UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1201 Elm Street, SUITE 500
DALLAS, TEXAS 75270

JAN 07 2020

Robert Blanz, P.E., Associate Director
Office of Water Quality
Arkansas Department of Environmental Quality
5301 Northshore Drive
Little Rock, AR 72118-5317

Re: Environmental Protection Agency action on final submittal of *Regulation No. 2: Regulation Establishing Water Quality Standards for Surface Waters of the State of Arkansas*, as amended by third party rulemaking initiated by Halliburton Energy Services/Dresser Industries

Dear Dr. Blanz:

The Environmental Protection Agency (EPA) has completed its review of the revisions to *Regulation No. 2: Regulation Establishing Water Quality Standards for Surface Waters of the State of Arkansas* that were made through Arkansas's Third-Party Rulemaking process as initiated by Halliburton Energy Services Inc./Dresser Industries for its Magcobar Mine Site. The revisions to Regulation No. 2 were adopted by the Arkansas Pollution Control and Ecology Commission August 25, 2017. These revisions were submitted to the EPA on November 30, 2018 by the Arkansas Department of Environmental Quality (ADEQ).

The Halliburton Energy Services Inc. rulemaking was based on implementing provisions in Regulation 2.105 and Appendix B, Environmental Improvement Project (EIP). At this time EPA is acting on the new and revised provisions to Regulation 2, including the site-specific criteria changes, adopting site-specific criteria for chloride, sulfate and total dissolved solids (TDS) applicable to multiple waters in the Ouachita Mountain and Gulf Coastal Ecoregions, including Scull Creek, Reyburn Creek, Rusher Creek, Lucinda Creek, Chamberlain Creek and Cove Creek. These revisions are approved pursuant to the Clean Water Act (CWA) § 303(c) and its implementing regulations at 40 CFR Part 131 for the 12.3-year duration of the EIP consistent with Caleb Osborne's November 30, 2018 letter. The EPA anticipates that ADEQ will evaluate the need for a Tier 2 review to determine if the use of assimilative capacity for chloride, sulfate and TDS is appropriate during the NPDES permitting process.

The EPA is approving this third-party rule based upon a weight-of-evidence approach using water quality, biological, and toxicity testing data, as well as data in published literature. We look forward to working with you and your staff to implement ADEQ's 2017 Mineral Criteria Development Strategy to improve the state's current 95th percentile methodology and third-party rulemaking process.

The EPA encourages third party rulemaking proponents and the ADEQ to align future EIP-based WQS submissions with the EPA's federal variance regulations at 40 CFR 131.14.
40 CFR 131.14(b)(2)(i)(A)(2) is specifically tailored to allow a temporary downgrade of the designated use and criterion where "*Actions necessary to facilitate lake, wetland, or stream restoration through dam removal or other significant reconfiguration activities preclude attainment of the designated use*

and criterion while the actions are being implemented." Close alignment with federal regulations for future submissions would likely expedite EPA's review significantly.

The approval of new and revised water quality standards is subject to the results of consultation under section 7(a)(2) of the Endangered Species Act (ESA). Section 7(a)(2) of the ESA requires that federal agencies consult with the U.S. Fish and Wildlife Service (Service), as appropriate, to ensure that actions they take, fund, or authorize are not likely to jeopardize the continued existence of listed species or result in the adverse modification or destruction of habitat. That consultation has been concluded with the Service's acknowledgement that EPA's approval of the revised criteria will have no effect on threatened and endangered species or critical habitat through email correspondence dated May 20, 2019.

I appreciate the Commission's and the ADEQ's effort in supporting the review of these revised provisions of State standards. If you have any questions or concerns, please contact me at 214-665-8138, or contact Richard Wooster at 214-665-6473 or wooster.richard@epa.gov.

Sincerely,

Charles W. Maguire.
Director
Water Division

Enclosures

cc: Joe Martin, Water Quality Planning, Office of Water Quality

TECHNICAL SUPPORT DOCUMENT

EPA REVIEW OF SITE-SPECIFIC CRITERIA REVISION TO *REGULATION 2:* HALLIBURTON ENERGY SERVICES, INC. DRESSER INDUSTRIES-MAGCOBAR FORMER MINE SITE OF AN ENVIRONMENTAL IMPROVEMENT PROJECT

Revisions Adopted by the Arkansas Pollution Control and Ecology Commission Modifying Water Quality Standards for Chloride, Sulfates and Total Dissolved Solids for Chamberlain Creek, Cove Creek, Lucinda Creek, Rusher Creek, Reyburn Creek and Scull Creek

U.S. EPA REGION 6
WATER DIVISION
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Summary of EPA's Action

The Environmental Protection Agency (EPA) acknowledges a degree of uncertainty remains regarding the derivation and basis for the revised site-specific criteria it is acting on today. However, in light of the currently evolving science on minerals and their impact on aquatic life, the confounding factors of multiple pollutants at this site which may affect aquatic life, and the EPA's intent to support the State of Arkansas's Environmental Improvement Project (EIP) process and this particular EIP project, the EPA considers the site-specific criteria revisions proposed by the State of Arkansas (as listed below) to be generally consistent with the Clean Water Act (CWA) Section 101(a)(2) objective of restoring the integrity of the nation's waters. Therefore, EPA is approving on a temporary basis revised site-specific criteria for the following waters in the Ouachita Mountain Ecoregion and Gulf Coastal Ecoregion pursuant to Sec. 303(c) of the CWA. These temporary site-specific criteria are approved for a period of 12.3 years from the date of this approval consistent with the timeline specified in ADEQ's November 30, 2018 letter for the EIP project. The EPA's concerns, as discussed below, regarding the underlying scientific basis for temporary revision of these site-specific minerals criteria are ameliorated by the ADEQ's position as stated in its November 30, 2018, letter that the revised criteria shall apply only as long as the EIP is being implemented and that upon completion of the EIP, the applicable criteria will revert to the previously approved Ecoregion Reference Stream Values (see Reg. 2.511(B)) [12.3 years from date of this approval]:

Ouachita Mountain Ecoregion
Temporary Site-Specific Water Quality Criteria Supporting Environmental Improvement Project

- Chamberlain Creek from headwaters to confluence with Cove Creek
  - Sulfates 1,384 mg/L; Total Dissolved Solids 2,261 mg/L; Chlorides 68 mg/L (OM-2, #1**)**
- Cove Creek from the confluence with Chamberlain Creek to the Ouachita River
  - Sulfates 250 mg/L; Total Dissolved Solids 500 mg/L (OM-2, #2)
- Lucinda Creek from the confluence of Rusher Creek to the confluence with Cove Creek
  - Sulfates 250 mg/L; Total Dissolved Solids 500 mg/L (OM-2, #3)
- Rusher Creek from the confluence of the East and West Forks to confluence with Lucinda Creek
  - Sulfates 250 mg/L; Total Dissolved Solids 500 mg/L (OM-2, #4)

Gulf Coastal Ecoregion
Temporary Site-Specific Water Quality Criteria Supporting Environmental Improvement Project

- Reyburn Creek from headwaters to confluence of Francois Creek
  - Sulfates 250 mg/L; Total Dissolved Solids 500 mg/L (GC-4, #2)
- Scull Creek from a point approximately 350 feet upstream of Clearwater Lake to Clearwater Lake (including Clearwater Lake) and from Clearwater Lake dam to confluence Reyburn Creek
  - Sulfates 250 mg/L; Total Dissolved Solids 500 mg/L (GC-4, #3)

I. Introduction

As described in § 303(c) of the Clean Water Act (CWA) and in the water quality standards regulations within the Code of Federal Regulations (CFR) at 40 CFR Part 131, states and authorized tribes have primary responsibility to develop and adopt water quality standards to protect their waters, and to submit adopted standards to the Environmental Protection Agency (EPA) for review. State and tribal water quality standards consist of three primary components: designated uses, criteria to support those uses, and an antidegradation policy.

Under 40 CFR § 131.21, the EPA reviews new and revised surface water quality standards adopted by states and authorized tribes based on the requirements of the Act as described at 40 CFR §§ 131.5 and 131.6. Authority to approve or disapprove new and/or revised standards submitted to EPA Region 6 for review has been delegated to the Water Division Director. Tribal or state water quality standards are not considered effective for CWA purposes until approved by EPA.

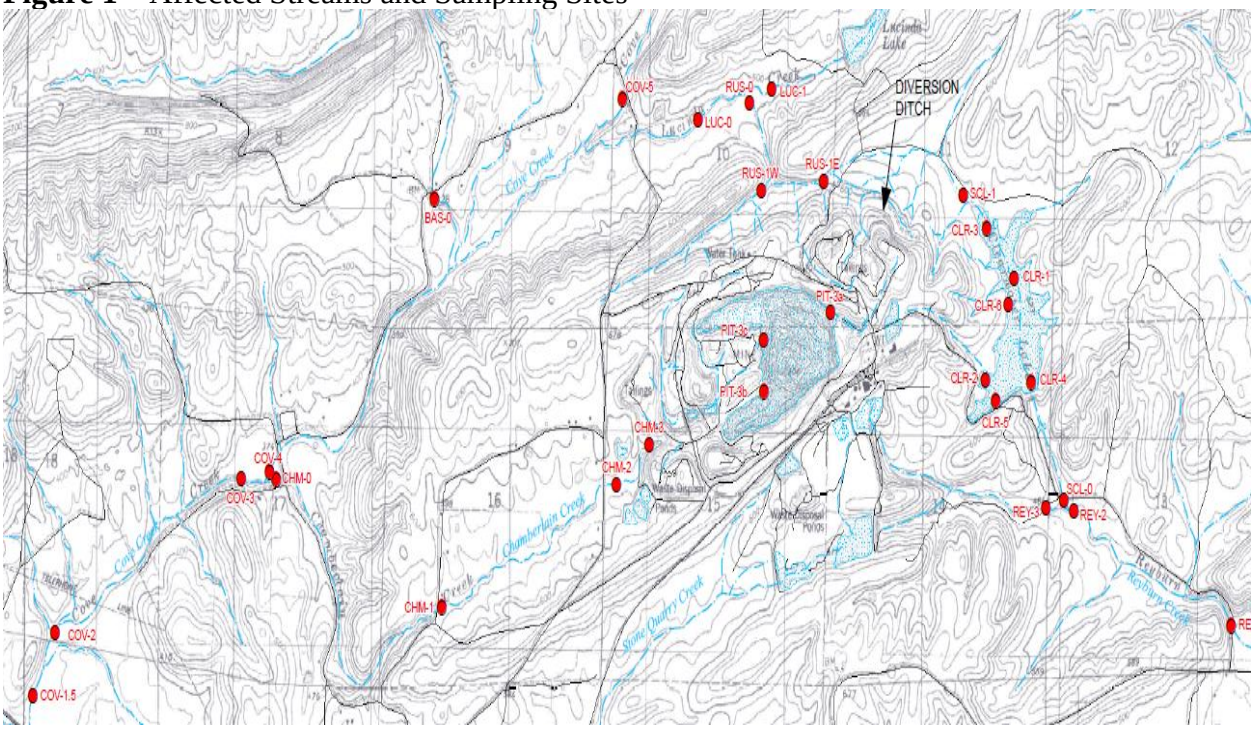
The purpose of this Technical Support Document (TSD) is to describe the basis for EPA's action on amendments to Regulation No. 2: *Regulation Establishing Water Quality Standards for Surface Waters of the State of Arkansas* adopted by the Arkansas Pollution Control and Ecology Commission (APC&EC or Commission). These amendments are described below.

Summary of Revised Provisions

Pursuant to the above cited Regulation No. 2 (Regulation 2), the Arkansas Department of Environmental Quality (ADEQ) submitted to EPA by letter dated August 31, 2017 temporary revised site-specific water quality criteria for chloride, sulfates and total dissolved solids (TDS) that were adopted by APC&EC via Minute Order No. 17-22.

The revisions to Regulation 2 include temporary site-specific minerals criteria - chloride, sulfate and total dissolved solids (TDS) - applicable to Chamberlain Creek from its headwaters to its confluence with Cove Creek; Cove Creek from its confluence with Chamberlain Creek to the Ouachita River; Lucinda Creek from its confluence with Rusher Creek to its confluence with Cove Creek; Rusher Creek from its confluence with the East and West Forks to its confluence with Lucinda Creek; Reyburn Creek from its headwaters to its confluence with Francois Creek; Scull Creek from a point approximately 350 feet upstream of Clearwater Lake to Clearwater Lake (including Clearwater Lake); and, Scull Creek from Clearwater Lake dam to its confluence with Reyburn Creek. See **Figure 1**.

Figure 1 – Affected Streams and Sampling Sites



II. Background

EIP Approach, Site Description and Background

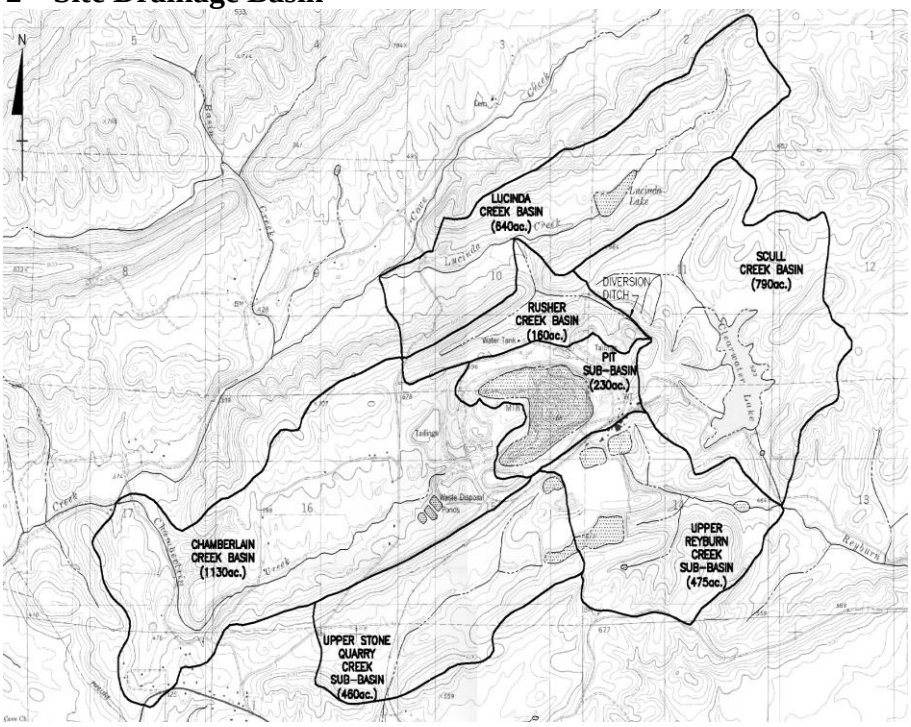
Arkansas's Regulation 2.105 provides a process that allows the Commission to grant temporary modifications to the state's water quality standards to allow for completion of long-term Environmental Improvement Projects (EIP). In Regulation 2, Appendix B contains statutory language describing the intent and requirements for an EIP. The EIP process preserves the state's ability to establish water quality standards while allowing and encouraging private entities to engage in closed or abandoned mine site remediations that would likely extend beyond the three-year limit for temporary variances to water quality standards currently provided in Regulation 2.309, Temporary Variance. EPA supports restoration of the nation's waters consistent with the objectives of the Clean Water Act (CWA), however, EPA notes the EIP process does not provide flexibility to temporarily downgrade a designated use while the remediation actions are being implemented. The EPA recommends that ADEQ update its water quality standards to ensure consistency with the federal variance provision at 40 CFR § 131.14. EPA notes that if ADEQ amends section 2.309 as currently planned to remove the three-year limit on temporary variances, the EIP provision in Appendix B of Regulation 2 might be unnecessary.

The Halliburton Energy Services, Inc. (HESI) Dresser Industries - Magcobar Mine Site (Magcobar Mine Site or Magcobar Site), where the EIP is being implemented, is a former barite mine and milling operation which was actively mined from 1939 to 1977. The Magcobar Site lies on the divide between the Ouachita River and Saline River basins and is located between the

Ouachita Mountains and the Coastal Plain ecoregions. Surface water from the Magcobar Site consists of two regional drainage basins associated with the Ouachita and Saline Rivers. These two basins are comprised of five topographically elevated drainage basins (**Figure 2**) that can be grouped based on their flow from and around the Pit Lake and main spoil piles. The surface waters considered here include all off-Site streams that flow from the Magcobar Site area. These include Scull Creek, which flows into Reyburn Creek. Reyburn Creek then flows into Francois Creek and ultimately into the Saline River. Also included are Rusher Creek, Lucinda Creek, and Chamberlain Creek, which flow to Cove Creek, which flows to the Ouachita River. The waters in these basins have been described as intermittent, except for Reyburn Creek and Cove Creek, which are perennial.

Most of the mine spoil is present in the Chamberlain Creek/Pit Lake watershed, with small amounts in the Rusher and Scull creek watersheds (Newfields Site Investigation Report, 2007). A made-made diversion from the northeast spoil piles directs runoff away from Rusher Creek to the Scull Creek watershed. Tailing impoundments are present in the Reyburn Creek watershed and to a much smaller extent, the Stone Quarry Creek watershed. Following cessation of mining and active dewatering activity, Pit Lake has filled with approximately 4.35 billion gallons of acid rock drainage (ARD) which results in low pH surface water and shallow ground water with high concentration of metals (including aluminum, manganese and zinc) as well as elevated concentrations of chloride, sulfate and total dissolved solids (TDS). The production of ARD and its subsequent migration to adjacent streams and groundwater are the primary environmental issue at the Magcobar Mine Site.

Figure 2 – Site Drainage Basin



An Administrative Settlement between ADEQ and HESI provides for interim remedial measures that were implemented from 2000 to 2003, including the construction of levees and a water

treatment system to allow a controlled discharge from the mine pit to Cove Creek via Chamberlain Creek. In 2003, ADEQ issued a Consent Administrative Order (CAO) LIS 03-061 allowing discharge by the wastewater treatment system (WTS) under the National Pollutant Discharge Elimination System (NPDES) Permit No. AR0049794 to Chamberlain Creek. The permit sets discharge limitations for several metals as well as minerals based on a hydrographically controlled discharge to Chamberlain Creek (based on flow in Cove Creek). State-issued permits may be more stringent but must comply with federal laws and regulations. 40 CFR 122.44(d)(1) requires NPDES permits to achieve water quality standards established under §303 of the CWA.

III. Revisions Submitted for EPA Review

In its September 20, 2017 letter to EPA, ADEQ provided revisions to Regulation 2 adopted by the Commission pursuant to Arkansas's EIP process. The EIP provision language in Regulation 2 refers to water quality standard modifications that apply both during and post-project to ensure that the post-project water quality standards are met as soon as reasonably practicable. The ADEQ submission letter references adoption of "temporary standards" for sulfates and TDS for portions of Chamberlain Creek, Cove Creek, Lucinda Creek, Rusher, Reyburn Creek and Scull Creek. A follow-up letter from ADEQ dated November 30, 2018 (see attached), also characterizes the revised site-specific criteria as temporary. Although not referred to in the ADEQ submission letter, Regulation 2 also includes a chloride criterion specific to Chamberlain Creek in addition to sulfate and TDS as identified in **Tables 1** and **2**.

Responding to EPA's request for additional information concerning the State's characterization of the site-specific revisions as "temporary" standards, ADEQ provided the subsequent November 30, 2018 letter referring to supporting documents currently in the record. EPA has considered both ADEQ's initial submission and the additional supporting documents provided to EPA subsequent to the original submission. Although the original submission does not specify a duration for the EIP, ADEQ's subsequent letter specifying a duration and the original supporting documents indicate that it was the state's intent for the revised site-specific criteria to be temporary.

Table 1. Existing ecoregion reference criteria and submitted temporary site-specific water quality criteria for Ouachita Mountain Ecoregion streams

Stream Reach	Ecoregion Reference Criteria			Revised Criteria		
	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)
Rusher Creek from the confluence of the East and West Forks to confluence with Lucinda Creek	6	15	128	No change	250	500
Lucinda Creek from the confluence of Rusher Creek to the confluence with Cove Creek	6	15	128	No change	250	500
Chamberlain Creek from headwaters to confluence with Cove Creek	6	15	128	68	1,384	2,261
Cove Creek from confluence with Chamberlain Creek to the Ouachita River	6	15	128	No change	250	500

Table 2. Existing ecoregion reference criteria and submitted temporary site-specific water quality criteria for criteria for Gulf Coastal Ecoregion streams.

Stream Reach	Ecoregion Reference Criteria			Revised Criteria		
	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Chloride (mg/L)	Sulfate (mg/L)	TDS (mg/L)
Scull Creek from a point approximately 350 feet upstream of Clearwater Lake to Clearwater Lake (including Clearwater Lake) and from Clearwater Lake dam to confluence with Reyburn Creek	14	31	123	No change	250	500
Reyburn Creek from headwaters to confluence with Francois Creek	14	31	123	No change	250	500

Summary descriptions of the relevant waterbodies' physical characteristics, water quality as it relates to revised site-specific criteria, and aquatic community including periphyton, macroinvertebrate and fish are included in source materials considered by the State in its rulemaking record. Avian and terrestrial species are also discussed in such source documents. The following tables further summarize ecoregion reference criteria, proposed temporary site-specific criteria, and monitoring data for those parameters and waters subject to the EPA's approval action.

Table 3. Summary of Rusher Creek water quality monitoring data

Ecoregion Reference Criteria		Revised Criteria		Statistic	Existing Condition/Sulfate			Existing Condition/TDS		
Sulfate (mg/L)	TDS (mg/L)	Sulfate (mg/L)	TDS (mg/L)		RUS-1W	RUS-1E	RUS-0	RUS-1W	RUS-1E	RUS-0
15	128	250	500	Min	120	110	23	150	200	44
				Mean	115.7	146.7	87	193.3	245.3	138
				Max	140	190	160	220	280	230

Table 4. Summary of Lucinda Creek water quality monitoring data

Ecoregion Reference Criteria		Revised Criteria		Statistic	Existing Condition/Sulfate	Existing Condition/TDS
Sulfate (mg/L)	TDS (mg/L)	Sulfate (mg/L)	TDS (mg/L)		LUC-O	LUC-0
15	128	250	500	Min	17	36
				Mean	30	53
				Max	72	82

Table 5. Chamberlain Creek water quality monitoring data, 2000 to 2012

Ecoregion Reference Criteria	Revised Criteria	Statistic	Existing Condition			
			CHM-3	CHM-2	CHM-1	CHM-0
Chloride 6 mg/L	68 mg/L	Min	1.1	1.1	2.0	0.51
		Mean	4.3	28	21	22
		Max	11	69	57	129
Sulfate 15 mg/L	1,384 mg/L	Min	2,010	<0.04	180	38
		Mean	2,605	1,377	739	635
		Max	3,200	3,730	1,350	1,380
TDS 128 mg/L	2,261 mg/L	Min	2,510	790	304	210
		Mean	3,837	2,078	1,062	973
		Max	5,000	4,800	1,970	2,100

IV. EPA's Evaluation of the Revised Criteria

The EPA recognizes the long-lasting impacts of past mining at the Magcobar Mine Site and the potential duration of related remediation activities that may be needed pursuant to the EIP for the site. During site remediation, the concentration of minerals in waterbodies addressed by the site-specific criteria revisions may increase significantly, and these high concentrations may persist for several years following active remediation. In its Responsive Summary, HESI agreed with EPA's prior comments that it would be helpful to identify in more detail the stream reaches to which the then-proposed criteria would apply, HESI noted that it cannot predict the exact location or to what magnitude increases in minerals concentrations will be observed in response to remediation activities (see attached).

As noted above, the State's EIP process does not provide for the temporary downgrade of designated uses during remediation activities. Since Arkansas has not downgraded the designated use for any of the waterbodies subject to the revised site-specific minerals criteria, EPA must determine if the revised criteria protect the most sensitive designated use, in this case aquatic life. Based upon the technical documentation provided by the state in support of the EIP and revised criteria, EPA evaluated the physical characteristics, water quality and the aquatic communities for Scull Creek, Reyburn Creek, Rusher Creek, Lucinda Creek, Chamberlain Creek, and Cove Creek. The technical documentation indicates low pH and ARD from direct inflow, surface runoff and/or impacted groundwater infiltration (depending on the proximity to the spoil piles and sludge ponds on the Magcobar Site) that directly affect aquatic life in some or all reaches of these waters. Low pH and several metals resulting in ARD are identified as contaminants of potential concern (COPCs) in these waters, including Cove Creek below the confluence with Chamberlain Creek. Although levels of chloride, sulfate and TDS that occur in the affected reaches may have an adverse impact on aquatic life, these contaminants are not identified as COPCs for either on or off-site waters. Available documentation does not provide specific analyses of the effect these mineral contaminants may have on aquatic life use or a comparison of biotic condition to unimpacted reference sites.

Chamberlain Creek

The revised site-specific criteria for Chamberlain Creek include chloride, sulfate and TDS (**Table 1**). These criteria were derived using the level of dissolved minerals in treated Pit Lake water, which reflects effluent data, not conditions in Chamberlain Creek or potential downstream effects in Cove Creek. EPA notes that the ADEQ based these revised site-specific criteria on the 95th percentile of effluent monitoring data corresponding to biomonitoring sampling events between June 2003 through June 2012, which exhibited no toxicity to *Ceriodaphnia dubia* and *Pimephales promelas*. The critical dilution used for each test was 100% treated effluent.

The EPA recognizes that the science surrounding minerals toxicity is evolving. 40 CFR 131.11(a)(1) requires states to adopt water quality criteria based on a sound scientific rationale that protects the most sensitive designated use. Arkansas's approach to developing site-specific criteria based on Reg. 2.303, Reg. 2.306 and guidance in the state's Continuing Planning Process (2000) document has resulted in 3rd party proponents relying on the 95th percentile of instream mineral conditions to derive criteria without extensive discussion of how the derived criteria

protect aquatic life. Criteria that are revised should be based on least-impacted reference conditions (USEPA, 1983 and 1989). EPA recommends any site-specific criteria that have been derived using this approach be re-evaluated in the near future based on advances in scientific understanding of ionic toxicity.

Although EPA has approved previous 3rd party rulemakings that include site-specific criteria based on the 95th percentile approach[1], EPA generally relies upon a weight-of-evidence approach when determining that the most sensitive designated use would be protected for each rulemaking, independent of prior action. The revised site-specific criteria for Chamberlain Creek were derived based on the 95th percentile of Whole Effluent Toxicity (WET) data for Pit Lake. The EPA has previously relayed and herein reiterates concerns to ADEQ regarding use of the 95th percentile of instream mineral criteria where there has been limited consideration of comparative reference streams.

Comparison of summary data from the upstream monitoring stations on Cove Creek to those below the confluence with Chamberlain Creek give an indication of the effect that impacted groundwater and high mineral concentrations passing through in the WTS discharge have on Cove Creek. Periphyton in upstream stations appear to be primarily impacted by flow. Below the confluence with Chamberlain Creek, there is a shift to species known to be tolerant of acidic conditions. Benthic taxa richness showed the most significant change, with richness two to three times greater upstream as compared with data from below the confluence across all sampling dates. High fish counts, and the number of species represented were reported upstream. However, below the confluence the total number of fish declines significantly, and number of species is lower as well. Although high flow events may have had some influence, recolonization appears to be low, suggesting inflow from Chamberlain Creek has an effect on the aquatic community below its confluence with Cove Creek.

In considering whether the revised site-specific criteria are protective of the most sensitive use in Chamberlain Creek, EPA considered the physical and biological conditions and anthropogenic contamination. As noted previously, Chamberlain Creek is intermittent and fed by small braided streams draining the western Spoil Area and the Pit Lake impoundment on the Magcobar Site, but most of the flow in the creek comes directly from the WTS. The biological data for Chamberlain Creek indicates that periphyton are potentially impacted, showing a shift below the WTS discharge to species more tolerant of acidic habitats. Benthic taxa richness was generally low throughout Chamberlain Creek. Summary data suggest impacts below the WTS discharge. However, based on the available data, EPA could not with certainty determine whether those impacts are due to ionic toxicity, low pH, or metals. Both the number of taxa and % EPT taxa improve further downstream.

Biological data indicate that aquatic life in both Chamberlain and Cove Creeks is adversely impacted under current conditions. Although the current NPDES permit requires the WTS to treat Pit Lake water by adjusting the pH and treating dissolved metals, it does not appear to require minerals to be treated by the WTS. Thus, they are likely to continue to remain elevated in

[1] EPA August 9, 2018 approval of site-specific criteria for portions of the White River downstream of Fayetteville, AR.

Chamberlain and Cove Creeks during the period of time covered by the temporary site-specific criteria.

Given that site-specific criteria for Chamberlain Creek are based on effluent toxicity data, rather than in-stream conditions, the submittal did not include a robust demonstration that the revised criteria are fully protective of aquatic life.

Rusher, Lucinda, Cove, Scull, and Reyburn Creeks

In-stream sampling data for Rusher Creek, Lucinda Creek, Cove Creek, Scull Creek and Reyburn Creek indicate a significant variation in the range of sulfate and TDS concentrations at individual monitoring stations, depending on the monitoring station proximity to spoil piles, settling and sludge ponds, related groundwater inflow and in-stream flow from sources like the WTS discharging to Chamberlain Creek. The revised criteria (250 mg/L sulfate and 500 mg/L TDS) for Rusher Creek, Lucinda Creek, Cove Creek, Scull Creek and Reyburn Creek are based on the EPA's secondary drinking water standards for TDS and sulfate (EPA 2009). These criteria are higher than measured ambient conditions for many reaches within these waters and lower than ambient conditions for others (**Tables 3-8**). Using Cove Creek as an example, **Table 6 s**hows that sulfate concentrations just above the confluence with Chamberlain Creek (COV-4) ranged from 7.8 to 21 mg/L, only slightly exceeding the Ecoregion Reference criteria for this stream. However, downstream of the Chamberlain Creek confluence (COV-3), the concentration range increased to 14 to 440 mg/L. Still further downstream (COV-2), sulfate concentrations continued to increase significantly, up to 1,050 mg/L. There have been observed negative shifts in species abundance and richness in the diatom assemblage, as well as negative shifts in invertebrate taxa richness over time. Observations of the fish community also exhibit slow and marginal recolonization, indicating a shift in water quality in Cove Creek. Similar disparities can be seen for Scull and Reyburn Creeks in **Tables 7** and **8**.

Table 6. Cove Creek water quality monitoring data, 2000 to 2012

Ecoregion Reference Criteria	**Revised Criteria**	**Statistic**	**Existing Condition/Sulfate**				
Sulfate (mg/L)	**Sulfate (mg/L)**		**COV-5**	**COV-4**	**COV-3**	**COV-2**	**COV-1**
15	250	**Min**	3.5	7.8	14	>0.2	7.8
		Mean	5.5	11	155	173	117
		Max	16	21	440	1050	538
			Existing Condition/TDS				
TDS (mg/L)	**TDS (mg/L)**		**COV-5**	**COV-4**	**COV-3**	**COV-2**	**COV-1**
128	500	**Min**	20	24	62	36	46
		Mean	34	48	253	281	206
		Max	72	84	640	1,500	793

Table 7. Scull Creek WQ monitoring data, 2000 to 2012, Clearwater Lake 2002

Ecoregion Reference Criteria		Revised Criteria			Existing Condition/Scull Creek			
Sulfate (mg/L)	TDS (mg/L)	Sulfate (mg/L)	TDS (mg/L)	Statistic	SCL-1		SCL-0	
31	123	250	500		Sulfate (mg/L)	TDS (mg/L)	Sulfate (mg/L)	TDS (mg/L)
				Min	5	33	10	50
				Mean	179	265	32	74
				Max	430	570	63	94
					Existing Condition/Clearwater Lake April 2002			
Sulfate (mg/L)	TDS (mg/L)	Sulfate (mg/L)	TDS (mg/L)	TDS (mg/L)	CLT-3		CLT-4	
31	123	250	500	Sulfate	100		520	
				TDS	150		890	

Table 8. Reyburn Creek water quality monitoring data, 2000 to 2012

Ecoregion Reference Criteria	Revised Criteria	Statistic	Existing Condition/Sulfate	
Sulfate (mg/L)	Sulfate (mg/L)		REY-3	REY-2
31	250	Min	120	50
		Mean	157	91
		Max	230	150
			Existing Condition/TDS	
TDS (mg/L)	TDS (mg/L)		REY-3	REY-2
123	500	Min	180	94
		Mean	258	159
		Max	400	240

The EIP process outlined in Appendix B of Regulation 2, Section 4(a) requires any temporary site-specific criteria to ensure CWA Section 101(a)(2) uses are maintained and fully protect the aquatic life designated use. In 2015, EPA finalized an update to federal regulations that included a new provision for water quality standards variances, which allow for a time-limited lowering of a designated use and corresponding criterion or criteria. EPA encourages ADEQ to finalize the currently proposed update to its temporary variance provision at 2.309 to bring it into conformance with federal water quality standards variance regulations at 40 CFR 131.14 and remove the three-year time restriction. EPA also recommends that ADEQ petition the state legislature to repeal the EIP process in Appendix B since it will be redundant with and superseded by the updated temporary variance provision.

The EPA also recommends that in future site-specific criteria revisions and temporary variances, revised criteria be more specifically tailored to distinguish among stream subsegments that are more versus less impacted. Using the Magcobar Site as an example, this may 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. Also, for some creeks, such as Rusher and Lucinda, criteria based on existing conditions would better represent the highest attainable criteria given that these creeks are currently exhibiting lower concentrations for sulfate and TDS than the secondary drinking water MCLs.

EPA is currently evaluating the science around ion toxicity as it continues to emerge. Ion toxicity is not solely dependent on an individual ion's magnitude; rather, the *in-situ* ion composition of the waterbody may have unique interacting effects, specific to individual taxa. These factors make it difficult to evaluate the protectiveness of the revised site-specific criteria. As a result, EPA's determination was based on weight-of-evidence; in-stream water quality, biological, and toxicity testing data; and, the intent of the EIP project in the context of CWA objectives. In future situations where a discharger seeks relief from mineral criteria, EPA strongly encourages the state to consider all relevant information and studies on ion toxicity as it becomes available.

V. EPA Recommendations

In 1998, EPA's approval of amendments to § 2.105 (Environmental Improvement Projects and Appendix B) noted that these provisions could be susceptible to application inconsistent with the CWA and that EPA would review all projects on a case-by-case basis. At that time EPA encouraged the Commission and ADEQ to work with Region 6 to develop appropriate implementation measures and to incorporate objective decisional criteria for these provisions in the authorizing provision and Appendix B.

While the intent of the EIP provision is generally consistent with the CWA Section 101(a)(2) objective (e.g., to restore and maintain the integrity of the nation's waters), those concerns EPA has identified with the submitted temporary site-specific criteria for the Magcobar Mine site could be addressed in future long-term environmental remediation projects by relying on EPA's federal variance regulations at 40 CFR 131.14, which is tailored for situations such as a remediation project to allow a temporary downgrade of the designated use and criterion. 40 CFR 131.14(b)(2)(i)(A)(2) allows for a federal variance where "*Actions necessary to facilitate lake, wetland, or stream restoration through dam removal or other significant reconfiguration activities preclude attainment of the designated use and criterion while the actions are being implemented*." 40 CFR 131.14(b)(1)(ii) notes that federal variances "*shall not result in any lowering of the currently attained ambient water quality, unless a WQS variance is necessary for restoration activities, consistent with paragraph (b)(2)(i)(A)(2) of this section*."

The EPA encourages ADEQ to adopt revisions to Regulation 2 currently being considered which would allow for federal water quality standards variances in accordance with 40 CFR 131.14. A summary of the requirements for federal water quality standard variances can be found in EPA's "Checklist For Evaluating State Submission Of Discharger-Specific Water Quality Standards Variances", available online at https://www.epa.gov/sites/production/files/2016-03/documents/checklist-evaluating-discharger-specific.pdf. EPA has also developed a variance building tool to help states territories, and authorized tribes determine whether a WQS variance is an appropriate tool for a particular situation and, if so, help the entity navigate the requirements at 40 CFR Part 131.14. The variance building tool is available online at https://www.epa.gov/wqs-tech/water-quality-standards-variance-building-tool.

EPA also recommends that ADEQ consider amending Regulation 2 per ADEQ's 2017 Mineral Criteria Development Strategy to adopt tiered aquatic life uses, and/or to allow for the adoption of sub-categories of the aquatic life use, where that is supported by a use attainability analysis.

Doing so could facilitate potentially appropriate downgrading of the aquatic life use without necessitating its removal if, as predicted, following the remediation project the ecoregional minerals criteria cannot be attained based on one of the factors at 40 CFR 131.10(g) but some limited aquatic life use can be attained.

VI. Antidegradation Requirements

Federal regulations require states to develop antidegradation implementation methods for the antidegradation policy that are, at a minimum, consistent with the state's policy and with 40 CFR 131.12(a). Neither Regulation 2 nor the state's Continuing Planning Process (CPP) document (2000) currently contain implementation methods for the state's antidegradation policy consistent with federal regulations. It is EPA's understanding that ADEQ is working to develop implementation methods and will likely incorporate methods in the next iteration of its CPP. It is important to note that the state is required to provide an opportunity for public involvement during the development of, and during any subsequent revisions of, the state's implementation methods and that the final version of the implementation methods must be available to the public. See 40 CFR 130.5(b)(6) and 40 CFR 131.12(b). While not required for EPA's approval of the state's revised site-specific criteria for Scull Creek, Reyburn Creek, Rusher Creek, Lucinda Creek, Chamberlain Creek and Cove Creek, the development of these implementation methods is critical for the proper implementation of the site-specific criteria that the state has adopted.

Antidegradation is an integral part of a state's or tribe's water quality standards, as it provides important protections that are critical to the fulfillment of the CWA objective to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. The federal regulations outline requirements for three tiers of antidegradation protection: protection for existing uses (Tier 1), protection for high quality waters (Tier 2), and protection for outstanding national resource waters (Tier 3). Antidegradation is broadly applicable to all pollutant sources, all water bodies, and at all times, but it is most commonly triggered through activities that could lower water quality and are regulated. No permit may be issued, without an antidegradation review, to a discharger to high-quality waters with effluent limits greater than actual current loadings if such loadings will cause a lowering of water quality (USEPA, 1989). The antidegradation review will assure that the applicable level of protection is being provided to that water body. Tier 1 protection is applicable to all waters of the U.S. and requires the protection of existing uses. Tier 2 protection applies to water bodies that are "high quality", which is a water body where the quality of the water exceeds levels necessary to support the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water.

Water quality data from the Magcobar Site WTS effluent, along with physical, chemical, and biological data from representative stream locations in the Saline and Ouachita River watersheds establish the baseline conditions for those waters included in this EIP which should be used for the purpose of an antidegradation review. The revised criteria for Scull Creek, Reyburn Creek, Rusher Creek, Lucinda Creek and Cove Creek were in some cases higher than ambient conditions, which suggests that assimilative capacity may be available on these waterbodies.

Where water quality is better than the levels necessary to support the CWA Sec. 101(a)(2) uses, the state must conduct a Tier 2 antidegradation review, including an analysis of alternatives, to find that a lowering of high-water quality is "necessary to accommodate important economic or social development in the area in which the waters are located." The EPA anticipates that ADEQ will evaluate the need for a Tier 2 antidegradation review as required by 40 CFR 131.12(a)(2)(i) to evaluate the use of assimilative capacity in allowing discharges of chloride, sulfate and TDS during the NPDES permitting process. The full requirements of a Tier 2 review can be found at 40 CFR 131.12(a)(2).

VII. Endangered Species Act Consultation

The approval of new and revised water quality standards is subject to the results of consultation under section 7(a)(2) of the Endangered Species Act (ESA). Section 7(a)(2) of the ESA requires that federal agencies consult with the U.S. Fish and Wildlife Service (USFWS), as appropriate, to ensure that actions they take, fund, or authorize are not likely to jeopardize the continued existence of listed species or result in the adverse modification or destruction of habitat. Species lists provided through the USFWS's Environmental Conservation Online System/Information for Planning and Consultation (ECOS/IPaC) site for the affected waters within the action area identified nine federally threatened or endangered species. Of these, six are aquatic species (mussels) and have the potential to be affected by this action. There is no designated critical habitat in the action area for any species.

The EPA coordinated with and sought the advice of the USFWS Conway Field Office on this matter. The EPA was not able to obtain any reasonably available scientific information that confirmed the presence of any federally threatened or endangered mussels at the Magcobar Mine Site or in the off-site waters to which the criteria apply. Based on current and long-term water quality in these affected waters indicating low pH, there is a strong possibility that these mussels have been extirpated within the action area, particularly in the ephemeral to intermittent off-site headwaters near the mine and those streams further away with perennial flow. Given the information stated above, EPA has determined that approval of these site-specific criteria will have no effect on threatened and endangered species or critical habitat.

VIII. Literature Cited

ADEQ. 2000. State of Arkansas Continuing Planning Process, Update and Revisions. Arkansas Department of Environmental Quality. January 2000.

ADEQ. 2000. "Administrative Settlement LIS 00-126." Arkansas Department of Environmental Quality. July 2000.

ADEQ 2008, 2010, 2012, 2014 and 2016. Arkansas's Final/Draft Impaired Waterbodies – 303(d) List by Year. Retrieved November 27, 2017, from https://www.adeq.state.ar.us/water/planning/integrated/303d/list.aspx

ADEQ. 2003. "Consent Administrative Order LIS 03-061." Arkansas Department of Environmental Quality. May 2003.

APCEC. 2017. *Regulation No. 2: Regulation Establishing Water Quality Standards for Surface Waters of the State of Arkansas*. Arkansas Pollution Control and Ecology Commission. August 2017.

Clean Water Act. 33 USC §§ 1251-1387

FTN. 2005. *Seasonal Monitoring of Chamberlain and Cove Creeks Per CAO LIS 03-061 Section B.3* [FTN No. 6750-028]. Prepared for Halliburton Energy Services, Inc., and TRE Management Company. Little Rock, AR. December 2005.

FTN. 2014. *Notice of Intent of a Environmental Improvement Project* [FTN No. 6750-110]. Prepared for Halliburton Energy Services, Inc. Little Rock, AR. December 2014.

NewFields. 2007. *Dresser Industries–Magcobar Mine Site, SI Report. Hot Spring County, Arkansas.* Prepared by Newfields for Halliburton Energy Services, Inc. and TRE Management Company. Boulder, CO. April 2007.

NewFields. 2009. *Feasibility Study Report, Dresser Industries–Magcobar Mine Site, Hot Spring County, Arkansas.* Prepared by NewFields for Halliburton Energy Services, Inc. Boulder, CO. August 2009.

USEPA. 1983. *Technical Support Manual: Waterbody Surveys and Assessments for Conducting Use Attainability Analyses, Volumes I-3*. (440/4-86-037, 440/4-86-038 and 440/4-86-039). US Environmental Protection Agency, Office of Water. November 1983.

USEPA. 1989. *Application of Antidegradation Policy to the Niagara River*. (Memorandum from Director, Office of Water Regulations and Standards to Director, Water Management Division, Region II; August 4.) Washington, DC. (Source #I 1.)

USEPA. 2008. Record of Decision. Regulation 2: Regulation Establishing Water Quality Standards for the State of Arkansas, Revisions Adopted by the Arkansas Pollution Control and Ecology Commission via Minute Order No. 07-36.

USEPA. 2009. *National Recommended Water Quality Criteria.* US Environmental Protection Agency, Office of Water, Office of Science and Technology. Available online at http://water.epa.gov/scitech/swguidance/standards/current.