BEFORE THE ARKANSAS POLLUTION CONTROL AND ECOLOGY COMMISSION

IN THE MATTER OF AMENDMENTS TO REGULATION NO. 2, REGULATION ESTABLISHING WATER QUALITY STANDARDS FOR SURFACE WATERS OF THE STATE OF ARKANSAS	))))	DOCKET NO. 16-003-R

ARKANSAS DEPARTMENT OF ENVIRONMENTAL QUALITY
RESPONSIVE SUMMARY

Pursuant to Minute Order 16-11, the Arkansas Department of Environmental Quality ("ADEQ" or "Department") submits the following Responsive Summary regarding proposed changes to APC&EC Regulation No. 2, Regulation Establishing Water Quality Standards for Surface Waters of the State of Arkansas.

On July 22, 2016, the Arkansas Pollution Control and Ecology Commission ("APC&EC" or "Commission") granted Halliburton Energy Services, Inc.'s ("HESI") Petition to Initiate Rulemaking to amend Regulation No. 2. The third-party petition was filed pursuant to APC&EC Regulation No. 8.809. In order to perform a twelve-year Environmental Improvement Project (EIP) for the former Dresser Industries—Magcobar (DIM) mine site located in Hot Springs County—HESI is requesting the following amendments to Regulation 2 for the duration of the EIP. HESI requests modification of the chloride, sulfate, and total dissolved solids (TDS) water quality criteria for Chamberlain Creek as follows: Chloride from 20 milligrams per liter (mg/L) to 68 mg/L; sulfate from 20 mg/L to 1,384 mg/L; and TDS from 200 mg/L to 2,261 mg/L. HESI requests modification of the sulfate and TDS water quality criteria for Cove Creek, Reyburn Creek, Lucinda Creek, Rusher Creek, Scull Creek, and Clearwater Lake as follows: sulfate from 20 mg/L to 250 mg/L and TDS from 200 mg/L to 500 mg/L.

One public hearing was held in Malvern on Tuesday, September 27, 2016. No oral comments were received during the public hearing. The final day to submit written comments was October 11, 2016. The Commission received written comments from two parties during the public comment period.

Signatory 1: Arkansas Department of Health

Comment 1: In the long term, reclamation of the former mine site is supportive of maintaining water quality in the Ouachita River which is utilized as a drinking water source for four public water systems. The four public water systems are: the Kimzey Regional Water District, the Malvern Waterworks, the Arkadelphia Waterworks, and the Camden Waterworks. Together these four public water systems provide drinking water to approximately 65,000 Arkansans. Once reclaimed, re-vegetation of the site and other improvements should improve water quality entering the Ouachita River.

Response: The Department acknowledges this comment.

Comment 2: Cove Creek discharges into the Ouachita River in close proximity to the Kimzey Regional Water District intake structure. While the potential for back mixing appears to be minimal, the ADH nevertheless asks that secondary drinking water standards criteria concerning minerals be applied to Cove Creek and this is consistent with the proposed rulemaking.

Response: According to Regulation No. 2, specifically Reg. 2.511(C), for water quality and designated use attainment, the criteria for Cove Creek are 250, 250, 500 mg/L of chlorides, sulfates, and total dissolved solids, respectively. The criteria in Reg. 2.511(C) are identical to the secondary drinking water standards. Additionally, according to the EIP, "Variations Supported by Environmental Improvement Project" the temporary standards proposed for Cove Creek are "sulfates 250 mg/L; total dissolved solids 500 mg/L".

Comment 3: Chloride concentrations of are particular concern with regards to drinking water systems efforts to control corrosion. Corrosion concerns occur at much lower levels than the secondary drinking water standard of 250 mg/liter for chlorides. While it appears that adequate dilution of chlorides will occur in Cove Creek and then in the Ouachita River, the ADH requests that discharges from the mine site be designed such that lower flow and continuous discharge protocols are favored over higher flow and periodic discharges. This should serve to minimize minerals concentration variations seen by downstream water users and thus facilitate consistency in drinking water treatment.

Response: The 2003 Consent Administrative Order (CAO), (LIS 03-061) requires the facility to operate as a hydrograph controlled release (HCR) based on the flow in Cove Creek. This is required to "...enable the reduction of the level of the Pit Lake by up to several feet a year. ... discharge of the annual volumes of water necessary to achieve these objectives and protect downstream water quality may require a hydrograph based discharge ..."

According to the June 18, 2003 Revised HCR Discharge Plan "The allowable monthly continuous discharges (Table I) were derived by first determining the critical monthly low flows for both Cove Creek and the Ouachita River. Next, WTS discharges were developed that could be continuously released during each month while protecting existing WQS in the Ouachita River and meeting interim dissolved mineral criteria in Cove Creek (860 mg/L sulfate, 1,600 mg/L Total Dissolved Solids [TDS] and 60 mg/L chloride)." *Note: WTS is "Water Treatment System."*

Although it may be beneficial to the downstream drinking water treatment facility, the use of a lower flow and continuous discharge may not be protective of all designated uses, especially during periods of low flow in Cove Creek.

Signatory 2: U.S. EPA Region 6

NOTE: The EIP is for temporary site-specific mineral (Cl, SO4, TDS) criteria. Several comments were received regarding metals and metals participate. These comments are relevant to the overall site remediation, yet not directly related to the EIP.

General Questions/Comments for the Halliburton Energy Services, Inc. Environmental Improvement Project

Comment 1: 1a) How will achievement of downstream criteria, particularly in Cove Creek, be ensured? In Cove Creek the 2000-2012 data demonstrates exceedances of several criteria with the maximum values measured in the creek. **1b)** Will the discharge be limited to a certain amount of flow to ensure that the criteria will be met? **1c)** What fail safes are in place to alter the permit if downstream criteria are being exceeded?

Response: 1a) Downstream criteria attainment will be assessed using the data collected as required by the Effectiveness Monitoring Plan (EMP) and data routinely collected by ADEQ.

1b) Although not a requirement of the current permit, the facility currently operates as a hydrograph controlled release (HCR) based on the flow in Cove Creek per a 2003 CAO (LIS 03-061). According to the CAO, allowable monthly continuous WTS discharge shall be as follows:

> January - 800 gpm, February- 1300 gpm, March - 1500 gpm, April - 1100 gpm, May - 500 gpm,
> June -100 gpm, July, August, September, October - 25-50 gpm, November - 200 gpm, December - 500 gpm.
> It also states that the allowable monthly discharge will be the maximum baseline mode of operation (although no discharge will occur if Cove Creek flow is zero). Final discharge amounts will be based on the results of the EMP and be determined after remediation activities are in place.

1c) The permit contains a reopener clause in the event that additional permit requirements need to be implemented. Monitoring and/or limits for specific parameter(s) for waterbody(ies) receiving stormwater runoff from the site could be included in the permit, if necessary.

Comment 2: Whole effluent toxicity (WET) tests downstream of the current water treatment facility have demonstrated toxicity in Chamberlain Creek and at times in Cove Creek, even when toxicity isn't seen in the discharge of the plant. Some of this toxicity is likely due to elements of acid rock drainage (ARD) originating from additional seepage that is not currently being treated by the water treatment facility, but may be captured with the new French drain. After remediation work begins, will toxicity still be monitored downstream on Chamberlain and Cove Creek to assure that the remediation plan is addressing this toxicity from seepage? If toxicity is still found, what steps will be taken to determine the source of the toxicity (i.e. metals vs. pH vs. minerals) and address remediation of this source of toxicity?

Response: ADEQ will request toxicity testing be included in the Effectiveness Monitoring Plan (EMP). Toxicity testing recommendations and the locations will be determined based on the design and remediation activity schedule. If the results of toxicity testing demonstrate that the implementation of the Remedial Action Decision Document (RADD) is not addressing toxicity, according to Section 11 of the RADD, the RADD and related documents may be revised as necessary.

Comment 3: Will toxicity tests be performed for Lucinda Creek, Reyburn Creek, Rusher Creek, Scull Creek, and Clearwater Lake once remediation work has begun?
Response: ADEQ will request toxicity testing be included in the EMP. Toxicity testing recommendations and the locations will be determined based on the design and remediation activity schedule.

Comment 4: It appears from the Remedial Action Decision Document (RADD), in the Effectiveness Monitoring Program section, that the remediation plan can be altered if progress towards compliance isn't occurring and new remediation activities need to be considered. Is there a schedule for periodic evaluation of the progress of the remediation and for investigation into new technology to treat minerals? Is there a number of years estimated to see effects of some of the non-point source remediation activities such as revegetation?
Response: Section 11.0 of the RADD allows for modification of the RADD should progress towards the remedial action objectives not be evident. The timeframe for evaluation will be set in the EMP. The sampling required by the EMP will be used to document progress towards the remedial action objectives.

Questions/Comments for Dresser Industries-Magcobar Mine Site Site Investigation Report, Hot Springs, Arkansas, April 19, 2007 (Appendix A)

Comment 5: Is there any concern that the pH of the sludge ponds will drop? Could the pH drop to a level that would potentially make ARD constituents soluble again? (pg. 223)
Response: Based on the page reference, this comment appears related to the settling ponds and not the sludge ponds. A large portion of the sludge from the settling ponds and the sludge ponds appears to have been removed; however, some sludge still remains in each. The major concern from the Acid Rock Drainage (ARD) is the pH drop. This pH drop is primarily being effected by mine spoils. The ARD constituents in the settling ponds and the sludge ponds are minimal compared to volume of mine spoils.

Comment 6: In determining the risk presented by metals in the aquatic sediments, was the risk of benthic organisms taking up metals and then the metals bioaccumulating in the food chain considered?(pg. 258)
Response: Bioaccumulation was considered when evaluating the hazard quotient (HQ) for riparian wildlife receptors of belted kingfishers and raccoons. The ecological risk assessment determined there is a potential for adverse effects on raccoons when their diet consisted of aquatic life from Cove Creek.

Comment 7: What is the risk of metals becoming soluble again from the sediments? Is there a pH threshold that would allow these metals to enter into solution again? (pg. 258)
Response: Lower pH increases the solubility and mobility of metals in soil and sediment. This allows for a higher bioavailability of metals in water, which increases the toxicity, especially for aluminum and manganese. The higher bioavailability will pose a greater risk to aquatic receptors in affected waters. Data shows that if the pH is greater than or equal to 6.5, adverse effects are not anticipated for aquatic life.

Comment 8: For fish sampling associated with future monitoring, it would be useful to quantify the number of fish caught per unit effort so that sampling at the various locations can be compared. For some locations in the past it appeared that much larger areas were sampled at one site location compared to another.
Response: Catch per unit effort (CPUE) is a commonly used indirect measure of species abundance. The Department will require HESI to report electrofishing sample time and reach length in order to evaluate individual species abundance and changes among sites and through time.

Comment 9: Streams need to be clearly defined as either perennial or intermittent. In particular the site investigation (SI) switches back and forth between calling Lucinda Creek an intermittent and a perennial stream (pg. 415)
Response: According to medium resolution NHD, high resolution NHD data, and topography maps, Lucinda Creek upstream of Lucinda Lake is considered intermittent and downstream of the lake it is considered perennial. The Department will request HESI refer to Lucinda Creek as intermittent when referring to the portion upstream of Lucinda Lake and perennial when referring to the portion downstream of the lake. This will be requested for all future documents and future revisions to existing documents.

Comment 10: Where did the Region 6 screening level value for sulfate come from? Is there a document that specifies this value? Was this screening level set for aquatic life or for human health? (pg. 436)
Response: Region 6 screening levels referenced in the table are from the 1986 Quality Criteria for Water or the "Goldbook" that provides screening levels for aquatic life. The value of 860 mg/L corresponds to the screening level for chlorides. This value was selected for sulfates during the SI, since sulfates would not be as toxic as chlorides. This value was also used in previous orders with the Office of Water Quality and EPA, since a sulfate screening level is not available.

Comment 11: 11a) In several instances it appears that discussion about the precipitate that has been created from pulling the metals out of solution is separated from the discussion about the risk posed by the sediments to the aquatic species. In some instances the precipitate exceeds the no effect concentration (NOEC) while the sediment does not. Given this, how does the presence of the precipitate factor into how the health of the streams was evaluated? **11b)** Was is assumed that the precipitate was not bioavailable, and if so, why? **11c)** Also, at what pH would the metals in the precipitate become bioavailable? (pg. 470)
Response: 11a) While not discussed in depth, Appendix B, Baseline Ecological Risk Assessment does note negative "stream health" effects due to the precipitate formation and the resulting embeddedness as well as a reduction in reduced interstitial spaces.

> Page 2-1 "Aluminum and iron precipitates may form as acidic drainage waters enter streams, causing temporary embedding and cementing of cobbles in stream substrates and corresponding temporary reduction in the aquatic habitat quality until the precipitates are removed during seasonal high flows."

Page 3-7 "Downstream of Scull Creek, the substrate was even more embedded than at the upstream site. A dull gray precipitate appears to cement the substrates firmly in place"

Page 4-28 "Observations at REY-2 suggested heavy precipitate during fall 2000 that acted to cement substrates providing reduced interstial spaces."

Page 7-27 "Risks due to toxic effects of aluminum in sediments to organisms are not expected, based on the concentrations measured in Cove Creek and Chamberlain Creek sediments. The precipitate may have two levels of effects, including a small degree of toxicity and physical effects. A small level of effects may be occurring in Cove and Chamberlain Creeks due to the quantity of material precipitating out of solution. Aluminum could cause more of a physical effect to benthic invertebrates such as smothering of intergravel spaces"

11b) A discussion of precipitate bioavailability is not included in the Baseline Ecological Risk Assessment or the SI.

11c) A discussion of the pH at which the metals in the precipitate would become bioavailable is not included in the Baseline Ecological Risk Assessment or the SI. Regulating the pH level through the water treatment system is anticipated to decrease the level of precipitate and the bioavailability of metals.

Comment 12: How were the physical impacts of the precipitate on the benthic organisms considered in the risk assessment? (pg. 470)

Response: While not discussed in depth, the SI and Appendix B, Baseline Ecological Risk Assessment does note risks to aquatic organisms.

Page 7-14 of the SI "Potential adverse effects (based on the mean PEC-Q) predicted for benthic invertebrates for the more recent sediment and precipitate data, further strengthens the observation that controlling pH and 7-15 dissolved metals in Chamberlain Creek, primarily, but also in Rusher, Reyburn, and Scull Creek headwaters will reduce risks of COPCs in sediments because the precipitation that currently deposits metals to sediments will be significantly reduced."

Page 7-27 of Appendix B "Risks due to toxic effects of aluminum in sediments to organisms are not expected, based on the concentrations measured in Cove Creek and Chamberlain Creek sediments. The precipitate may have two levels of effects, including a small degree of toxicity and physical effects. A small level of effects may be occurring in Cove and Chamberlain Creeks due to the quantity of material precipitating out of solution. Aluminum could cause more of a physical effect to benthic invertebrates such as smothering of intergravel spaces"

Comment 13: EPA is concerned that manganese was not retained as a contaminant of potential concern (COPC) for sediments, as in many creeks its hazard quotient (HQ) was between 1 and 1.5. When this value was rounded, the justification given for not retaining it as a COPC was that the HQ was not greater than 1, even though it was when the value was not rounded. (pg. 507) This occurs with a few other parameters as well.

Response: A common risk assessment practice is to round calculations to one significant digit; this methodology was exercised in the SI. ADEQ acknowledges, this methodology could potentially result in certain contaminants of potential concern (COPCs) being prematurely removed from the risk assessment. However, adjustment and safety factors are typically included in the toxicity factors, which would compensate for rounded down risk calculations. Furthermore, ADEQ maintains that the remedial action of regulating the pH level should decrease the level of precipitate and the bioavailability of metals, including manganese. The exclusion of manganese and other constituents as a result of rounding should not adversely affect the overall remedial goals.

Comment 14: Is there an upper limit of hardness tolerance in aquatic species? (pg. 523)
Response: There is not any readily available research specifically related to an upper limit of hardness tolerance to aquatic species. However, when hardness values are high, it may be appropriate to investigate how the concentrations of the various ions would affect aquatic life.

Comment 15: In Table 7-3, there appears to be many more values that exceed the lower benchmark value than are actually noted in this table. (pg. 559)
Response: There are instances when exceedances were not properly flagged, and ADEQ can only attribute this to random error. Ultimately, ADEQ maintains these errors should not adversely affect the overall remedial goals.

Questions/Comments for Draft Feasibility Study Report Dresser Industries-Magcobar Mine Site,
Hot Spring County, Arkansas, August 20, 2009 (Appendix B)
Comment 16: The report states that "Recovery of affected streams is anticipated to be nearly immediate when the pH is controlled". EPA believes this is an overstatement of how quickly the streams will recover and the impact the streams will still experience from elevated minerals and metals that will remain partially elevated even after pH control. (pg. 20)
Response: The Department acknowledges this comment. The Effectiveness Monitoring Plan (EMP) will serve to determine the rate and extent at which the affected streams recover when pH controls and other control/remediation measures are implemented.

Comment 17: It is unclear from the report how the cost estimate for Alternative 2 was calculated as $6,910,000. The report states that alternative 2 assumes a periodic cost of $1,000,000 every 5 years, beginning in year 15 and that the life span of the water treatment system (WTS) is 100 years. 100yrs-15yrs = 85 yrs /5 yrs = 17. At a minimum this cost should be $17,000,000 just for periodic cost. What other factors are in this equation that makes this cost estimate so much less than 17 million dollars? (pg. 133)
Response: The cost estimate appears to have been based on one million being spent every 15 years. So, 100 yrs / 15 yrs = 6.66 which would provide a similar estimate to $6.91 million cost estimate with cost of consultants billing.

Comment 18: Why wasn't an alternative that considered upgraded source control without pit treatment considered in the alternatives analysis (a combination of alternative 3 and 5 rather than alternative 5 just expanding on alternative 4)? (pg. 150)

Response: All of the Alternatives that are presented in this EIP are based on the feasibility study (FS) that was acknowledged by ADEQ. These Alternatives were based on certain criteria that addressed the effectiveness, performance, cost, etc. Upon approval of the FS, the EIP did not require any additional studies to be performed.

Questions/Comments for Remedial Action Decision Document, Dresser Industries-Magcobar Mine
Site, Magnet Cove, Hot Spring County, Arkansas (Appendix C)
Comment 19: It is not clear that the improvement in the headwaters surface water quality will lead to sediment improvement without any direct remediation on the sediments. What processes are occurring in the sediments that would make the metals unavailable to the benthic organisms? Also, how long are the metals that are already present in the sediment expected to persist?
Response: The primary direct remediation option available would be removal of the sediments via dredging. This could potentially pose additional risks to aquatic life in the short term by mobilizing metals in the surface water. ADEQ maintains the selected remedial action of regulating the pH level will be protective of aquatic receptors in the short and long term. As the pH increases in the surface water, the level of precipitate and the bioavailability of metals should decrease. ADEQ could not estimate the amount of time metals will persist in sediments; however, over time metal levels will ultimately be decreased with the natural mixing of clean sediment.

Comment 20: SP3 spoil pile alternative (extensive regrading and revegetating) should potentially be thought of as a next step in the remediation process if monitoring demonstrates that initial actions are not sufficient to meet remediation goals (pg.33)
Response: The Department acknowledges this comment. The RADD, Section 11.0, includes provisions for a change in remedy should the selected remedy not prove effective. A remedy included in the Feasibility Study or another remedy may be proposed.

Comment 21: Reference sites should be included in the biological sampling plan (upstream of mine influence and potentially one off site) to act as a control while monitoring the progress of the remediation and so that any outside impacts unrelated to the remediation work at the site can be taken into account. (pg. 43)
Response: While not noted in the body of the RADD, reference sites are noted in other related documents.

- The RADD response to comments included on page 52 of 75 states "…Basin Creek (the background location)…"
- The July 28, 2016 version of the Baseline Sampling and Analysis Plan (SAP) makes reference to reference sampling stations and biological sampling at those stations.
    - COVE-5 Upstream reference conditions for Cove Creek above influence of Lucinda Creek, Chamberlain Creek
    - BAS-0 Non-impacted stream upgradient of Chamberlain Creek and tributary to Cove Creek (serves as reference)
    - REF-1, 2, 3, &4 Reference stream to be identified during site reconnaissance
    - Reference streams in the area will also be identified and used throughout the baseline sampling. The reference streams will be selected based on comparability

of size, watershed size, and flow to Chamberlain Creek, Lucinda Creek, Rusher Creek, Scull Creek, and Reyburn Creek. The purpose of the reference stream characterization will be to provide chemical, biological, and habitat information to describe attainable aquatic life uses expected for similar local streams.

- The Department concurs that biological sampling of reference sites should occur as part of the baseline monitoring, during remediation monitoring, and as part of the effectiveness monitoring included in the EMP.

Comment 22: What sort of monitoring will be performed to assure that no metals are leaching from sludge ponds and that contact by terrestrial receptors is prevented? Is there a monitoring plan to test the soil cover that will be placed over the sludge piles to make sure that no metals are leaching?
Response: Monitoring will be established through the Effectiveness Monitoring Plan (EMP). Additionally, Halliburton will utilize a soil cover for the sludge ponds, which will diminish the direct contact pathway for terrestrial receptors and reduce water infiltration.

Comment 23: The current plan is designed for 100 years and involves active management, including active water treatment, to assure that the level of water in the pit is kept at a non-dangerous depth and that the water released from the pit is not toxic to wildlife. The plan does not seem to address a longer term solution, so what actions are anticipated after the hundred years that will assure that the pit lake and its water are not a risk to the environment?
Response: The time frame of 100 years was used to allow continuing evaluation at the Magcobar site. The site owners will be performing additional periodic reviews that will be outlined in the Effectiveness Monitoring Plan. These periodic reviews include assessing new technologies as they become available.

Comment 24: If Halliburton Energy Services, Inc. (HESI) isn't going to pay for new residents to be connected to the municipal water source, how is it assured that new residents will not drill into the ground water for a drinking water supply that may potentially be impacted by the mine site?

- What expense is the company responsible for in terms of adding new municipal water source connections? In the comments on the RADD HESI seems to imply they are not responsible for this cost, but the cost estimate is included in the feasibility study.

Response: The RADD requires Halliburton to submit a report documenting that persons within the area noted on Figure 3 of the RADD have access to municipal water. The remedy for shallow and deep groundwater is designed to prevent groundwater use as a domestic water supply. Halliburton is responsible for any cost associated with implementing this remedy, and therefore, the cost of connecting these persons to a municipal water supply.

Comment 25: 25a) Is there any enforcement power for the metals that do not have state criteria? **25b)** Is there any enforcement power to assure that the remediation work is completed, aside from the NPDES permit for the water treatment facility?
Response: 25a) ADEQ has the authority to implement federal criteria in permits when there is not an adopted state standard. Additionally, federal criteria can be utilized for state enforcement

actions. ADEQ will use the federal criteria noted in, but not limited to, the EPA National Water Quality Criteria – Aquatic Life Criteria Table and the 1986 Gold Book criteria. https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table
25b) CAO LIS16-043, Order and Agreement, paragraph 18 addresses the consequences of a failure to comply with any provisions of the Order. The RADD is incorporated into the Order, CAO LIS 16-043, Order and Agreement, paragraph 3.

Comment 26: Please include a description of how the physical presence of precipitates will be evaluated and how their impacts on benthic organisms will be minimized.
Response: Chemical, biological, and sediment sampling will be established through the EMP that has not been submitted or approved to date. Additionally, ADEQ maintains the selected remedial action of regulating the pH level should decrease the level of precipitate and the bioavailability of metals to ecological receptors.

Questions/Comments for Seasonal Monitoring in Chamberlain and Cove Creeks, Per CAO LIS 03-061 Section B.3. December 9, 2005 (Appendix D)
Comment 27: Please make sure that monitoring data is appropriately described. For instance, one sentence states "The percent of total individuals as EPT was relatively constant across Cove Creek stations and decreased slightly during the monitoring period across all stations." This statement appears to be misleading as the percent of total individuals as EPT was about 65% in October 2003 and was about 18% in April 2005. A loss of approximately 45% is more than a slight decrease. (pg.26,28)
Response: The Department will request HESI make scientifically valid descriptions and conclusions when describing and interpreting data collected during the baseline monitoring, during remediation monitoring, and as part of the effectiveness monitoring.

Comment 28: 28a) Please also make sure that all information is accurately represented. In table 4.3, two metals, aluminum and manganese, are listed as having 0 permit violations. However, both of these metals are listed as report in the 2008 permit and do not have a limit, so listing them as having 0 violations is misleading. This is operating under the assumption that the 2008 permit contains the same limits as the previous permit. This should have an n/a since there was no limit in place that could be violated. **28b)** In addition, both of these metals are still being discharged at concentrations that are quite high, even though the treatment has resulted in a large reduction in their concentrations (pg. 29)
Response: 28a) The Department will request that in future reports and related documentation that HESI use the terminology "violation" only for those parameters that have permit limits. For those parameters that are "report", the terminology "exceedance of state or federal criteria" should be used.
28b) The Department acknowledges this comment.

Comment 29: In Table 4.3, why is there no average pH or median pH values? (pg. 29)
Response: The Department will request HESI report descriptive statistics for all parameters for data collected during the baseline monitoring, during remediation monitoring, and as part of the effectiveness monitoring. This will include but is not limited to, min, max, average, median, and lower quartile.

Comment 30: For Table 4.3, it appears that according to the 2008 permit TDS and sulfate both actually had permit violations. A previous version of the permit could not be located online, but according to the 2008 permit, sulfate values and TDS values are both in violation. The listed TDS limit is 212 mg/L for monthly average and for sulfate is 31 mg/L. Was another standard or permit value in place that made these values not in violation for the time period reported in this report?
Response: The facility had a permit effective February 1, 2003 which expired January 31, 2008. This permit was superseded by CAO LIS 03-061. The amended Exhibit A of the 2003 CAO states "Report only for Minerals", therefore no permit limit violations for sulfate or TDS would have been noted.

Comment 31: For the biological monitoring results, please specify why particular taxa were excluded from the total taxa count. It appears that the highlighted taxa could potentially fit into another counted taxa, which is why they were excluded, but this is not clear from the footnote. (pg. 40)
Response: The Department will request HESI give details regarding taxa groupings and/or exclusions for data collected during the baseline monitoring, during remediation monitoring, and as part of the effectiveness monitoring.

Questions/Comments for Appendix E: Historical Database
Comment 32: Even when the WTS was operating, aluminum concentrations, although reduced, were still very high and at times the pH was still below 6. What elements of the remediation plan will work to bring the aluminum and pH into ranges that are not harmful to aquatic life? What sort of fail safes are in place if the initial remediation plan is not sufficient?
Response: A Sampling and Analysis Plan (SAP) being performed in accordance with Remedial Action Decision Document (RADD) will monitor the performance of the remedy. If the aluminum and pH fall out of specifications, then Magcobar site owners will have to stop discharging until they return to the allowed discharge concentrations. The RADD, section 11.0, requires HESI to demonstrate progress towards compliance and allow for modification of the RADD, if necessary, to effect progress.

Comment 33: Several concentrations are listed as less than concentrations rather than exact measurements, while exact measurements were attained during another monitoring season for concentrations below that less than threshold (ex: Lead at Scull Creek was measured at a maximum of 0.6 µg/L during the SI monitoring, but was measured at <40 µg/L during 2006 monitoring). Going forward, please make sure that the assessment methods utilized for the monitoring can detect the parameter in the range that is necessary to determine whether it is causing impairments to aquatic life.
Response: The Department will request HESI use analytical methods that can detect parameters in the range that is necessary to determine whether it is causing impairments to aquatic life.

Questions/Comments for Halliburton Energy Services, Inc. Dresser Industries-Magcobar Former
Mine Site Notice of Intent of an Environmental Improvement Project, October 29, 2014.
Comment 34: Currently the Notice of Intent (NOI) states that no direct remediation will be conducted to treat the elevated concentrations of minerals that are a result of the ARD from the

Magcobar mine. It also implies that no work will be done to investigate new remediation techniques in the future that may assist in lowering minerals levels and may be more practical than reverse osmosis techniques. EPA would like to encourage the inclusion of consideration of new minerals treatment techniques over the course of the EIP so that minerals can potentially undergo remediation in the future.
Response: According to Section 11 of the RADD, the RADD and related documents may be revised as necessary in the event that new treatment techniques and technologies become available.

Comment 35: 35a) In several locations the temporary minerals criteria that are being proposed are much higher than the maximum concentration of that parameter that had been measured in that creek over the past 12 years. EPA would recommend dividing some of these creeks into upstream and downstream sections to designate different criteria for those area more impacted by the mine versus those less impacted by the mine. This seems to be appropriate for Scull Creek upstream and downstream of Clearwater Lake, Cove Creek upstream and downstream of Chamberlain Creek, and Reyburn Creek upstream and downstream of Scull Creek.
35b) Also for some creeks, such as Rusher and Lucinda, a lower criteria than 500 mg/L TDS and 250 mg/L sulfate seems more appropriate as these creeks are not demonstrating concentrations this high. If the higher minerals criteria are anticipated due to the construction effort associated with the remediation project than perhaps the higher standard can be applied just during the construction period and then reduced to a lower value after the regrading/revegetating is complete.

Creek Sampling Site	Proposed TDS Criteria (mg/L)	Max TDS from 2000-2012 (mg/L)	Proposed Sulfate Criteria (mg/L)	Max Sulfate from 2000-2012 (mg/L)
RUS-1W	500	220	250	140
RUS-1E	500	280	250	190
RUS-0	500	230	250	160
LUC-0	500	82	250	72
COV-5	500	72	250	16
COV-4	500	84	250	21
COV-3	500	640	250	440
COV-2	500	1500	250	1050
COV-1	500	793	250	538
SCL-1	500	570	250	430
SCL-0	500	94	250	63
CRL-4S (mean)	500	100	250	62
CRL-4B (mean)	500	120	250	67
CRL-1S (mean)	500	110	250	63
CRL-1B (mean)	500	110	250	66
REY-3	500	400	250	230
REY-2	500	240	250	150

Response: 35a) ADEQ concurs that the steam segments not impacted by the mine and the associated remediation activities do not need to be included in the EIP. ADEQ will request HESI clarify that the EIP does not include those stream segments that are definitively outside the influence of the mine and remediation activities. ADEQ will request HESI provide further specification for where EIP reaches began. This will include but is not limited to Lucinda, Cove, and Scull creeks.
35b) At this time there are portions of the waterbodies surrounding the mine that do not appear to be influenced by the current drainage patterns. However, the facility cannot certify that certain waterbody reaches may not be temporally influenced by remediation activities. These stream reaches are included in EIP due to the potential for impact during remediation activities.

Comment 36: In several instances there are places where a maximum value is listed as less than a number and then an exact number is provided for the mean. This seems to imply that two different techniques were used to measure the concentration of this parameter over the years. Moving forward, as these streams continue to be monitored, a measurement technique that can provide an exact value rather than a less than value should be selected. Without an exact value, the effectiveness of the remediation cannot be appropriately assessed.
Response: ADEQ will coordinate with Halliburton to ensure that all analytical methods are conducted with low enough detection limits to provide adequate values for analysis. Additionally, there should be a concise method on the use of non-detect values when determining maximum values and means.

Comment 37: Is there any data for pH in Scull Creek? (pg. 39)
Response: Appendix E. page 41 of 46, page 43 of 46 have pH data for site SCL0. Additionally, ADEQ measures pH in Scull Creek quarterly and the data is available upon request.

Comment 38: Please explain why metals weren't assessed in Clearwater Lake? (pg. 40)
Response: Data from previous investigations are provided in Appendix E, including Clearwater Lake (page 33 and 34 of 46). Additionally, metals were not discussed in the EIP NOI since limits on metal discharge are not being altered in this rulemaking.

Comment 39: Is there any pH data for Reyburn Creek? (pg. 41)
Response: Appendix E. page 35 of 46, page 37 of 46 have pH data for sites REY1 and REY2. ADEQ measures pH in Reyburn Creek quarterly and the data is available upon request.

Comment 40: Are the bench sheets available for the WET testing that was performed? (pg. 42)
Response: The WET tests were conducted as part of an ADEQ and EPA cooperative project. EPA Houston lab did not provide ADEQ with bench sheets for these tests. ADEQ was provided with brief final reports which were forwarded to Karen Kesler on July 25, 2016.

Comment 41: In Table 3.8, on November 3, 2008 there is no value for percent mortality, but it is still marked as significantly different. How is it known that the results were significantly different if the data values are unknown? (pg. 43)
Response: The * in Table 3.8 is reflective of how EPA Region 6 Houston lab reported the data to ADEQ on page 4 of a12/5/08 report. Additionally, page 1 of the 12/5/08 report states:

Report Narrative
Ceriodaphnia dubia and Pimephales promelas:
After 24 hours, the test showed total mortality for both species of test organisms exposed to the Chamberlin Creek water sample tested (0811002-01).

Comment 42: The language indicating significance is inappropriate for the toxicity data tables. It states "*Significantly different ($p \geq 0.95$) from control." If the p value was greater than or equal to 0.95, than these values would not be significantly different; the p value should be less than 0.05 to indicate a statistically significant difference. After speaking to the EPA Houston Lab it appears that they are determining significance by observing data outside of the 95% confidence interval. This footnote should be corrected to appropriately indicate how significance was determined. (pg. 43)
Response: The footnote for Tables 3.8 and 3.9 are reflective of how EPA Region 6 Houston lab reported toxicity data to ADEQ. The Department will request EPA Houston Lab clarify "*Significantly different ($p \geq 0.95$) from control." when/if ADEQ receives 96 hour acute toxicity test data as part of future cooperative sampling projects.

Comment 43: In Table 3.9, please provide the bench sheets for the 3/23/2009 toxicity test. It is surprising that 47.5% mortality was not significantly different from the control. EPA would like to see the bench sheets to review the amount of variation between the samples and review the amount of mortality present in the controls. (pg. 43)
Response: The WET tests were conducted as part of an ADEQ and EPA cooperative project. EPA Houston lab did not provide ADEQ with bench sheets for these tests. ADEQ was provided with brief final reports which were forwarded to EPA Region 6 on July 25, 2016.

Comment 44: In section 3.3.1, please state when this fish sampling was conducted.
Response: Section 3.3 states that biological sampling of waterbodies occurred in April 2012. Specifically, fish sampling occurred April 25-26, 2012.

Comment 45: Please provide the lab sheets for the WET testing results presented in Table 5.1. The discharge monitoring reports (DMR) data appendix only provides the lab sheets for the water chemistry data and not for the WET testing. (pg. 50)
Response: The Department will request HESI submit the requested data if available.

Comment 46: During what years was the water treatment system operational? DMR values from Outfall 001 seem to indicate that it was operational from 2003 to 2012, but with various points of nonoperation within that time frame. Please indicate when the plant was and was not operational and why operation was suspended during this time.
Response: The facility was in operation from June 2003 until September 2012. The facility ceased operation in August 2013 and did not discharge again until August 2016. The Department has monthly DMR data for the June 2003 until September 2012 discharge period and notes the following periods of no discharge: August – October 2006, June – October 2008, August – November 2010, and August – October 2011. These periods are during the discharge period where "An extremely low flow rate of approximately 25-50 gpm of treater water may be discharged during the July-October period to improve water quality of Chamberlain and Cove Creek"

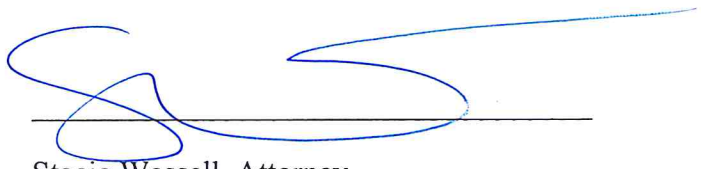
Comment 47: Was any chronic WET testing performed? If so, what were these results? The 2008 permit indicates that WET testing for growth for fathead minnows and reproduction for *Ceriodaphnia dubia* were supposed to be conducted. Please provide the results from that testing. (pg. 50)
Response: As part of the permit requirements, chronic WET testing was conducted using Fathead minnow and *C. dubia*. The Department has records for chronic (lethal and sub-lethal endpoints) WET tests conducted by the facility from June 2003 until August 2013. The facility ceased operation in August 2013 and did not discharge again until August 2016. A summary of the WET test data is available upon request.

Comment 48: Please also provide the minerals, pH, and metals DMR data for all of the WET tests performed while the plant was operational. Please include this data for tests where toxicity was and was not present. (pg. 50)
Response: The Department will request HESI submit the requested data if available.

Comment 49: Please justify why the secondary drinking water standards for TDS and sulfate are used as the criteria for Lucinda Creek, Rusher Creek, Scull Creek, Clearwater Lake, and Reyburn Creek when the most sensitive use is aquatic life. How are these criteria protective of aquatic life? (pg.55)
Response: The secondary drinking water standards are identical to the criteria in Reg. 2.511(C); 250, 250, 500 mg/L for chlorides, sulfates, and total dissolved solids, respectively. Waterbodies without site specific criteria listed in Reg. 2.511(A) are assessed against Reg. 2.511(C). The effectiveness of the criteria to protect aquatic life was evaluated in the SI and will be evaluated again in the EMP.

Comment 50: Please discuss what the anticipated time frame is for meeting metals and pH criteria.
Response: Metals criteria are not expected to be met site-wide until the remedial construction activities are complete. With the proposed schedule, that should be the year 2020. The EMP will be used to track progress towards the remedial action objectives and keep the project moving forward.

Submitted by:



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