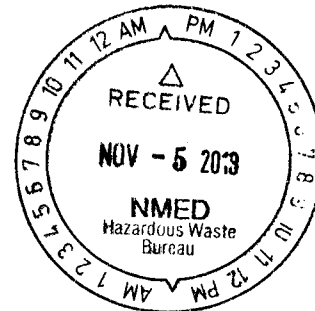


**Department of Energy**  
 Carlsbad Field Office  
 P. O. Box 3090  
 Carlsbad, New Mexico 88221

**OCT 31 2018**



Mr. John E. Kieling, Bureau Chief  
 Hazardous Waste Bureau  
 New Mexico Environment Department  
 2905 Rodeo Park Drive East, Building 1  
 Santa Fe, New Mexico 87505-6303

Subject: Transmittal of the Mine Ventilation Rate Monitoring Annual Report

Dear Mr. Kieling:

The Mine Ventilation Rate Monitoring Annual Report, required by the Waste Isolation Pilot Plant Hazardous Waste Facility Permit No. NM4890139088—TSDF, is attached. This report is required by the Permit in effect during the reporting period, Part 4, Section 4.6.4.2. and Permit Attachment O, Section O-5a.

We certify under penalty of law that this document and all attachments were prepared under our direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on our inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of our knowledge and belief, true, accurate, and complete. We are aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have questions regarding this submittal, please contact Mr. Michael R. Brown at (575) 234-7476.

Sincerely,

Todd Shrader, Manager  
 Carlsbad Field Office

Bruce C. Covert, Project Manager  
 Nuclear Waste Partnership LLC

cc: w/enclosure  
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 D. Biswell, NMED ED  
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\*ED denotes electronic distribution

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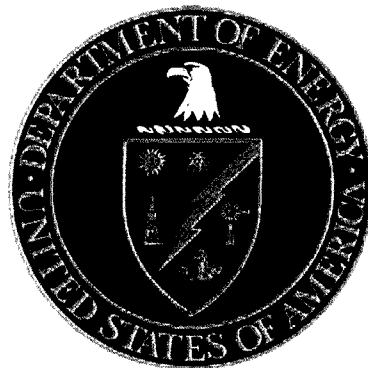
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# Mine Ventilation Rate Monitoring Annual Report

DOE/WIPP-18-3557

Revision 0

United States Department of Energy  
Carlsbad Field Office  
Carlsbad, New Mexico



Effective October 2018

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**Mine Ventilation Rate Monitoring Annual Report  
DOE/WIPP-18-3557**

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**Mine Ventilation Rate  
Monitoring Annual Report**

DOE/WIPP-18-3557

Revision 0

United States Department of Energy  
Carlsbad Field Office  
Carlsbad, New Mexico



Effective October 2018

Approved by: Signature on File Date: 10/30/18  
Michael R. Brown, Director  
Office of Environmental Protection

ISSUED

**Mine Ventilation Rate Monitoring Annual Report  
DOE/WIPP-18-3557**

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CHANGE HISTORY SUMMARY

Revision Number	Date Issued	Description of Changes
0	10/30/18	Initial issue.

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**ABBREVIATIONS/ACRONYMS**

acfm	actual cubic feet per minute
CMRO	Central Monitoring Room Operator
IVS	Interim Ventilation System
MVRMP	Mine Ventilation Rate Monitoring Plan
Permit	Waste Isolation Pilot Plant Hazardous Waste Facility Permit
QA	Quality Assurance
QAPD	Quality Assurance Program Description
RPD	relative percent difference
scfm	standard cubic feet per minute
SVS	Supplemental Ventilation System
U/G	underground
UVS	Underground Ventilation System
WIPP	Waste Isolation Pilot Plant

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**EXECUTIVE SUMMARY**

The Waste Isolation Pilot Plant (**WIPP**) Hazardous Waste Facility Permit (**Permit**), Permit Number 4890139088-TSDF, Part 4, Section 4.6.4.1., requires the WIPP facility Permittees to implement the WIPP Mine Ventilation Rate Monitoring Plan (**MVRMP**) described in Permit Attachment O. Permit Part 4, Section 4.6.4.2., requires that an annual report be submitted every October with the results of the data and analysis of the MVRMP. The objective of the MVRMP is to describe how the ventilation requirements in the Permit are met. This report describes how the objective was met and documents the process by which the Permittees demonstrated compliance with the ventilation requirements in the Permit during the reporting period. The reporting period for this MVRMP is July 1, 2017, through June 30, 2018. From July 1, 2017 through April 22, 2018, the Permit required verification of the total mine airflow as part of the mine ventilation rate monitoring plan. A permit modification eliminating the verification of total mine airflow from the mine ventilation rate monitoring plan became effective on April 23, 2018. For this reason, results for total mine airflow in this report are for the time period of July 1, 2017 through April 30, 2018.

The underground (**U/G**) repository ventilation system operated in Filtration Mode for the reporting period.

Permit Attachment O, Section O-3, describes the basic processes that make up the MVRMP:

- Test and Balance, a periodic re-verification of the satisfactory performance of the entire underground ventilation system and associated components
- Monitoring of active room(s) to ensure a minimum flow of 35,000 standard cubic feet per minute (**scfm**) whenever waste disposal is taking place and workers are present in the room
- If an active room ventilation rate of 35,000 scfm cannot be met, actions as described in Section O-3b(1) shall be taken during waste disposal operations when workers are present
- Verification of the total mine airflow (applicable for the July 1, 2017 through April 23, 2018 time period)



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Results of the processes that make up the mine ventilation rate monitoring plan are as follows:

- A Test and Balance of the Underground Ventilation System (**UVS**) and the Interim Ventilation System (**IVS**) incorporating the Supplemental Ventilation System (**SVS**) was conducted in November 2017. The next Test and Balance is scheduled for February 2019.
- Waste emplacement activities continued through the reporting period. The monthly average active room ventilation readings are recorded in Table 2, *Summary of Total Mine and Active Disposal Room Ventilation Flow Rate Monitoring Data*. The lowest average active room ventilation rate of 44,404 actual cubic feet per minute (**acfm**) occurred in April 2018, while the highest average active room ventilation rate of 50,990 acfm occurred in September 2017.
- The active room ventilation rate of 35,000 scfm was met for all waste emplacement evolutions for this reporting period; therefore, actions as described in Section O-3b(1) were not implemented.
- Results of the verification of the total mine airflow are presented in Table 2, *Summary of Total Mine and Active Disposal Room Ventilation Flow Rate Monitoring Data (Through April 2018)*. The highest average monthly total mine airflow of 119,170 scfm occurred in April 2018. The lowest average monthly total mine airflow of 90,680 scfm occurred in January 2018.

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## **1.0 INTRODUCTION**

Permit Attachment O is the MVRMP. The MVRMP contains the methods and procedures for documenting compliance with the ventilation requirements identified in Permit Part 4, Section 4.5.3.2.

Permit Part 4, Section 4.6.4.2., specifies that an annual report be submitted to the Secretary of the New Mexico Environment Department every October that describes the implementation of the MVRMP and presents the results of the monitoring activities. This document fulfills the annual reporting requirement for the period from July 1, 2017, through June 30, 2018. A modification to the Permit was made in April 2018 that removed the requirement to verify total mine airflow.

The U/G repository ventilation system operated in Filtration Mode for the reporting period. Installation of the SVS was completed in November 2017. With the addition of the SVS, the total U/G Filtration Mode airflow capacity increased from a nominal 106,000 scfm to a nominal 146,000 scfm. The Underground Ventilation Filtration System consists of operating one of three 860 fans and the associated filtration system. The IVS consists of operating one or two 960 fans and their associated filtration systems. The SVS consists of operating an underground booster fan where a nominal 40,000 scfm of uncontaminated air exhausts up the Salt Handling Shaft while the remainder of the mine exhaust air is routed up the Exhaust Shaft and through the filtration system.

The Filtration Mode airflow quantity is compatible with the capacity of the available High-Efficiency Particulate Air filter units. With the Underground Ventilation Filtration System, IVS, and SVS in operation, four different levels of Filtration Mode ventilation provide four different airflow quantities:

- Minimum Filtration Ventilation: Filtration fans (two-960 fans or one-860 fan) operating to provide 43,000 or 60,000 scfm nominal filtered flow
- Intermediate Filtration Ventilation: Filtration fans (one-860 fan and one 960 fan) operating to provide 83,000 scfm nominal filtered flow
- Maximum Filtration Ventilation: Filtration fans (one-860 fan and two-960 fans) operating to provide 106,000 scfm nominal filtered flow
- SVS Ventilation: The SVS fan will not operate unless WIPP is operating in the Maximum Filtration Ventilation Mode. This SVS fan provides the majority of the intake air for the underground in SVS mode. Additionally, when in the SVS mode a nominal 40,000 scfm of uncontaminated air is exhausted unfiltered through the Salt Handling Shaft. In SVS mode the underground exhaust airflow is nominally 146,000 scfm (106,000 scfm filtered and 40,000 scfm unfiltered).

Waste emplacement occurs during the Maximum Filtration Ventilation Mode or the SVS Ventilation Mode.

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The following sections describe the procedures that make up the MVRMP (Section 1), the results of the MVRMP monitoring (Section 2), and the Quality Assurance requirements (Section 3) associated with the MVRMP for the reporting period. The results of the MVRMP data analysis are contained in Section 4.

### 1.1 Verification of Total Mine Airflow

The average total mine airflow is computed on a monthly basis. The monthly averages are based on run-times for the ventilation modes of operation, as documented in the Central Monitoring Room Operator (CMRO) Log. Run-time information is recorded each time the ventilation system configuration changes, including periods when there is no ventilation. The flow rates for various ventilation modes of operation are listed in Table 1.

**Table 1 – Ventilation Operating Modes and Associated Flow Rate**

Mode of Operation	Flow Rate (scfm) – Nominal Values	Test and Balance Summary (November 2017)
Normal (two main** fans) [not in use]	425,000	N/A*
Alternate (one main** fan) [not in use]	260,000	N/A*
Maintenance Bypass [parallel operation of main** fan(s) and filtration*** fan(s)] [not in use]	260,000 to 425,000	N/A*
Reduced (two filtration*** fans) [not in use]	120,000	N/A*
Minimum (one filtration*** fan) [not in use]	60,000	N/A
Filtration (one filtration fan or one IVS fan***)	60,000 or 23,000	N/A
Filtration (one filtration fan and one IVS fan or two IVS fans***)	83,000 or 43,000	±8.4%
Filtration (one filtration fan and two IVS fans***)	106,000	±5.9%
Filtration & Upcast (one filtration fan, two IVS fans***, and SVS fan)	146,000	±4.0%

\* Note: Testing and balancing of this mode of operation was not performed during the November 2017 Test and Balance because it was not in use during the reporting period.

\*\* Note: The main fans are also referred to as the 700 fans and are restricted from being used.

\*\*\* Note: The filtration fans are also referred to as the 860 fans; the IVS fans are also referred to as the 960 fans.

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The calculation of the monthly average mine flow rate is computed using the run-times entered in the CMRO Log in accordance with the following equation:

- (1) Monthly Average Flow Rate = [(Normal Mode Run-Time (hours) x 425,000 scfm] + [Alternate Mode Run-Time (hours) x 260,000 scfm] + [Maintenance Bypass Run-Time (hours) x 260,000 scfm] + [(Reduced Mode Run-Time (hours) x 120,000 scfm] + [Minimum Mode Run-Time (hours) x 60,000 scfm] + [Filtration Mode (1-860) Run-Time (hours) x 60,000 scfm] + [Filtration Mode (1-960) Run-Time (hours) x 23,000 scfm] + [Filtration Mode (2-960) Run-Time (hours) x 43,000 scfm] + [Filtration Mode (1-860 & 1-960) Run-Time (hours) x 83,000 scfm] + [Filtration Mode (1-860 & 2-960) Run-Time (hours) x 106,000 scfm] + [SVS Mode (1-860, 2-960, & SVS) Run-Time (hours) x 146,000 scfm] / x hours per month.

### 1.2 Ventilation Rate Monitoring in the Active Disposal Room

Ventilation rate monitoring in the active disposal room is performed to demonstrate compliance with Permit Part 4, Section 4.5.3.2, and Attachment A2, Section A2-2a(3). The Permit requires a minimum of 35,000 scfm of airflow through the active room when waste disposal is taking place and workers are present in the room. Permit Attachment O, Section O-1, defines 42,000 acfm as being equivalent to 35,000 scfm. Permit Part 4, Section 4.6.4.3., requires compliance to be evaluated monthly for the active disposal room.

A full-entry traverse using a calibrated Davis ball-bearing anemometer, as described in McPherson (2009), *Subsurface Ventilation Engineering*, is the standard method for measurement of airflow in the active waste disposal room. Airflow measurements are collected at an established location near the entrance of each active disposal room. The location is chosen by the operator to minimize airflow disturbances caused by system intersections and corners in accordance with McPherson (2009). The readings are used to verify that a minimum 35,000 scfm ventilation flow rate has been achieved through the active room prior to waste disposal taking place with workers present in the room. Multiple measurements are taken at each field location to ensure accurate results and correlated within 10 percent for acceptability. Data are collected, recorded, and verified by qualified operators. Additionally, the operator verifies proper ventilation flow rates any time there is an operational mode change or change in the U/G ventilation system configuration that could affect the active room ventilation flow rate. A momentary reduction in U/G ventilation caused by the realignment or switching of U/G ventilation fans is not an operational mode change and does not require verification of airflow in the active disposal room.

Once the ventilation flow rate is verified, the operator records the measured acfm value on the Underground Active Disposal Room and Regulator 74-B-308 Ventilation Log Sheet. The operator compares the recorded acfm value with the minimum required acfm value provided at the top of the log sheet. As described in Permit Attachment O, 42,000 acfm is the minimum value needed to ensure that the 35,000 scfm minimum requirement is met. The operator checks and records the airflow through the active

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room during the shift whenever there is an operational mode change or a change in system configuration that could affect the active room ventilation flow rate. If the required ventilation rate is not achieved or cannot be supported due to operational needs, the Permittees will either restrict access to the room or take measures as described in Permit Attachment O, Section O-3b(1).

### **1.3 Test and Balance**

The Test and Balance is a comprehensive series of measurements and adjustments designed to ensure that the U/G ventilation system is operating within acceptable design parameters. The Test and Balance is an appropriate method of verifying U/G ventilation system flow because it provides consistent results based on good engineering practices. The Test and Balance is conducted on a 12- to 18-month interval, in accordance with Permit Attachment O, Section O-3a(2).

Once completed, the Test and Balance data become the baseline for U/G ventilation system operations until the next Test and Balance is performed. Test and Balance results are used to accommodate varying operational conditions in the underground.

The Test and Balance frequency interval is sufficient to account for changes in the mine configuration and to verify system performance. Minor system modifications that occur between tests produce small changes to the ventilation system resistance in comparison to the overall ventilation system resistance. Historic data indicate airflow changes can be attributed to additional or reduced linear feet of mined passage (i.e., mining new entries, closure of formerly ventilated portions of the mine, or reduction in drift size due to salt creep).

A Test and Balance of the mine ventilation system was performed in November 2017 and incorporated the SVS. A summary of the results of the November 2017 Test and Balance is presented in Table 1, in accordance with Permit Attachment O, Section O-5a.

The next Test and Balance is scheduled to be performed in February 2019.

### **1.4 Airflow Instrument Verification Checks**

Verification checks of the total mine airflow instruments were performed in accordance with Permit Attachment E, Table E-1 for the July 1, 2017 through April 23, 2018 time period. The inspections related to total mine airflow were removed from the Permit in the April 23, 2018 modification. The 700 (main) fans were not operable during the reporting period; therefore, procedure IC041098, *U/G Exhaust Mass Flow Measurement System for Fans 700A, B & C*, was not performed.

Procedures IC413005, *Calibration of Flow Indicating Transmitters For U/G Exhaust Fans*, (860 fans) and IC041087, *Calibration of Suction Flow Transmitters for 41-B-956 and 41-B-957*, (960 fans) were used to perform semi-annual calibration and maintenance checks of the total mine airflow instruments from the filtration fans.

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The verification checks require the measurement of airflow induced by each of the fans during various modes of operation using a standard pitot tube traverse. The flow measurement instrument indications are compared to the standard pitot tube traverse. If the relative percent difference (**RPD**) is greater than  $\pm 5$  percent, the instrument sensors are cleaned and the instrument is calibrated. After calibration, an additional pitot tube traverse is performed to verify an RPD of less than  $\pm 5$  percent.

The equipment used to perform the airflow verification checks is controlled and calibrated through the WIPP Metrology Program. The WIPP Metrology Program ensures that maintenance and test equipment used in the performance of maintenance activities meets the WIPP Quality Assurance Program Description (**QAPD**) requirements and is traceable to National Institute of Standards and Technology standards. The frequency and method of equipment calibration are governed by the WIPP Metrology Program using the manufacturer's recommendations and the equipment reliability. The equipment used by subcontractor is calibrated to an equivalent standard and verified.

## **2.0 MINE VENTILATION RATE MONITORING RESULTS**

This section presents the data from implementation of the MVRMP for the reporting period. The data presented were collected in accordance with Permit Attachment O.

### **2.1 Total Mine Airflow**

Total mine airflow verification was required by the Permit for the July 1, 2017 through April 23, 2018 time period. A modification to the Permit that was effective on April 23, 2018 eliminated the need for total mine airflow verification. Therefore, subsequent text in this section along with data applies to the aforementioned time period.

Total mine airflow monthly averages were calculated using Equation 1 (Section 1.1). The data used to perform the calculations were obtained from the CMRO Log and from Permit Attachment O, Table O-1<sup>1</sup>.

Table 2 provides a summary of the total mine airflow monthly averages. The monthly summaries showing the calculation of the total mine airflow are presented in Attachment 1.

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<sup>1</sup> This reference to Table O-1 is to the Permit that was effective prior to April 23, 2018, not to the current Permit.

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**Table 2 – Summary of Total Mine and Active Disposal Room Ventilation Flow Rate Monitoring Data**

	<b>Total Mine Ventilation Flow Data (avg scfm)</b>	<b>Active Disposal Room Ventilation Flow Data (avg acfm)</b>
Jul 17	92,480	45,240
Aug 17	106,000	50,718
Sep 17	106,000	58,990
Oct 17	105,070	47,130
Nov 17	104,980	50,804
Dec 17	96,210	49,928
Jan 18	90,680	45,873
Feb 18	114,820	49,466
Mar 18	110,400	46,320
Apr 18	119,170	44,404
May 18	N/A	47,726
Jun 18	N/A	46,249

N/A – Permit modification eliminated the requirement for total mine airflow in the month indicated

## 2.2 Active Disposal Room Ventilation Rate

TRU mixed waste handling activities continued throughout the reporting period. Table 2 provides the monthly averages for active disposal room ventilation rate monitoring for the reporting period.

An active room ventilation rate of 35,000 scfm (42,000 acfm) was consistently maintained during the reporting period; therefore, actions described in Permit Attachment O, Section O-3b(1), were not required to be taken.

## 2.3 Test and Balance

The most recent Test and Balance of the mine ventilation system was performed in November 2017 which incorporated the SVS. These results are listed in Table 1. The next Test and Balance is due no later than May 2019 and is currently scheduled to be performed in February 2019.

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## **2.4 Equipment Calibration and Maintenance Checks**

Total mine airflow verification was required by the Permit for the July 1, 2017 through April 23, 2018 time period. A modification to the Permit that was effective on April 23, 2018 eliminated the need for total mine airflow verification. Therefore, subsequent text in this section along with data applies to the aforementioned time period.

Calibration and maintenance of the equipment used for total mine airflow verification checks were not performed for the 700 (main) fans. Since the U/G remains in Filtration Mode, the 700 (main) fans were not operated.

Calibration and maintenance of the equipment used for total mine airflow verification were performed on the 860 and 960 filtration fans. The data sheets showing the as-left results of the calibration checks are maintained at the facility.

## **3.0 QUALITY ASSURANCE PROGRAM**

This section describes the Quality Assurance Program as it relates to the MVRMP.

### **3.1 Description of Mine Ventilation Rate Monitoring Quality Assurance Program**

Quality Assurance (QA) associated with the MVRMP consists of several elements. The qualifications of personnel conducting ventilation flow measurements are maintained through a training qualification process. The ventilation simulation software program is controlled in accordance with the Managing and Operating Contractor's QAPD and the computer software QA plans.

Data generated by the MVRMP, as well as records and procedures to support the MVRMP, are maintained and managed in accordance with the QAPD.

Nonconformance or conditions adverse to quality are addressed and corrected in accordance with applicable QA procedures.

Instrumentation used to implement the MVRMP is of known precision and accuracy. The information regarding precision and accuracy is recorded in the instrumentation calibration documentation.



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#### **4.0 SUMMARY OF MINE VENTILATION RATE MONITORING**

Mine ventilation rate monitoring of the U/G repository and active disposal rooms is conducted at predetermined frequencies. The following is an analysis of the data from this program:

- A Test and Balance of the UVS incorporating the SVS was conducted in November 2017. The next Test and Balance is scheduled for February 2019.
- The monthly average active room ventilation readings are recorded in Table 2, *Summary of Total Mine and Active Disposal Room Ventilation Flow Rate Monitoring Data*. The lowest average active room ventilation rate of 44,404 acfm occurred in April 2018, while the highest average active room ventilation rate of 50,990 acfm occurred in September 2017.
- The active room ventilation rate of 35,000 scfm was met for all waste emplacement evolutions for this reporting period; therefore, actions as described in Section O-3b(1) were not implemented.
- Results of the verification of the total mine airflow for July 1, 2017 through April 30, 2018 are presented in Table 2, *Summary of Total Mine and Active Disposal Room Ventilation Flow Rate Monitoring Data*. The highest average monthly total mine airflow of 119,170 scfm occurred in April 2018. The lowest average monthly total mine airflow of 90,680 scfm occurred in January 2018.

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**5.0 REFERENCES**

DOCUMENT NUMBER AND TITLE
Waste Isolation Pilot Plant Hazardous Waste Facility Permit, EPA Identification No. NM4890139088-TSDF
McPherson, Malcolm J., 2009, Subsurface Ventilation Engineering, Omnipress, Second Edition
IC041098, <i>U/G Exhaust Mass Flow Measurement System for Fans 700A, B &amp; C</i>
IC413005, <i>Calibration of Flow Indicating Transmitters for U/G Exhaust Fans</i>
IC041087, <i>Calibration of Suction Flow Transmitters for 41-B-956 and 41-B-957</i>

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Attachment 1 – Monthly Summary of Mine Ventilation Rate Monitoring

<b>SURFACE</b>				
<b>MODE OF OPERATION</b>	<b>RUNTIME (min)</b>	<b>RUNTIME (hours)</b>	<b>FLOW RATE (kscfm)</b>	<b>TOTAL FLOW (kscfm-hr)</b>
ALIGNMENT 1 (41-B-860 A, B, C)	480	8.00	60	480.00
ALIGNMENT 2 (41-B-960A AND 41-B-960B)	8550	142.50	43	6127.50
ALIGNMENT 3 (41-B-860A, B, OR C; AND 41-B-960A OR B)	1860	31.00	83	2573.00
ALIGNMENT 4 (41-B-860 A, B, OR C; AND 41-B-960A AND B)	33750	562.50	106	59625.00
ALIGNMENT 5 (41-B-960A OR 41-B-960B)	0	0.00	23	0.00
NO VENTILATION	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
<b>TOTAL</b>		744.00		
<b>SUM OF FLOW(kscfm-hr)</b>				68805.50
<b>MONTHLY AVERAGE FLOW RATE(kscfm)</b>				<b>92.48</b>

**CALENDAR MONTH - JULY 2017**

COMMENTS:

<b>ACTIVE ROOM</b>		
<b>MONTHLY AVERAGE FLOW (kacfm)</b>	MINIMUM = 35K scfm = 42K acfm	<b>45.240</b>
<b>NUMBER OF DATA POINTS USED IN CALCULATION OF AVERAGE</b>		1.00

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Attachment 1 – Monthly Summary of Mine Ventilation Rate Monitoring

<b>SURFACE</b>				
<b>MODE OF OPERATION</b>	<b>RUNTIME (min)</b>	<b>RUNTIME (hours)</b>	<b>FLOW RATE (kscfm)</b>	<b>TOTAL FLOW (kscfm-hr)</b>
ALIGNMENT 1 (41-B-860 A, B, C)	0	0.00	60	0.00
ALIGNMENT 2 (41-B-960A AND 41-B-960B)	0	0.00	43	0.00
ALIGNMENT 3 (41-B-860A, B, OR C; AND 41-B-960A OR B)	0	0.00	83	0.00
ALIGNMENT 4 (41-B-860 A, B, OR C; AND 41-B-960A AND B)	44640	744.00	106	78864.00
ALIGNMENT 5 (41-B-960A OR 41-B-960B)	0	0.00	23	0.00
NO VENTILATION	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
<b>TOTAL</b>		744.00		
<b>SUM OF FLOW(kscfm-hr)</b>				78864.00
<b>MONTHLY AVERAGE FLOW RATE(kscfm)</b>				<b>106.00</b>

**CALENDAR MONTH - AUGUST 2017**

COMMENTS:

<b>ACTIVE ROOM</b>		
<b>MONTHLY AVERAGE FLOW (kacfm)</b>	MINIMUM = 35K scfm = 42K acfm	<b>50.718</b>
<b>NUMBER OF DATA POINTS USED IN CALCULATION OF AVERAGE</b>		8.00

**Mine Ventilation Rate Monitoring Annual Report  
DOE/WIPP-18-3557**

Attachment 1 – Monthly Summary of Mine Ventilation Rate Monitoring

<b>SURFACE</b>				
<b>MODE OF OPERATION</b>	<b>RUNTIME (min)</b>	<b>RUNTIME (hours)</b>	<b>FLOW RATE (kscfm)</b>	<b>TOTAL FLOW (kscfmhr)</b>
ALIGNMENT 1 (41-B-860 A, B, C)	0	0.00	60	0.00
ALIGNMENT 2 (41-B-960A AND 41-B-960B)	0	0.00	43	0.00
ALIGNMENT 3 (41-B-860A, B, OR C; AND 41-B-960A OR B)	0	0.00	83	0.00
ALIGNMENT 4 (41-B-860 A, B, OR C; AND 41-B-960A AND B)	43200	720.00	106	76320.00
ALIGNMENT 5 (41-B-960A OR 41-B-960B)	0	0.00	23	0.00
NO VENTILATION	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
<b>TOTAL</b>		720.00		
<b>SUM OF FLOW(kscfm-hr)</b>				76320.00
<b>MONTHLY AVERAGE FLOW RATE(kscfm)</b>				<b>106.00</b>

**CALENDAR MONTH - SEPTEMBER 2017**

COMMENTS:

<b>ACTIVE ROOM</b>		
<b>MONTHLY AVERAGE FLOW (kacfm)</b>	MINIMUM = 35K scfm = 42K acfm	<b>58.990</b>
<b>NUMBER OF DATA POINTS USED IN CALCULATION OF AVERAGE</b>		10.00

**Mine Ventilation Rate Monitoring Annual Report  
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Attachment 1 – Monthly Summary of Mine Ventilation Rate Monitoring

<b>SURFACE</b>				
<b>MODE OF OPERATION</b>	<b>RUNTIME (min)</b>	<b>RUNTIME (hours)</b>	<b>FLOW RATE (kscfm)</b>	<b>TOTAL FLOW (kscfm-hr)</b>
ALIGNMENT 1 (41-B-860 A, B, C)	780	13.00	60	780.00
ALIGNMENT 2 (41-B-960A AND 41-B-960B)	0	0.00	43	0.00
ALIGNMENT 3 (41-B-860 A, B, OR C; AND 41-B-960A OR B)	240	4.00	83	332.00
ALIGNMENT 4 (41-B-860 A, B, OR C; AND 41-B-960A AND B)	43620	727.00	106	77062.00
ALIGNMENT 5 (41-B-960A OR 41-B-960B)	0	0.00	23	0.00
NO VENTILATION	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
<b>TOTAL</b>		744.00		
<b>SUM OF FLOW(kscfm-hr)</b>				78174.00
<b>MONTHLY AVERAGE FLOW RATE(kscfm)</b>				<b>105.07</b>

**CALENDAR MONTH - OCTOBER 2017**

COMMENTS:

<b>ACTIVE ROOM</b>		
<b>MONTHLY AVERAGE FLOW (kacfm)</b>	MINIMUM = 35K scfm = 42K acfm	<b>47.130</b>
<b>NUMBER OF DATA POINTS USED IN CALCULATION OF AVERAGE</b>		7.00

**Mine Ventilation Rate Monitoring Annual Report  
DOE/WIPP-18-3557**

Attachment 1 – Monthly Summary of Mine Ventilation Rate Monitoring

<b>SURFACE</b>				
<b>MODE OF OPERATION</b>	<b>RUNTIME (min)</b>	<b>RUNTIME (hours)</b>	<b>FLOW RATE (kscfm)</b>	<b>TOTAL FLOW (kscfmhr)</b>
ALIGNMENT 1 (41-B-860 A, B, C)	0	0.00	60	0.00
ALIGNMENT 2 (41-B-960A AND 41-B-960B)	0	0.00	43	0.00
ALIGNMENT 3 (41-B-860 A, B, OR C; AND 41-B-960A OR B)	1914	31.90	83	2647.70
ALIGNMENT 4 (41-B-860 A, B, OR C; AND 41-B-960A AND B)	41286	688.10	106	72938.60
ALIGNMENT 5 (41-B-960A OR 41-B-960B)	0	0.00	23	0.00
ALIGNMENT 6 SVS (ONE 860 AND TWO 960'S)	0	0.00	146	0.00
NO VENTILATION	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
<b>TOTAL</b>		720.00		
<b>SUM OF FLOW(kscfm-hr)</b>				75586.30
<b>MONTHLY AVERAGE FLOW RATE(kscfm)</b>				<b>104.98</b>

**CALENDAR MONTH - NOVEMBER 2017**

COMMENTS:

<b>ACTIVE ROOM</b>		
<b>MONTHLY AVERAGE FLOW (kacfm)</b>	MINIMUM = 35K scfm = 42K acfm	<b>50.804</b>
<b>NUMBER OF DATA POINTS USED IN CALCULATION OF AVERAGE</b>		9.00

**Mine Ventilation Rate Monitoring Annual Report  
DOE/WIPP-18-3557**

Attachment 1 – Monthly Summary of Mine Ventilation Rate Monitoring

<b>SURFACE</b>				
<b>MODE OF OPERATION</b>	<b>RUNTIME (min)</b>	<b>RUNTIME (hours)</b>	<b>FLOW RATE (kscfm)</b>	<b>TOTAL FLOW (kscfm-hr)</b>
ALIGNMENT 1 (41-B-860 A, B, C)	360	6.00	60	360.00
ALIGNMENT 2 (41-B-960A AND 41-B-960B)	6675	111.25	43	4783.75
ALIGNMENT 3 (41-B-860A, B, OR C; AND 41-B-960A OR B)	0	0.00	83	0.00
ALIGNMENT 4 (41-B-860 A, B, OR C; AND 41-B-960A AND B)	37605	626.75	106	66435.50
ALIGNMENT 5 (41-B-960A OR 41-B-960B)	0	0.00	23	0.00
ALIGNMENT 6 SVS (ONE 860 AND TWO 960)	0	0.00	146	0.00
NO VENTILATION	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
<b>TOTAL</b>		744.00		
<b>SUM OF FLOW(kscfm-hr)</b>				71579.25
<b>MONTHLY AVERAGE FLOW RATE(kscfm)</b>				<b>96.21</b>

**CALENDAR MONTH - DECEMBER 2017**

COMMENTS:

<b>ACTIVE ROOM</b>		
<b>MONTHLY AVERAGE FLOW (kacfm)</b>	MINIMUM = 35K scfm = 42K acfm	<b>49.928</b>
<b>NUMBER OF DATA POINTS USED IN CALCULATION OF AVERAGE</b>		7.00



**Mine Ventilation Rate Monitoring Annual Report  
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Attachment 1 – Monthly Summary of Mine Ventilation Rate Monitoring

<b>SURFACE</b>				
<b>MODE OF OPERATION</b>	<b>RUNTIME (min)</b>	<b>RUNTIME (hours)</b>	<b>FLOW RATE (kscfm)</b>	<b>TOTAL FLOW (kscfm-hr)</b>
ALIGNMENT 1 (41-B-860 A, B, C)	6253	104.22	60	6253.00
ALIGNMENT 2 (41-B-960A AND 41-B-960B)	4826	80.43	43	3458.63
ALIGNMENT 3 (41-B-860A, B, OR C; AND 41-B-960A OR B)	4138	68.97	83	5724.23
ALIGNMENT 4 (41-B-860 A, B, OR C; AND 41-B-960A AND B)	28345	472.42	106	50076.17
ALIGNMENT 5 (41-B-960A OR 41-B-960B)	0	0.00	23	0.00
ALIGNMENT 6 SVS (1 860 AND 2 960S)	804	13.40	146	1956.40
NO VENTILATION	274	4.57	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
<b>TOTAL</b>		744.00		
<b>SUM OF FLOW(kscfm-hr)</b>				67468.43
<b>MONTHLY AVERAGE FLOW RATE(kscfm)</b>				<b>90.68</b>

**CALENDAR MONTH - JANUARY 2018**

COMMENTS:

<b>ACTIVE ROOM</b>		
<b>MONTHLY AVERAGE FLOW (kacfm)</b>	MINIMUM = 35K scfm = 42K acfm	<b>45.873</b>
<b>NUMBER OF DATA POINTS USED IN CALCULATION OF AVERAGE</b>		7.00

**Mine Ventilation Rate Monitoring Annual Report  
DOE/WIPP-18-3557**

Attachment 1 – Monthly Summary of Mine Ventilation Rate Monitoring

<b>SURFACE</b>				
<b>MODE OF OPERATION</b>	<b>RUNTIME (min)</b>	<b>RUNTIME (hours)</b>	<b>FLOW RATE (kscfm)</b>	<b>TOTAL FLOW (kscfm-hr)</b>
ALIGNMENT 1 (41-B-860 A, B, C)	30	0.50	60	30.00
ALIGNMENT 2 (41-B-960A AND 41-B-960B)	0	0.00	43	0.00
ALIGNMENT 3 (41-B-860A, B, OR C; AND 41-B-960A OR B)	0	0.00	83	0.00
ALIGNMENT 4 (41-B-860 A, B, OR C; AND 41-B-960A AND B)	31365	522.75	106	55411.50
ALIGNMENT 5 (41-B-960A OR 41-B-960B)	0	0.00	23	0.00
ALIGNMENT 6 SVS( 1 860 AND 2 960's)	8925	148.75	146	21717.50
NO VENTILATION	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
<b>TOTAL</b>		672.00		
<b>SUM OF FLOW(kscfm-hr)</b>				77159.00
<b>MONTHLY AVERAGE FLOW RATE(kscfm)</b>				<b>114.82</b>

**CALENDAR MONTH - FEBRUARY 2018**

COMMENTS:

<b>ACTIVE ROOM</b>		
<b>MONTHLY AVERAGE FLOW (kacfm)</b>	MINIMUM = 35K scfm = 42K acfm	<b>49.466</b>
<b>NUMBER OF DATA POINTS USED IN CALCULATION OF AVERAGE</b>		7.00

**Mine Ventilation Rate Monitoring Annual Report  
DOE/WIPP-18-3557**

Attachment 1 – Monthly Summary of Mine Ventilation Rate Monitoring

<b>SURFACE</b>				
<b>MODE OF OPERATION</b>	<b>RUNTIME (min)</b>	<b>RUNTIME (hours)</b>	<b>FLOW RATE (kscfm)</b>	<b>TOTAL FLOW (kscfm-hr)</b>
ALIGNMENT 1 (41-B-860 A, B, C)	480	8.00	60	480.00
ALIGNMENT 2 (41-B-960A AND 41-B-960B)	2273	37.88	43	1628.98
ALIGNMENT 3 (41-B-860A, B, OR C; AND 41-B-960A OR B)	0	0.00	83	0.00
ALIGNMENT 4 (41-B-860 A, B, OR C; AND 41-B-960A AND B)	32847	547.45	106	58029.70
ALIGNMENT 5 (41-B-960A OR 41-B-960B)	0	0.00	23	0.00
ALIGNMENT 6 SVS ( 1 860 AND 2 960'S)	9040	150.67	146	21997.33
NO VENTILATION	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
<b>TOTAL</b>		744.00		
<b>SUM OF FLOW(kscfm-hr)</b>				82136.02
<b>MONTHLY AVERAGE FLOW RATE(kscfm)</b>				<b>110.40</b>

**CALENDAR MONTH -MARCH 2018**

COMMENTS:

<b>ACTIVE ROOM</b>		
<b>MONTHLY AVERAGE FLOW (kacfm)</b>	MINIMUM = 35K scfm = 42K acfm	<b>46.320</b>
<b>NUMBER OF DATA POINTS USED IN CALCULATION OF AVERAGE</b>		11.00

**Mine Ventilation Rate Monitoring Annual Report  
DOE/WIPP-18-3557**

Attachment 1 – Monthly Summary of Mine Ventilation Rate Monitoring

<b>SURFACE</b>				
<b>MODE OF OPERATION</b>	<b>RUNTIME (min)</b>	<b>RUNTIME (hours)</b>	<b>FLOW RATE (kscfm)</b>	<b>TOTAL FLOW (kscfmhr)</b>
ALIGNMENT 1 (41-B-860 A, B, C)	0	0.00	60	0.00
ALIGNMENT 2 (41-B-960A AND 41-B-960B)	0	0.00	43	0.00
ALIGNMENT 3 (41-B-860A, B, OR C; AND 41-B-960A OR B)	0	0.00	83	0.00
ALIGNMENT 4 (41-B-860 A, B, OR C; AND 41-B-960A AND B)	28980	483.00	106	51198.00
ALIGNMENT 5 (41-B-960A OR 41-B-960B)	0	0.00	23	0.00
ALIGNMENT 6 SVS ( 1 860 AND 2 960'S)	14220	237.00	146	34602.00
NO VENTILATION	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
<b>TOTAL</b>		720.00		
<b>SUM OF FLOW(kscfm-hr)</b>				85800.00
<b>MONTHLY AVERAGE FLOW RATE(kscfm)</b>				<b>119.17</b>

**CALENDAR MONTH - APRIL 2018**

COMMENTS:

<b>ACTIVE ROOM</b>		
<b>MONTHLY AVERAGE FLOW (kacfm)</b>	MINIMUM = 35K scfm = 42K acfm	<b>44.404</b>
<b>NUMBER OF DATA POINTS USED IN CALCULATION OF AVERAGE</b>		12.00

**Mine Ventilation Rate Monitoring Annual Report  
DOE/WIPP-18-3557**

Attachment 1 – Monthly Summary of Mine Ventilation Rate Monitoring

<b>SURFACE</b>				
<b>MODE OF OPERATION</b>	<b>RUNTIME (min)</b>	<b>RUNTIME (hours)</b>	<b>FLOW RATE (kscfm)</b>	<b>TOTAL FLOW (kscfmhr)</b>
ALIGNMENT 1 (41-B-860 A, B, C)	930	15.50	60	930.00
ALIGNMENT 2 (41-B-960A AND 41-B-960B)	0	0.00	43	0.00
ALIGNMENT 3 (41-B-860A, B, OR C; AND 41-B-960A OR B)	0	0.00	83	0.00
ALIGNMENT 4 (41-B-860 A, B, OR C; AND 41-B-960A AND B)	25582	426.37	106	45194.87
ALIGNMENT 5 (41-B-960A OR 41-B-960B)	0	0.00	23	0.00
ALIGNMENT 6 SVS ( 1 860 AND 2 960'S)	18128	302.13	146	44111.47
NO VENTILATION	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
<b>TOTAL</b>		744.00		
<b>SUM OF FLOW(kscfm-hr)</b>				90236.33
<b>MONTHLY AVERAGE FLOW RATE(kscfm)</b>				<b>121.29</b>

**CALENDAR MONTH - MAY 2018**

COMMENTS:

<b>ACTIVE ROOM</b>		
<b>MONTHLY AVERAGE FLOW (kacfm)</b>	MINIMUM = 35K scfm = 42K acfm	<b>47.726</b>
<b>NUMBER OF DATA POINTS USED IN CALCULATION OF AVERAGE</b>		13.00

**Mine Ventilation Rate Monitoring Annual Report  
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Attachment 1 – Monthly Summary of Mine Ventilation Rate Monitoring

<b>SURFACE</b>				
<b>MODE OF OPERATION</b>	<b>RUNTIME (min)</b>	<b>RUNTIME (hours)</b>	<b>FLOW RATE (kscfm)</b>	<b>TOTAL FLOW (kscfmhr)</b>
ALIGNMENT 1 (41-B-860 A, B, C)	0	0.00	60	0.00
ALIGNMENT 2 (41-B-960A AND 41-B-960B)	0	0.00	43	0.00
ALIGNMENT 3 (41-B-860A, B, OR C; AND 41-B-960A OR B)	0	0.00	83	0.00
ALIGNMENT 4 (41-B-860 A, B, OR C; AND 41-B-960A AND B)	24434	407.23	106	43166.73
ALIGNMENT 5 (41-B-960A OR 41-B-960B)	0	0.00	23	0.00
ALIGNMENT 6 SVS ( 1 860 AND 2 960'S)	18766	312.77	146	45663.93
NO VENTILATION	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
	0	0.00	0	0.00
<b>TOTAL</b>		720.00		
<b>SUM OF FLOW(kscfm-hr)</b>				88830.67
<b>MONTHLY AVERAGE FLOW RATE(kscfm)</b>				<b>123.38</b>

**CALENDAR MONTH - JUNE 2018**

COMMENTS:

<b>ACTIVE ROOM</b>		
<b>MONTHLY AVERAGE FLOW (kacfm)</b>	MINIMUM = 35K scfm = 42K acfm	<b>46.249</b>
<b>NUMBER OF DATA POINTS USED IN CALCULATION OF AVERAGE</b>		11.00