part of the original "old loadout" system.

The berm is ringed on top with a double row of concrete Jersey barriers placed side-by-side with the intervening space filled with earthen material for added stability. The remaining side of the basin is constructed from the 12" thick pre-existing concrete wall mentioned above. The Jersey barriers on the earth berm, along with the existing concrete wall left over from the old loadout, define the limits of the settling basin. The barriers also provide public safety by keeping vehicular traffic, foot traffic and animals from entering the basin area.

The interior of the basin is lined with a pit liner similar to that used for containing drilling fluids in drilling operations. (See Attachment 3 for additional information on the liner material.) The pit liner is secured around the perimeter by tucking it into the space between the barrier walls and backfilling with earth material. A felt underlining was also placed down before (below) the pit liner to provide protection against damage. A chain link fence is installed around the basin atop the barriers to provide additional public security.

The outslopes of the berm have been covered with a layer of gravel to help prevent erosion and maintain stability. Also, the outer toe of the berm located adjacent to the Forest Service road has been armored with concrete jersey barriers sufficient to prevent potential erosion from surface runoff along the road.

Prior to constructing the berm and placing the pit-liner, an underdrain system was installed in the area of the basin. This underdrain system consists of cleaned drain rock and perforated drainpipe placed in a trench running along the upper toe of the berm at the lower (down-dip) end of the basin. The drain is then routed in a buried 4" pipe to the main discharge line. This underdrain system is designed to carry any water, possibly coming from pin-hole leaks in the pit liner, directly out from the basin so that it cannot saturate any portion of the berm. The pit liner is fabricated and fused as a single piece and is not expected to leak, but the underdrain system was installed as a measure of added insurance. As mentioned previously, the berm has been constructed on the site of the old loadout which was constructed on both solid rock blasted out of the ledge, and on previously compacted structural fill material.

INSTALLATION OF THE MAELSTROM UNIT

The treatment facility consists of a manufactured mechanical aeration device known as the "Maelstrom Oxidizer Unit". (See Attachment 1 for additional information regarding this

unit.) This oxidizer unit consists of a pre-fabricated high-density plastic structure equipped with a series of baffles and a 20 hp blower. The mine water is fed into one end of the unit where it then travels a serpentine route over and under the baffles, and at the same time, a large volume of air is forced through the water by way of a number of nozzles located in the bottom of the unit. The unit has been sized according to the anticipated flow rate, such that the dissolved oxygen in the water as it exits from the unit is nearly 100%. The high oxygen content then reacts chemically to change the dissolved iron from the ferrous state to the ferric state, which forms iron precipitates which can then be settled out. The maelstrom unit is located ahead of the settling basin, and is also the focal point for the injection of the coagulant and flocculant treatment processes and the sludge re-circulation system described below.

INSTALLATION OF CHEMICAL INJECTION SYSTEM

Based on field trials it was determined that, in order to successfully settle out the iron it was necessary to add a chemical coagulant to the water ahead of the maelstrom, and also add a chemical flocculant to the water after the maelstrom. The coagulant presently used is a ferric chloride compound, specifically WaterSolve Solve 3. This coagulant provides the "seed" mechanism for the iron to adhere to as it goes through the oxidation process. After being oxidized the coagulated ferric iron particles are still too small to settle out on their own. Therefore, a flocculant is injected into the water after it exits from the maelstrom. The flocculant is a polyacrylamide, specifically Nalco 7763. The treated water is then allowed to sent to a settling basin. The MSDS sheets for both Solve 3 and Nalco 7763 is included in Attachment 10.

The chemical treatment equipment is housed within a pre-existing shed located adjacent to the settling basin. The shed has been retrofitted to accommodate the chemical injection apparatus, including new roofing, interior walls, insulation, heating, and lighting. Two overhead equipment doors have been installed to allow storage bulk storage of the chemicals within the shed, and a 2-ton jib crane has been installed to allow handling of the chemical storage totes. A 4" water line was installed, tapping off the main discharge line, to bring a continuous supply of mine water into the treatment shed. The shed is divided into two bays; a storage bay and a treatment bay. Both bays are heated and insulated. The storage bay is designed to store up to seven totes of coagulant and two totes of flocculant. The bay also can store up to 5000 gallons of clean water to be used as make-up water for the chemical system.

The treatment bay houses the chemical mixing and injection system. The coagulant is injected into the discharge water through an adjustable metering pump. This chemical is added to the 4" split of minewater and then piped out of the shed, where it is injected into the main flow of mine discharge water immediately ahead of the maelstrom unit. The flocculant chemical is premixed in a factory-built make-down unit. This unit automatically batches up a pre-determined quantity of concentrated floc solution which can then be used on an as-needed basis. During the batching process, the floc is pumped from the factory-supplied tote into the make-down unit through an adjustable-rate metering pump. At the same time, clean make-up water (stored in tanks in the adjacent storage bay) is pumped into the make-down unit at a controlled rate. This produces a floc solution with a consistent, known and pre-determined concentration. This

solution is then pumped (at an adjustable rate) into a separate split of push water which is then pumped out of the shed and injected into the mine discharge water at the outlet end of the maelstrom unit, prior to discharge into the settling basin.

The treatment facility is presently (as of May 11, 2011) being upgraded so that all elements of the chemical treatment can be automatically controlled and monitored. A flow meter has been installed at the inlet to the maelstrom unit to give a continuous electronic reading of the mine-water flow. This flow rate will be sent back to a programmable controller which will automatically adjust the injection rate of both the coagulant and the flocculant as the mine-water discharge rate varies. This will allow the system to maintain a consistent level of chemical dosage at all times, and will allow the operators to easily make fine-tune adjustments of the chemical injection rates. The programmable controller will also constantly monitor the operational status of the facility, and can immediately send warning messages and alarms to company personnel in remote locations via computer interface if any part of the system needs maintenance or repair. The programmable controller will also keep data-base records of chemical usage, flow rates, and unplanned outages.

The treatment shed has been set up to allow storage of four totes of coagulant and one tote of flocculant. At current injection rates, this will allow the system to operate about two months before requiring refill of the coagulant storage, and about 6 months for the flocculant. However, additional storage of both chemical will always be available in the adjacent storage bay which can easily be pumped into the treatment bay storage totes. Therefore, the facility has been designed to operate on a long-term continuous basis without requiring any chemical replacement supply disruptions.

At present (May 11, 2011) the facility has been successfully treating the mine discharge water so that all UPDES compliance levels have been met for the past 14 months since March, 2010. However, the company is now implementing measures to minimize the amounts of both the coagulant and flocculant used in the treatment process. For example, the automated (programmable controller) control and monitoring system will allow precise fine-tuning of the chemical injection rate to the minimum needed for regulatory compliance.

As mentioned previously, the purpose of the coagulant is to provide seed particles for the oxygenated ferric iron to adhere to in preparation for settling. In an attempt to reduce the amount of coagulant usage, the company has also experimented with re-circulation of the iron sludge back through the maelstrom unit. In theory, the precipitated iron particles in the re-circulated sludge can then provide the seed particles for the mine-water ferric iron to adhere to, thus reducing the need for the ferric chloride coagulant to accomplish the same function. Toward this end, the company has installed six intake suction manifolds in the upper bay of the settling basin. From these manifolds, concentrated iron sludge material is pumped back into the inlet end of the maelstrom unit over and over again. This re-circulation system now appears to be effective in holding down the necessary dosage of coagulant.

~~Samples of the Crandall mine water were sent to the factory for bench testing and the results were very encouraging, showing treated water well within UPDES compliance levels. (Results~~

~~of the bench test are included in Attachment 2.)~~

~~While the bench testing indicates that the iron should settle in 5.5 hours sufficient to meet UPDES compliance levels, the option remains open to treat the water with chemical flocculants as well if needed to enhance the settling rate. Previous bench tests conducted by Nalco Chemical showed that particle settling rates can be greatly accelerated through the application of a small amount of chemical additives. Electric power has been installed to the unit which could be utilized in the future for a chemical pumping/injection system. However, a simpler and perhaps more dependable system would involve the use of chemical gel-logs. These logs are designed to be immersed in to stream flow after aeration and dissolve at a predetermined rate in order to add the proper amount of chemical flocculant to the discharge water ahead of the settling basin. Typically, such gel-log applications can operate for several weeks without requiring attendance. The oxidizer unit has been constructed such that if, in the future, iron levels in the mine-water increase sufficiently to the extent that chemical treatment is required in addition to the oxidization, either a chemical injection system or gel-log chamber can easily be fitted to the unit.~~

The chemically treated water from the oxidizer unit is then sent to the settling basin~~. This basin is constructed within a compacted earthen berm.~~ Iron precipitates generated in the oxidizer unit drops out of suspension and accumulates in the settling basin. ~~The basin has been designed with nearly twice the volume (i.e., retention time) recommended from the bench testing in order to maximize the potential for meeting UPDES compliance level (see Attachment 2 for details).~~ The basin has been divided into four individual cells, separated one from another by filter fabric curtains extending across the full width of the basin. These dividing curtains have been installed to force the water flow through the basin to follow a serpentine pattern from inlet to outlet. This is designed to maximize the retention time of the water in the basin to allow maximum settling of the iron sludge material. The treated water exits the basin through a spillway, dropping into an inlet structure to a discharge pipe which is buried under the road and connects to the existing discharge line leading to the designated UPDES outfall point. ~~A flow meter has also been installed in the line.~~ The UPDES water samples are taken at the outlet of the basin prior to entering the pipe leading to the outfall. This is similar to the manner and location in which the UPDES monitoring was previously conducted, and is agreeable to Division of Water Quality.

CLEAN-OUT

~~Precipitated iron is allowed to settle and accumulate in the settling basin. Because of the newness of this type of facility it is not known at this time the exact nature of the iron precipitate material that is expected to accumulate in the settling basin as a result of the oxidizer treatment. It is assumed that the accumulations will be visible as they begin to settle out in the bottom of the basin, because the water is generally clear and inherently devoid of suspended solids. Also regular sampling of the water at the approved UPDES outfall will provide a good indication that the settling mechanism is functioning properly. By utilizing both visual observations and sampling results it should become apparent when the basin is ready to be cleaned. Since the rate of accumulations is expected to be consistent (unlike a sediment pond that fills up in response to~~

~~often violent precipitation events), the cleaning process can be anticipated well in advance. Also, due to the slow rate of accumulation, the accumulation level should be easy to monitor. A series of floating booms will be strung across the basin to slow down and spread out the flow of water through the basin, in order to maximize retention time and to help direct the pattern of material accumulation within the bottom of the basin.~~

~~As indicated by the calculations appearing in Attachment 5, the basin should be capable of holding several years of accumulation before cleaning is required. However, in order to be safe, the company commits to cleaning the basin when accumulations have reached the 7812' level, which would be about 3' deep at the deepest part of the basin. As explained in Attachment 5, this still leaves ample pond volume above the accumulation level to achieve the 5.5 hour settling time recommended by the bench testing. Several staff gauges (sediment markers) will be installed in the deepest areas of the basin to serve as a visual aid in determining when the basin should be cleaned. Because the iron staining may render the tick marks of the staff gauges illegible, additional markers will be also be installed beside the gauges whose top is cut off at the 7812' elevation in order to make visual observations of the accumulation level easier. The company proposes to use the accumulation level of 7812' for the initial cleaning. However, based on operational experience, this level may be changed to reflect actual (versus hypothetical) accumulation rates, refinements in clean-out techniques, topographic and spatial patterns of accumulations within the basin, and other operational dynamics.~~

Precipitated iron is allowed to settle and accumulate in the settling basin. In order to facilitate cleaning the sludge material from the basin, the company has installed a number of cleaning tube in the basin. Each tube consists of several segments of 4" pvc pipe glued together to make a long continuous tube which extends across the width of the basin. The far end of the tubes are sealed closed, and the near end (located at the road-side of the basin) is open. There are mor than twenty of these cleaning tubes installed parallel to each other from the top end of the basin to the bottom. Each of the tubes has a number of holes drilled at closely-spaced intervals along the top and across the entire length of the tube. During the cleaning operation, a 2" flexible non-collapsible suction hose is inserted into the cleaning tube. This suction hose is then connected to a pump or vacuum truck. The overlying sludge material is sucked though the holes in the top of the cleaning tube and into the inner suction hose. As cleaning proceeds, the inner hose is slowly pulled across the length of the basin, cleaning the sludge above it as it moves. After one of the tubes is cleaned in this manner, the inner suction hose is inserted in the adjacent tube, and the process is repeated.

~~After the accumulated material has reached the 7812' level (which is 4' below the surface level), the clean-out will begin. Without prior operational experience it is difficult at this time to predict the exact nature of the precipitated iron accumulation material that will have to be cleaned out of the bottom of the basin. However, based on input from Division staff, literature on treatment systems for mining sites suggest that solids content in the accumulation material is about 5%. This consistency of material would allow removal by vacuum methods. Vacuum tanker trucks will be positioned along the road next to the basin in preparation for clean-up. The semi-flexible 4" suction inlet line will be lowered into the deepest part of the basin, which is~~

~~located at the lower (outlet) end of the facility, where iron accumulations are expected to be deepest, and the material will be sucked up into the waiting trucks.~~ Care will be taken during the clean-out process to minimize stirring up the accumulations so that suspended iron particles do not begin to flow out of the pond. During the clean-out process, excelsior logs or other suitable sediment control (filtration) devises will be installed at the basin outlet spillway to help trap any iron material stirred up. Visual observations and sampling of the water will be made at the spillway (i.e., UPDES monitoring point) to make certain that stirred up iron material is not exiting the basin. If needed, cleaning operations will be delayed until sufficient time is allowed to re-settle any stirred up material. ~~Experience will help refine the cleaning technique. For example, it may be determined that using a perforated suction line that allows multiple access points for material entry along the length of the pipe is more effective than a single entry point. It may also be determined that several cleanup suction lines can be left permanently in place at designated locations within the basin to make future clean-out efforts quicker and easier. Experience will tell.~~

~~Prior to cleaning operation a sample of the iron material will be taken an analyzed for RCRA hazardous constituents. If the RCRA analysis shows the material to be hazardous, it will be disposed of at an approved, licensed hazardous waste diposal facility. However, if the results of this RCRA analysis showsthe material to be non-hazardous, the iron precipitate material from the basin clean-out will be hauled to the company-owned Wildcat Loadout where it will be disposed of in Sediment Pond C.~~ During the initial cleaning, a sample of the sludge was taken and analyzed for RCRA metals and other constituents. The results show the material to be non-toxic and non-hazardous. A copy of the analysis is presented in Attachment 9. Several cleaning operations have been initiated, each with notification of the Division. Initially, the sludge was quite fluffy. The material was sucked out of the basin using a vacuum truck, and was hauled off site and disposed of at the Wildcat Loadout Sediment Pond C, as per the previously approved plan. ~~There it can dry out and remain in-place until buried at final reclamation, or if the volume is excessive, it can be scooped out and moved to the approved refuse disposal pile located at the loadout. Under the currently approved Mining and Reclamation Plan for the Wildcat Loadout (C/007/033), this refuse pile will be buried under at least 4' of earthen material upon final reclamation. (As shown in Attachment 4, Sediment Pond C is a very large pond with ample capacity to contain more than 2.5 acre-ft (108,900 cu. ft.) of material and still have sufficient volume to contain a 10-year/24-hour precipitation event. This is far more volume than is expected to be needed to accommodate the iron clean-out material, as explained in Attachment 5. However, under no circumstance will the pond level be allowed to exceed the 10-year/24-hour design capacity level. Additional information about Wildcat Sediment Pond C and the refuse disposal pile can be found in Mining & Reclamation Plan C/007/033 on file with the Division.~~

The initial sludge material hauled to Wildcat was determined by laboratory analysis to be mostly water. Therefore, attempts have been made to densify the sludge to allow for more efficient cleaning and disposal in the future. The sludge re-circulation (mentioned above, to reduce the coagulant usage), had the desirable side effect of making the sludge much more dense. The company also attempted to run the sludge through a cyclone separator during the cleaning process in hopes of obtaining a more concentrated sludge, but this was not successful. The company then conduced a series of cleanings wherein the sludge material was pumped directly

into geotube filtration bags. This technique showed encouraging results, but unfortunately, freezing winter weather conditions, and the complexities of rigging up a separate flocculant system has prevented the geobag option from being as yet fully explored and developed. However, given the promising preliminary results, the company intends to resume geobag cleaning trials as soon as weather conditions permit.

Previously, this sludge material was hauled to the Wildcat Loadout (permitted under MRP C/007/033), where it was disposed of in Sediment Pond C. However, the company has recently turned ownership of the Wildcat Loadout over to the Intermountain Power Agency (IPA), and can no longer utilize Pond C for disposal. Therefore, as an alternate to the Wildcat disposal site, the company is now in the process of permitting a new disposal site in lower Huntington Canyon. This site is located on SITLA land and will consist of several shallow evaporation ponds. This site would be permitted, designed and constructed as a permanent SMCRA disposal facility for the "non-coal waste" sludge material. In the meantime, the company will continue to experiment with alternate sludge disposal options, such as geo-bag filtration devices, which would hopefully provide a more cost-effective alternative for longer-term sludge disposal.

Prior to initiating any cleaning of the basin, the company will provide a minimum of 24-hour notice to the Division.

MAINTENANCE

There may be times during required maintenance that the oxidizer must be shut down for repair or cleaning, at which time the mine discharge water will need to bypass the treatment system. By opening the by-pass valve located ahead of the oxidizer unit, the water will be directed into a flexible 8" discharge hose which will route the water around the settling basin and into the main sediment pond through the existing disturbed ditch DD-10 and culvert C-4 located immediately below the treatment facility. Information included in the back of Attachment 6 shows that an 8" hose can carry nearly 1300 gpm, which is adequate for bypassing the normal flow from the mine discharge. Disturbed ditch DD-10 and culvert C-4 are both sized to adequately handle the maximum anticipated bypass flow of about 1000 gpm in addition to the potential flow from a 10-year, 24-hour precipitation event, as shown in Appendix 7-4.

Prior to bypassing any mine water into the sediment pond for maintenance or cleaning of the settling basin the static water level in the sediment pond will be decanted to as low as possible below the elevation level of 7773.2'. This will ensure that there is still sufficient capacity left in the pond to accommodate a 10-year/24-hour precipitation event. At no time during the flow bypass will the water level in the sediment pond be allowed to exceed the 7773.2' level, unless specifically authorized by the Division. A clearly visible reference marker will be installed within the sediment pond to clearly delineate the 7773.2' elevation level so that persons in charge of the maintenance operations can observe the water level at all times during any bypass situation. Any decanting of the sediment pond will be done according to the requirements of the approved UPDES permit for this outfall point. Also, prior to bypassing any water into the sediment pond, the sediment level in the pond will be verified to be below the approved clean-out level of 7769'.

(Note: The sediment pond was completely cleaned in December of 2009, immediately prior to putting the iron treatment facility into operation, and certification reports were supplied to the Division). Since the required capacity volume for a 10yr-24hr event is 2.45 acre-ft, this leaves a usable volume of 0.77 acre-ft for the purpose of maintenance bypass, assuming the water level has been previously decanted down to the sediment cleanout level of 7769' This equates to 251,000 gallons At an average flow rate of 500 gpm from the mine, the sediment pond could theoretically contain over 8 hours worth of by-passed discharge flow. In other words, this could allow more than 8 hours of time to perform maintenance work on the treatment facility before the sediment pond was filled to within the 10/24 capacity volume level at the maximum level of 7773.2'. This should provide sufficient time for most routine or emergency maintenance procedures, especially in light of the mechanical simplicity of the system. Details of the sediment pond capacity for this scenario can be found in Appendix 7-4.

Prior to initiating any routine or scheduled maintenance on the oxidizer unit or the settling basin, the company will provide a minimum 24-hour notice to the Division. Emergency maintenance occasions will be reported to the Division immediately.

DRAINAGE

The "old loadout area" is depicted on Plate 7-5 and in Appendix 7-4 (Sedimentation and Drainage Control Plan) as disturbed drainage area WSDD-10. Much of this area is now dedicated to the installation of the iron treatment facility. The treated minewater, along with any direct precipitation falling into the settling basin, is discharged into Crandall Creek via the original approved UPDES outfall point. Therefore, part of this treatment area is now excluded from draining into the sediment pond as disturbed area drainage. The basin berm, which supports the concrete barrier wall, serves to effectively separate the settling basin from the disturbed area drainage around it. Effectively, all surface drainage now bypasses the treatment facility area, and there is no co-mingling of storm surface runoff with the mine discharge water undergoing treatment. Relevant drainage information from Appendix 7-4 is included in Attachment 6 for ease of reference. This attachment also contains information that shows the adequacy of the basin spillway and the discharge pipe to handle the combined flow of the mine water and a 10 year/24 hour precipitation event on the surface.

While the facility is neither an ASCA nor a small area exemption, it represents a small area within the disturbed area wherein runoff is treated along with the mine discharge water and discharges through an approved UPDES outfall point, and therefore does not drain to the sediment pond. Also, the outer toe of the berm located adjacent to the Forest Service road has been armored with concrete jersey barriers sufficient to prevent potential erosion from surface runoff along the road, and to route surface drainage around the basin into drainage ditch DD-10, thence into culvert C-4, and thence into the sediment pond. Calculations in Appendix 7-4 show that these drainage structures are adequately sized to handle the bypass flow (at a peak of about 1200 gpm) in addition to the 10 yr-24 hr precipitation event design flow.

~~FINAL RECLAMATION~~

~~There is every reason to believe that water will permanently discharge from the Crandall Mine portals. The iron level of the mine water historically was very low, and began rising only after the water began to build up and impound within the mine workings following the mine collapse of 2007. It is now the consensus that the elevated iron concentration will be a permanent situation, and that the reclamation plan must provide for a permanent means of treating the discharge water so as to meet UPDES requirements, even subsequent to final reclamation. To address this situation, the company commits to revising the reclamation plan in the near future.~~

~~Based on recent input from various state and federal agencies (Div. Oil, Gas and Mining, Forest Service, BLM, Div Water Resources, Div. Wildlife Resources) a conceptual treatment plan for final reclamation was agreed upon. This plan would utilize a passive aeration system (modifying the existing portal access road into a long, cascading, open-air aeration waterway), emptying out into a set of large settling basins to be constructed in the area presently occupied by the shop/warehouse building. The company commits to collecting the necessary baseline data, consulting with the appropriate agencies, and revising the reclamation plan in accordance with the agreed-upon passive concept, so that the revised reclamation plan can be approved by August 1, 2010. This plan will include not only the facility design but also projected operating and maintenance costs for long-term (perpetual) bonding considerations. In light of the long-term treatment requirements for final reclamation, the existing treatment facility is now considered temporary (i.e., short-term, operational) and will be removed at the time of final reclamation after the permanent (post-reclamation) passive facility is constructed.~~

RECLAMATION AND BONDING

At such time as the water treatment facility is no longer needed, the facility will be reclaimed. This could be at the time of final reclamation or prior to it, depending on circumstances at the time. Or it could be replaced with a long-term facility capable of post-reclamation treatment of the water, if needed. The existing facility is currently approved and bonded for reclamation by the Division. Presently (May, 2011) the company and the Division are in negotiated discussions regarding the bonding requirements for long-term future operating costs.

BASELINE MONITORING

Additional baseline data has been incorporated into the approved plan. This data includes: 1) flow quantities from the seep in the sandstone ledge above the treatment facility, 2) historical data concerning the iron concentration levels in the mine discharge water, and 3) performance data demonstrating the effectiveness of the existing treatment system methodology of oxidation/settling. as opposed to other treatment methods such as reverse-osmosis, fine-element filtration, chemical coagulants/flocculants, etc.

1) Ledge seep water flow: The treatment area is separated from the portal bench above by a

massive sandstone ledge of bare sandstone rock. There are several seeps emanating from this ledge and this seep water drains down the ledge toward the area of the settling basin. Based on previous measurements, the flow is minimal (approximately 1-2 gpm), but constant. A concrete trough has been poured behind the existing retaining wall (between the ledge rock and the back of the wall) to collect this seepage water and route it through a 4" PVC pipe to the settling basin overflow culvert inlet. In this manner the seepage water is contained, can be monitored, and is also subject to treatment thru dilution. The flow data collected from monitoring this seep will be provided to the Division and will assist in determining the most appropriate geotechnical method for future reclamation of this area, i.e., final reclamation. Monitoring will be conducted monthly, although freeze/thaw conditions in winter months will have to be factored into interpreting the data. The monitoring information will be provided to the Division (via email) prior to the end of each month and will continue until the Division determines that it is no longer necessary~~, and at a minimum, until such time as the revised final reclamation plan has been approved, since this information will be needed in order to properly design the approximate-original-contour requirements for the "old loadout area"~~.

The location of the seep water discharge pipe into the basin overflow culvert inlet provides safe and convenient access for collection of this data. It should also be noted that much of the seep water seems to be coming from underneath the concrete pad of the old crusher building sitting on top of the ledge. Since this building, and its concrete floor, will be removed during final, there is a high probability that much of the seep water can be isolated and contained at time of final reclamation. ~~This issue will be addressed in greater detail in the preparation of the revised final reclamation plan.~~ Details of this seep collection system can be found in the engineering drawings in Attachment 8.

2) Mine discharge water quality: This data is essentially the monthly UPDES sampling and monitoring that is presently on-going.

3) Operational performance data: In addition to the normal UPDES data (item 2), the company commits to gathering data to reflect on the effectiveness of the oxidation/settling methodology employed in the existing system. ~~This data will facilitate the design of a final reclamation treatment system that will include perpetual treatment of the mine-water discharge~~. This data will be collected monthly and will be provided to the Division via email. Samples will be collected from the 12" HDPE pipeline prior to the oxidizer unit, and at the UPDES sampling point at the outlet of the settling basin. The analytical parameters will include the following:

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

~~BONDING~~

~~As described above (under FINAL RECLAMATION) this facility is to be considered as a short-term, operational facility, designed to treat to the discharge water up until the time of final reclamation, but not thereafter. Because the facility has been constructed using non-permanent structures it will be easy to reclaim. For example, the earthen berm has been constructed out of less than 700 cubic yards of granular borrow which can easily be hauled off or used as backfill material during final reclamation. The oxidizer unit is a pre-fabricated unit that can be removed with a fork-lift. The Jersey barriers can be removed with a backhoe and hauled off to be re-used elsewhere. There is no concrete to be removed and disposed of. The only concrete associated with the facility is a small amount which was poured behind the existing retaining wall which will remain in place during final reclamation. Because all components can easily be dismantled and removed (i.e., are not permanent), any increased costs for reclamation should be negligible. Indeed, if the iron concentrations of the mine water come back into compliance naturally, as they have always been in the past, the treatment facility might no longer be needed and could be disassembled prior to final reclamation of the minesite. Based on discussions with Division, in light of the short-term, non-permanent nature of construction of the facility, the cost of reclamation would be less than $3000, which include demolition and disposal costs.~~

~~It should also be noted that at the present time (November, 2009), the Crandall Canyon Mines reclamation bond contains positive coverage for the following reasons:~~

~~1) The East Mountain Drillpads have been reclaimed and the ivision has determined that the site now qualifies for Phase 1 bond release. This bond is presently posted at $286,196. Phase 1 release would free up 60% of this amount, or $171,717 which could be transferred to apply to any increase resulting from the treatment facility.~~

~~2) Due to the construction of the Crandall Canyon Memorial, the upper end of the mineyard has been deeded over to Emery County, and will not be reclaimed as reflected in the current mine reclamation bond. Based on estimates previously submitted to the Division (Task #3092, April 6, 2009, reprint available on request), this should result in a reduction of the reclamation costs of the minesite by about estimated amount of $77,798. This positive bonding re-adjustment could also be utilized to cover any increase resulting from the installation of the treatment facility.~~

~~As stated previously, the company is committed, under Division Order DO09A, to revising the final reclamation plan to include a permanent, passive treatment facility which will replace the existing one. This revised reclamation plan will include a major re-evaluation of the overall reclamation costs of the Crandall Canyon minesite, and subsequent bond re-adjustments. In light of this pending revision, and the relatively minor reclamation and operating costs associated with the existing facility, and the existing bonding excess presently in place, the company requests that bonding considerations for this existing facility be delayed temporarily and worked into the up-coming "permanent facility" revised reclamation plan and bond.~~

OFF-SITE IMPACTS

In early 2009 the iron concentrations in the water began to exceed UPDES limits. By the summer of 2009, Crandall Creek below the mine began to display an orange discoloration from the iron staining, resulting in violations from both DOGM and Division of Water Quality. Therefore, the company ~~commits to~~ performed an on-site inspection of the Crandall Creek drainage with the appropriate regulatory agencies in the ~~once access is possible (late spring/early~~ summer of 2010). The purpose of the inspection was to assess the extent of the total iron accumulations within Crandall Creek. Following the site-visit, the Division (with concurrence with the Forest Service, and consultation from other agencies) made the determination to not remove the iron accumulations from the stream channel at this time. However, if needed, future inspections will be conducted by the Division (with concurrence with the Forest Service and consultation from other agencies) to make a determination as to what clean-up measures, if any, should be taken to remove the iron accumulations from the stream channel.

~~BACK UP/CONTINGENCY PLAN~~

~~The company commits to establishing a back-up/contingency plan for the oxidizer unit once it has been demonstrated that the mine-water discharge levels of total iron are within UPDES limits for three consecutive months.~~

TEMPORARY USE OF CRANDALL SEDIMENT POND

~~*(Note: This section has been added subsequent to the initial approval of the iron treatment facility)*~~

During late April and early May of 2010, the iron accumulation material (a.k.a., cleanout sludge) was cleaned out of the settling basin for the first time. There was at this time approximately three months worth of sludge material accumulated in the basin. Cleanout was accomplished by installing a total of ten cleanout tubes sequentially across the entire width of the the basin, from top to bottom. Each cleanout tube was constructed of 4" pvc pipe with ½" holes drilled on 8" centers along the top of the pipe. At the time of cleaning, a 2" flexible hose was inserted into the cleanout tube, with the other end connected to a vacuum truck. During cleanout, the open end of the vacuum hose was slowly retracted through the length of the cleanout tube, sucking the sludge from the immediate area through the holes in the outer tube. This process was then repeated for each tube until the entire length of the basin had been cleaned. The sludge material was then hauled by tanker truck to the Wildcat Loadout and discharged into Sediment Pond C, as per the plan. In total, 38 truckloads of sludge were cleaned from the basin, totaling 216,000 gallons of material. Since the initial cleaning, additional cleaning tubes have been added and the pond has been cleaned several more times.

Laboratory analysis of the cleanout sludge shows that it is in compliance with all standards for RCRA metals (see Exhibit 4, Attachment 9). Lab analysis also shows that the sludge material is mostly water, being 94.12% water, 5.88% solids (see Exhibits 1 and 5, Attachment 9). Shortly

after the cleanout, representatives of the Division inspected the material in Pond C at Wildcat. By this time much of the solids had settled out, leaving a clear supernate on top. This supernate material was sampled and analyzed (see Exhibits 2 and 6, Attachment 9). Exhibit 3, Appendix 9 shows additional photos of the Wildcat Pond C as the sludge continued to settle and dry out. Within the next several weeks the sludge material dried up entirely, leaving only a thin residue caked in the bottom of Pond C.

The company is now experimenting with various methods to improve on the cleanout process. The sludge material in the settling basin is voluminous, but mostly water (94% water, 6% solids). Therefore, efforts to remove as much of the water as possible from the sludge prior to disposal are now being explored. These efforts will include the use of mechanical filtration devices (geogbags) used during cleanout, on a trial basis. To facilitate the testing of these new methods, the company will utilize the Crandall Canyon Mine sediment pond on a temporary basis for short-term storage of the cleanout material. This period of utilization will be restricted during the summer and autumn months (October 31, 2011 when seasonal weather conditions will promote effective evaporation of the sludge material. By being able to temporarily store the material in the Crandall sediment pond, ~~rather than hauling it 40 mines away to Wildcat~~, a greater degree of flexibility can be employed in the trial-and error methods for developing the most effective de-watering process. Such de-watering process will then be incorporated into the long-term cleanout program. It should be emphasized that use of the Crandall sediment pond during this testing period will be temporary, as authorized by the Division.

It should be noted that in no case will the sediment level (of the combined sediment/sludge material) in the pond be allowed to accumulate above the presently approved 7770' maximum sediment level. It should also be noted that at no time will the total water level in the sediment pond be allowed to exceed the 7773.2' elevation as a result of the cleaning/testing. By not exceeding this level, the sediment pond will still maintain sufficient capacity to hold surface runoff from a 10-year, 24-hour precipitation event. A high-water level marker has been installed in the pond to make certain that this level is not exceeded during cleaning and testing. In the unlikely event that any supernate water needs to be decanted from the pond during this time, it will be decanted in accordance with the approved UPDES permit. It is encouraging to note that, should decanting be necessary, analysis of the supernate from the initial cleaning showed compliance with all UPDES parameters. It should also be noted that any sludge material deposited in the Crandall sediment pond during this time will eventually be removed and disposed of as part of the normal approved sediment pond clean-out procedure.

As mentioned previously, this sludge material was hauled to the Wildcat Loadout (permitted under MRP C/007/033), where it was disposed of in Sediment Pond C. However, the company has recently turned ownership of the Wildcat Loadout over to the Intermountain Power Agency (IPA), and can no longer utilize Pond C for disposal. Therefore, as an alternate to the Wildcat disposal site, the company is now in the process of permitting a new disposal site in lower Huntington Canyon near the northern terminus of the Burma Road. This site is located on SITLA land and will consist of several shallow evaporation ponds. Therefore, the company will seek verbal approval from the Division to temporarily utilize the Crandall sediment pond for sludge disposal during the

time period involved in permitting and constructing the "Burma" evaporation ponds. This usage would be under all of the same conditions as the previously approved temporary usage as specified above.

~~FUTURE COMMITMENTS~~

~~(Note: This section has been added subsequent to the initial approval of the iron treatment facility)~~

~~Following the termination of the clean out testing period (ending October 30th, 2010), the following revisions to Appendix 7-65, Mine Discharge Water Iron Treatment Facility, will be submitted to the Division of Oil, Gas and Mining by November 30th, 2010:~~

~~a) Deletion of any previously approved language, discussion or attachment that is no longer relevant or applicable based upon current conditions.~~

~~b) Revisions that reflect the design, as-built construction, operation, clean out and maintenance aspects of the Mine Discharge Water Iron Treatment System.~~

~~c) A summary/chronology of the experimental process that led to the final design including:~~

~~A summary of the various treatment methods that were examined/tested.~~

~~A discussion as to the chemical additives that were employed during the trial and error process. The discussion shall include the ratios of chemicals that were utilized in the various test configurations as well as the corresponding water quality results.~~

~~An up to date tabulation of the mine-water flow data that has been collected since the installation of the AVF Flow Meter~~

~~The field data and lab analytical results that were obtained during the various test configurations/water treatment approaches that were explored.~~

~~d) A discussion of iron sludge disposal options as contingency in the event that the Wildcat Loadout facility is no longer available to receive the material.~~

~~e) An up to date summary of the operational costs for the operational water treatment system configuration including: chemical costs, labor costs, maintenance costs, clean-out costs and equipment repair/replacement costs.~~

ON-GOING STATUS AS OF MAY, 2011

The company has been working on the design, permitting, construction and operation of the iron treatment facility since January, 2009. Under the existing treatment system, the mine-water

discharge has been brought into compliance with UPDES parameters since March, 2010. Presently, the facility is being upgraded to allow greater dependability under the constraints of the requirements for continuous 24/7 operational performance and regulatory compliance. Much of the work has been on a "trial-and-error" basis because the iron treatment issue is relatively new to the Utah coal industry, and accepted treatment methodologies for eastern coal mines often involve dissimilar water chemistry and differing operating and environmental circumstances. Also, much of the construction/operation of the facility has been under near-emergency conditions, given the fact that the company was in violation with several state agencies, and the discharge into Crandall Creek has been under constant scrutiny from other federal and local agencies. The constant pressure and necessity to keep the discharge water in compliance at all times has made it more difficult to make adjustments, add new equipment or explore new treatment options. To date (May, 2011), the company has spent nearly $800,000 on construction, operation, clean-out and maintenance of the system.

CHRONOLOGY OF EVENTS

A chronology of events associated with the weater treatment facility is presented in Attachment 11. This chronology is provided in response to Division Order 10A.

PROJECTED ANNUAL OPERATING COSTS

A summary of the estimated projected operating costs of the water treatment facility is provided in Attachment 12. This summary of projected operating costs is provided in response to Division Order 10A.

APPENDIX 7-65.....ATTACHMENT 2

NOTE TO REVIEWERS:

PLEASE DELETE ATTACHMENT 2 FROM APPENDIX 7-65. IT IS NO LONGER RELEVANT

ATTACHMENT 2

********DELETED, MAY, 2011********

~~1) IRON TREATMENT BENCH TEST RESULTS~~

~~2) SETTLING BASIN VOLUME DETERMINATION~~

~~SETTLING BASIN VOLUME DETERMINATION~~

1) ~~Continuous flow readings from September 9, 2009 through October 27, 2009 have been taken on a daily basis. The cumulative flow over this 48 day time period was 33,249,830 gallons. This equates to 692,704 gal/day = 481 gal/min. The instantaneous readings ranged between a low of 314 gpm to a high of 1033 gpm. The average instantaneous reading was 491 gpm, which agrees closely with the cumulative average of 481 gpm. Therefore, the design parameter for the treatment facility was chosen at 500 gpm.~~

2) ~~Based on the bench test conducted by the manufacturer of the oxidizer unit (see Attachment 2) compliance levels of iron reduction was achieved with a 5.5 hr retention (settling) time, without the use of chemical flocculants or coagulants.~~

3) ~~Therefore, the manufactures recommended settling basin volume is:~~

~~5.5 hrs x 500 gal/min x 60 min/hr = 165,000 gal~~

4) ~~Based on computer generated volumetrics, the proposed settling basin has a volume of 288,000 gallons. Therefore, the settling basin is 288,000/165,000 = 1.75 time bigger than the manufacturer's recommendation. Actual usable settling volume will gradually decrease as accumulation material settles in the bottom of the basin.~~

5) ~~However, if during operation of the facility, it is determined that additional settling is needed, a chemical coagulant and/or flocculant can be added. The oxidizer unit has been modified to allow easy addition of a chemical injection system in the future. These chemicals dramatically increase the settling rate of the iron particulates.~~

APPENDIX 7-65.....ATTACHMENT 4

NOTE TO REVIEWERS:

PLEASE DELETE ATTACHMENT 4 FROM APPENDIX 7-65. IT IS NO LONGER RELEVANT

ATTACHMENT 4

*******DELETED, MAY, 2011*******

~~WILDCAT SEDIMENT POND C~~
~~VOLUME DETERMINATION~~

APPENDIX 7-65.....ATTACHMENT 5

NOTE TO REVIEWERS:

PLEASE DELETE ATTACHMENT 5 FROM APPENDIX 7-65. IT IS NO LONGER RELEVANT

ATTACHMENT 5

********DELETED, MAY, 2011********

~~SETTLING BASIN CLEAN-UP VOLUME ESTIMATION~~

~~SETTLING BASIN CLEAN-UP VOLUME ESTIMATION~~

~~Based on history of non-compliance the iron level has been about 2 to 3 mg/liter (spiking on occasion to 8 mg/liter), with compliance level being 1 mg/liter. Therefore, to achieve compliance could require the removal of up to 7 mg/liter of iron~~

~~Removal of 7 mg/liter of iron from a 500 gal/min flow would result in 21 kg/day iron removal, or 33.4 k/day of iron oxide. Assuming the accumulation material which settles at the bottom of the basin is in a semi-liquid (slurry) form of 5% solids (iron oxide)-95% water, the yearly volume of accumulated sludge material would be approximately 8,200 cubic feet. The stage volumes for the settling basin are as follows:~~

~~elevation~~	~~cumulative volume(cu ft)~~	~~years of storage~~
~~7810'~~	~~1,487~~	~~0.18~~
~~7811'~~	~~4,429~~	~~0.54~~
~~7812'~~	~~9,105~~	~~1.11~~
~~7813'~~	~~15,856~~	~~1.93~~
~~7814'~~	~~23,241~~	~~2.83~~
~~7815'~~	~~31,055~~	~~3.78~~
~~7816' (water level)~~	~~39,135~~	~~4.77~~

~~Based on the manufacturer's bench testing, 5.5 hours of settling time is sufficient to bring the treated mine-water into UPDES compliance. Five and one half hours of discharge is equivalent to 165,000 gallons or 22,059 cubic feet. Since the total basin volume at the spillway level is 39,135 cubic feet, the available capacity of basin volume for iron accumulation over 17,000 cubic feet. As indicated by the figures above, this equates to an estimated two years of storage. Although these estimates are conservative and subject to speculative variables at this time, it seems safe to assume that the basin can hold sufficient iron accumulations to allow for a regular scheduled clean-out program.~~

~~Cleaning out the basin when the accumulations have reached a depth of 3' (i.e., at elevation 7812') would leave sufficient capacity for adequate settling volume above the accumulations. At this level, clean-out could be expected about once per year.~~

~~**********~~

~~According to Attachment 4, "Wildcat Pond C Volume Determination" (attached hereto), Pond C has excess capacity to store 2.577 ac-ft of material while still retaining sufficient free-board capacity for a 10-year, 24-hour storm event.~~

$$\cancel{2.577\ \text{ac-ft} \times \frac{43560\ \text{cu ft}}{\text{ac-ft}} \times \frac{\text{year}}{8200\ \text{cu ft}} = 13.7\ \text{years}}$$

~~Since Wildcat Loadout Sediment Pond C is in a very dry environment, it is safe to assume that the iron material will dry out soon after it is put in the pond. In this case, assuming the accumulation material is 5% solids-95% water, the pond could hold more than 250 years worth of material. The purpose of this "quick-and-dirty"calculation is to demonstrate that there is ample reason to conclude that the volume of Wildcat Sediment Pond C is more than capable of containing the iron accumulation material from the Crandall Mine for a very long time.~~

APPENDIX 7-65.....ATTACHMENT 8

NOTE TO REVIEWERS:

ADD THESE NEW DRAWINGS TO THE OTHER DRAWINGS IN ATTACHMENT 8 OF APPENDIX 7-65

AS-BUILT PLAN, IRON TREATMENT FACILITY

MINE-WATER TREATMENT AS-BUILT FLOW DIAGRAM

KEYED NOTES

1. MAELSTROM OXIDIZING UNIT
2. SLUDGE RECIRCULATING PUMPS
3. SLUDGE RECIRCULATION MANIFOLDS
4. FLOCCULANT MAKEDOWN UNIT
5. FLOW METER
6. 2500 GALLON FRESH MAKEUP WATER TANK
7. GRAVITY TAKE-UP GUARD
8. FABRIC CURTAINS EXTENDING TO BOTTOM OF SETTLING BASIN
9. TYPICAL 4" PERFORATED PIPE CLEANOUT TUBES
10. 12" MINE DISCHARGE WATER PIPE
11. 4" PUSH WATER PIPE
12. 4" PIPE FOR FLOCCULANT INJECTION
13. 4" PIPE FOR COAGULANT INJECTION
14. 4" PIPE FOR SLUDGE RECIRCULATION
15. 4" PERFORATED DRAIN PIPE BELOW POND LINER
16. LEDGE SEEP AREA
17. 12" WATER DISCHARGE PIPE
18. BELT STRUCTURE SUPPORTS
19. CONCRETE RETAINING WALL
20. VALVE
21. COAGULANT STORAGE TOTES
22. FLOCCULANT STORAGE TOTE

LEGEND

- TYPICAL 10' LONG JERSEY BARRIER
- DIRECTION OF WATER FLOW
- TYPICAL 10' LONG JERSEY BARRIER WITH 4.0' TALL CHAIN LINK SAFETY FENCE

AS-BUILT PLAN

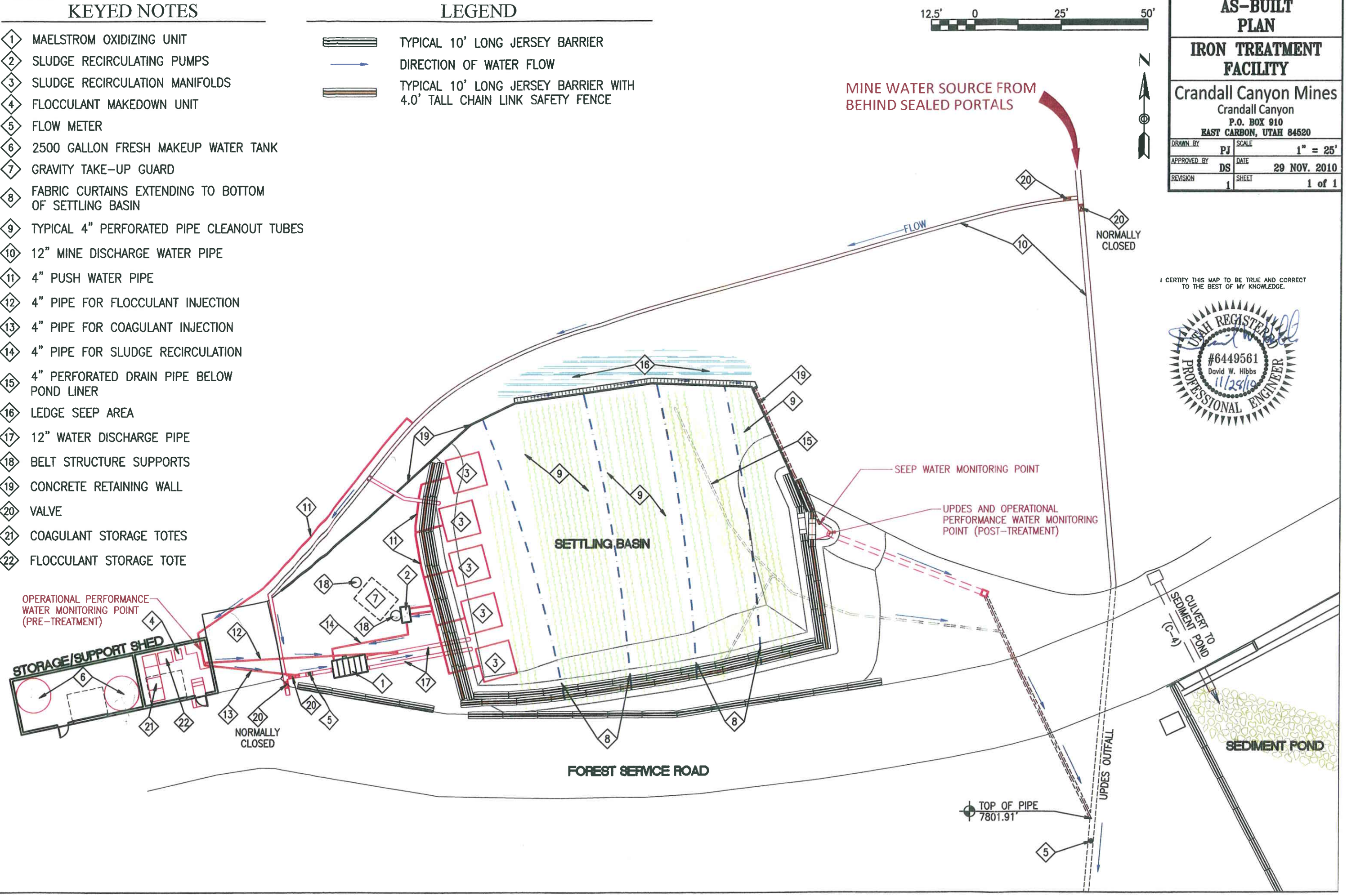
IRON TREATMENT FACILITY

Crandall Canyon Mines
Crandall Canyon
P.O. BOX 910
EAST CARBON, UTAH 84520

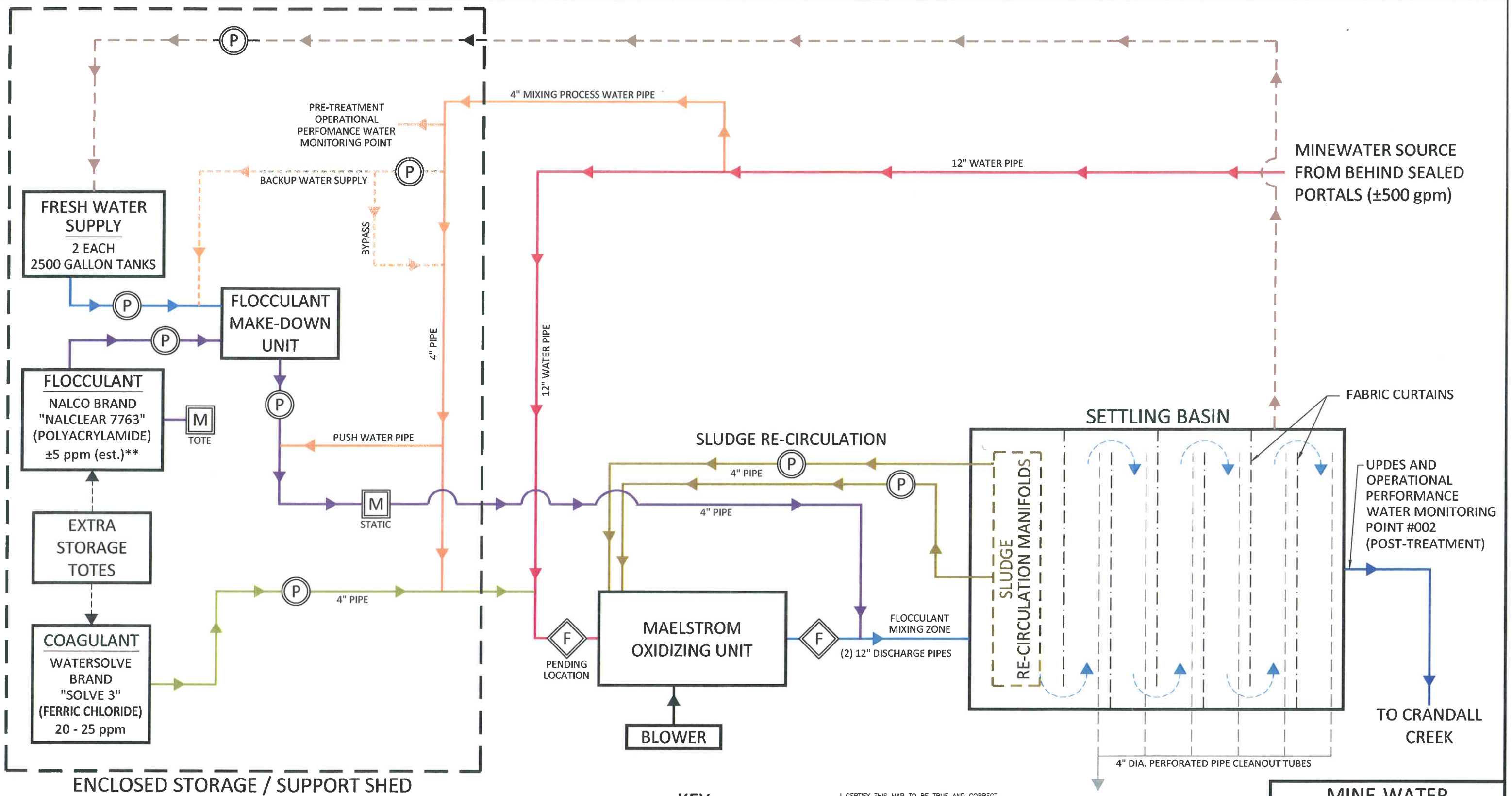
DRAWN BY	PJ	SCALE	1" = 25'
APPROVED BY	DS	DATE	29 NOV. 2010
REVISION	1	SHEET	1 of 1

I CERTIFY THIS MAP TO BE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE.

UTAH REGISTERED PROFESSIONAL ENGINEER #6449561 David W. Hibbs 11/29/10



\Current Drawings\MRP Maps\Crandall Canyon\Current\CranDall Portal Reclamation\Settlement Pond As-Built 11-19-10.dwg, Plan View, 11/29/2010 3:55:57 PM



KEY

- P — PUMP
- F — FLOW METER
- M — MIXER

** CHEMICALS ARE CURRENT AS OF MAY 2011. DOSAGE RATES ARE APPROXIMATE. CHEMICALS AND RATES MAY CHANGE IN THE FUTURE BASED UPON TRIAL TESTING RESULTS, AND IMPROVED MECHANIZATION AND CONTROL.

I CERTIFY THIS MAP TO BE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE.

UTAH REGISTERED PROFESSIONAL ENGINEER #6449561 David W. Hibbs 5/12/11

MINE-WATER TREATMENT AS-BUILT FLOW DIAGRAM

Crandall Canyon Mines
Crandall Canyon
P.O. BOX 910
EAST CARBON, UTAH

DRAWN BY	PJ	SCALE	NONE
APPROVED BY	DH	DATE	10 MAY 2011
SHEET			

G:\Current Drawings\Maps\Crandall Canyon\Current\CranDall Portal Reclamation\Settlement Pond Flow Diagram 5-10-11.dwg, Mod 5/10/2011 1:28:27 PM

APPENDIX 7-65.....ATTACHMENT 10

NOTE TO REVIEWERS:

ADD THIS ATTACHMENT 10 TO THE BACK OF APPENDIX 7-65. THIS ATTACHMENT CONTAINS THE TREATMENT CHEMICAL MSDS SHEETS

ATTACHMENT 10

MSDS SHEETS FOR

NALCO 7763 (FLOCCULENT)
SOLVE 3 (COAGULANT)

NALCO

SAFETY DATA SHEET

PRODUCT

NALCLEAR® 7763

EMERGENCY TELEPHONE NUMBER(S)
(800) 424-9300 (24 Hours) CHEMTREC

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **NALCLEAR® 7763**

COMPANY IDENTIFICATION : Nalco Company
1601 W. Diehl Road
Naperville, Illinois
60563-1198

EMERGENCY TELEPHONE NUMBER(S) : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING
HEALTH : 0 / 1 FLAMMABILITY : 1 / 1 INSTABILITY : 0 / 0 OTHER :
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme * = Chronic Health Hazard

2. COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has found that this product is not hazardous under 29 CFR 1910.1200.

3. HAZARDS IDENTIFICATION

****EMERGENCY OVERVIEW****

CAUTION
May cause irritation with prolonged contact. Toxic to aquatic organisms.
Do not get in eyes, on skin, on clothing. Do not take internally. Wear suitable protective clothing. Keep container tightly closed. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of soap and water. Protect product from freezing.
Wear suitable protective clothing, gloves and eye/face protection.
May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions.
Water in contact with the product will cause slippery floor conditions.

PRIMARY ROUTES OF EXPOSURE :
Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :
May cause irritation with prolonged contact.

SKIN CONTACT :
May cause irritation with prolonged contact.

INGESTION :
Not a likely route of exposure. If swallowed a jelly mass may form which in digestion may cause blockage.

INHALATION :
Not a likely route of exposure. No adverse effects expected.

SYMPTOMS OF EXPOSURE :
Acute :
A review of available data does not identify any symptoms from exposure not previously mentioned.
Chronic :
Frequent or prolonged contact with product may defat and dry the skin, leading to discomfort and dermatitis.

AGGRAVATION OF EXISTING CONDITIONS :
A review of available data does not identify any worsening of existing conditions.

4. FIRST AID MEASURES

EYE CONTACT :
Immediately flush eye with water for at least 15 minutes while holding eyelids open. Get medical attention.

SKIN CONTACT :
Remove contaminated clothing. Wash off affected area immediately with soap and plenty of water. If symptoms develop, seek medical advice.

INGESTION :
Do not induce vomiting without medical advice. If conscious, washout mouth and give water to drink. If symptoms develop, seek medical advice.

INHALATION :
Remove to fresh air, treat symptomatically. If symptoms develop, seek medical advice.

NOTE TO PHYSICIAN :
Based on the individual reactions of the patient, the physician's judgement should be used to control symptoms and clinical condition. If swallowed a jelly mass may form which in digestion may cause blockage.

5. FIRE FIGHTING MEASURES

FLASH POINT :	Not flammable
LOWER EXPLOSION LIMIT :	Not flammable
UPPER EXPLOSION LIMIT :	Not flammable

EXTINGUISHING MEDIA :
Foam, Dry powder, Carbon dioxide, Other extinguishing agent suitable for Class B fires

UNSUITABLE EXTINGUISHING MEDIA :
Do not use water unless flooding amounts are available.

FIRE AND EXPLOSION HAZARD :
May evolve oxides of carbon (COx) under fire conditions. May evolve oxides of nitrogen (NOx) under fire conditions. Water in contact with the product will cause slippery floor conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :
In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :
Restrict access to area as appropriate until clean-up operations are complete. Notify appropriate government, occupational health and safety and environmental authorities. Ensure clean-up is conducted by trained personnel only. Do not touch spilled material. Stop or reduce any leaks if it is safe to do so. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Spill may be slippery.

METHODS FOR CLEANING UP :
SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. LARGE SPILLS: Water in contact with the product will create a voluminous, slippery gel. Soak up as thoroughly as possible with inert absorbent material or sawdust. Do NOT hose down area until all possible traces of polymer are removed. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :
This product is toxic to fish and other water organisms. Do not discharge directly into lakes, ponds, streams, waterways or public water supplies.

7. HANDLING AND STORAGE

HANDLING :
Do not take internally. Have emergency equipment (for fires, spills, leaks, etc.) readily available. Ensure all containers are labeled. Do not get in eyes, on skin, on clothing. Use with adequate ventilation. Keep the containers closed when not in use.

STORAGE CONDITIONS :
Store in suitable labeled containers. Store the containers tightly closed. Store separately from oxidizers. Protect product from freezing.

SUITABLE CONSTRUCTION MATERIAL :
Compatibility with Plastic Materials can vary; we therefore recommend that compatibility is tested prior to use.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :
This product does not contain any substance that has an established exposure limit.

Substance(s)	Category:	ppm	mg/m3	Non-Standard Unit

ENGINEERING MEASURES :
General ventilation is recommended.

RESPIRATORY PROTECTION :
Due to its low volatility and toxicity, the hazard potential associated with this material is relatively low. Respiratory protection is not normally needed.

HAND PROTECTION :
Nitrile gloves PVC gloves

SKIN PROTECTION :
Wear standard protective clothing.

EYE PROTECTION :
Wear chemical splash goggles.

HYGIENE RECOMMENDATIONS :
Use good work and personal hygiene practices to avoid exposure. Keep an eye wash fountain available. Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse. Always wash thoroughly after handling chemicals. When handling this product never eat, drink or smoke.

HUMAN EXPOSURE CHARACTERIZATION :
Based on our recommended product application and personal protective equipment, the potential human exposure is: Low

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE	Emulsion
APPEARANCE	Opaque Off-white
ODOR	Hydrocarbon
SPECIFIC GRAVITY	1.03 - 1.07 @ 77 °F / 25 °C
DENSITY	8.6 - 9.0 lb/gal
SOLUBILITY IN WATER	Emulsifiable
pH (100 %)	8
VISCOSITY	400 - 1,200 cps @ 77 °F / 25 °C
FREEZING POINT	< -4 °F / < -20 °C
VOC CONTENT	27.4 % EPA Method 24

Note: These physical properties are typical values for this product and are subject to change.

10. STABILITY AND REACTIVITY

STABILITY :
Stable under normal conditions.

HAZARDOUS POLYMERIZATION :
Hazardous polymerization will not occur.

CONDITIONS TO AVOID :
Freezing temperatures. Extremes of temperature

MATERIALS TO AVOID :
Addition of water results in gelling. Contact with strong oxidizers (e.g. chlorine, peroxides, chromates, nitric acid, perchlorate, concentrated oxygen, permanganate) may generate heat, fires, explosions and/or toxic vapors.

HAZARDOUS DECOMPOSITION PRODUCTS :
Under fire conditions: Oxides of carbon, Oxides of nitrogen

11. TOXICOLOGICAL INFORMATION

No toxicity studies have been conducted on this product.

SENSITIZATION :
This product is not expected to be a sensitizer.

CARCINOGENICITY :
None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HUMAN HAZARD CHARACTERIZATION :
Based on our hazard characterization, the potential human hazard is: Low

12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for the product and a 1% aqueous solution of the product.

ACUTE FISH RESULTS :

Species	Exposure	LC50	Test Descriptor
Sheepshead Minnow	96 hrs	> 1,000 mg/l	1% Aqueous Solution of a Similar Product
Rainbow Trout	96 hrs	> 1,000 mg/l	1% Aqueous Solution of a Similar Product
Fathead Minnow	96 hrs	34.3 mg/l	Product
Inland Silverside	96 hrs	52.5 mg/l	Product

ACUTE INVERTEBRATE RESULTS :

Species	Exposure	LC50	EC50	Test Descriptor
Daphnia magna	48 hrs	280 mg/l		1% Aqueous Solution of Product
Mysid Shrimp (Mysidopsis bahia)	96 hrs	400 mg/l		1% Aqueous Solution of Product

MOBILITY :
The environmental fate was estimated using a level III fugacity model embedded in the EPI (estimation program interface) Suite TM, provided by the US EPA. The model assumes a steady state condition between the total input and output. The level III model does not require equilibrium between the defined media. The information provided is intended to give the user a general estimate of the environmental fate of this product under the defined conditions of the models.
If released into the environment this material is expected to distribute to the air, water and soil/sediment in the approximate respective percentages;

Air	Water	Soil/Sediment
<5%	10 - 30%	70 - 90%

BIOACCUMULATION POTENTIAL
This preparation or material is not expected to bioaccumulate.

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION
Based on our hazard characterization, the potential environmental hazard is: Moderate
Based on our recommended product application and the product's characteristics, the potential environmental exposure is: Moderate

If released into the environment, see CERCLA/SUPERFUND in Section 15.

13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it is not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D.

As a non-hazardous waste, it is not subject to federal regulation. Consult state or local regulation for any additional handling, treatment or disposal requirements. For disposal, contact a properly licensed waste treatment, storage, disposal or recycling facility.

14. TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are as follows.

LAND TRANSPORT :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

AIR TRANSPORT (ICAO/IATA) :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

MARINE TRANSPORT (IMDG/IMO) :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

15. REGULATORY INFORMATION

This section contains additional information that may have relevance to regulatory compliance. The information in this section is for reference only. It is not exhaustive, and should not be relied upon to take the place of an individualized compliance or hazard assessment. Nalco accepts no liability for the use of this information.

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :
Our hazard evaluation has found that this product is not hazardous under 29 CFR 1910.1200.

CERCLA/SUPERFUND, 40 CFR 302 :
Notification of spills of this product is not required.

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :
This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :
Our hazard evaluation has found that this product is not hazardous under 29 CFR 1910.1200.

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :
This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :
The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

FOOD AND DRUG ADMINISTRATION (FDA) Federal Food, Drug and Cosmetic Act :
When use situations necessitate compliance with FDA regulations, this product is acceptable under : 21 CFR 176.170 Components of paper and paperboard in contact with aqueous and fatty foods and 21 CFR 176.180 Components of paper and paperboard in contact with dry foods.

Limitation: For use as an adjuvant in the manufacture of paper and paperboard in an amount not to exceed that necessary to accomplish the technical effect and not to exceed 2 percent (as polymer) by weight of the paper or paperboard.

NSF INTERNATIONAL :
This product has received NSF/International certification under NSF/ANSI Standard 60 in the coagulation and flocculation category. This product has received NSF/International certification under NSF/ANSI Standard 60 in the Filtration Aid category. The official name is "Polyacrylamide." Maximum product application dosage is : 1 mg/l.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR 116.4 / formerly Sec. 311 :
Substances listed under this regulation are not intentionally added or expected to be present in this product. Listed components may be present at trace levels.

CLEAN AIR ACT, Sec. 112 (Hazardous Air Pollutants, as amended by 40 CFR 63), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :
Substances listed under this regulation are not intentionally added or expected to be present in this product. Listed components may be present at trace levels.

CALIFORNIA PROPOSITION 65 :
Substances listed under California Proposition 65 are not intentionally added or expected to be present in this product. Trace levels of listed components may be present.

MICHIGAN CRITICAL MATERIALS :
Substances listed under this regulation are not intentionally added or expected to be present in this product. Listed components may be present at trace levels.

STATE RIGHT TO KNOW LAWS :
Substances listed under this regulation are not intentionally added or expected to be present in this product. Listed components may be present at trace levels.

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :
Not considered a WHMIS controlled product.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :
The substance(s) in this preparation are included in or exempted from the Domestic Substance List (DSL).

AUSTRALIA
All substances in this product comply with the National Industrial Chemicals Notification & Assessment Scheme (NICNAS).

CHINA
All substances in this product comply with the Provisions on the Environmental Administration of New Chemical Substances and are listed on the Inventory of Existing Chemical Substances China (IECSC).

EUROPE
The substances in this preparation have been reviewed for compliance with the EINECS or ELINCS inventories.

JAPAN
All substances in this product comply with the Law Regulating the Manufacture and Importation Of Chemical Substances and are listed on the Existing and New Chemical Substances list (ENCS).

KOREA
All substances in this product comply with the Toxic Chemical Control Law (TCCL) and are listed on the Existing Chemicals List (ECL)

NEW ZEALAND
All substances in this product comply with the Hazardous Substances and New Organisms (HSNO) Act 1996,and are listed on or are exempt from the New Zealand Inventory of Chemicals.

PHILIPPINES
All substances in this product comply with the Republic Act 6969 (RA 6969) and are listed on the Philippines Inventory of Chemicals & Chemical Substances (PICCS).

16. OTHER INFORMATION

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide assistance for your own risk management practices. We have evaluated our product's risk as follows:

* The human risk is: Low

* The environmental risk is: Moderate

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department
Date issued : 11/06/2009
Version Number : 1.20

Appendix C-MSDS

Inorganic Coagulant
Solve 3A

Material Safety Data Sheet

Date Issued: 09/17/09
Date Revised: 09/17/09

I. Product Identification

Product Name: **Solve 3A**
Chemical Type: Ferric Chloride
Chemical Family: Inorganic Salts
Formula: $FeCl_3$
Synonym: Iron (III) Chloride

Company: WaterSolve LLC., 4964 Starr St. S.E. Grand Rapids, Michigan 49546, USA
For product information call 616 575-8693 or visit www.gowatersolve.com

COMPOSITION/INFOMRATION ON INGREDIENTS

Component:	CAS#	Weight %	ACGIH TWA	OSHA (PEL)
Ferric Chloride	7705-08-0	38-42%	Not established	Not established
Water	7732-18-5	55-63	Not available	
Hydrochloric Acid	7647-01-0	<0.5%	2ppm (Ceiling)	7 mg/m³ (Ceiling) 5ppm (Ceiling)

II. Hazards Identification

EMERGENCY OVERVIEW:
APPEARANCE AND ODOR:
COLOR: reddish-brown
APPEARANCE: liquid
ODOR: slight pungent
STATEMENT OF HAZARD:
WARNING! CAUSES EYE AND SKIN IRRITATION

DANGER!
Corrosive material. Causes burns. Reacts with metals to release flammable hydrogen gas. May be harmful or fatal if swallowed in large amounts. Effects may be delayed.

POTENTIAL HEALTH EFFECTS

Target organs: Eyes, skin, respiratory system, digestive system.
Signs and symptoms of short-term (acute) exposure:
Inhalation: Vapors and mists may be corrosive or irritating to the nose, throat and respiratory tract. Symptoms may include burning sensation, coughing, shortness of breath, lung inflammation and pulmonary edema (fluid accumulation).
Skin Contact: Vapors, mists and liquids may cause severe irritation and/or corrosive burns to the skin. Symptoms may include dryness, discomfort or rash, deep burns and tissue damage.
Eye contact: Direct eye contact may cause severe irritation, tearing, blurred vision, corrosive burns, severe damage, eye injury and permanent blindness.
Ingestion: Vapors, mists, and liquids are corrosive to the mouth, throat and digestive system. Ingestion may result in abnormal liver and kidney function. Symptoms may include nausea, vomiting, pain, diarrhea, coma and death. Effects may be delayed by up to three days.
Effects of long term (chronic) exposure: Chronic skin contact with low concentrations may cause dermatitis.
Other important hazards: eye contact may cause eye tissue discoloration. For further information on other important hazards, see TOXICOLOGICAL INFORMATION.

III. First Aid

General: If you feel unwell, seek medical attention (show the label or this MSDS if possible. Effects of exposure (inhalation, ingestion, or skin contact) To substance may be delayed. Ensure that medical personnel are aware of the material (s) involved, and take precautions to protect themselves.

Eye Contact: Do not rub. Immediately flush eyes gently for 30 minutes with plenty of water, occasionally lifting upper and lower lids, until no evidence of chemical remains. Call a physician immediately.

Skin Contact: Wash immediately with plenty of water for at least 30 minutes while removing contaminated clothing, jewelry and shoes..Do not reuse contaminated clothing without laundering.. If irritation or pain is still present, seek medical attention .

Inhalation: Remove person from exposure area to fresh air. If breathing is difficult, give oxygen. Apply artificial respiration by qualified medical personnel if patient is not breathing. Obtain medical attention immediately.

Ingestion: I f swallowed, call a physician immediately. Only induce vomiting at the instruction of a physician. Have victim rinse mouth with water. Never give anything by mouth to an unconscious person. Give one or two glasses of water to drink and refer to medical personnel or take direction from either a physician or a poison control center.

IV. FIRE-FIGHTING MEASURES

Fire hazards/conditions of flammability: This material is not considered to be flammable. Product may release small amounts of flammable Hydrogen gas on contact with metals. Closed containers may rupture if exposed to excess heat or flame, due to build-up of internal pressure.

Flash point: Not applicable

Auto-ignition temperature: Not applicable

Lower flammable limit (%by volume): Not applicable

Upper flammable limit (%by volume): Not applicable

Explosion data: Sensitivity to mechanical impact/static discharge: Not applicable

Oxidizing properties: Data not available

Suitable extinguishing media: Use water spray, water fog, alcohol resistant foam, dry chemicals, CO^2 or other agents as appropriate for surrounding fires.

Special fire-fighting procedures/equipment: Firefighters should wear proper protective equipment and a self-contained breathing apparatus. Move containers from fire area if it can be done without risk. Water spray may be useful in cooling equipment and containers exposed to heat and flame.

Hazardous combustion products: May release toxic fumes of Hydrogen chloride gas in a fire.

Suitable Extinguishing Media:

The substance is not combustible. Use extinguishing media appropriate to the surrounding fire.

NOTE: Also see Section Stability and Reactivity.

Protective Equipment:

Wear full firefighting protective clothing. See MSDS Section (Exposure Controls/Personal Protection). Firefighters, and others exposed, wear self-contained breathing apparatus.

Special Hazards:

Keep containers cool by spraying with water if exposed to fire. During a fire, irritating/toxic hydrogen chloride, and/or phosgene gases may be generated if material is dried and them heated to decomposition.

Mechanical/Static Sensitivity Statements:

None

6. ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Personal precautions:

Restrict access to area until completion of clean-up. Ensure clean-up is conducted by trained personnel only. Where exposure level is not known, wear NIOSH approved, positive pressure, self-contained respirator. Where exposure level is known, wear NIOSH approved respirator suitable for level of exposure. In addition to the protective clothing/equipment in Section 8, wear a two piece PVC suit with hood or PVC

overalls with hood, wear impervious boots. Keep all other personnel upwind and away from the spill/release.

Environmental Precautions:
Prevent water contaminated with this product from entering drains, sewers or streams, growing crops/keeping animal areas, and sites of native flora and fauna. Dike far ahead of the spill for later recovery or disposal.

Spill response/Cleanup: Ventilate area of release. Stop leak if you can do so without risk. Neutralize spill with lime or soda ash. Absorb neutralized spill with inert absorbent material, them place absorbent material into a suitable, labeled container for later disposal. Flush spill area with water, in accordance with applicable regulations, to waste treatment system. Notify the appropriate authorities as required.

Reportable Quantity: Spills over 1000 dry pounds (454Kg) must be reported to National Response Center (800)—424-8802

7. HANDLING AND STORAGE

Handling

Precautionary Measures: Avoid contact with eyes, skin and clothing. Wash thoroughly after handling

Special Handling Statements:

Wear appropriate chemically protective equipment. Use in well ventilated area with proper engineering controls. Avoid inhalation of vapors. Keep away from heat and flame. This material will corrode steel or aluminum at a rate greater than 6.25 mm (0.25 inches/year) @ 55°C (130 °F). It is thus considered to be a corrosive material for transportation purposes. Protect container from physical damage. Do not strike containers or fittings with tools or hard objects. Keep container closed and dry. Review the label, this MSDS and any other applicable information before use. Keep separated from incompatible substances. Use appropriate Personal Protective Equipment per Section 8. Handle only with equipment, materials and supplies specified by their manufacturer as being compatible and appropriate for use with this product.

STORAGE:

Bulk storage containers and ancillary fill and feed systems should be constructed out of appropriate materials such as polyethylene, polypropylene, rub-lined steel and FRP designated as appropriate for use with this product. Storage tanks should be vented to scrubber or exterior atmosphere. Storage facilities should have secondary containment as required by law or regulation. Storage tanks, piping and offloading points should be labeled with appropriate signage to avoid accidents. Some concentrations of this product will freeze or crystallize at low temperatures. Insulate and heat-trace storage tanks, pumps, pipes and ancillary equipment as necessary. Product should be used within one (1) year and stored in a cool, dry well ventilated area away from all sources of heat and incompatible material.. Material may be stored in tightly closed shipping containers, preferably the supplier containers. Containers of this material may be hazardous when empty, since they retain product residues (vapor, liquid); observe all warnings and precautions listed for the product.

Incompatible materials: Oxidizing agents, metals, strong bases, reducing agents, alcohols, sulfides monomers (e.g. Styrene).

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Permissible exposure levels:

Ingredient name	OSHA PEL	ACGIH TLV
FERRIC CHLORDIE	*1 mg/m³ (final rule/vacated limit)	*1 mg/m³

***Note:** the OSHA PEL's and ACGIH TLV's listed above for Ferric chloride are for "Iron sales, soluble, as Fe".

Ventilation and engineering controls: Provide good general room ventilation to minimize exposure to vapors or mists. Local exhaust ventilation may be required in order to meet TLV requirements.

Engineering Measures:

Where this material is not used in a closed system, good enclosure and local exhaust ventilation should be provided to control exposure.

Respiratory Protection:
Respiratory protection is required if the airborne concentrations exceeds the TLV, NIOSH-approved full face respirators are recommended depending on the airborne concentration levels.
Eye Protection:
Wear eye/face protection such as chemical splash proof goggles or face shield. Do not wear contact lenses. Eyewash equipment and safety shower should be provided in areas of potential exposure.
Skin Protection:
Avoid skin contact. Wear impermeable gloves and suitable protective clothing.
Other protective equipment: Wear protective clothing to minimize skin contact. Full-face shield, rubber footwear, acid-resistant hood and full-body suit recommended as appropriate. An eyewash station and safety shower should be made available in immediate working area.
Additional Advice:
Food, beverages and tobacco products should not be carried, stored or consumed where this material is in use. Before eating, drinking, or smoking, wash face and hands thoroughly with soap and water.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor:	Reddish-brown, liquid; slight pungent odor
Boiling Point:	105-110 °C; 220-230°F
Melting Point/ Freezing point:	-15°F (37% solution)
Vapor Pressure:	Not applicable
Specific Gravity:	126-1.48
Vapor Density	Not applicable
% Volatile (By Wt):	Not available
pH:	<2
Saturation in Air (% by Vol):	Not applicable
Evaporation Rate:	Not applicable
Solubility in Water:	Negligible
Volatile Organic Content:	None
Flash point:	Non flammable
Flammable Limits (% by vol):	Not available
Autoignition temp:	Not available
Decomposition temp:	Not available
Odor Threshold	Not available
Partition coefficient (n-octanol/water)	Not available

10 STABILITY AND REACTIVITY

Stability:	Stable under the recommended storage and handling conditions prescribed.
Conditions to avoid:	Product may release small amounts of flammable hydrogen gas on contact with metals.
Polymerization:	Will not occur
Conditions to Avoid:	Dangerous gases may accumulate in confined spaces. Avoid contact with incompatible materials, heat and flame. Material is acidic and corrodes most metals.
Materials to avoid:	Metals such as iron, or steel which are subject to corrosion.
Hazardous decomposition:	hydrochloric acid vapors (at high temperature)
Products:	Thermal decomposition of dried residues- will produce hydrogen chloride gas.

11. TOXICOLOGICAL INFORMATION

Toxicological information for the product is found under Section 3. HAZARDS INDENTIFICTION
Toxicological information on the OSHA regulated components of this product is as follows:
Routes of exposure: Skin contact, eye contact, inhalation and ingestion.
Base on Ferric Chloride Solid (anhydrous)
TOXICOLOGICAL DATA: LD50 (oral, rat) = 450 mg/kg

Mutagenicity: Other mutation test systems: Escherichia coli- 500 nmol/tube;
Phage inhibition capacity: Escherichia coli 41 ng/well

Reproductive Effects: TDLo Rat 1 day(s) intratesticular 12976 mg/kg
TDLo Rat 1 day (s) intravaginal 29 mg/kg pre pregnancy continous

Teratogenicity and Fetotoxicity: Not available
Synergistic Materials: Not available

Hydrochloric acid has a 4-hour inhalation LC-50 (rat) value of 3124 ppm (4.7mg/L). Contact with hydrochloric acid solutions or mists can cause severe skin and eye irritation. Acute overexposure to hydrochloric acid vapor may cause severe eye and respiratory tract irritation.

12. .ECOLOGICAL INFORMATION
ECOTOXICITY:

Environmental effects: The product sh7ld not be allowed to enter drains or water courses or be deposited where it can affect ground or surface waters.

Test: Acute immobilization (OECD 202)
Duration: 48hr
Water Flea (Daphnia magna) 48hr EC 50 27.9 mg/l

13. DISPOSAL CONSIDERATIONS

The information on RCRA waste classification and disposal methodology provided below applies only to the product, as supplied. If the material has been altered or contaminated, or it has exceeded its recommended shelf life, the guidance may be inapplicable. Hazardous waste classification under federal regulations (40 CFR Part 261 et seq) is dependent upon whether a material is a RCRA "listed hazardous waste" or has any of the four RCRA "hazardous waste characteristics." Refer to 40 CFR Part 261.33 to determine if a given material to be disposed of is a RCRA "listed hazardous waste"; information contained in Section 15 of this MSDS is not intended to indicated if the product is a "listed hazardous waste." RCRA Hazardous Waste Characteristic. There are four characteristics defined in 40 CFR Section 261.21-61.24: Ignitability, Corrosivity, Reactivity, and Toxicity. To determine Ignitability, See Section 9 of this MSDS (flash point). For Corrosivity, see sections 9 and 14 (pH and DOT corrosivity). For Reactivity, see Section 10 (incompatible materials). For Toxicity, see Section 2 (composition). Federal regulations are subject to change. State and local requirements, which may differ from or be more stringent that the federal regulations, , may also apply to the classification of the material to be disposed. The company encourages the recycle, recovery and reuse of materials , where permitted, as an alternate to disposal as a waste. The company recommends that organic materials classified as RCRA hazardous wastes to be disposed of by thermal treatment or incineration at EPA approved facilities. The company has provided the foregoing for information only; the person generating the waste is responsible for determining the waste classification and disposal method.

14. TRANSPORT INFORMATION

This section provides basic shipping classification information. Refer to appropriate transportation regulations for specific requirements.

USDOT

Proper Shipping Name: Ferric Chloride Solution
Hazard Class: 8
Packing Group: III
UN/ID Number: UN2582
Transport Label Required: Corrosive
Hazardous Substances:

Component / CAS No.	Reportable Quantity of Product (lbs.)d
Ferric Chloride	2381 (RQ-1000)

TRANSPORT CANADA

Proper Shipping Name: Ferric Chloride Solution
Hazard Class: 8
Packing Group: III
UN/ID Number: UN2582
Transport Label Required: Corrosive

ICAO/IATA

Proper Shipping Name: Ferric Chloride Solution
Hazard Class: 8
Packing Group: III
UN/ID Number: UN2582
Transport Label Required: Corrosive
Packing Instructions/Maximum Net Quantity Per Package
Passenger Aircraft-
Cargo Aircraft-

IMO

Proper Shipping Name: Ferric Chloride Solution
Hazard Class: 8
Packing Group: III
UN/ID Number: UN2582
Transport Label Required: Corrosive

15. REGULATORY INFORMATION

INVENTORY INFORMATION

USA All components of this product are included on the TSCA Chemical Inventory or are not required to be listed on the TSCA Chemical I inventory.

Canada: All components of this product are included on the Domestic Substances List (DSL) or are not required to be listed on the DSL.

European Union (EU): All components of this product are included on the European Inventory of Existing Chemical Substances (EINECS) or are not required to be listed on EINECS.

Australia: All components of this product are included in the Australian Inventory of Chemical Substances(AICA).

China: All components of this product are included on the Chinese inventory or are not required to be listed on the Chinese Inventory.

Japan: All components of this product are included on the Japanese (ENCS) inventory or are not required to be listed on the Japanese Inventory.

Korea: All components of this product are included on the Korean (ECL) inventory or are not required to be listed on the Korean inventory

Philippines: All components of this product are included on the Philippine (PICCS) inventory or are not required to be listed on the Philippine inventory.

OTHER ENVIRONMENTAL INFORMATION

The following components of this product may be subject to reporting requirements pursuant to Section 313 of CERCLA (40 CFR 372), Section 12(b) of TSCA, or may be subject to release reporting requirements (40 CFR 307, 40 CFR 311, etc.) See Section 13 for information on waste classification and waste disposal of this product. This product does not contain any components regulated under sections of the EPA.

Component:	CAS#	Weight %	TPQ (lbs)	RQ(lbs)	S313	TSCA 12B
Ferric Chloride	7705-08-0	38-42%	None	1000	No	No
Hydrochloric Acid	7647-01-0	<0.5%	500	5000	Yes	No

Product Classification under section 311 of SARA
Acute (Y)

16. OTHER INFORMATION

	HEALTH	FLAMMABILITY	REACTIVITY
NFPA	3	0	0
HMIS	3	0	0

REASON FOR ISSUE: New Format

This information is for the specific material described only and may not be valid if the material is used in combination with any other materials or in any process. The user is responsible to determine the completeness of the information and suitability for the user's own particular use. The knowledge and belief of the company, the information is accurate and reliable as of the date indicated but the company makes no express or implied warranty of merchantability for the material or the information. The company makes no express or implied warranty of fitness for a purpose for the material or for the information. We do not assume any legal responsibility for same, nor do we give permission, inducement, or recommendations to practice any patented invention without a license. Before using any product, read its label.

APPENDIX 7-65.....ATTACHMENT 11

NOTE TO REVIEWERS:

ADD THIS ATTACHMENT 11 TO THE BACK OF APPENDIX 7-65. THIS ATTACHMENT CONTAINS THE CHRONOLOGY OF THE WATER TREATMENT EFFORTS

ATTACHMENT 11

CHRONOLOGY

Chronology for Iron Treatment Pond at Crandall Canyon Mine:

8/6/2007	Crandall Canyon Mine Collapse
10/2007	Crandall Canyon Mine Portals were sealed
01/2008	Mine Water began to spill from the Mine Portals
10/2008	Total Iron begins to climb
02/2009	NOV from Division of Water Quality - Violation of the total iron effluent limitation requirements.
08/2009	NOV from Division of Water Quality – Discoloration of Crandall Creek.
12/2009	Maelstrom Oxidizer installed
1/28/2010	UPDES Sample: Total Iron = 3.2 mg/L
2/12/2010	Conference call about the Nalco 7762 Chemical;
2/23/2010	UPDES Sample: Total Iron = 3.3 mg/L
2/24/2010	Sodium Hydroxide Test without Oxidizer – Did not flock;
2/25/2010	Meet on site with Bill (Nalco) NaOH Test with Oxidizer and Flocculent 7763 – Needed to raise the pH to >10 to get a flock; Could never repeat our results.
3/15/2010	Begin working with Nalco Chemicals Flocculent 7763 Coagulant 7888 Chemicals produced a good flock and fell out quickly
3/16/2010	DOGM came down to look at the pond. Pond is beginning to change color from orange to a light green color. Pond is clearing up using the Nalco chemicals, 7888 and 7763.
3/18/2010	Install a new AVFM flow meter. Work on piping for Chemicals.
3/19/2010	Tried a new Coagulant Chemical 8158 Chemical did not work.
3/25/2010	Tried a new Neo Solutions Chemical 18100 Chemical did not work as well as the 7888.
3/26/2010	UPDES Sample: Total Iron = 0.323 mg/L

3/29/2010	Begin recirculation of the sludge
4/1/2010	Sampled for Dissolved Aluminum.
4/6/2010	Conference call with Jeff Studenka at DWQ; discussed Aluminum testing. Conference call with Steve and Kevin at DOGM. Need to do a RCRA metals 8 test on iron sludge.
4/8/2010	Forest Service meeting. Discussed alternatives to treating the Mine Water. DOGM also joined the meeting via phone conferencing. Experimented with insertion points of chemicals. Took sludge samples for RCRA test to lab.
4/9/2010	Sampled for Aluminum.
4/13/2010	Begin Cleaning Pond with vacuum truck – Haul to Wildcat Pond C.
4/15/2010	Get RCRA Metal 8 results: 1. Arsenic <0.10 2. Barium 0.825 3. Cadmium <0.02 4. Chromium <0.02 5. Lead <0.05 6. Selenium <0.10 7. Silver <0.02 8. Mercury <0.0005
4/16/2010	Recirculation test. Able to cut the 8187 Chemical in half
4/21/2010	UPDES Sample: Total Iron = 0.497 mg/L
4/26/2010	Recirculation test - Cut the 8187 Chemical in half.
4/28/2010	Meet with Ringi and Wendell on site about setting up programmable controller
5/5/2010	Meeting on site to look at Crandall Creek with the Forest Service, Division of Water Quality, DOGM, and Karla from JBR. The group decided no action needed to be taken at that time.
5/7/2010	End of Cleaning. Total of 38 loads and 216,000 gallons of sludge hauled to Wildcat Pond C.
5/12/2010	Do another recirculation test. Still flocking and dropping out.
5/17/2010	Sampled for Aluminum.

5/18/2010	UPDES Sample: Total Iron = 0.502 mg/L
5/25/2010	Install new curtain in pond – ECI updates electrical for large pumps
6/4/2010	WET Test
6/7/2010	WET Test
6/9/2010	WET Test
6/10/2010	New Pumps and Manifolds installed; recirculation added approximately 450 gpm
6/18/2010	WET Test
6/21/2010	WET Test
6/23/2010	WET Test UPDES Sample: Total Iron = 0.427 mg/L
7/13/2010	Meet with Nalco to discuss flocculent problem. Get a quote for an Automatic Batch system (Make-down unit).
7/15/2010	Ferrous Iron Samples
7/19/2010	Sent 5 gallon bucket samples of sludge to 3 Geotube companies and one press company. Begin Pumping directly into Sediment Pond.
7/21/2010	UPDES Sample: Total Iron = 0.68 mg/L
7/23/2010	Talked with WaterSolve about GeoTube Cleaning and Polymer Testing.
7/27/2010	Meet with Darrell Lewis from United Central Industrial Supply on site to go over GeoTube setup. DOGM on site.
7/28/2010	Ordered a Geotube to try from United Central Industrial Supply.
7/30/2010	Start enclosing pumping shed.
8/3/2010	Order Make-down unit for flocculent system.
8/18/2010	DOGM on site. Inspection from Division of Water Quality.
8/23/2010	End of Pond Cleaning.
8/24/2010	Order new flow meter.
8/27/2010	UPDES Sample: Total Iron = 0.39 mg/L
9/16/2010	Install Crane for moving around chemical totes.

9/23/2010	Install Make-down unit for flocculent.
9/29/2010	UPDES Sample: Total Iron = 0.17 mg/L
10/20/2010	Meet on site with Randy from WaterSolve. Test Geotube with Solve 151 Flocculent.
10/21/2010	Meeting with DOGM and WaterSolve. Discuss Polymer testing.
10/27/2010	Order fresh water tanks.
10/29/2010	UPDES Sample: Total Iron = 0.71 mg/L
11 – 2011	Enclosed Upper Bay.
11/22/2010	UPDES Sample: Total Iron = 0.43 mg/L
12/01/2010	Meeting with Mike Herkimer from Division of Water Quality.
12 – 2010	Plumb and pipe recirculation for fresh water system.
12/17/2010	UPDES Sample: Total Iron = 0.46 mg/L
1/12/2011	Order New Chemical (Solve 3)
1/20/2010	Order backup pumps for treatment system.
1/24/2011	UPDES Sample: Total Iron = <0.05 mg/L
2/23/2011	UPDES Sample: Total Iron = <0.05 mg/L
3 – 2011	Begin Automation of Iron Treatment System.
3/23/2011	UPDES Sample: Total Iron = 0.10 mg/L
3 – 2011	Begin baseline for permitting of Burma evaporation ponds.
4/18/2011	Set-up mine water bypass to sediment pond.
4/19/2011	Install new flow meter.
4/26/2011	UPDES Sample: Total Iron = 0.12 mg/L
6/8/2011	Scheduled upcoming GeoTube testing with WaterSolve.

APPENDIX 7-65.....ATTACHMENT 12

NOTE TO REVIEWERS:

ADD THIS ATTACHMENT 12 TO THE BACK OF APPENDIX 7-65. THIS ATTACHMENT CONTAINS THE PROJECTED OPERATING COSTS OF THE EXISTING TREATMENT FACILITY

ATTACHMENT 12

PROJECTED OPERATING COSTS

Crandall Canyon Mine
Projected Annual Mine Water Treatment and Operating Costs
Summary - May 10, 2011

Equipment			
Pumps, Hoses, Piping and Fittings		$25,500.00	See Sheet 1
Settling Basin		$12,800.00	See Sheet 1
Water Treatment Equipment		$101,600.00	See Sheet 1
Sludge Dewatering Equipment			
Subtotal Equipment		$139,900.00	See Sheet 1
Operations			
Labor		$36,400.00	See Sheet 2, Note 1
Treatment Chemicals			
Coagulant (New WaterSolve Chemical)	*$21,800.00*		See Sheet 2, Note 2
Flocculant	*$8,100.00*		See Sheet 2, Note 3
Total Treatment Chemicals		$29,900.00	
Facilities/Support Costs			
Snow Removal	*$2,520.00*		See Sheet 2, Note 4
Water Analysis	*$3,729.00*		See Sheet 2, Note 5
Power	*$6,144.00*		See Sheet 2, Note 6
Telephone	*$540.00*		See Sheet 2, Note 7
UPDES Permit Renewal	*$720.00*		See Sheet 2, Note 8
Total Facilities/Support Costs		$13,653.00	
Subtotal Operations		$80,000.00	
Maintenance			
Sludge Cleanout & Disposal			See Sheet 2
Vac Truck and Operator	*$26,880.00*		See Sheet 2, Note 9
Labor	*$11,760.00*		See Sheet 2, Note 10
Total Sludge Cleanout & Disposal		$38,600.00	
Equipment Maintenance			Included in Operations Labor Costs above
Pond Maintenance			Included in Operations Labor Costs above
Subtotal Maintenance		$38,600.00	
Total Operations & Maintenance Costs		**$118,600.00**	

Sheet 1

Projected Annual Mine Water Treatment and Operating Costs

Description	Materials / Model No.	Unit Cost	Unit	Length	Area	Number	Unit	Cost
Pumps, Hoses, Piping and Fittings								
Sludge Recirculation #1, 5 hp centrifugal	Dayton LTDH23TD	700	EA			1	EA	700
Sludge Recirculation #2, 5 hp centrifugal	Dayton LTDH23TD	700	EA			1	EA	700
Flexible Hose, 4-inch		2.5	FT	100				250
Pipe, 4-inch PVC		2	FT	400				800
Pipe, perforated, PVC, 4-inch		2.5	FT	2700				6750
Pipe, 12-inch		25	FT	500				12500
Coupler, 12-inch		100	EA			20	EA	2000
Valve, 12-inch		250	EA			2	EA	500
Tee, 12-inch		250	EA			4	EA	1000
Misc PVC Fittings, 4-in		250	LS			1	LS	250
Other (Add Line Items as Necessary)								
Subtotal - Pumps, Hoses, Piping and Fittings								25500
Settling Basin								
Pit Liner		1	SF		10000			10000
Cribbing Timbers		10	EA			80	EA	800
Geotextile Fabric (for curtains)		1	SF		2000			2000
Other (Add Line Items as Necessary)								
Subtotal - Settling Basin								12800
Water Treatment Equipment								
2500-gal Fresh Makeup Water Tank, poly		1810	EA			2	EA	3620
Oxidizer Unit (Maelstrom)	Environmental Solutions	59000	EA			1	EA	59000
Blower for Oxidizer Unit		500	EA			1	EA	500
Flow Meter, pre-Oxidizer Unit, Electromagnetic	MJK 297246-150-00	7500	EA			1	EA	7500
Flow Meter, post-Oxidizer Unit	Grayline AVFM-11	3500	EA			1	EA	3500
Flocculant Makeup Unit	NALCO 181-MPF090.88	9885	EA			1	EA	9885
Solution Pump Unit (Flocculant injection pump)	NALCO 141-G81030.88	6090	EA			1	EA	6090
Flocculant mixer	Leeson	1500	EA			1	EA	1500
Flow meter, Flocculant neat	Omega FMG71	1250	EA			1	EA	1250
Flow meter, coagulant neat	Omega FMG3002-PP	950	EA			1	EA	950
Flow meter, makeup water		250	EA			1	EA	250
PLC - Allen Bradley	2711P-T10C4A1 Panel view	4483	EA			1	EA	4483
Coagulant injection pump	LMI B131-75HV	1376	EA			1	EA	1376
Fresh water pond pump (to tanks), 2 HP	Dayton LTAF21SA	1200	EA			1	EA	1200
Fresh water Jet Well Pump (to makeup unit)	Dayton 2XZF4	500	EA			1	EA	500
Other (Add Line Items as Necessary)								
Subtotal - Water Treatment Equipment								101600
Sludge Dewatering Equipment	(Not yet identified)							
Subtotal - Sludge Dewatering Equipment								
Total								139900

Notes:
Does not include earthwork, Jersey barriers, fencing, culverts, etc.
Items in red are Crandall Canyon Mine historical costs.
Items in black are DOGM estimated costs (DOGM Spreadsheet Crandall_Treat_Costs_03312011.xls)

Sheet 2

Projected Annual Mine Water Treatment and Operating Costs

	Operations Assumptions	
Note 1	**Labor Costs:**	
	Assumes 4 hours/day x 5 days/week x 52 weeks/year x $35/hour =	***$36,400.00***
	Includes estimated labor costs associated with daily travel to site, facility inspection, routine maintenance,	
	sampling and analysis, pond cleaning, record keeping, accounts payable/receivable, snow removal,	
	delivery of supplies, and emergency maintenance. This assumes a fully automated treatment system with	
	off-site real-time computer monitoring and alarm capabilities.	
Note 2	**Coagulant Chemical Assumptions:**	
	Assumes 400 gpm Mine Water (measured historical flow)	
	Assumes 25 ppm (current compliance dosage rate, at approximately 2.5 mg/L total Iron level)	
	Bulk Pricing $0.36/lb.	
	Treating 210,240,000 gallons/year @ 25 ppm = 5,256 gallons/year x 11.5 lbs/gallon = 60,444 lbs	
	60,444 lbs x $0.36 =	***$21,759.84***
Note 3	**Flocculant Chemical Assumptions:**	
	Assumes 400 gpm Mine Water	
	Assumes 2.5 - 3.0 ppm, 2.5 totes/year (current compliance dosage rate, at approximately 2.5 mg/L total Iron level)	
	Tote Pricing $3,250.00	
	2.5 Totes x $3250.00 =	***$8,125.00***
Note 4	**Snow Removal**	
	Assumes clearing Crandall Canyon road and site 6 times per year using wheel truck snow plow	
	6 hours/storm x 6 storms/year x $70/hour =	***$2,520.00***
Note 5	**Water Analysis**	
	Assumes bi-monthly sampling for existing UPDES parameters	
	24 analysis/year x $155.35 =	***$3,728.40***
Note 6	**Electrical Power**	
	Assumes 25 KVA continuous power service at Rate 6 billing schedule	
	$512/month x 12 months/year =	***$6,144.00***
Note 7	**Telephone Service**	
	Assumes basic voice service, single line	
	$45/month x 12 months/year =	***$540.00***
Note 8	**UPDES Permit Renewal**	
	$3600 every 5 years	***$720.00***
	Maintenance Assumptions	
	Sludge Cleanout and Disposal	
Based on	1. Assumes disposal at new "Burma" evaporation site (Lower Huntington Canyon), DOGM permitting on-going	
	2. Previous sludge cleaning experience	
Note 9	**Vac Truck and Operator**	
	Assumes 6 cleanouts/year x 8 hours/day x 7 days/cleanout x $80/hour =	***$26,880.00***
Note 10	**Labor**	
	Assumes 6 cleanouts/year x 8 hours/day x 7 days/cleanout x $35/hour =	***$11,760.00***