IN THE UNITED STATES DISTRICT COURT FOR THE SOUTHERN DISTRICT OF WEST VIRGINIA

CHARLESTON DIVISION

OHIO VALLEY ENVIRONMENTAL COALITION, WEST VIRGINIA HIGHLANDS CONSERVANCY and SIERRA CLUB,

Plaintiffs,

v.

CIVIL ACTION NO. 2:13-21588
(Consolidated with 2:13-16044)

FOLA COAL COMPANY, LLC,

Defendant.

MEMORANDUM OPINION AND ORDER REGARDING INJUNCTIVE RELIEF

From May 9 to 10, 2016, the Court held a bench trial on the issue of remedying violations found in the liability phase ("Phase I") of this litigation. See OVEC v. Fola Coal Co., 120 F. Supp. 3d 509, 518 (S.D.W. Va. 2015) [hereinafter Phase I Order]. In Phase I, the Court found Defendant Fola Coal Company, LLC ("Fola") violated environmental permits governing Fola Mine No. 2 and Mine No. 6 by discharging into two streams, Road Fork and Cogar Hollow, high levels of ionic pollution, which has caused or materially contributed to a significant adverse impact on the chemical and biological components of the applicable streams' aquatic ecosystem. Id. at 1. In this Opinion and Order, the Court explains its findings of fact and conclusions of law in the remedy phase ("Phase II") of this litigation. The Court begins by summarizing the findings and rulings made at the May 2016 trial and the additional findings and rulings made in this Opinion and Order.

At the conclusion of the May 2016 bench trial, the Court made several findings and issued relevant orders, which the Court supplements now. First, the Court **FOUND** injunctive relief is appropriate and necessary to remedy Fola's permit violations determined in Phase I. The Court

further **FOUND** the data presented at the Phase II trial pertaining to water flow and water quality in Road Fork and Cogar Hollow streams provided an inadequate basis for the Court to order any of the alternative remedies proposed by the Parties. Accordingly, the Court **STAYED** its decision on a specific remedy and **ORDERED** Fola to submit, within fourteen days of the bench trial's conclusion, a proposed plan for collecting water flow and quality data for Road Fork and Cogar Hollow. Fola should be prepared to implement that data collection plan within thirty days of its submission, even if the plan is not yet approved by this Court. The data collection plan should, at a minimum, collect measurements necessary to evaluate and decide which of the remedies proposed at the bench trial—namely water treatment through reverse osmosis and water management plans that divert flow high in ionic toxicity away from the impaired streams—will ensure Fola's compliance with its permits as soon as possible. Although the Court has required collection of additional data, the Court also **FOUND** time is of the essence in collecting data and remedying Fola's violations. For that reason, the Court **ORDERED** the Parties to appear for periodic case management conferences to guarantee swift progress on choosing a specific remedy and implementing it. The Court also **FOUND** appointing a special master—who will refine the data collection plan, oversee implementation of that plan, recommend a specific remedy based on the data collected, and oversee implementing a specific remedy—is the most promising means of ensuring Fola's prompt compliance. At this time and pursuant to Federal Rule of Civil Procedure 53(a)(1)(C), the Court **APPOINTS** Mr. James H. Kyles as Special Master of engineering, and the Court issues an accompanying Order confirming him as Special Master.[1] The Special Master's

[1] The Parties both requested that the Court appoint Mr. Kyles as Special Master in this case. Mr. Kyles, who serves as special master in several other similar cases against Fola and other coal mine operators, has indicated in an affidavit accompanying this Opinion and Order that he will accept this appointment.

role and authority are explained more fully below. After data collection, if the Parties are unable to agree on a specific remedy that will ensure Fola's permit compliance, the Court will decide at that time, based on the Special Master's recommendation, which of the specific remedies offered by the Parties during Phase II is appropriate.

In the remainder of this Opinion, the Court makes factual findings based on evidence presented during Phase II, explains the legal standard for Phase II, discusses which of the Parties' proposed alternative remedies may ultimately be appropriate in this case, and concludes by presenting in detail the Court's Phase II decisions summarized above.

I. FACTS

A. Background on Phase I

Plaintiffs Ohio Valley Environmental Coalition ("OVEC"), West Virginia Highlands Conservancy, and Sierra Club filed this case pursuant to the citizen suit provisions of the Federal Water Pollution Control Act ("Clean Water Act" or "CWA"), 33 U.S.C. § 1251 et seq., and the Surface Mining Control and Reclamation Act ("SMCRA"), 30 U.S.C. § 1201 et seq. Compl., ECF No. 1. The Complaint alleges Defendant Fola violated permits obtained under the National Pollutant Discharge Elimination System ("NPDES")[2] and SMCRA by discharging water polluted with ionic toxicity, measured as conductivity, into several West Virginia streams. This action is split into two phases: one on liability, the other on a remedy.[3]

[2] NPDES permits are a creature of the CWA. See 33 U.S.C. §§ 1311(a), 1342 (prohibiting discharge of any pollutant by any person unless a statutory exception applies, with the primary exception being procurement of a NPDES permit).

[3] For other background information relevant to this Opinion and Order, including the regulatory framework for this case and the Court's Phase I decision, refer to OVEC v. Fola Coal Co., 120 F. Supp. 3d 509 (S.D.W. Va. 2015).

In Phase I, the Court found Fola violated its permits under the CWA and SMCRA for Mine No. 2 and Mine No. 6 by discharging into Road Fork and Cogar Hollow high levels of ionic pollution, which has caused or materially contributed to a significant adverse impact on the chemical and biological components of the applicable streams' aquatic ecosystem. Phase I Order, at 547. More specifically, the Court found: (1) Road Fork and Cogar Hollow are biologically impaired, as measured by West Virginia Stream Condition Index ("WVSCI") scores below the federally approved threshold score of 68;[4] (2) the discharges complained of share the same characteristic composition presently known in the scientific community to cause or materially contribute to impairment in central Appalachian streams; (3) the conductivity levels observed at Defendant's discharges are far in excess of the 300 µS/cm threshold identified by the EPA and the available scientific literature known to cause stress to aquatic communities; (4) Defendant's mining operations are the only land use that could have caused impairment; and (5) changes in the biological community particularly show the loss of conductivity-intolerant organisms. Id. at 545. Based on this, the Court held that high-conductivity discharges from Fola Surface Mine No. 2 and No. 6 are causing or materially contributing to the biological impairment of Road Fork and Cogar Hollow in violation of Defendant's current NPDES and SMCRA permits. Id.

After finding violations in Phase I, the Court held a bench trial in Phase II to decide on a remedy for Fola's violations. Next, the Court details its findings of fact from the Phase II trial.

[4] WVSCI is a multimetric index used to conduct biological assessments of stream conditions. WVSCI is currently used by the West Virginia Department of Environmental Protection ("WVDEP") to determine whether a violation of the biological standard requires recognizing a given stream as "impaired" pursuant to Section 303(d) of the CWA. See Phase I Order at n.6.

B. Findings of Fact from Phase II Trial

At the Phase II bench trial, the Parties presented evidence through several experts on the issue of what injunctive relief will effectively remedy Fola's permit violations. To that end, evidence was introduced about the characteristics of Road Fork and Cogar Hollow, the streams found biologically impaired by Fola's discharging high-conductivity water. The Parties also presented evidence on their proposed alternative remedies. The Court next makes factual findings pertaining to the streams at issue and the Parties' proposed alternative remedies.

1. Background on Streams

Road Fork and Cogar Hollow are located in Clay and Nicholas Counties, West Virginia. Both streams are tributaries of Leatherwood Creek, meaning they flow into Leatherwood Creek, which in turn is a tributary of the Elk River. Pls.' Ex. 188, at 1. Road Fork runs approximately 0.80 miles in length from its start at Outlet 001 to where it empties into Leatherwood Creek. Id. Cogar Hollow is slightly shorter, running approximately 0.70 miles in length from its start at Outlets 013, 015, and 017 to where it drains into Leatherwood Creek. Id. Cogar Hollow's confluence with Leatherwood Creek is upstream from where Road Fork meets Leatherwood Creek. Id. Road Fork and Cogar Hollow empty into Leatherwood Creek approximately 7.5 miles and 9.5 miles, respectively, upstream from Leatherwood Creek's confluence with the Elk River. Id.

The source of water for Road Fork and Cogar Hollow includes drainage from Fola's valley fills.[5] Water from a valley fill drains into streams in one of two ways. After a precipitation event, either the water flows across the top of the fill directly into the stream, known as runoff flow, or

[5] The valley fills in this case consist of material that once—prior to surface mining for coal—composed the top of a mountain. In the process of surface mining, the mountaintop is removed by excavation so that coal beneath the mountaintop may be mined. See Pls.' Ex. 188, at 3. The removed mountaintop material is then placed in a nearby valley adjacent to or on top of a stream, hence the name valley fill.

the water seeps into the valley fill, which slowly releases the water into the stream like a water-logged sponge steadily drips. This latter drainage phenomenon produces what is known as underdrain flow—an apt name because the water flows from the bottom of the fill, essentially from underneath the fill, into the nearby stream. At Mine No. 2, three valley fills drain into Outlet 001, which discharges into Road Fork. Phase I Order, at 513. At Mine No. 6, three valley fills drain into Outlets 013, 015, and 017, to be discharged to Cogar Hollow. Id. at 514.

Water source matters, but the extent to which it matters is unknowable from the evidence presented during the Phase II trial. Some Phase II evidence shows that underdrain flow contains more ions producing conductivity than run off flow. Pls.' Ex. 188, at 1. The Parties explain this by theorizing that material in the fill contains more ions than material on the fill's surface—the result of weather-caused erosion carrying such ions away from the surface over long periods of time. And so, when water infiltrates the fill, the water picks up more ions that produce conductivity; conversely, runoff flow, because it does not infiltrate the fill, is believed to contain fewer ions producing conductivity. See id. However, the Parties presented insufficient evidence during Phase II for the Court to make an accurate finding regarding the amount of conductivity contained in runoff and underdrain flows into Road Fork and Cogar Hollow.

In Phase II, two of Fola's experts provided flow estimates for both streams, but these estimates contradicted each other and were not based on adequate data collection at Road Fork and Cogar Hollow. As an initial matter, evidence presented during Phase II shows Road Fork is a perennial stream, meaning water flows through it year-round. Cogar Hollow is a perennial-intermittent stream, meaning water flows through it mostly year-round but during some brief periods the river may run dry.[6] Fola's environmental engineer expert, Mr. Meek, estimated Road

[6] Plaintiffs' expert, Dr. Baker, explained that during periods of dryness, aquatic life seeks refuge

Fork's average total flow is about 1,471 gallons per minute (g/m) year-round; Cogar Hollow's total flow is estimated at 542 g/m year-round. Mr. Meek obtained these average flow estimates not by measuring flow at Road Fork and Cogar Hollow but by predicting them based on flow data from other locations on Fola's property. Pls.' Ex. 188, at 3. In sharp contrast, Mr. Burns, Fola's expert retained to design a water management remedy, estimated Road Fork's average total flow at about 100 g/m and Cogar Hollow's at 75 g/m. Mr. Burns made these average flow estimates by observing, without measuring, water flowing at Road Fork and Cogar Hollow on a single day in January 2016. As of the Phase II trial, neither Fola nor any other entity had conducted any long-term flow measurement of Road Fork or Cogar Hollow. The Parties admit that Fola has not collected sufficient data regarding the amount of water flowing per minute through both streams to make an accurate estimate of either stream's average flow at any given time of year. See Pls.' Ex. 188, at 3.

Additionally, water entering Road Fork and Cogar Hollow on and through the valley fills discussed above varies greatly depending on precipitation events. The runoff and underdrain flows are estimated to be about 479 g/m (runoff) and 992 g/m (underdrain) at Road Fork, Def.'s Ex. 239, and about 177 g/m (runoff) and 366 g/m (underdrain) at Cogar Hollow, Def.'s Ex. 240. These runoff and underdrain flow estimates were obtained by Mr. Meek's prediction based, again, on nearby Fola sites, as well as weather data for the area of Road Fork and Cogar Hollow. As demonstrated above, this prediction method proved imprecise in the context of predicting the flow of water through Road Fork and Cogar Hollow. Accordingly, the Court finds Fola's runoff and underdrain flow predictions insufficient to make a finding on the runoff and underdrain flows from Mine Nos. 2 and 6 into Road Fork and Cogar Hollow.

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in the still-wet streambed or leftover pools of water.

Because Fola's flow data is insufficient, the Court is unable to make an accurate finding on: (1) the average volume of water flowing per minute through Road Fork and Cogar Hollow at any given time of year, and (2) the average runoff flow and underdrain flow into Road Fork and Cogar Hollow at any given time of year.

The high ionic toxicity and biological impairment in Road Fork and Cogar Hollow were analyzed in Phase I. These streams, in general, have endured a pattern of increasing conductivity levels and declining WVSCI scores since Fola commenced its mining operations. Phase I Order, at 538. Prior to Fola's mining activities, Road Fork lacked water quality issues, but afterward, Road Fork's water quality noticeably suffered. Id. More specifically, monitoring of water discharged by Fola into Road Fork from 2010 to 2012 revealed conductivity levels ranging from 1,803 µS/cm to 5,700 µS/cm, and in May 2014, the conductivity was 2,920 µS/cm. Id.at 538–39.

Cogar Hollow has a similar history of impairment. Before Fola's mining, Cogar Hollow enjoyed healthy water quality, with conductivity levels usually well below 300 µS/cm; but afterward, the stream's water quality diminished considerably. Phase I Order, at 541. Measurements taken since July 2012 consistently reveal conductivity levels ranging from 3,000 µS/cm to 5,000 µS/cm, and in May 2014, conductivity ranged from 2,910 µS/cm to 3,202 µS/cm. Id. In the end, the Court determined that conductivity in both streams far exceeded the EPA's 300 µS/cm benchmark. Phase I Order, at 541–42, 544–45.

During Phase I, the Court further found these excessive conductivity levels materially contributed to the biological impairment of ion-sensitive aquatic life in both streams. Phase I Order, at 539, 541–42, 545. Between 2011 and 2014, Fola reported WVSCI scores for Road Fork that were well below 68, the EPA threshold for a passing score. Id. at 539 (finding scores for 2011 to 2014 ranged between 46 and 56). This indicates Road Fork was biologically impaired at least

since 2011. Id. As for Cogar Hollow, it too experienced a decline in aquatic life, with a May 2014 WVSCI score of 41.81—also far beneath a passing score. Id. at 542.

Leatherwood Creek, the receiving river for both Road Fork and Cogar Hollow, is also listed by West Virginia's Department of Environmental Protection ("WVDEP") as biologically impaired for its entire length. 2012 WVDEP 303(d) List, JE1067, ECF No. 110-8. And ionic toxicity is a significant stressor related to that impairment, as evidenced by samplings taken at points of Leatherwood Creek downstream from its confluences with Road Fork and Cogar Hollow. Compare Pls.' Ex. 189 (showing WVSCI scores reported by WVDEP from years 2007 to 2012 all fell below a passing score of 68), with id. (showing Leatherwood Creek's conductivity levels for that same period ranged from 1,800 to 3,200 µS/cm, far above EPA's 300 µS/cm benchmark), with Pls.'s Ex. 190 (showing conductivity levels far exceeded EPA benchmark at all points of Leatherwood Creek, according to WVDEP samplings from 2007 to 2012). In sum, Leatherwood Creek has failing WVSCI scores, high conductivity, and biological impairment that is related to ionic toxicity.

2. Alternative Injunctive Relief Presented by the Parties

During Phase II, the Parties presented evidence on what injunctive relief is appropriate to remedy Fola's permit violations found in Phase I, and in doing so, they proposed competing alternative remedies. The Court will now explain the remedies proposed by the Parties.

a. Plaintiffs' Proposed Remedy—Water Treatment: Reverse Osmosis

In Phase II, Plaintiffs urged requiring Fola to install water treatment systems at Road Fork and Cogar Hollow, specifically, a membrane filtration system known as reverse osmosis.[7]

[7] Reverse osmosis is a water purification technology that uses a semipermeable membrane to remove from water particles that cause ionic toxicity. Pls.' Ex. 188 at 1. In reverse osmosis, an applied pressure forces water across a membrane; as the water moves to the other side of the

Evidence on reverse osmosis—presented in part through testimony of Dr. Drew McAvoy, Plaintiffs' environmental engineer expert—shows reverse osmosis is a currently available treatment technology which could reduce conductivity levels below 300 µS/cm, the threshold above which current science concludes impairment is probable. See Phase I Order, at 518 ("[W]hen conductivity reaches 300 µS/cm, it is more likely than not that the streams will suffer impairment.").[8] Reverse osmosis has been used for roughly fifty years in other contexts, such as industrial settings, to produce pure water, devoid of any ions, including those which cause ionic toxicity. However, application of the reverse osmosis technology in these other settings is generally dissimilar to employing reverse osmosis in a mine setting. Recognizing this dissimilarity, Dr. McAvoy also reviewed designs for two large-scale reverse osmosis systems constructed in the context of underground coal mine drainage, namely systems at the Boardtree watershed and Dunkard Creek, the latter design being prepared by a contractor named Veolia. Veolia's plans for the Dunkard Creek facility called for a much larger treatment facility than that which Road Fork and Cogar Hollow would require. Dr. McAvoy also identified two reverse osmosis systems currently operating at mine sites in Appalachia: one in Buchanan, Virginia, and the other is the system at Dunkard Creek. Although the Dunkard Creek system may have been operational since 2011, Dr. McAvoy admitted that he only reviewed an initial design and no operational data from that facility. Based on these designs of reverse osmosis systems, another design prepared by Fola's expert,[9] and his experience, Dr. McAvoy testified that within three years it would be feasible to

membrane, it leaves behind particles causing ionic toxicity. Id.

[8] Plaintiffs' experts during the Phase II trial, Dr. Baker and others, testified to this as well.

[9] Fola's expert, Mr. Al Meek, designed a reverse osmosis treatment system for Road Fork and Cogar Hollow, which is discussed below.

install at Road Fork and Cogar Hollow a reverse osmosis system that treats water discharged from Mine Nos. 2 and 6 and reduces the conductivity of the discharged water to less than 300 μS/cm.

Dr. McAvoy's testimony and other evidence in Phase II revealed several problems with the efficacy of reverse osmosis treatment at Road Fork and Cogar Hollow. First, there is a dearth of experience using reverse osmosis in a surface mine setting, where weather conditions vary tremendously and other factors are unlike the settings in which this treatment is presently used, e.g., underground mine drainage. For instance, the pure water coming out of the reverse osmosis system would likely have to be blended with other water to make it suitable for aquatic life.[10] Fola's expert, Mr. Meek, discussed how weather conditions add complexity to using reverse osmosis in this setting because water temperatures determine the rate of flow across the membrane of the reverse osmosis system, making for lower flow in colder months and higher flow in summer months. Also, underground mines generate less water to treat than surface mines,[11] and they deal with fewer suspended solids that can clog the membrane.

Further complicating reverse osmosis's adaptation into the surface mine setting is that Dr. McAvoy's review of other reverse osmosis systems—ones at Buchanan, Virginia and Dunkard Creek in West Virginia—was limited to proposals and designs. Dr. McAvoy did not review any operational data from those systems, which could prove or disprove their effectiveness at reducing conductivity while not impairing aquatic life.[12] Based in part on this lack of analogous use, Fola's

[10] Fola's expert in ecological risk assessment and environmental risk-based remediation, Dr. Timothy Versylcke, testified that discharging the treated water, which has no or very low conductivity, into the streams directly, without adding ions, could actually impair aquatic life and result in continued failing WVSCI scores.

[11] Plaintiffs did present evidence that water flow is not an issue for adapting reverse osmosis to the surface mine setting. The flow rate for the system operating at Dunkard is much higher than the flow rate estimated for Road Fork and Cogar Hollow.

[12] Plaintiffs introduced excerpts of CONSOL Energy's corporate responsibility report to show the Buchanan system is currently, effectively treating mine water. These excerpts are, however, very

expert, Dr. Versylcke, testified he found no evidence indicating reverse osmosis can achieve a passing WVSCI score by simply discharging water with conductivity less than 300 µS/cm. According to Dr. Versylcke, achieving a passing WVSCI score requires considering factors other than just conductivity, which Plaintiffs' proposed reverse osmosis option fails to account for. In short, to order reverse osmosis treatment at Road Fork and Cogar Hollow based on the evidence produced during Phase II would be to enter uncharted territory. Reverse osmosis has been used primarily in industries other than surface mining that do not pose the same challenges present here. Without such analogous use, the Court is left with serious questions about the efficacy of using reverse osmosis treatment to achieve passing WVSCI scores at Road Fork and Cogar Hollow.

The second problem with requiring reverse osmosis treatment is the facility's footprint might be so large at the impaired streams that it fundamentally alters the landscape there. Reverse osmosis systems require a large area of land because the treatment entails substantial pre- and post-treatment components, for example equalization.[13] Additionally, it remains to be determined whether one or two facilities would be required to effectively treat the water discharged into both streams. Mr. Meek, Fola's expert who has actual experience with reverse osmosis treatment systems, also considered design challenges presented by reverse osmosis. Mr. Meek pointed out that in addition to a large equalization basin, reverse osmosis treatment would require treatment

general statements found in a report generated by a company to prove its own corporate responsibility. The statements are not provided by an expert on water treatment or aquatic life. And so, the excerpts do not provide reliable evidence that reverse osmosis has proven success in reducing impairment in the mining setting. Furthermore, the excerpts do not address the unique problems discussed above that come with using reverse osmosis in the surface mine setting, as opposed to the underground setting.

[13] Equalization refers to the process of diverting, retaining, and releasing a steady flow of polluted water into the treatment system so that water coming into the system will not exceed the design flow range during periods of heavier flow. Equalization requires a significantly large basin or set of tanks somewhere close to the stream being treated, to hold a large volume of water.

structures, a system of pumps, and other facilities, all of which would have to be constructed onsite, either on the fill or along the riparian area, presenting significant issues unaddressed by Dr. McAvoy. In sum, the large footprint of reverse osmosis treatment may be problematic in the valley setting where the affected streams flow, and therefore, additional information on possible designs for reverse osmosis treatment facilities at the affected streams will be necessary before the problems posed by the system's large footprint can be determined.

Third, reverse osmosis treatment requires a significant amount of electrical power to run water pumps capable of operating the system, more power than Fola's proposed water management options. Furthermore, the source of power for a potential reverse osmosis system at Road Fork and Cogar Hollow was not ascertained at trial. More information on the power source for a reverse osmosis system at Road Fork and Cogar Hollow will need to be provided before the Court could consider ordering reverse osmosis as the remedy for Fola's permit violations.

Fourth, reverse osmosis creates a substantial waste product. According to Mr. Meek's reverse osmosis design for Road Fork and Cogar Hollow, about 8% of water being treated is lost through the treatment process. Treatment also produces a liquid or solid waste. Based on Mr. Meek's design, about 10,000 tons of solid waste per year is expected to be produced by a reverse osmosis facility at Road Fork and Cogar Hollow. This solid waste would be placed in a landfill offsite by the truckload. Another firm's design of a reverse osmosis treatment system at Road Fork and Cogar Hollow could yield more or less waste.

Fifth, reverse osmosis is expensive, costing much more initially and over the years than Fola's water management plans. For Road Fork, Mr. Meek estimated the cost for constructing a reverse osmosis system at the impaired stream would be over $72 million with annual operating costs over $6.5 million, amounting to over $213 million total in present-day costs for a 35-year

operation. For Cogar Hollow, Mr. Meek estimated the cost for constructing a reverse osmosis system at the impaired stream would be over $28.5 million with annual operating costs over $2.5 million, amounting to over $86.5 million total in present-day costs for a 35-year operation. In his expert report, Mr. Meek noted these figures could vary up by 35% or down by 15%; and at trial, he testified these costs could vary more drastically if the actual flow at the impaired streams differs from Mr. Meek's estimates in his expert report. For instance, if estimates provided by Fola's other expert, Mr. Burns, are correct, the cost of constructing and operating reverse osmosis systems at the impaired streams would be significantly less.

Due to the unaddressed problems with reverse osmosis discussed above, Fola offered water management as an alternative.[14]

b. Defendants Proposed Remedy—Water Management

In Phase II, Fola has proposed several variations of a water management system as an alternate remedy that aims to reduce conductivity in Road Fork and Cogar Hollow, eventually achieve passing WVSCI scores, and obtain permit compliance. Fola contends its water management system is permissible under the CWA, ensures permit compliance, and is less expensive and intrusive on the environment than reverse osmosis. Below, the Court summarizes a simplified version of Fola's water management options and explains the shortfalls of these options.

Option 1: Reduce Water Infiltrating Valley Fills

One option attempts to reduce water infiltration into the relevant valley fills by using surface water control structures. This option, relying on impermeable lining to reduce water

[14] As with Dr. McAvoy, Mr. Meek's search for other treatment systems was unavailing. Biological agents have not been demonstrated to be feasible treatment in this setting; chemical treatments using mineral precipitation have not been used on this scale. Neither side could identify any currently available treatment options besides reverse osmosis.

draining into the valley, would divert water from becoming underdrain flow—which purportedly picks up more ions that increase the water's conductivity than runoff flow—and converts that water into runoff flow. Fola's own expert recognized the efficacy of this option is questionable and he did not recommend it. And so, the Court will not consider ordering this water management option as a remedy.

Option 2: Divert Underdrain Flow and Supplement Stream Water

Fola's second option, the only promising one, offered several variations of a water management system that calls for diverting underdrain flow from Road Fork and Cogar Hollow to another nearby waterbody, and if necessary, supplementing both streams for the lost underdrain flow with water from nearby sources. The Court presents this option and its variations, collectively referred to as the divert-and-supplement option, in two steps below.

Step 1: Divert underdrain flow to either Leatherwood Creek or the Elk River

The first step of Fola's water management option requires diverting away from Road Fork and Cogar Hollow at least 95% of the water draining from the base of valley fills at Mine Nos. 2 and 6. Again, Fola targets underdrain flow because it is expected to contain conductivity levels much greater than runoff flow. The diverted underdrain flow will be channeled, without treatment, into pipes bypassing Road Fork and Cogar Hollow and discharged directly into Leatherwood Creek or the Elk River, a large river approximately twelve miles away from the impaired streams. Because the diverted underdrain flow will be untreated, the conductivity of the water discharging into Leatherwood Creek or the Elk River would be about the same as when that water flows from underneath the valley fills. The water remaining in the watershed, which includes 5% underdrain flow and all of the runoff flow, would be discharged directly into Road Fork and Cogar Hollow, without treatment, from ponds currently at Mine Nos. 2 and 6. The conductivity of the undiverted water entering Road Fork and Cogar Hollow is anticipated to be somewhere below 3,600 µS/cm,

but still probably higher than 300 µS/cm. Diverting underdrain flow to Leatherwood Creek would cost approximately $1,002,000. The cost of diverting underdrain flow to the Elk River was not adequately developed at trial.

Step 2: Supplement the streams with water from either Big Branch Impoundment or the Elk River

In the event that diverting underdrain flow from Road Fork and Cogar Hollow leaves either stream with flow insufficient to attain passing WVSCI scores, which is uncertain at this time, Fola's water management plan calls for supplementing the flow at one or both streams. The proposed source of supplemental water is either Big Branch Impoundment ("Big Branch"), an artificial waterbody managed by Fola a couple miles away from Road Fork and Cogar Hollow, or the Elk River, about twelve miles away. Without presenting any water quality reports, Fola estimates the conductivity of water at Big Branch is less than 230 µS/cm, and conductivity of water in the Elk River was not ascertained at trial. From Big Branch, Fola estimates it could pull 100 g/m total to supplement both Road Fork and Cogar Hollow, which would cost approximately $1,400,000 total. From the Elk River, Fola estimates it could pull about 500 g/m, which would cost about $ 8,700,000 total.

Shortfalls of Fola's Divert-and-Supplement Water Management Option

Evidence presented in Phase II shows Fola's divert-and-supplement water management option has several shortfalls. First, using currently available data to prepare and implement a plan diverting underdrain flow away from Road Fork and Cogar Hollow could leave these streams with inadequate flow to achieve passing WVSCI scores. As mentioned earlier, Fola's experts presented inconsistent estimates for the average amount of water flowing through Road Fork and Cogar Hollow. That said, some Phase II evidence shows diverting up to 95% of the underdrain flow away from Road Fork and Cogar Hollow could leave those streams almost entirely devoid of flow for

two consecutive months a year, which would result in further biological impairment of those streams.[15] Accordingly, if underdrain is diverted away from Road Fork and Cogar Hollow, then those streams will need to be supplemented with water from either Big Branch or the Elk River. Although the Elk River contains plenty of water to supplement both Road Fork and Cogar Hollow year-round, Fola was unable to show the same for Big Branch.[16] Furthermore, the amount of water necessary to supplement these streams during dry months is yet unknown because Fola did not, prior to trial, measure the average flow of the impaired streams by conducting a flow analysis. In the end, due to Fola's failure to conduct a flow analysis at these streams, Fola's plans to supplement the streams with water from Big Branch and the Elk River suffer grave uncertainty about their ability to achieve a passing WVSCI score. Therefore, to determine the efficacy of Fola's water management option, sufficient data on average water flow through Cogar Hollow and Road Fork, in addition to data on runoff and underdrain flows into both streams, would need to be collected by way of conducting a flow analysis.

Second, Fola's water management option leave open the possibility that the water entering Road Fork and Cogar Hollow—specifically, runoff flow from valley fills—could contain high conductivity. Fola's water management plans call for continuing to let the untreated runoff flow drain into Road Fork and Cogar Hollow. Despite this, Fola has not measured the conductivity of

[15] More specifically, Dr. Baker testified, based on Mr. Meek's flow predictions, that the undiverted water to be discharged into Road Fork and Cogar Hollow—mostly runoff flow—will not contain enough flow to prevent Road Fork and Cogar Hollow from drying up during periods of no or low rainfall; these periods of dryness, in turn, are likely to result in a failing WVSCI score for these already-impaired streams.

[16] Evidence presented during Phase II left questions about whether Big Branch contains enough water to supply the supplemental water needed at Road Fork and Cogar Hollow during periods of the year with little or no rainfall. For instance, if Mr. Meek's estimate for flow through Road Fork is correct, Big Branch would not be able to provide sufficient supplemental flow to Road Fork for that stream to certainly obtain a passing WVSCI score of 68.

the runoff flow into the impaired streams. EPA's benchmark, which the Court credited in Phase I as accurately predicting biological impairment, says that conductivity in excess of 300 µS/cm causes biological impairment in streams like Road Fork and Cogar Hollow. Although there was some discussion during Phase II's trial about the possibility of achieving a passing WVSCI score of 68 while also discharging water in excess of 300 µS/cm, this simply was a rehashing of the liability phase, where the Court found 300 µS/cm is an accurate benchmark for predicting biological impairment. The Court is unlikely to order a remedy that permits Fola to discharge water with conductivity in excess of 300 µS/cm into Road Fork or Cogar Hollow. That said, it is possible that Fola's water management plans would not discharge water with conductivity that high. Accordingly, the conductivity of runoff flow entering Road Fork and Cogar Hollow needs to be measured before the Court could find the water management option will remedy Fola's violations.

Lastly and of particular note, one variation of Fola's water management option calls for discharging high-conductivity water directly into either the Elk River or Leatherwood Creek, a biologically impaired stream with high conductivity already a significant stress on its aquatic life. Plaintiffs' biological expert, Dr. Carys Mitchelmore, testified that water discharged with 3,000 µS/cm of conductivity would likely fail Whole Effluent Toxicity ("WET") tests. The amount of conductivity found in Fola's discharges at Road Fork and Cogar Hollow averages or exceeds 3,000 µS/cm. Therefore, discharging diverted, high-conductivity underdrain flow directly into the Elk River or Leatherwood Creek would likely fail WET tests, and based on that failure, violate the narrative water quality standard that prohibits discharges of "[m]aterials in concentrations which are . . . toxic to . . . aquatic life." See 47 C.S.R. § 47-2-3.2.e. Furthermore, Plaintiffs' expert, Dr. Matthew Baker, testified that Fola's proposal to divert high-conductivity underdrain flow to Leatherwood Creek would contribute to Leatherwood Creek's continued biological impairment

due to ionic toxicity. At bottom, Plaintiffs contend water management without treatment simply moves pollution downstream and does not ensure Fola's permit compliance, the goal of any injunctive relief that could be ordered in this case.

II. LEGAL STANDARDS

An injunction is an equitable remedy a court should issue only where such intervention is essential to protect property rights against injuries otherwise irremediable. Weinberger v. Romero–Barcelo, 456 U.S. 305, 312 (1982) (internal quotations and citation omitted). "[T]he basis for injunctive relief in the federal courts has always been irreparable injury and the inadequacy of legal remedies." Id. (citations omitted). "[A] federal judge sitting [in equity] is not mechanically obligated to grant an injunction for every violation of law." Id. at 313 (citations omitted). Instead, a plaintiff is entitled to a permanent injunction only if it can demonstrate:

> (1) that it has suffered an irreparable injury; (2) that remedies available at law, such as monetary damages, are inadequate to compensate for that injury; (3) that, considering the balance of hardships between the plaintiff and defendant, a remedy in equity is warranted; and (4) that the public interest would not be disserved by a permanent injunction.

Monsanto Co. v. Geertson Seed Farms, 561 U.S. 139, 156–57 (2010) (citation omitted); Christopher Phelps & Assocs., LLC v. Galloway, 492 F.3d 532, 543 (4th Cir. 2007) (citation omitted). Injunctive relief must be "tailored to restrain no more than what is reasonably required to accomplish its ends." *Nat'l Audubon Soc'y v. Dept. of Navy*, 422 F.3d 174, 201 (4th Cir. 2005) (citing and quoting S.C. Dept. of Wildlife & Marine Res. v. Marsh, 866 F.2d 97, 100 (4th Cir. 1989)).

If injunctive relief is to be ordered in this case, it is warranted under the CWA and SMCRA. See 33 U.S.C. § 1365(a) (authorizing district courts to enforce effluent standards or limitations); 30 U.S.C. § 1270(a)(1) (authorizing citizen suits to compel compliance).

The CWA's purpose is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." 33 U.S.C. § 1251(a); Weinberger, 456 U.S. at 315. To further this purpose, the Act prohibits any person from discharging any pollutant unless a statutory exception applies, and the primary exception is discharging pursuant to an NPDES permit. 33 U.S.C. §§ 1311(a), 1342.[17] All West Virginia NPDES permits incorporate by reference West Virginia Code of State Rules § 47-30-5.1.f, which states that "discharges covered by a WV/NPDES permit are to be of such quality so as not to cause violation of applicable water quality standards promulgated by [West Virginia Code of State Rules § 47-2]." West Virginia's water quality standards are violated if wastes discharged from a surface mining operation "cause . . . or materially contribute to" (1) "[m]aterials in concentrations which are harmful, hazardous or toxic to man, animal or aquatic life" or (2) "[a]ny other condition . . . which adversely alters the integrity of the waters of the State." W. Va. Code R. § 47-2-3.2.e–3.2.i. Additionally, "no significant adverse impact to the chemical, physical, hydrologic, or biological components of aquatic ecosystems shall be allowed." Id. § 47-2-3.2.i. This Court has previously determined that a WVSCI score below the EPA-approved impairment threshold of 68 indicates a violation of West Virginia's biological narrative water quality standards, as embodied in § 47-2-3.2.e and 3.2.i. OVEC v. Fola Coal Co., No. 13-5006, 2015 WL 5972430, at *2 (S.D.W. Va. Oct. 14, 2015) (citing OVEC v. Elk Run Coal Co., 24 F. Supp. 3d 532, 556 (S.D.W. Va. 2014)) (Court's remedial order in Fola-Stillhouse case).

Once a violation of the CWA is established, the Court has discretion to "order relief that will achieve compliance with the Act." Weinberger v. Romero-Barcelo, 456 U.S. 305, 318

[17] Furthermore, the CWA's purpose "is to be achieved by compliance with the Act, including compliance with the permit requirements." Weinberger, 456 U.S. at 315.

(1982). The CWA "permits the district court to order that relief it considers necessary to secure prompt compliance with the Act." Id. at 320. EPA regulations mandate that when compliance with water quality effluent limitations cannot be met immediately, any schedule for compliance must be tailored to achieve compliance "as soon as possible." 40 C.F.R. § 122.47(a)(1) (2015). In other words, prompt compliance means compliance as soon as possible.

III. DISCUSSION

This section begins by analyzing whether injunctive relief is appropriate in this case. The Court then considers alternative forms of injunctive relief proposed by the Parties to remedy Fola's permit violations. Lastly, this section concludes by presenting in detail the Court's Phase II decisions, made at trial and in this Opinion and Order, regarding injunctive relief appropriate here.

a. Injunctive Relief is Appropriate

As stated above, Plaintiffs must satisfy a four-factor test before the Court may grant a permanent injunction. Monsanto, 561 U.S. at 156–57 ((1) plaintiff has suffered an irreparable injury; (2) remedies available at law are inadequate to compensate for that injury; (3) balancing the hardships between plaintiff and defendant, a remedy in equity is warranted; and (4) the public interest would not be disserved by a permanent injunction). First, Plaintiffs have established an irreparable injury incapable of being remedied by monetary damages. "Environmental injury, by its nature, can seldom be adequately remedied by monetary damages and is often permanent or at least of long duration, i.e., irreparable." Amoco Prod. Co. v. Village of Gambell, A.K., 480 U.S. 531, 545 (1987); see also Nat'l Audubon Soc'y v. Dep't of Navy, 422 F.3d 174, 201 (4th Cir. 2005) (same). The liability phase of this trial revealed that Fola has violated its permits by discharging high levels of ionic pollution into Road Fork and Cogar Hollow. This has caused or materially contributed to a significant adverse impact on the biological components of the streams' aquatic ecosystem, in violation of the narrative water quality standards incorporated into those permits.

Fola's violation and the resulting biological impairment are sufficient to establish irreparable harm, as well as the inadequacy of monetary damages.

The balance of hardships also weighs in favor of issuing an injunction. "If [environmental] injury is sufficiently likely . . . the balance of harms will usually favor issuance of an injunction to protect the environment." Amoco, 480 U.S. at 545. "Harm to [the] environment outweighs a defendant's financial interests, particularly where the violations are of a longstanding and continual nature." Idaho Conservation League v. Atlanta Gold Corp., 879 F. Supp. 2d 1148, 1161 (D. Idaho 2012). In fashioning an equitable remedy under an environmental statute, district courts should focus on "the underlying substantive policy the [statute] was designed to effect." Amoco, 480 U.S. at 544. In this case, achieving water quality standards is "one of the [CWA's] central objectives." Arkansas v. Oklahoma, 503 U.S. 91, 106 (1992). Additionally this Court has previously found that protecting water uses "is the overriding purpose of West Virginia's water quality standards and the goal of the state's permit requirements." Elk Run, 24 F.3d at 579. Applying these principles to this case, the equities favor an injunction that ensures compliance with West Virginia water quality standards and protects the State's aquatic resources.

Finally, instead of being disserved, the public interest will be furthered by permanent injunctive relief in this case. There is a paramount public interest in environmental protection, including the protection of aquatic resources. Protecting water quality is "a critical public interest that profoundly outweighs a company's bottom line." Atlanta Gold, 879 F. Supp. 2d at 1162. Furthermore, the public interest is served by citizen-suits that obtain injunctions requiring compliance with the CWA. See Nat. Res. Def. Council v. Train, 510 F.2d 696, 699–700 (D.C. Cir. 1974) ("[The citizen suit] reflects Congress's recognition that citizens can be a useful instrument for detecting violations and bringing them to the attention of the enforcement agencies and courts

alike."); see also Gwaltney of Smithfield, Ltd. v. Chesapeake Bay Found., 484 U.S. 49, 62 (1987); *Piney Run Pres. Ass'n v. Cty Comm'rs of Carroll C*ty, Md, 523 F.3d 453, 456 (4th Cir. 2008).

To conclude, all four factors support issuing some form of permanent injunctive relief that requires Fola to eliminate its violations of West Virginia water quality standards and comply with its NPDES and SMCRA permits. Next, the Court explains the alternative forms of injunctive relief presented by the Parties to specifically remedy Fola's permit violations found in Phase I, followed by the Court's conclusions at this time on what form of injunctive relief is appropriate in this case.

b. Analysis of the Parties' Proposed Injunctive Relief Reveals Problems

Evidence in Phase II reveals several problems with the options for injunctive relief the Parties proposed as remedies for Fola's permit violations. As proposed, each alternative remedy contains shortfalls that preclude the Court from ordering a specific remedy at this time. The Court will now explain these shortfalls.

The efficacy of using reverse osmosis to obtain passing WVSCI scores for Road Fork and Cogar Hollow was put into question by evidence presented during Phase II. As discussed above, reverse osmosis has been used in contexts dissimilar from the surface mining context, which makes its effectiveness at achieving passing WVSCI scores in this context questionable; its treatment facilities require a large area at the impaired streams; the treatment process requires a substantial, permanent power source, which was unidentified at trial; the byproduct of reverse osmosis includes a sizable amount of solid waste, which was only tangentially discussed at trial; and reverse osmosis is quite expensive compared to other remedy options. Based on some of these problems with reverse osmosis, Fola's expert, Dr. Versylcke, testified he found no evidence indicating reverse osmosis can achieve a passing WVSCI score. Additionally, Dr. McAvoy's opinion is granted less weight in considering the efficacy of using reverse osmosis at Road Fork and Cogar

Hollow because he did not design a reverse osmosis treatment plan for the streams at issue. Instead, he only identified reverse osmosis as an available technology capable of reducing conductivity, and he relied upon Mr. Meek's design of a reverse osmosis treatment system for the impaired streams. Mr. Meek did not recommend implementing his own design for a reverse osmosis treatment system. Dr. Versylcke's testimony, coupled with the limitations of Dr. McAvoy's testimony mentioned here and the problems with reverse osmosis discussed above, lead the Court to find evidence from Phase II seriously undermines the opinion that a reverse osmosis system at Road Fork and Cogar Hollow could effectively achieve WVSCI scores above 68 without fundamentally changing the character of those streams and the surrounding area.

Unreliable cost estimates for installing and operating a reverse osmosis treatment system at the impaired streams also makes it inappropriate to order, at this time, reverse osmosis as the specific remedy for Fola's permit violations. The cost estimates included in Mr. Meek's designs for reverse osmosis systems are unreliable because they rely on inadequate flow data. As discussed above, Fola has presented insufficient data to support a finding on the average flow of the impaired streams year-round and the average runoff and underdrain flows year-round into those streams from valley fills at Mine Nos. 2 and 6. The cost of using reverse osmosis to treat a stream is dependent on the flow of water into the treatment system. In order to accurately estimate the cost of implementing reverse osmosis treatment at the impaired streams, Fola must have data on the average flow of the impaired streams year-round and the average runoff and underdrain flows into those streams year-round. The cost estimates are unreliable also because Mr. Meek based them on six-year old cost estimates from a design for a reverse osmosis system at Buchanan. Improvements in the technology for reverse osmosis may have rendered it less expensive in the interceding six years. Although cost is not dispositive, it is a factor the Court should consider in exercising

equitable discretion and choosing among equally viable remedy options. Here, the cost estimates for installing a reverse osmosis system at Road Fork and Cogar Hollow are too unreliable to support ordering reverse osmosis as a specific remedy.

It is important to note that Fola did not merely contend reverse osmosis is too expensive to be an appropriate remedy in this case; instead, Fola argued the evidence in Phase II puts into question whether reverse osmosis will ensure a passing WVSCI score of 68, which is ultimately necessary to secure Fola's permit compliance. And while reducing conductivity is the central goal of remedying Fola's permit violations at Road Fork and Cogar Hollow, Fola properly noted reducing conductivity is not the only concern in selecting an appropriate remedy for those streams' biological impairment. Biological impairment results not only from high-conductivity but also from other factors that must be considered in a plan that calls for using reverse osmosis. Based on the problems with reverse osmosis identified above and discussed in this section, the Court finds that additional data on installing and operating a reverse osmosis treatment system at Road Fork and Cogar Hollow is necessary before the Court could order reverse osmosis as a specific remedy in this case. Further information gathering may dispel the problems identified in this Opinion and Order, and so the Court does not foreclose reverse osmosis as a remedy in this case. Instead, the Court concludes it cannot order at this time, based on evidence presented during the Phase II trial, reverse osmosis as the remedy for Fola's permit violations. If the problems identified in this Opinion and Order are later dispelled by additional information gathering, the Court will consider at that time whether reverse osmosis is an appropriate remedy in this case.

As for the remedy proposed by Fola, evidence in Phase II reveals shortfalls with Fola's divert-and-supplement water management option that preclude the Court from ordering, at this time, a specific remedy using this option. As an initial matter, one variation Fola presented would

divert untreated underdrain flow, which is expected to be high in ionic toxicity, directly into Leatherwood Creek. Because Leatherwood Creek is biologically impaired and ionic toxicity is a significant stressor on Leatherwood Creek, the Court will not consider a water management plan that diverts untreated underdrain flow directly into Leatherwood Creek. In fashioning an injunctive remedy for a statutory violation, district courts must exercise their equitable discretion "'in light of the large objectives of the [statute].'" Albemarle Paper Co. v. Moody, 422 U.S. 405, 416 (1975) (citing and quoting Hecht Co. v. Bowles, 321 U.S. 321, 331 (1944)). This reflects the understanding that injunctive powers of a district court are tempered by the court's obligation to carry out Congressional mandates contained in statute. U.S. v. City of Painesville, 644 F.2d 1186, 1193 (6th Cir. 1981) (reviewing injunctive relief in context of Clean Air Act). Through the CWA, Congress has mandated that all discharges comply with water quality standards. See 33 U.S.C. §§ 1311(a), 1311(b)(1)(C).[18] Considering the CWA's purpose, the Court will not order a specific remedy that calls for diverting untreated, high-conductivity water into Leatherwood Creek, a stream biologically impaired by ionic toxicity.

Looking to the remaining variations of Fola's divert-and-supplement water management option, two serious problems remain.[19] The first problem stems from Fola's failure to conduct a flow analysis. As mentioned in Part I.B.2.b. of this Opinion and Order, to determine the efficacy of Fola's water management options, sufficient data on average water flow through Road Fork and Cogar Hollow, in addition to data on runoff and underdrain flows into both streams, would need

[18] Similarly, in the SMCRA, Congress has required that mine operations be "designed to prevent material damage to the hydrologic balance outside the permit area," 30 U.S.C. § 1260(b)(3), and regulations implementing this SMCRA provision require compliance with water quality standards. 30 C.F.R. § 816.42 (2015).

[19] To be clear, the remainder of Fola's divert-and-supplement water management option calls for diverting underdrain flow away from Road Fork and Cogar Hollow and into the Elk River, and for supplementing these streams for the lost underdrain flow with water from either Big Branch or the Elk River.

to be collected by way of conducting a flow analysis. Results of such flow analysis will need to be available before the Court could order water management as a specific remedy in this case.

The second problem arises from Fola's failure to test the water quality of underdrain and runoff flows into Road Fork and Cogar Hollow. In Part I.B.2.b. above, the Court noted that Fola's divert-and-supplement plan leaves open the possibility that undiverted water entering Road Fork and Cogar Hollow, mostly runoff flow into those streams, could contain high conductivity. If runoff flow into these streams is unabated, and that flow has high conductivity, the divert-and-supplement water management option may be ineffective at reducing conductivity of water discharged into these streams to a level expected to obtain passing WVSCI scores, which is necessary to bring Fola into permit compliance. Accordingly, the conductivity of runoff flow entering Road Fork and Cogar Hollow needs to be measured before the Court could find Fola's water management plans will remedy Fola's violations.

Not only does the conductivity of runoff flow need to be measured, the conductivity of underdrain flow also needs to be measured in order for the Court to find Fola's divert-and-supplement option could be an effective remedy. Dr. Mitchelmore's testimony revealed that discharging diverted, high-conductivity underdrain flow directly into the Elk River could result in failing WET tests, and thereby, violate the narrative water quality standard that prohibits discharges of "[m]aterials in concentrations which are . . . toxic to . . . aquatic life." See 47 C.S.R. § 47-2-3.2.e. Again, the Court will not order a remedy that conflicts with the objectives of the CWA. If the underdrain flow contains enough conductivity to fail a WET test, the Court will not order a remedy that calls for diverting untreated underdrain flow directly into the Elk River. Accordingly, conductivity of the underdrain flow will also need to be measured before the Court

could find that Fola's water management plan is an appropriate remedy for Fola's permit violations.

To conclude, the Court has found several problems with the injunctive relief options the Parties proposed as remedies for the violations found in Phase I. These problems will need to be refined or eliminated, as discussed above, before the Court will be able to order a specific remedy in this case.

c. Appropriate Injunctive Relief at this Time

Based on the evidence presented in Phase II, the Court found during the bench trial that some form of injunctive relief is appropriate and necessary to remedy Fola's permit violations found in Phase I. The remaining task is to determine what specific injunctive relief will cure Fola's permit violations. To that end, the Court made other findings and rulings—pertaining to gathering additional data, scheduling conferences, appointing a special master, and ordering a specific remedy—all of which are explained in detail and supplemented in the following subsections.

1. Necessary Data and Data Collection Plan

At trial, the Court **FOUND** the data presented during Phase II pertaining to water flow and water quality in Road Fork and Cogar Hollow provided an inadequate basis for the Court to order any of the alternative remedies proposed by the Parties. Accordingly, the Court **STAYED** its decision on a specific remedy and **ORDERED** Fola to submit, within fourteen days of the bench trial's conclusion, a proposed plan for collecting water flow and quality data for Road Fork and Cogar Hollow. Fola should be prepared to implement that data collection plan within thirty days of its submission, even if the plan is not yet approved by this Court. The data collection plan should, at a minimum, collect measurements necessary to evaluate and decide which of the remedies proposed at the bench trial—namely water treatment through reverse osmosis and water

management that diverts underdrain flow away from the impaired streams—will ensure Fola's NPDES and SMCRA permit compliance as soon as possible. More specifically, the data collection efforts must measure, for a period of time sufficient to support justifiable extrapolation, (1) the average total water flow through Road Fork and Cogar Hollow year-round, (2) the average total underdrain and runoff flows discharged by Fola into Road Fork and Cogar Hollow year-round, and (3) the conductivity of water in Road Fork and Cogar Hollow, as well as conductivity in the underdrain and runoff flows into Road Fork and Cogar Hollow year-round. Further proceedings may necessitate, and the Special Master may require, a data collection plan with more robust parameters than those laid out in this Opinion and Order.

2. Periodic Case Management Conferences

Although the Court has ordered collection of additional data, the Court also **FOUND** time is of the essence in collecting data and remedying Fola's violations. For that reason, the Court **ORDERED** the Parties to appear for periodic case management conferences to guarantee swift progress on choosing a remedy and implementing it.

3. Special Master

The Court also **FOUND** appointing a special master is the most promising means of ensuring Fola's prompt compliance with its NPDES and SMCRA permits. Appointing a special master is proper in this case because the proposed injunctive relief includes complex analysis and implementation of environmental engineering plans and monitoring to correct Fola's violations.

At this time, the Court **APPOINTS** Mr. James H. Kyles as Special Master of engineering pursuant to Federal Rule of Civil Procedure 53(a)(1)(C), and the Court issues an accompanying Order confirming him as Special Master. The Parties both requested that the Court appoint Mr. Kyles as Special Master in this case. Mr. Kyles, who serves as Special Master in several other

similar cases against Fola and other coal mine operators, has indicated in an affidavit accompanying this Opinion and Order that he will accept this appointment.

The Special Master's duties center upon assisting the Court in determining what specific injunctive relief will remedy Fola's permit violations, more specifically, what remedy will most effectively and quickly reduce the level of conductivity in Road Fork and Cogar Hollow to achieve a passing WVSCI score in those streams. To this end, the Special Master is authorized to refine the data collection plan, to oversee implementation of that plan, to recommend to the Court a specific remedy based on the data collected, and to oversee implementation of the specific remedy. Fola shall provide to the Special Master any sampling and other data, plan details and modeling, and other information the Special Master deems necessary for refining the data collection plan and recommending a specific remedy. To approve Fola's data collection plan, the Special Master must determine, consistent with customary engineering principles and practices, that the plan is reasonably likely to gather all of the data necessary for determining which of the proposed remedies selected above will most swiftly and effectively bring Fola into compliance with its permits. Within ninety days of this Opinion and Order, the Special Master will provide the Court with information on the current and proposed use of reverse osmosis treatment in surface and underground coal mine sites. After reviewing the Special Master's reverse osmosis report, the Court will determine whether to require Fola to employ a consulting firm with expertise in using reverse osmosis to treat high-conductivity water discharged from mine sites like the ones in this case. The Special Master, before recommending a specific remedy, must determine, consistent with customary engineering principles and practices, that the proposed specific remedy: (1) is reasonably likely to reduce conductivity in Road Fork and Cogar Hollow streams to a level that is at or below 300 µS/cm, achieves a sustained, passing WVSCI score, or both, and (2) does not

negatively impact water quality or aquatic life at these streams, Leatherwood Creek, the Elk River, or any other receiving water body. Lastly, the Special Master shall have all other authority granted under Rule 53(c).

4. Ordering a Specific Remedy

After data collection, if the Parties are unable to agree on a specific remedy that will ensure Fola's permit compliance, the Court will decide at that time, based on the Special Master's recommendation, which of the specific remedies offered by the Parties in Phase II is appropriate.

IV. CONCLUSION

At the conclusion of the May 2016 bench trial on a remedy in this case, the Court made several findings and issued relevant orders, which the Court recounts, explains, and supplements in this Opinion and Order. During the Phase II trial, the Court **FOUND** injunctive relief is appropriate and necessary to remedy Fola's violations found in Phase I. The Court further **FOUND** the data presented during Phase II pertaining to water flow and water quality in Road Fork and Cogar Hollow provided an inadequate basis for the Court to order any of the alternative remedies proposed by the Parties. Accordingly, the Court **STAYED** its decision on a specific remedy and **ORDERED** Fola to submit, within fourteen days of the bench trial's conclusion, a proposed plan for collecting water flow and quality data for Road Fork and Cogar Hollow. Fola should be prepared to implement that data collection plan within thirty days of its submission, even if the plan is not yet approved by this Court. The detailed requirements for the data collection plan are set forth above. Although the Court has required collection of additional data, the Court also **FOUND** time is of the essence in collecting data and remedying Fola's violations. For that reason, the Court **ORDERED** the Parties to appear for periodic case management conferences to guarantee swift progress on choosing a specific remedy and implementing it. The Court also

FOUND appointing a special master—who will refine the data collection plan, oversee implementation of that plan, recommend a specific remedy based on the data collected, and oversee implementing the specific remedy—is the most promising means of ensuring Fola's prompt permit compliance. At this time and pursuant to Federal Rule of Civil Procedure 53(a)(1)(C), the Court **APPOINTS** Mr. James H. Kyles as Special Master of engineering, and the Court issues an accompanying Order confirming him as Special Master. The Special Master's role and authority are explained more fully above. After data collection, if the Parties are unable to agree on a specific remedy that will ensure Fola's permit compliance, the Court will decide at that time, based on the Special Master's recommendation, which of the specific remedies proposed by the Parties is appropriate.

The Court **DIRECTS** the Clerk to send a copy of this Opinion and Order to counsel of record, the Special Master, and any unrepresented parties.

ENTER: June 7, 2016

ROBERT C. CHAMBERS, CHIEF JUDGE