Department of Energy
Carlsbad Field Office
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MAR 0 4 2019

Mr. John E. Kieling, Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87508-6303

Subject: Response to the Referenced Information Request, Waste Isolation Pilot Plant Hazardous Waste Facility Permit Number: NM4890139088-TSDF

Reference: New Mexico Environment Department Correspondence from John E. Kieling, Chief, Hazardous Waste Bureau to Todd Shrader, Carlsbad Field Office and Bruce C. Covert, Nuclear Waste Partnership LLC, dated January 25, 2019, subject: Information Request, Determination of Class for New Shaft and Associated Connecting Drifts Waste Isolation Pilot Plant EPA I.D. Number NM4890139088

Dear Mr. Kieling:

Enclosed please find the Permittees' response to the items in the above referenced information request.

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 any questions, please contact Mr. Michael R. Brown at (575) 234-7476.

Sincerely,

Signatures on file

Todd Shrader, Manager
Carlsbad Field Office

Bruce C. Covert, Project Manager
Nuclear Waste Partnership LLC

Enclosure

cc: w/enclosure

R. Maestas, NMED	*ED
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CBFO:OEP:MRB:AC:19-0210:UFC 5487.00

Response to NMED Information Request, Determination of Class for a Permit Modification Request for the Excavation of a New Shaft and Associated Connecting Drifts

1) Question

Elaborate on the technological advancement to the WIPP Facility identified in the Class Determination as new ventilation control technology.

RESPONSE

The current design and operation of the WIPP underground ventilation system relies on manual adjustments of ventilation components to overcome various weather extremes. These adjustments are the result of using single speed fans and manually operated flow control devices. The new system uses variable frequency and voltage fans which facilitate automatic control of the system. This automatic control is a technological advancement for the WIPP facility. The following explains this advancement in detail.

Prior to the February 2014 events, the Underground Ventilation System (**UVS**) operated with exhaust fans on the surface in an unfiltered mode. The exhaust fans pulled air through the underground to the bottom of the Exhaust Shaft (**ES**), then through the ES to the surface where it was released. The fresh air was pulled into the underground (**UG**) through three intake shafts: the Salt Handling Shaft (**SHS**), the Waste Shaft (**WS**), and the Air Intake Shaft (**AIS**). There were no fans or controls on the three intake shafts.

The main exhaust fan motors operated with a fixed frequency and voltage, meaning that the fan flow could not be controlled by varying the frequency and voltage to the motor. Facility Operations personnel could modify the exhaust fan airflow by manually opening or closing the Inlet Vane Control (**IVC**) located on each surface exhaust fan. The IVC is essentially a set of vanes located in the fan housing that operate similarly to a Venetian blind; the vanes can be opened a little bit for a small amount of flow, or they can be opened completely for the maximum amount of flow.

The underground is approximately 2,150 feet below the surface. Due to the difference in elevation between the surface and the underground, there is a difference in air density between the surface air and the underground air. The difference in density creates what is referred to as the Natural Ventilation Pressure (**NVP**) of the UVS. The difference in air density changes with changes in temperature, barometric pressure, and relative humidity.

When the surface temperature is very cold (winter conditions), the intake air is more dense (heavier) than the UG air and wants to “fall” down the open intake shafts (note that the WS is enclosed by the waste handling building and, therefore, experiences less of this effect). In this instance the UVS experiences a positive NVP. The cold air falling down the shaft aids the fans in providing air to the underground. With the

IVC completely open, the fans are able to exhaust air at a higher flow rate as the fresh air is being pushed into the UG by the cold air falling down the shafts as well as being pulled out of the UG by the exhaust fans.

If the airflow being exhausted is reduced (i.e., switching from Normal Mode to Minimum Mode), then the air falling down the AIS (being pushed into the UG) is more than the smaller fan can exhaust. This scenario causes the airflow to reverse in one of the other shafts (typically the SHS) as the other shaft acts like a relief valve for the UG airflow. To prevent this from happening, the Standard Operating Procedure is for Facility Operations to cover or partially cover the AIS.

When the surface air temperature is very hot (summer conditions) the intake air is less dense than the UG air and resists being pulled into the UG (hot air rises). This condition creates a negative NVP, meaning the exhaust fans must work harder (operate at a higher fan pressure) to pull the same amount of air into the UG. If the IVC is wide open and the fan pressure cannot be increased (in part due to the fixed frequency and voltage applied to the motor), then the UVS experiences a reduction in total airflow.

As explained above, the UVS does not have the capability of automatically adjusting to changes in temperature, barometric pressure, and relative humidity, which increases the susceptibility of the UVS to changes in airflow quantity. The Permanent Ventilation System (**PVS**) upgrades, consisting of both the New Filter Building (**NFB**) and Shaft #5 (**S#5**), will provide a technologically advanced capability to automatically adjust the intake fan and exhaust fan flow, thereby enhancing operational control of the ventilation system. As stated in the Determination of Class submittal, *"The design of S#5 assumes that new exhaust fans and a new filter building are operational and that the Supplemental Ventilation System (**SVS**) and Interim Ventilation System will no longer be operational."*

The new exhaust fans that will be installed as part of the NFB project will each be equipped with a variable frequency drive (**VFD**). Although VFDs are not brand-new technology to the mining industry, they represent a significant technological advancement for the WIPP facility. The main exhaust fans at the WIPP facility used manually-operated IVCs to control airflow. A VFD uses a motor controller to vary the frequency and voltage applied to the motor to adjust the motor speed which in turn adjusts the airflow. A fan operating with a VFD does not need an IVC as the motor speed controls the airflow. A numerical set point, or desired airflow, is programmed into the VFD. A flow sensor in the fan system relays information to the motor controller which then adjusts the speed of the motor to maintain the airflow at the programmed set point. By using this new VFD technology, the UVS will be able to maintain a constant airflow output at the exhaust fans. This assures reliable airflows throughout the underground, thereby enhancing worker safety.

The new S#5 will be an enclosed shaft. The collar of the shaft will be covered with a steel cover. Surface fans (intake fans) will be connected to S#5 via duct from the fan to an intersection point in the shaft that is approximately 30-50 feet below the surface

(See Figure 1). The intake fans will push air into the UG while the steel cover over the collar will ensure that the air is directed into the UG. Two fans will be connected to the shaft. One fan will operate while the other fan will be used as a back-up. The fans will have VFD controllers. The VFDs will be programmed to respond to the flow from the exhaust fans. As an example, if one exhaust fan were to suddenly break down, total exhaust at the ES would be reduced. The reduced flow rate would be communicated to the intake fan at S#5. The VFD would slow down the intake fan to a desired pre-programmed intake airflow rate to prevent the intake fan from over-pressuring the UG. This type of automatic integrated control of both the intake and exhaust flow for the UG is a technological advancement for the operation of the ventilation system at the WIPP facility for the following reasons:

- It will reduce the impacts of NVP on the UVS by controlling both intake and exhaust flow
- It will provide an automated ventilation system that is more responsive to changes in conditions such as NVP by eliminating the need to manually adjust fan flow
- A more responsive UVS ensures the continuity of adequate airflow in the underground, thereby maintaining a safe environment for the underground workers
- The technologically advanced system will provide efficiency by eliminating the manual manipulation that was needed on the surface with the old system.

2) Question

Clarify whether the uses of the proposed new shaft, as outlined in the Class Determination, have changed since the submittal.

RESPONSE

The planned uses for S#5 described in the Determination of Class Permit Modification Request (**PMR**) have not changed. The planned usage for the new shaft (S#5) is described in the PMR Overview as follows:

> *The S#5 design allows for increased ventilation airflow into the underground and an unfiltered exhaust path through the existing AIS for the Construction Circuit airflow. This design allows for concurrent mining (unfiltered ventilation), maintenance (either unfiltered or filtered ventilation, depending on location), and waste emplacement operations (filtered ventilation) to take place. This design also allows the salt particulate that is generated in the Construction Circuit (generated by mining) to be exhausted through an unfiltered exhaust path while the particulate that is generated in the North, Disposal, and Waste Shaft Station Circuits (generated by travel and maintenance operations) is exhausted through the Salt Reduction Building prior to being routed through the filters. This design will not only reduce the particulate build-up on the filters, it will reduce the amount of particulate from the Salt Reduction Building that must be disposed of.*
> (Overview p. 1)

Shaft #5 will be the primary source of intake air for the underground facility. The intake air from S#5 will be used to ventilate the North, Construction, and Disposal Circuits. The ventilation circuits are described in Permit Attachment A2, Section A-2a(3), Underground Facilities Ventilation System. The Salt Handling Shaft will downcast and will supplement the intake air from S#5 that is used to ventilate the north area of the underground. The Waste Shaft will continue to provide the intake air for the Waste Shaft Station Circuit. (Overview p. 1)

Underground ventilation is ubiquitous in that it affects the entire underground facility regardless of facility configuration. Therefore, the ventilation uses for S#5, as described in the PMR, will apply to both current and future facility configurations.

3) **Question**

Clarify why the new shaft project now is being referred to as the “Utility Shaft Project”.

RESPONSE

The name of the new shaft is Shaft #5, as outlined in the PMR. The original DOE budget line item name of the project was “15-D-412 Exhaust Shaft”. The terms used to describe the project have changed over time. The initial pre-conceptual idea in 2014 was that the new shaft would need to be an exhaust shaft with an integral filter building. Subsequent evaluation of the condition of the ES led to the conclusion that it was useable for the NFB. Engineering, modeling, and design work demonstrated that the best design for the PVS upgrades would be to use the new shaft as an intake shaft. As an intake shaft, S#5 can support current needs and future uses (e.g. hoisting personnel, materials, and salt for the construction of additional disposal panels). Such future uses are mentioned in the budget request documentation. Therefore, the DOE budget line item name of the project was subsequently changed to “15-D-412 Utility Shaft” to be consistent with budget request documentation.

4) **Question**

Clarify whether the designation of the proposed new shaft as a utility shaft significantly changes any of the ventilation parameters described in the Class Determination.

RESPONSE

See Response 2) regarding future uses of the S#5. The PMR was prepared for S#5 to provide underground ventilation as an air intake shaft, and the designation of the proposed new shaft project as the Utility Shaft project does not change any of the ventilation parameters described in the PMR. The Utility Shaft project does not include future developments of the underground beyond the ventilation changes that are proposed in the PMR. Ventilation is a ubiquitous parameter meaning that the proposed changes can support current and future needs. However, specific future repository configurations are beyond the scope of this modification.

5) **Question**

Identify whether a hoist is planned for the proposed new shaft as part of the project. If this is the case, state why a description of a hoist is not included in the Class Determination.

RESPONSE

A permanent hoist is not part of the current design or budget for the Utility Shaft project, but it is not precluded as a future design change when the need develops (e.g., to hoist salt from mining additional disposal areas). A design drawing of S#5 showing a side view with the ventilation duct extending to the surface is included as Figure 1. Figure 1 shows that the collar of the shaft is capped with a steel cover which prevents the installation and operation of a hoist. A temporary hoist will be installed over the shaft to allow for excavation (salt removal) of S#5 and the associated drifts. The temporary hoist will be removed once it is no longer needed for the construction phase of the project. When design changes are proposed to S#5 in the future as part of future repository configurations, the appropriate regulatory process will be followed to initiate applicable changes to the Permit. However, specific future repository configurations are beyond the scope of this modification.

6) **Question**

The Class Determination was submitted on December 22, 2017. Permit modifications have been made since that time including: Class 1 modifications and approvals of the New Filter Building, changes to the Training Program, and changes to the Panel Closure Plan. Clarify whether these modifications, or any others, affect the statements made in the overview or affect the proposed Permit text contained in the Class Determination.

RESPONSE

The modifications that have been incorporated into the Permit since the submittal of the PMR in 2017 do not affect the statements made in the overview of the PMR. The changes to the Permit due to Class 1 modifications, the New Filter Building Class 2 modification, the Training Program Class 2 modification, and the Panel Closure Plan Class 3 modification do affect the redline/strikeout of the PMR. The proposed PMR changes need to be incorporated into the current Permit text to provide an updated redline/strikeout.

7) **Question**

Identify any new Permit language that should be added, or any changes to Permit text that should be made, to the Class Determination since its submittal.

RESPONSE

A change to the proposed Permit text that will be made is the correction of a "cut and paste" error in proposed Figure A2-9c, *Underground Ventilation System Airflow (with S#5).* The corrected figure is attached to this document.

8) **Question**

State whether the proposed new shaft and associated connecting drifts support development of future disposal units to replace disposal capacity lost in Panel 9 and unused portions of Panel 7.

RESPONSE

See Response 2). The Utility Shaft project (new shaft and associated connecting drifts) is a stand-alone capital asset project separate from new disposal units. This capital asset project does not include future disposal units. Therefore, specific future repository configurations are beyond the scope of this modification. Because of the ubiquitous nature of underground ventilation, the new shaft and connecting drifts in conjunction with the NFB will be capable of supporting future disposal units to replace disposal capacity lost in Panel 9 and the unused portion of Panel 7 by providing the airflow needed to mine, maintain, and subsequently emplace waste in new units. When design changes are proposed in the future as part of future repository configurations, including changes that affect S#5, the appropriate regulatory process will be followed to initiate applicable changes to the Permit.

9) **Question**

State the current timeframe for the proposed new shaft and associated drifts to connect to the existing underground facility.

RESPONSE

The following time lines are estimated for the Utility Shaft Project:

a. Initiate sinking of S#5 in March 2020
b. Shaft sinking complete approximately 17 months after start date (August 2021)
c. Drifts (mining from west to east) complete approximately 8-month duration (April 2022; the connection to the existing facility will be made at approximately this point in time)
d. Startup/Testing/Project Closeout approximately one-year duration (March 2023)

10) **Question**

Identify any other updates to the Class Determination the Permittees would like to include.

RESPONSE

An illustration showing a side view of S#5 along with the ventilation duct from the shaft to the fans is attached as Figure 1.

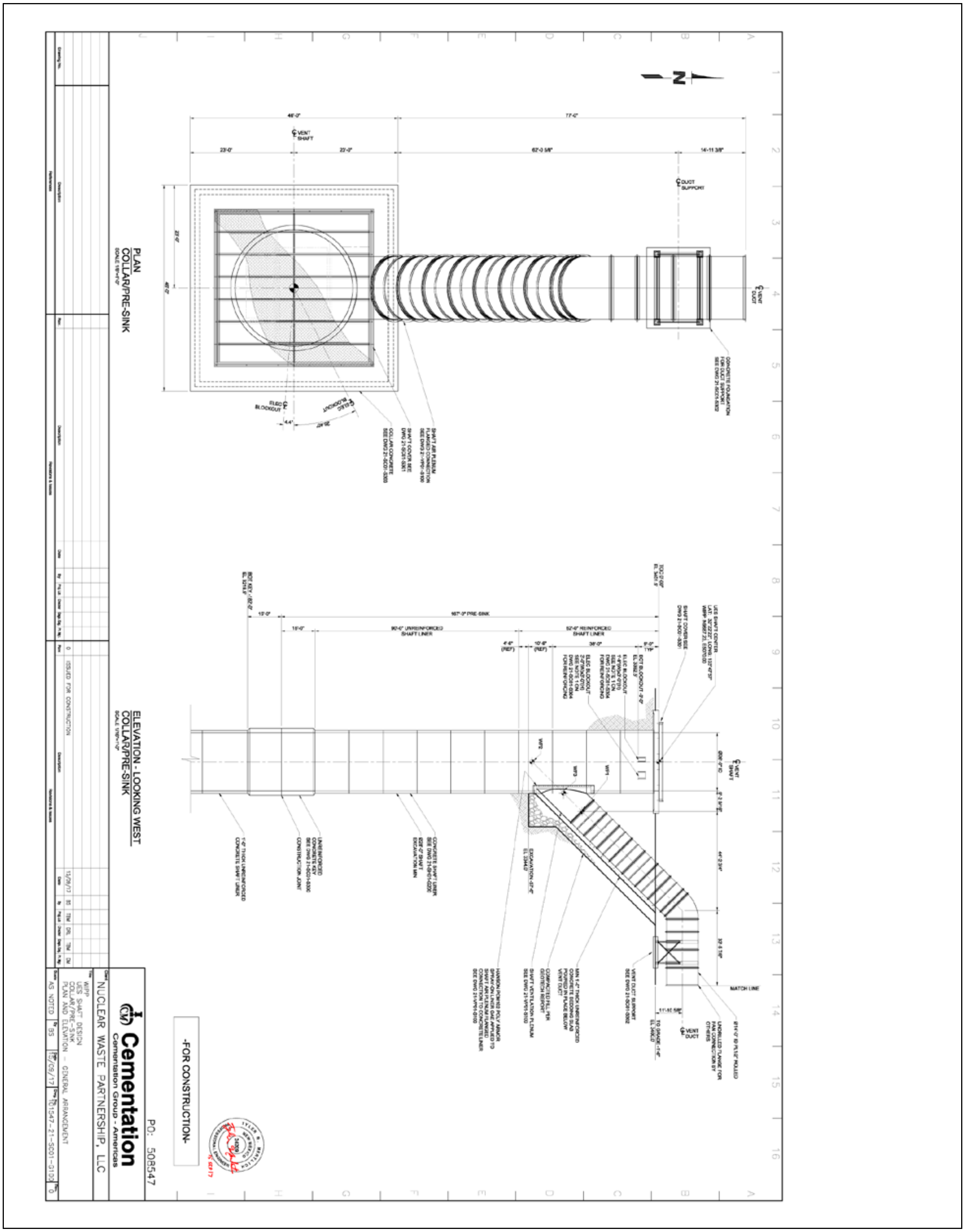

Figure 1: Design Drawing of S#5

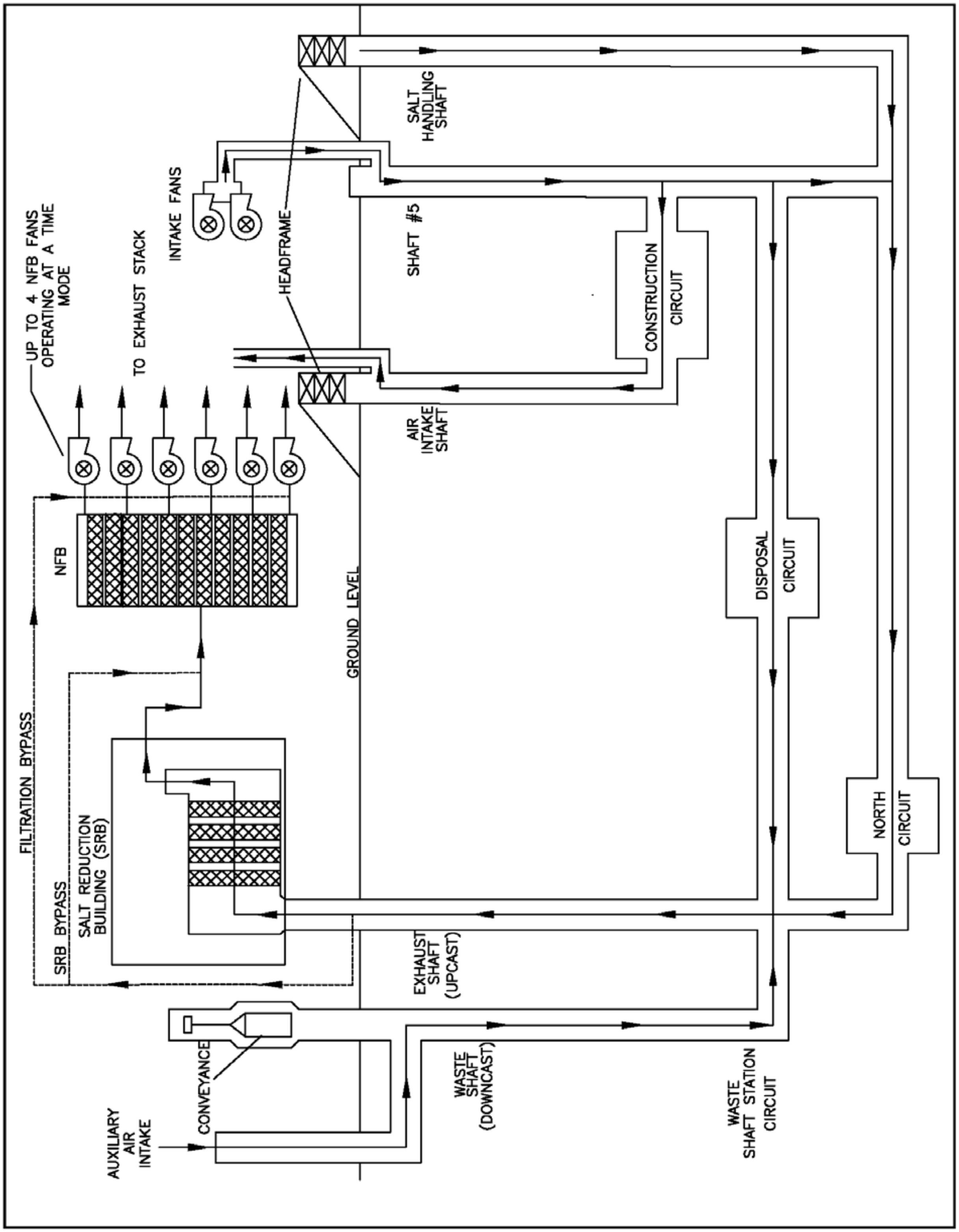

Figure A2-9c (with correction)
Underground Ventilation System Airflow (with S#5)