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west virginia department of environmental protection

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Earl Ray Tomblin, Governor  
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## ENGINEERING EVALUATION / FACT SHEET

### BACKGROUND INFORMATION

Application No.:	R13-2893
Plant ID No.:	109-00200
Applicant:	Pinnacle Mining Company, LLC
Facility Name:	Pinnacle Mine
Location:	Pineville (Mouth of the mine) Asco & Woosley (Nearest to the gob gas wells)
NAICS Code:	2121121
Application Type:	Construction
Received Date:	August 2, 2011
Engineer Assigned:	Edward S. Andrews, P.E.
Fee Amount:	\$1000.00
Date Received:	August 4, 2011
Completeness Date:	September 21, 2011
Due Date:	December 20, 2011
Newspaper:	<i>Independent Herald &amp; The Welch News</i>
Applicant Ad Date:	August 10, 2011 & August 8, 2011
UTMs:	Easting: 446.4 km      Northing: 4,150.6 km      Zone: 17
Description:	Construction of a gob gas flare.

### DESCRIPTION OF PROCESS

Cliffs Natural Resources (Cliffs), owners of Pinnacle Mining Company, LLC, has elected to install an elevated flare for the purposes of destroying methane components of the gob gas.

Pinnacle Mining uses a long-wall plow to mine coal from the Pocahontas coal seam at the Pinnacle Mine. During mining, methane gas (gob gas), entrapped during the formation of coal

beds, is released. Methane gas is highly explosive and must be ventilated to the outside to prevent underground explosions.

Vertical wells are drilled in the rock overlaying the coal seam to remove the gob gas from the mine gob material after the long-wall machine removes the coal. The strata overlying the mined-out area collapses behind the machine causing it to fracture as the long-wall machine removes the coal. In time, the methane laden gas is released from the gob material and surrounding rock. Historically, Pinnacle Mining has vented the gob gas through the wells directly to the atmosphere.

Pinnacle Mining proposes to voluntarily install a flare to convert the methane, which is classified as a greenhouse gas, in the gob gas to carbon dioxide and water. The gob gas will be evacuated from the gob well using an induction fan (blower). The blower will create suction on the well, which will draw the gob gas to the surface. Pinnacle Mining is proposing to use an ABUTECH low emission flare to destroy the gas. This particular flare design is a cross between an enclosed flare and a thermal oxidizer. From the blower, the gob gas enters a mixing chamber, which is directly below the burner. In the mixing chamber, additional air is injected in a controlled fashion into the chamber. From the mixing chamber, the mixture of gob gas & excess air is routed to the burner, in which the mixture is burned. This stack will confine the exhaust from the burner and extend upward with a total height above ground elevation of approximately 33 feet.

Pinnacle Mining predicts that methane concentration that can support combustion without any supplemental fuel will last up to 3 months for each well. Then, the flare and other support equipment will be moved to the next gob gas well once it is ready for venting.

## SITE INSPECTION

On September 28, 2011, Mr. Gene Coccari of the Small Business Assistance workgroup for the DAQ, and the writer visited a couple of the gob gas well sites. Mr. Douglass Townsend, Environmental Manager for Pinnacle Mining escorted and identified Gob Gas Wells 9F-2 and 9F-3. These sites are very remote and require permission by Pinnacle Mining to enter the access

road going to the gob gas sites. Of the two sites visited, there are no sign of any residences. Mr. Townsend estimated the nearest residence to any of the sites to be over 300 feet away.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

The emission estimates in the application were based on the methane content in the gob gas at 100% of maximum rated flow rate for the blower and emission factors from the proposed revision of Chapter 2.4-4 of AP-42. This writer re-estimated the flare emissions using emission factors from the flare manufacturer as a comparison. These estimates are presented in the following table.

Table #1 – Flare Emissions				
Pollutant	Emissions Rates based on Proposed update AP-42 Ch. 2.4.2.		Manufacturer Data Based Emissions Rates	
	lb/hr	TPY	lb/hr	TPY
PM/ PM <sub>10</sub> / PM <sub>2.5</sub>	0.59	2.58	-	-
NO <sub>x</sub>	1.52	6.66	0.936	4.1
CO	1.79	7.84	0.35	1.53
VOCs*	0.21	0.92	-	-

\* VOC based on emission factor from CH. 1.4 of AP-42

Gob gas mainly contains methane and air. Methane is not classified as a VOC pollutant. Thus, the VOC rate listed in the table is due to incomplete combustion of methane. Assuming a single well vents 100% methane @ 650 cfm, the carbon dioxide equivalent (CO<sub>2</sub>e) of this methane without the flare would be 17.4 tons per hour. The proposed flare would at the very least reduce the CO<sub>2</sub>e down to 2.8 tons per hour.

It is the writer’s understanding that the sulfur or sulfur compounds are not in a gaseous state while entrapped in the gob. Thus, it was assumed that the gob gas would not contain any hydrogen sulfide or other sulfur containing compounds. Based on this assumption, no sulfur dioxide should be formed from the combustion process of the flare.

Another note, the applicant include potential formaldehyde emissions from combustion and entrained in the gob gas. The writer does not agree with some of the assumptions or comparisons used to predict the formaldehyde potential. Formaldehyde is typically a product of poor or incomplete combustion. It can be formed naturally and it might be possible to be trapped within the gob but highly unlikely. Further, one of the most preferred control technologies to destroy formaldehyde is oxidation. Given the manufacturer has a published CO emission, CO is a good indicator of complete combustion, rate that is 80% lower than EPA's published factor for flares, it must be assumed that the proposed device has the ability to close the gap to complete combustion more than most other flare designs. Thus, the potential to form formaldehyde is significantly reduced. Regardless, the applicant has estimated formaldehyde potential to be 26 pounds per year.

The applicant estimated the fugitive emissions from the access roads (right-ways to the wells) to be 1.23 tons of PM/PM<sub>10</sub> and 0.12 tons of PM<sub>2.5</sub> per year.

#### REGULATORY APPLICABILITY

##### **45CSR6 - To Prevent and Control Air Pollution From Combustion of Refuse**

The purpose of this rule is to prevent and control air pollution from combustion of refuse. The permittee has proposed to construct a flare to destroy gob gas. This rule defines incineration as the destruction of combustible refuse by burning in a furnace designed for that purpose. The purpose of this flare is to destroy the gob gas through incineration. Thus, it meets the definition.

Per section 4.1, this flare must meet the particulate matter limit by weight. The flare will have an allowable particulate matter emission rate of 4.5 pounds per hour (based on maximum mass flow rate of gob gas rate of 1655 lb/hr). The predicted particulate matter rate from the flare has been estimated to be 0.59 pounds per hour, which is significantly less than the allowable under this rule.

The flare is also subject to the 20% opacity limitation in section 4.3 of this rule. Typically, the incineration or burning of natural gas produces little to no visible emissions when combusted.

**45CSR13 - Permits for Construction, Modification, Relocation and Operation of Stationary sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation**

The potential-to-emit from the proposed flare does not exceed the 6 pounds per hour and 10 tons per year for any regulated pollutant, which is the trigger level of a stationary source as defined in 45CSR§13-2.24. However, Rule 6 requires all incinerators to obtain a construction or modification permit in accordance with Rule 13 regardless of size. Pinnacle Mining has proposed to install a flare, which is subject to Rule 6. Therefore, the facility is required to obtain a permit as required in 45CSR6-6.1.

The facility has met the applicable requirements of this rule by publishing a Class I Legal Advertisement in the *Independent Herald* on August 10, 2010 and *The Welch News* on August 8, 2011, paid the \$1000.00 application fee, and submitted a complete permit application. These gob gas wells will be located in McDowell and Wyoming Counties. Thus, the flare will be moved from well to well as the mining operation moves through the coal seam.

The flare will not have a potential to exceed the major source trigger level under Title V. Thus, this flare will be subject to Rule 22 as a 9M source.

Rules 5 or 7 are not applicable to this facility. Thus, Rule 17 requires the applicant to minimize fugitive dust from access roads to and from these wells. Due to the remoteness of the access road, it is not practicable to apply water or typical dust suppressants. Further, the density vegetation along the road and the terrain limits or minimizes fugitive dust. The writer estimates the safe traveling speed should never exceed 15 MPH with some portions that road physically restricts traveling speeds to less than 5 MPH. The writer believes no further controls need to be applied at this time.

## TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

Hazardous air pollutants (HAPs) from the flare will most likely be products of incomplete combustion, which will be less than 0.03 pounds per hour. Due to the very low emission rate, there will be no toxicity discussion of these HAPs.

## AIR QUALITY IMPACTS ANALYSIS

The writer deemed that an air dispersion modeling study or analysis was not necessary, because the proposed flare does not meet the definition of a major source as defined in 45CSR14.

## MONITORING OF OPERATIONS

There is no state rule or federal regulation that requires Pinnacle Mining to destroy the methane (gob gas) before it is emitted to the atmosphere. Pinnacle Mining is doing this project on a voluntary basis. The real driving force for Pinnacle Mining is trading these CO<sub>2</sub>e reductions on a carbon-offset market or exchange. These markets have specific protocols to be used when quantifying and validating the carbon reduction or offsets, which may differ by market or exchange.

The Division of Mining and Reclamation (DMR) reviews and approves these requests for gob gas wells under a mine operator's mining permit as Incidental Boundary Revisions (IBR) request. Typically, for a long-wall operation, the mine operator will have to submit several of these requests to gain permission to install the gob wells as the mining operation moves forward through the coal seam. These wells must be precisely located to promote safe drainage of the methane away from the area that is being actively mined. The operator will only request permission to install a few of these gob wells at a time (5 to 10 wells).

The DAQ does not regulate the open venting of gob gas or oversee the permitting of these gob gas wells. Because these wells are regulated by the DMR under their permitting program, the DAQ is not involved in the construction of the wells or the actual location.

Methane content in the gob gas will decrease over time to the point that the flare cannot be operated. This period is relatively short (one to three months). Natural gas is considered a clean burning fuel. Because natural gas is mainly composed of 80 to 90 percent methane, this gob gas should behave the same. Monitoring of natural gas combustion sources is usually focused on the amount of natural gas combusted in a given period and proper operation of the flare that could be indicated by combustion chamber temperature.

Taking everything into consideration, the writer recommends the operator continuously monitor the combustion chamber and estimate the amount of gob gas flared by individual well. Usually, DAQ inspectors obtain compliance data during routine inspections. The writer believes that routine inspections would not be practicable since the source is not under any obligation to operator the flare. Thus, annual submissions of compliance data would be more practicable and less consuming of agency resources in ensuring compliance with the permit.

#### RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates the proposed flare will meet all the requirements of the application rules and regulations when operated in accordance with the permit application. Therefore, the writer recommends granting Pinnacle Mining a Rule 13 construction permit for the gob gas flare associated with the Pinnacle Mine.

Edward S. Andrews, P.E.  
Engineer

Date: October 19, 2011

Fact Sheet R13-2893B  
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