

**ATTACHMENT N**

**~~CONFIRMATORY~~ VOLATILE ORGANIC COMPOUND MONITORING PLAN**

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## ATTACHMENT N

### CONFIRMATORY VOLATILE ORGANIC COMPOUND MONITORING PLAN

#### TABLE OF CONTENTS

List of Tables .....	<a href="#">N-iii</a>
List of Figures .....	<a href="#">N-iii</a>
Acronyms and Abbreviations .....	<a href="#">N-iv</a>
N-1 <u>Introduction</u> .....	<a href="#">N-1</a>
N-1a <u>Background</u> .....	<a href="#">N-1</a>
N-1b <u>Objectives of the Confirmatory Volatile Organic Compound Monitoring Plan</u> ..	<a href="#">N-2</a>
N-2 <u>Target Volatile Organic Compounds</u> .....	<a href="#">N-2</a>
N-3 <u>Monitoring Design</u> .....	<a href="#">N-3</a>
N-3a <u>Sampling Locations</u> .....	<a href="#">N-3</a>
N-3a(1) <u>Sampling Locations for Repository VOC Monitoring</u> .....	<a href="#">N-3</a>
N-3a(2) <u>Sampling Locations for Disposal Room VOC Monitoring</u> .....	<a href="#">N-4</a>
N-3b <u>Analytes to Be Monitored</u> .....	<a href="#">N-4</a>
N-3c <u>Sampling and Analysis Methods</u> .....	<a href="#">N-5</a>
N-3d <u>Sampling Schedule</u> .....	<a href="#">N-6</a>
N-3d(1) <u>Sampling Schedule for Repository VOC Monitoring</u> .....	<a href="#">N-6</a>
N-3d(2) <u>Sampling Schedule for Disposal Room VOC Monitoring</u> .....	<a href="#">N-6</a>
N-3e <u>Data Evaluation and Reporting</u> .....	<a href="#">N-6</a>
N-3e(1) <u>Data Evaluation and Reporting for Repository VOC Monitoring</u> .....	<a href="#">N-6</a>
N-3e(2) <u>Data Evaluation and Reporting for Disposal Room VOC Monitoring</u>	<a href="#">N-8</a>
.....	<a href="#">N-8</a>
N-4 <u>Sampling and Analysis Procedures</u> .....	<a href="#">N-8</a>
N-4a <u>Sampling Equipment</u> .....	<a href="#">N-9</a>
N-4a(1) <u>SUMMA<sup>®</sup> Canisters</u> .....	<a href="#">N-9</a>
N-4a(2) <u>Volatile Organic Compound Canister Samplers</u> .....	<a href="#">N-9</a>
N-4a(3) <u>Sample Tubing</u> .....	<a href="#">N-9</a>
N-4b <u>Sample Collection</u> .....	<a href="#">N-9</a>
N-4c <u>Sample Management</u> .....	<a href="#">N-10</a>
N-4d <u>Sampler Maintenance</u> .....	<a href="#">N-11</a>
N-4e <u>Analytical Procedures</u> .....	<a href="#">N-11</a>
N-4e(1) <u>Sample Preparation</u> .....	<a href="#">N-12</a>
N-4e(2) <u>Analytical System Requirements</u> .....	<a href="#">N-12</a>
N-4e(3) <u>Standard Preparation</u> .....	<a href="#">N-12</a>
N-4e(4) <u>Calibration Procedures</u> .....	<a href="#">N-13</a>
N-4e(5) <u>Library Searches</u> .....	<a href="#">N-13</a>

N-4e(6) <u>Data Reporting</u> .....	<a href="#">N-13</a>
N-4f <u>Laboratory Selection</u> .....	<a href="#">N-14</a>
N-4g <u>Laboratory Procedures</u> .....	<a href="#">N-14</a>
N-5 <u>Quality Assurance</u> .....	<a href="#">N-14</a>
N-5a <u>Quality Assurance Objectives for the Measurement of Precision, Accuracy, Sensitivity, and Completeness</u> .....	<a href="#">N-15</a>
N-5a(1) <u>Evaluation of Laboratory Precision</u> .....	<a href="#">N-15</a>
N-5a(2) <u>Evaluation of Field Precision</u> .....	<a href="#">N-16</a>
N-5a(3) <u>Evaluation of Laboratory Accuracy</u> .....	<a href="#">N-16</a>
N-5a(d) <u>Evaluation of Sensitivity</u> .....	<a href="#">N-17</a>
N-5a(e) <u>Completeness</u> .....	<a href="#">N-17</a>
N-5b <u>Sample Handling and Custody Procedures</u> .....	<a href="#">N-17</a>
N-5c <u>Calibration Procedures and Frequency</u> .....	<a href="#">N-17</a>
<del>N-5d <u>Analytical Procedures</u> .....</del>	<del><a href="#">N-17</a></del>
N-5e <u>d Data Reduction, Validation, and Reporting</u> .....	<a href="#">N-17</a>
N-5f <u>e Performance and System Audits</u> .....	<a href="#">N-18</a>
N-5g <u>f Preventive Maintenance</u> .....	<a href="#">N-18</a>
N-5h <u>g Corrective Actions</u> .....	<a href="#">N-18</a>
N-5i <u>h Records Management</u> .....	<a href="#">N-19</a>
N-6 <u>References</u> .....	<a href="#">N-20</a>

## List of Tables

Table	Title
N-1	Target Analytes and Methods for Confirmatory Repository VOC (Station VOC-A and VOC-B) Monitoring and Disposal Room Monitoring During the WIPP Disposal Phase
N-2	Volatile Organic Compound Concentrations of Concern
N-3	Bromofluorobenzene Key Ions and Ion Abundance Criteria
N-4	Quality Assurance Objectives for Accuracy, Precision, Sensitivity, and Completeness

## List of Figures

Figure	Title
N-1	Panel Area Flow
N-2	VOC Monitoring System Design
N-3	Example Request for Analysis Form - Disposal Room VOC Monitoring
N-4	Example of Chain of Custody Form - VOC Sample Head Arrangement

## Acronyms and Abbreviations

BFB	<del>4-Bromofluorobenzene</del>
BS/BSD	blank spike/blank spike duplicate
CH	Contact-handled
CLP	Contract Laboratory Program
COC	concentration of concern
CRQL	contract-required quantitation limit
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ft	feet
FTIR	<del>Fourier transform infrared spectrometry</del>
g/mol	grams per mole
GC/MS	gas chromatography/mass spectrometry
HWDU	Hazardous Waste Disposal Unit
LCS	laboratory control sample
m	meter
MDL	method detection limit
MOC	Management and Operating Contractor (Permit Condition I.D.3)
MRL	method reporting limit
NIST	National Institute of Standards and Testing
NMAC	<del>New Mexico Administrative Code</del>
ppbv	parts per billion by volume
QA	quality assurance
QAPD	Quality Assurance Program Description
QAPjP	<del>Quality Assurance Project Plan</del>
QC	quality control
RCRA	Resource Conservation and Recovery Act
RPD	relative percent difference
SOP	standard operating procedure
SOW	<del>statement of work</del>
TIC	tentatively identified compound
TRU	Transuranic
VOC	volatile organic compound

WIPP      Waste Isolation Pilot Plant

## ATTACHMENT N

### CONFIRMATORY VOLATILE ORGANIC COMPOUND MONITORING PLAN

#### 1 N-1 Introduction

2 This Permit Attachment describes the confirmatory monitoring plan for volatile organic  
3 compound (VOC) emissions from mixed waste that may be entrained in the exhaust air from the  
4 U.S. Department of Energy (DOE) Waste Isolation Pilot Plant (WIPP) Underground Hazardous  
5 Waste Disposal Units (HWDUs) during the disposal phase at the facility. The purpose of the  
6 confirmatory VOC monitoring is to ensure compliance with confirm that the concentrations of  
7 VOCs in the emissions from the Underground HWDUs do not exceed the VOC room-based  
8 limits specified in Permit Module IV. This VOC monitoring plan consists of two programs as  
9 follows; (1) Repository VOC Monitoring, which assesses compliance with the environmental  
10 performance standards in Table IV.F.2.c; and (2) Disposal Room VOC Monitoring, which  
11 assesses compliance with the disposal room performance standards in Table IV.F.3.b.  
12 Implementation of this plan ensures compliance with the disposal room performance standards  
13 as directed by Section 311 of Public Law (P.L.) 108-137 and Section 310 of Public Law 108-  
14 147. This plan includes the monitoring design, a description of sampling and analysis  
15 procedures, quality assurance (QA) objectives, and reporting activities.

#### 16 N-1a Background

17 The Underground HWDUs are located 2,150 feet (ft) (655 meters [m]) below ground surface, in  
18 the WIPP underground. As defined for this Permit, an Underground HWDU is a single  
19 excavated panel consisting of seven rooms and two access drifts designated for disposal of  
20 contact-handled (CH) and remote-handled (RH) transuranic (TRU) mixed waste. Each room is  
21 approximately 300 ft (91 m) long, 33 ft (10 m) wide, and 13 ft (4 m) high. Access drifts connect  
22 the rooms and have the same cross section. The Permittees shall dispose of TRU mixed waste  
23 in Underground HWDUs designated as Panels 1 through 7.

24 This plan addresses the following elements:

25 1. Rationale for the design of the VOC monitoring programs, based on:

- 26 ● Possible pathways from WIPP during the active life of the facility
- 27 ● Demonstrating compliance with the disposal room performance standards by  
28 monitoring VOCs in underground disposal rooms
- 29 ● VOC sampling operations at WIPP
- 30 ● Optimum location of the ambient mine air monitoring stations

31 2. Descriptions of the specific elements of the VOC monitoring programs, including:

- 32 ● The type of monitoring conducted
- 33 ● The location of the monitoring stations
- 34 ● The monitoring interval



- The specific hazardous constituents monitored
- The implementation schedule for the VOC monitoring programs
- The equipment used at the monitoring stations
- Sampling and analytical techniques used
- Data recording/reporting procedures
- Action levels for remedial action if limits are approached

The results of baseline VOC monitoring at WIPP were used, in part, to define the confirmatory VOC monitoring programs that will be established for the Disposal Phase, during which full-scale waste emplacement activities will occur. The baseline VOC monitoring results were presented in Appendix D21 of the WIPP Resource Conservation Recovery Act (RCRA) Part B Permit Application (DOE, 1997). These data represent the anticipated background levels of VOCs during operations at WIPP. The technical basis for Disposal Room VOC Monitoring is discussed in detail in the Technical Evaluation Report for Room-Based VOC Monitoring (WRES, 2003).

#### N-1b Objectives of the Confirmatory Volatile Organic Compound Monitoring Plan

The CH and RH TRU mixed waste disposed in the WIPP Underground HWDUs contain VOCs which could be released from open and closed panels located at WIPP during the disposal phase of the project. This plan describes how:

- VOCs released from waste panels will be monitored to confirm that the annual average concentration of VOCs in the air emissions from the Underground HWDUs do not exceed the VOC concentrations of concern (COC) listed in Table N-2: identified in Permit Module IV, Table IV.F.2.c. Appropriate remedial action, as specified in Permit Condition IV.F.2.d, will be taken if the limits in Permit Module IV, Table IV.F.2.c are reached.
- VOCs released from waste containers in disposal rooms will be monitored to confirm that the concentration of VOCs in the air of closed and active rooms in active panels do not exceed the VOC disposal room limits identified in Permit Module IV, Table IV.D.1. Appropriate remedial action, as specified in Permit Condition IV.F.3.c, will be taken if the Action Levels in Permit Module IV, Table IV.F.3.b are reached.

#### N-2 Target Volatile Organic Compounds

The target VOCs for repository monitoring (Station VOC-A and VOC-B) and disposal room monitoring presented in Table N-1. this sampling plan will be as follows:

- Carbon tetrachloride
- Chlorobenzene
- Chloroform
- 1,1-Dichloroethylene
- 1,2-Dichloroethane
- Methylene chloride
- 1,1,2,2-Tetrachloroethane

1 —●— Toluene  
2 —●— 1,1,1-Trichloroethane

3 These target VOCs were selected because together they represent approximately 99 percent of  
4 the risk due to air emissions. ~~Physical and chemical data for these target VOCs for confirmatory~~  
5 ~~air monitoring are presented in Table N-1.~~

### 6 N-3 Monitoring Design

7 Detailed design features of this plan are presented in this section. This plan uses available  
8 sampling and analysis techniques to measure VOC concentrations in air. ~~Available sampling~~  
9 ~~equipment includes the WIPP VOC canister samplers both the Repository and~~  
10 ~~Disposal Room VOC Monitoring Programs.~~

### 11 N-3a Sampling Locations

12 Air samples will be collected in the underground to quantify airborne VOC concentrations as  
13 described in the following sections.

### 14 N-3a(1) Sampling Locations for Repository VOC Monitoring

15 The initial configuration for the ~~confirmatory~~ repository VOC monitoring stations is shown in  
16 Figure N-1. All mine ventilation air which could potentially be impacted by VOC emissions from  
17 the Underground HWDUs identified as Panels 1 through 7 will pass monitoring Station VOC-A,  
18 located in the E-300 drift as it flows to the exhaust shaft. Air samples will be collected at two  
19 locations in the facility to quantify airborne VOC concentrations. VOC concentrations  
20 attributable to VOC emissions from open and closed panels containing CH TRU mixed waste  
21 will be measured by placing one VOC monitoring station just downstream from Panel 1 at VOC-  
22 A. The location of Station VOC-A will remain the same throughout the term of this Permit. The  
23 second station (Station VOC-B) will always be located upstream from the open panel being filled  
24 with waste (starting with Panel 1 at monitoring Station VOC-B (Figure N-1). In this configuration,  
25 Station VOC-B will measure VOC concentrations attributable to releases from the upstream  
26 sources and other background sources of VOCs, but not releases attributable to open or closed  
27 panels. The location of Station VOC-B will change when disposal activities begin in the next  
28 panel. Station VOC-B will be relocated to ensure that it is always upstream of the open panel  
29 that is receiving TRU mixed waste. Station VOC-A will also measure upstream VOC  
30 concentrations measured at Station VOC-B, plus any additional VOC concentrations resulting  
31 from releases from the closed and open panels. A sample will be collected from each monitoring  
32 station on designated sample days. For each quantified target VOC, the concentration  
33 measured at Station VOC-B will be subtracted from the concentration measured at Station  
34 VOC-A to assess the magnitude of VOC releases from closed and open panels.

35 The sampling locations were selected based on operational considerations. There are several  
36 different potential sources of release for VOCs into the WIPP mine ventilation air. These  
37 sources include incoming air from above ground and facility support operations, as well as open  
38 and closed waste panels. In addition, because of the ventilation requirements of the  
39 underground facility and atmospheric dispersion characteristics, any VOCs that are released  
40 open or closed panels may be difficult to detect and differentiate from other sources of VOCs at

1 any underground or above ground location further downstream of Panel 1. By measuring VOC  
2 concentrations close to the potential source of release (i.e., at Station VOC-A), it will be possible  
3 to differentiate potential releases from background levels (measured at Station VOC-B).

#### 4 N-3a(2) Sampling Locations for Disposal Room VOC Monitoring

5 For purposes of compliance with the Section 311 of Public Law 108-137 and Section 310 of  
6 Public Law 108-447, the VOC monitoring of airborne VOCs in underground disposal rooms in  
7 which waste has been emplaced will be performed as follows:

- 8 1. A sample head will be installed inside the disposal room behind the exhaust drift  
9 bulkhead and at the inlet side of the disposal room.
- 10 2. TRU mixed waste will be emplaced in the active disposal room.
- 11 3. When the active disposal room is filled, another sample head will be installed to  
12 the inlet of the filled active disposal room. (Figure N-3 and N-4)
- 13 4. The exhaust drift bulkhead will be removed and re-installed in the next disposal  
14 room so disposal activities may proceed.
- 15 5. A ventilation barrier will be installed where the bulkhead was located in the active  
16 disposal room's exhaust drift. Another ventilation barrier will be installed in the  
17 active disposal room's air inlet drift, thereby closing that active disposal room.
- 18 6. Monitoring of VOCs will continue in the now closed disposal room. Monitoring of  
19 VOCs will occur in the active disposal room and all closed disposal rooms in  
20 which waste has been emplaced until commencement of panel closure activities  
21 (i.e., completion of ventilation barriers in Room 1).
- 22
- 23
- 24

25 This sequence for installing sample locations will proceed in the remaining disposal rooms until  
26 the inlet air ventilation barrier is installed in disposal room one. An inlet sampler will not be  
27 installed in disposal room one because disposal room sampling proceeds to the next panel.

#### 28 N-3b Analytes to Be Monitored

29 The nine VOCs that have been identified for repository and disposal room monitoring are listed  
30 in Table N-1. The analysis will focus on routine detection and quantification of these compounds  
31 in collected samples. ~~Other compounds may also be present in the samples. As part of the~~  
32 ~~analytical evaluations, the presence of other compounds will be investigated. The analytical~~  
33 ~~method will allow semiquantitative evaluation of these compounds as tentatively identified~~  
34 ~~compounds.~~ The analytical laboratory will be directed to classify these compounds as  
35 Tentatively Identified Compounds (TICs). TICs detected in 25% or more of the repository VOC  
36 monitoring samples collected over a twelve-month timeframe will be added to the target analyte  
37 lists for both the repository and disposal room VOC monitoring programs, unless the Permittees  
38 can justify the exclusion from the target analyte list(s).

1 TICs detected in the repository and disposal room VOC monitoring programs will be placed in  
2 the WIPP Operating Record and reported to NMED in the Annual VOC Monitoring Report as  
3 specified in Permit Condition IV.F.2.b.

#### 4 N-3c Sampling and Analysis Methods

5 The present WIPP VOC monitoring program includes a comprehensive VOC monitoring  
6 program established at the facility; equipment, training, and documentation for VOC  
7 measurements are already in place.

8 The method that will be used for VOC sampling is based on the concept of pressurized sample  
9 collection contained in the U.S. Environmental Protection Agency (EPA) Compendium Method  
10 TO-14A (EPA, 1997) TO-15 (EPA, 1999). The TO-14A5 sampling concept uses 6-liter SUMMA®  
11 passivated (or equivalent) stainless-steel canisters to collect integrated air samples at each  
12 sample location. This conceptual method will be used as a reference for collecting the samples  
13 at WIPP. The samples will be analyzed using gas chromatography/mass spectrometry (GC/MS)  
14 under an established QA/quality control (QC) program. Laboratory analytical procedures have  
15 been developed based on the concepts contained in both TO-14A5 and 8260B the draft EPA  
16 *Contract Laboratory Program - Statement of Work (CLP-SOW) for Volatile Organics Analysis of*  
17 *Ambient Air in Canisters* (EPA, 1994). Section N-5 contains additional QA/QC information for  
18 this project.

19 The TO-14A5 method is an EPA-recognized sampling concept for VOC sampling and  
20 speciation. It can be used to provide integrated samples, or grab samples, and compound  
21 quantitation for a broad range of concentrations. The sampling system can be operated  
22 unattended but requires detailed operator training. This sampling technique is viable for use  
23 while analyzing the sample using other EPA methods such as 8260B.

24 The field sampling systems will be operated in the pressurized mode. In this mode, air is drawn  
25 through the inlet and sampling system with a pump. The air is pumped into an initially evacuated  
26 SUMMA® passivated (or equivalent) canister by the sampler, which regulates the rate and  
27 duration of sampling. ~~The passivation process forms a pure chrome-nickel oxide on the interior~~  
28 ~~surfaces of the canisters.~~ The treatment of tubing and canisters used for VOC sampling  
29 effectively seals the inner walls and prevents compounds from being retained on the surfaces of  
30 the equipment. By the end of each sampling period, the canisters will be pressurized to about  
31 two atmospheres absolute. In the event of shortened sampling periods or other sampling  
32 conditions, the final pressure in the canister may be less than two atmospheres absolute.  
33 Sampling duration will be approximately six hours, so that a complete sample can be collected  
34 during a single work shift.

35 The canister sampling system and GC/MS analytical method are particularly appropriate for the  
36 VOC Confirmatory Monitoring Programs because a relatively large sample volume is collected,  
37 and multiple dilutions and reanalyses can occur to ensure identification and quantification of  
38 target VOCs within the working range of the method. The contract-required quantitation limits  
39 (CRQL) proposed by the EPA in the CLP-SOW are 5 parts per billion by volume (ppbv) or less  
40 for the nine target compounds (EPA, 1994). Consequently, low concentrations can be  
41 measured. CRQLs are the EPA-specified levels of quantitation proposed for EPA contract  
42 laboratories that analyze canister samples by GC/MS. For the purpose of this plan, the CRQLs

1 will be defined as the method reporting limits (**MRL**). The MRL is a function of instrument  
2 performance, sample preparation, sample dilution, and all steps involved in the sample analysis  
3 process.

4 ~~Alternative sampling methods will be considered for deployment. One option will be to use~~  
5 ~~subatmospheric samplers rather than pressurized sampling systems for stations VOC-A and~~  
6 ~~VOC-B. In addition, remote sensing by proposed draft EPA Method TO-16, open-path fourier~~  
7 ~~transform infrared spectrometry (**FTIR**) and extractive FTIR, may constitute supplemental or~~  
8 ~~alternative methods for detecting VOCs released from waste panels at WIPP. WIPP personnel~~  
9 ~~will continue to follow the development of emerging FTIR technology, and other potentially~~  
10 ~~applicable technologies for assessing VOCs in the WIPP environment. Real-time monitoring~~  
11 ~~with an FTIR system may be a feasible future option for the VOC Confirmatory Monitoring~~  
12 ~~Program. If the Permittees determine that an alternate sampling technique is appropriate, the~~  
13 ~~Permittees will submit a request for a Permit modification to the Secretary for review and~~  
14 ~~approval. The Permit modification request will include a revised confirmatory VOC monitoring~~  
15 ~~plan.~~

16 **Disposal room VOC monitoring system will employ the same canister sampling method as used**  
17 **in the repository VOC monitoring. Passivated or equivalent sampling lines will be installed in the**  
18 **disposal room as described in Section N-3a(2) and maintained once the room is closed until the**  
19 **panel associated with the room is closed. The independent lines will run from the sample inlet**  
20 **point to the individual sampler located in the access drift to the disposal panel. The air will pass**  
21 **through dual particulate filters to prevent sample and equipment contamination.**

#### 22 N-3d Sampling Schedule

23 The Permittees will evaluate whether the monitoring systems and analytical methods are  
24 functioning properly. The assessment period will be determined by the Permittees.

#### 25 **N-3d(1) Sampling Schedule for Repository VOC Monitoring**

26 ~~Confirmatory~~ **Repository** VOC sampling at Stations VOC-A and VOC-B will begin with initial  
27 waste emplacement in Panel 1. Sampling will continue until the certified closure of the last  
28 Underground HWDU. Routine sampling will be conducted two times per week.

#### 29 **N-3d(2) Sampling Schedule for Disposal Room VOC Monitoring**

30 **The disposal room sampling will occur once every two weeks, unless the need to increase the**  
31 **frequency to weekly occurs in accordance with Permit Condition IV.F.3.c.**

#### 32 N-3e Data Evaluation and Reporting

#### 33 **N-3e(1) Data Evaluation and Reporting for Repository VOC Monitoring**

34 When the Permittees receive laboratory analytical data from an air sampling event, the data will  
35 be validated as specified in Section N-5e. After obtaining validated data from an air sampling  
36 event, the data will be evaluated to determine whether the VOC emissions from the  
37 Underground HWDUs exceed the COCs. The COCs for each of the nine target VOCs are

1 presented in **Permit Module IV, Table IV.F.2.c** ~~Table N-2~~. The values are presented in terms of  
2 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) and ppbv.

3 The COCs were calculated assuming typical operational conditions for ventilation rates in the  
4 mine. The typical operational conditions were assumed to be an overall mine ventilation rate of  
5 425,000 standard cubic feet per minute and a flow rate through the E-300 Drift at Station VOC-A  
6 of 130,000 standard cubic feet per minute.

7 Since the mine ventilation rates at the time the air samples are collected may be different than  
8 the mine ventilation rates during typical operational conditions, the Permittees will measure  
9 and/or record the overall mine ventilation rate and the ventilation rate in the E-300 Drift at  
10 Station VOC-A that are in use during each sampling event. The Permittees shall also measure  
11 and record temperature and pressure conditions during the sampling event to allow all  
12 ventilation rates to be converted to standard flow rates.

13 If the air samples were collected under the typical mine ventilation rate conditions, then the  
14 analytical data will be used without further manipulation. The concentration of each target VOC  
15 detected at Station VOC-B will be subtracted from the concentration detected at Station VOC-A.  
16 The resulting VOC concentration represents the concentration of VOCs being emitted from the  
17 open and closed Underground HWDUs upstream of Station VOC-A (or the Underground HWDU  
18 VOC emission concentration.)

19 If the air samples were not collected under typical mine ventilation rate operating conditions, the  
20 air monitoring analytical results from both Station VOC-A and Station VOC-B will be normalized  
21 to the typical operating conditions. This will be accomplished using the mine ventilation rates in  
22 use during the sampling event and the following equation:

$$NVOC_{AB} = VOC_{AB} * \left( \frac{425,000_{scfm} / 130,000_{scfm}}{V_{O_{scfm}} / V_{E-300_{scfm}}} \right) \quad (N-1)$$

24 Where:  $NVOC_{AB}$  = Normalized target VOC concentration from Stations  
25 VOC-A or VOC-B  
26  $VOC_{AB}$  = Concentration of the target VOC detected at Station  
27 VOC-A or VOC-B under non-typical mine ventilation rates  
28 scfm = Standard cubic feet per minute  
29  $V_o$  = Sampling event overall mine ventilation rate (in standard  
30 cubic feet per minute)  
31 VE-300 = Sampling event mine ventilation rate through the E-300  
32 Drift (in standard cubic feet per minute)

33 The normalized concentration of each target VOC detected at Station VOC-B will be subtracted  
34 from the normalized concentration detected at Station VOC-A. The resulting concentration  
35 represents the Underground HWDU VOC emission concentration.

36 The Underground HWDU VOC emission concentration for each target VOC that is calculated for  
37 each sampling event will be compared directly to its COC listed in **Permit Module IV, Table**

1 ~~IV.F.2.c Table N-2~~. This will establish whether any of the concentrations of VOCs in the  
2 emissions from the Underground HWDUs exceeded the COCs at the time of the sampling.

3 As specified in Permit Module IV, the Permittees shall notify the Secretary in writing, within five  
4 (5) working days of obtaining validated analytical results, whenever the concentrations of any  
5 target VOC listed in exceeds the concentration of concern specified in **Permit Module IV, Table**  
6 ~~IV.F.2.c Table N-2~~.

7 The Underground HWDU VOC emission concentration for each target VOC that is calculated for  
8 each sampling event will then be averaged with the Underground HWDU VOC emission  
9 concentrations calculated for the air sampling events conducted during the previous 12 months.  
10 This will be considered the running annual average concentration for each target VOC. For the  
11 first year of air sampling, the running annual average concentration for each target VOC will be  
12 calculated using all of the previously collected data.

13 As specified in Permit Module IV, the Permittees shall notify the Secretary in writing, within five  
14 (5) ~~working~~ **working** days of obtaining validated analytical results, whenever the running annual  
15 average concentration (calculated after each sampling event) for any target VOC exceeds the  
16 concentration of concern specified in **Permit Module IV, Table IV.F.2.c** ~~Table N-2~~.

17 If the results obtained from an individual air sampling event do not trigger the notification  
18 requirements of Permit Module IV, then the Permittees will maintain a database with the VOC  
19 air sampling data and the results will be reported to the Secretary as specified in Permit Module  
20 IV.

#### 21 **N-3e(2) Data Evaluation and Reporting for Disposal Room VOC Monitoring**

22 **When the Permittees receive laboratory analytical data from an air sampling event, the data will**  
23 **be validated as specified in Section N-5a, within three (3) working days of receiving the**  
24 **laboratory analytical data. After obtaining validated data from an air sampling event, the data will**  
25 **be evaluated to determine whether the VOC concentrations in the air of any closed room, the**  
26 **active open room, or the immediately adjacent closed room exceeded the Action Levels for**  
27 **Disposal Room Monitoring specified in Permit Module IV, Table IV.F.3.b.**

28 **The Permittees shall notify the Secretary in writing, within five (5) working days of obtaining**  
29 **validated analytical results, whenever the concentration of any VOC specified in Permit Module**  
30 **IV, Table IV.D.1 exceeds the action levels specified in Permit Module IV, Table IV.F.3.b.**

31 **The Permittees shall submit to the Secretary the Annual VOC Monitoring Report specified in**  
32 **Permit Condition IV.F.2.b that also includes results from disposal room VOC monitoring.**

#### 33 **N-4 Sampling and Analysis Procedures**

34 This section describes the equipment and procedures that will be implemented during sample  
35 collection and analysis activities for VOCs at WIPP.

1 N-4a Sampling Equipment

2 The sampling equipment that will be used includes the following: 6-liter (L) stainless-steel  
3 SUMMA<sup>®</sup> canisters, and VOC canister samplers, **treated stainless steel tubing, and a dual filter**  
4 **housing**. A discussion of each of these items is presented below.

5 N-4a(1) SUMMA<sup>®</sup> Canisters

6 Six-liter, stainless-steel canisters with SUMMA<sup>®</sup> passivated interior surfaces will be used to  
7 collect and store all ambient air and gas samples for VOC analyses collected as part of the  
8 monitoring processes. These canisters will be cleaned and certified prior to their use, in a  
9 manner similar to that described by Compendium Method TO-14A~~5~~ and the draft EPA GLP-  
10 ~~SOW for Analysis of Ambient Air in Canisters (EPA, 1994)~~. The canisters will be certified clean  
11 to below the required reporting limits for the VOC analytical method for the target VOCs (see  
12 **Table N-42**). The vacuum of certified clean samplers will be verified at the sampler upon  
13 initiation of a sample cycle.

14 N-4a(2) Volatile Organic Compound Canister Samplers

15 A conceptual diagram of a VOC sample collection unit is provided in Figure N-2. ~~Two such~~  
16 ~~systems, located~~ **Such units will be used** at monitoring Stations VOC-A and VOC-B, ~~will be~~  
17 ~~operational at the time waste disposal operations begin in Panel 4~~ **and at sampling locations for**  
18 **disposal room measurements**. The sampling ~~system~~ **unit** consists of a sample pump, flow  
19 controller, sample inlet, ~~two~~ inlet filters in series to remove particulate matter, vacuum/pressure  
20 gauge, electronic timer, inlet purge vent, two sampling ports, and sufficient collection canisters  
21 so that any delays attributed to laboratory turnaround time and canister cleaning and  
22 certification will not result in canister shortages. Knowledge of sampler flow rates and duration  
23 of sampling will allow calculation of sample volume. The set point flow rate will be verified before  
24 and after sample collection from the mass flow indication. Prior to their initial use and annually  
25 thereafter, the sample collection units will be tested and certified to demonstrate that they are  
26 free of contamination above the reporting limits of the VOC analytical method (see Section N-5).  
27 Ultra-high purity humidified zero air will be pumped through the inlet line and sampling unit and  
28 collected in previously certified canisters as sampler blanks for analysis. The cleaning and  
29 certification procedure is derived from concepts contained in the EPA Compendium Method ~~TO-~~  
30 ~~14A (EPA, 1997)~~ **TO-15 (EPA, 1999)**.

31 N-4a(3) Sample Tubing

32 **Treated stainless steel tubing is used as a sample path, from the desired sample point to the**  
33 **sample collection unit. This tubing is treated to prevent the inner walls from absorbing**  
34 **contaminants when they are pulled from the sample point to the sample collection unit.**

35 N-4b Sample Collection

36 Six-hour integrated samples will be collected on each sample day. Alternative sampling  
37 durations may be defined for experimental purposes. The VOC canister sampler at each  
38 location will sample ambient air on the same programmed schedule. The sample pump will be  
39 programmed to sample continuously over a six-hour period during the workday. The units will



1 sample at a nominal flow rate of 33.3 actual milliliters per minute over a six-hour sample period.  
2 This schedule will yield a final sample volume of approximately 12 L. Flow rates and sampling  
3 duration may be modified as necessary for experimental purposes and to meet the data quality  
4 objectives.

5 Sample flow will be checked each sample day using an in-line mass flow controller. The flow  
6 controllers are initially factory-calibrated and specify a typical accuracy of better than 10 percent  
7 full scale. Additionally, each air flow controller is calibrated at a manufacturer-specified  
8 frequency using a National Institute of Standards and Testing (NIST) primary flow standard.

9 Upon initiation of waste disposal activities in Panel 1, samples will be collected twice each week  
10 (at Stations VOC-A and VOC-B). Samples collected at the panel locations should represent the  
11 same matrix type (i.e., elevated levels of salt aerosols). To verify the matrix similarity and  
12 assess field sampling precision, field duplicate samples will be collected (two canisters filled  
13 simultaneously by the same sampler) from each sampling station (Stations VOC-A and VOC-B)  
14 during the first sampling event and at an overall frequency of 5 percent thereafter (see  
15 Section N-5a).

16 Prior to collecting the active open disposal room and closed room samples, the sample lines are  
17 purged to ensure that the air collected is not air that has been stagnant in the tubing. This is  
18 important in regard to the disposal room sample particularly because of the long lengths of  
19 tubing associated with these samples. The repository samples do not require this action due to  
20 the short lengths of tubing required at these locations.

#### 21 N-4c Sample Management

22 Field sampling data sheets will be used to document the sampler conditions under which each  
23 sample is collected. These data sheets have been developed specifically for VOC monitoring at  
24 the WIPP facility. The individuals assigned to collect the specific samples will be required to fill  
25 in all of the appropriate sample data and to maintain this record in sample logbooks. The  
26 program team leader will review these forms for each sampling event.

27 All sample containers will be marked with identification at the time of collection of the sample. A  
28 Request-for-Analysis Form (Figure N-3) will be completed to identify the sample canister  
29 number(s), sample type and type of analysis requested.

30 All samples will be maintained, and shipped if necessary, at ambient temperatures. Collected  
31 samples will be transported in appropriate containers. Prior to leaving the underground for  
32 analysis, sample containers may undergo radiological screening. No potentially contaminated  
33 samples or equipment will be transported to the surface. No samples will be accepted by the  
34 receiving laboratory personnel unless they are properly labeled and sealed to ensure a tamper  
35 free shipment.

36 An important component of the sampling program is a demonstration that collected samples  
37 were obtained from the locations stated and that they reached the laboratory without alteration.  
38 To satisfy this requirement, evidence of collection, shipment, laboratory receipt, and custody will  
39 be documented with a completed Chain-of-Custody Form (Figure N-4). Chain-of-custody

1 procedures will be followed closely, and additional requirements imposed by the laboratory for  
2 sample analysis will be included as necessary.

3 Individuals collecting samples will be responsible for the initiation of custody procedures. The  
4 chain of custody will include documentation as to the canister certification, location of sampling  
5 event, time, date, and individual handling the samples. Deviations from procedure will be  
6 considered variances. Variances must be preapproved by the program manager and recorded  
7 in the project files. Unintentional deviations, sampler malfunctions, and other problems are  
8 nonconformances. Nonconformances must be documented and recorded in the project files. All  
9 field logbooks/data sheets must be incorporated into WIPP's records management program.

#### 10 N-4d Sampler Maintenance

11 Periodic maintenance for canister samplers and associated equipment will be performed during  
12 each cleaning cycle. This maintenance will include, but not be limited to, replacement of  
13 damaged or malfunctioning parts without compromising the integrity of the sampler, leak testing,  
14 and instrument calibration. Additionally, complete spare units will be maintained on-site to  
15 minimize downtime because of sampler malfunction. At a minimum, canister samplers will be  
16 certified for cleanliness initially and annually thereafter **upon initial use**, after any parts that are  
17 included in the sample flow path are replaced, or any time analytical results indicate potential  
18 contamination. All sample canisters will be certified prior to each usage.

#### 19 N-4e Analytical Procedures

20 Analytical procedures used in the analysis of VOC samples from canisters are based on  
21 concepts contained in Compendium Method ~~TO-14A (EPA, 1997)~~ **TO-15 (EPA, 1999)** and in  
22 **SW-846 Method 8260B (EPA 1996)** ~~the draft CLP-SOW for Analysis of Ambient Air (EPA,~~  
23 ~~1994).~~ ~~The technical approach for canister sample analysis is summarized below.~~

24 **Analysis of samples will be performed by a certified laboratory. Methods will be specified in**  
25 **procurement documents and will be selected to be consistent with Compendium Method TO-15**  
26 **(EPA, 1999) or EPA recommended procedures in SW-846 (EPA, 1996). Additional detail on**  
27 **analytical techniques and methods will be given in laboratory SOPs.**

28 **The Permittees will establish the criteria for laboratory selection, including the stipulation that**  
29 **the laboratory follow the procedures specified in the appropriate Air Compendium or SW-846**  
30 **method and that the laboratory follow EPA protocols. The selected laboratory shall demonstrate,**  
31 **through laboratory SOPs, that it will follow appropriate EPA SW-846 requirements and the**  
32 **requirements specified by the EPA Air Compendium protocols. The laboratory shall also provide**  
33 **documentation to the Permittees describing the sensitivity of laboratory instrumentation. This**  
34 **documentation will be retained in the facility operating record and will be available for review**  
35 **upon request by NMED.**

36 **The SOPs for the laboratory currently under contract will be maintained in the operating record**  
37 **by the Permittees. The Permittees will provide NMED with an initial set of applicable laboratory**  
38 **SOPs for information purposes, and provide NMED with any updated SOPs on an annual basis.**

1 ~~Data validation will be performed by the Permittees. Copies of the data validation report will be~~  
2 ~~kept on file in the operating record for review upon request by NMED.~~

3 ~~N-4e(1) Sample Preparation~~

4 ~~Because canisters will be pressurized during the sampling procedure, laboratory pressurization~~  
5 ~~will not normally be necessary for analyses. Canister pressures will be verified by the laboratory~~  
6 ~~when they are received to confirm that significant losses did not take place during shipping and~~  
7 ~~storage.~~

8 ~~N-4e(2) Analytical System Requirements~~

9 ~~The GC/MS analytical system will consist of three major components: the sample introduction~~  
10 ~~system, the analyte separation system (**GC**), and the analyte detector system (**MS**).~~

- 11 ~~● Sample Introduction System for Canisters: This system may include a drying tube to~~  
12 ~~remove moisture from the gas stream. One or more cryogenic traps may be used to~~  
13 ~~focus and desorb trapped material. Transfer lines within the introduction unit will be~~  
14 ~~heated as necessary so that volatile compounds are not actively adsorbed. Valves and~~  
15 ~~solenoids will be heated and of a low dead volume type. The introduction system will~~  
16 ~~have an in-line mass flow controller. The introduction unit will be capable of introducing~~  
17 ~~internal standards directly into the sample flow path.~~
- 18 ~~● Analyte Separation: Analyte separation will be achieved by GC. The GC will be capable~~  
19 ~~of subambient temperature programming.~~
- 20 ~~● Detection System: Analyte detection will be accomplished by MS. The MS must be~~  
21 ~~capable of scanning from 35 to 300 mass-to-charge ratio in one second or less, using 70~~  
22 ~~electron-volt electron energy in the electron impact ionization mode, and produce a~~  
23 ~~mass spectrum which meets all the instrument performance acceptance criteria when 50~~  
24 ~~nanograms of 4-bromofluorobenzene (**BFB**) is analyzed. The MS must have a data~~  
25 ~~system capable of continuous acquisition and storage on machine readable media~~  
26 ~~storing all raw data, and a computer algorithm for analyte quantitation and forward library~~  
27 ~~searching. All raw and processed GC/MS data must be stored on magnetic tape or disk~~  
28 ~~and maintained as Lifetime Records (i.e., for the life of the confirmatory VOC monitoring~~  
29 ~~program plus six years).~~

30 ~~N-4e(3) Standard Preparation~~

31 ~~Primary analytical standards will be prepared by the laboratory from commercially available,~~  
32 ~~certified calibration gases. Alternatively, primary standards may be generated internally by the~~  
33 ~~laboratory. Primary standards of analytes that are gases at standard temperature and pressure~~  
34 ~~may be prepared internally in a static gas dilution bottle. For analytes that are liquid or solid at~~  
35 ~~standard temperature and pressure, a mixture may be made and loaded directly into a standard~~  
36 ~~preparation cylinder. These internally generated standards will be checked against EPA audit~~  
37 ~~cylinders or other reference materials to verify the accuracy of their concentrations.~~

1 Primary standards will be prepared for the nine target compounds as well as the internal  
2 standards. Secondary standards used for instrument calibration will be prepared from dilution of  
3 the primary standards.

#### 4 ~~N-4e(4) Calibration Procedures~~

5 Prior to the analysis of a standard curve, the GC/MS system must undergo a mass calibration  
6 check. This check is performed by introducing 50 nanograms of BFB into the capillary column  
7 through the preconcentrator. The requirements (criteria) for relative ion abundances for BFB,  
8 listed in Table N-3, must be met before analyses may proceed. BFB requirements must be met  
9 for each 12 hours of operation.

10 Quantitative standards for the nine target analytes will be analyzed at five concentrations.  
11 These concentrations should define the linear range of the instrument for these nine  
12 compounds; however, if some nonlinearity exists, concentrations may be determined by curve  
13 fitting or physically plotting the data. One standard concentration shall be at or near a  
14 concentration corresponding to the required MRL for each target compound. Relative response  
15 factors will be generated for each target compound. These response factors must meet the  
16 requirements listed in Section N-5a(3). As discussed above, if low concentration standards do  
17 not meet the linearity requirement, a curve-fitting routine may be used. The method used to  
18 quantify the data must be reported with the analytical results. In addition, a single point  
19 calibration check will be performed for each 12 hours of analytical system operation.

#### 20 ~~N-4e(5) Library Searches~~

21 In every sample analyzed, a forward search of the NIST library of mass spectra for tentatively  
22 identified compounds must be performed for all chromatographic peaks greater than 10 percent  
23 of the nearest internal standard.

#### 24 ~~N-4e(6) Data Reporting~~

25 The laboratory will provide a data package that identifies and describes the sample analyzed,  
26 the analysis date, the analytical results, the QC check results and description of any unusual  
27 conditions encountered.

28 Sample target analyte concentrations will be quantified using the average relative response  
29 factor of the initial calibration standards and will be reported in ppbv. Non-target sample  
30 contaminants identified by NIST library searches will be reported as tentatively identified  
31 compounds, and concentration calculations will be based on the response of the nearest  
32 internal standard. The relative response factor used for quantitation, as well as copies of  
33 spectra with the library search results (purity and/or fit), will be submitted with the results. A  
34 table listing the run sequence with the corresponding internal standard area counts will be  
35 reported with the analytical results. A narrative describing any problems with sample analyses  
36 will be included. Any nonconformances must be included with the reporting of the data.

1 N-4f Laboratory Selection

2 Sample will be analyzed at the WIPP on-site analytical laboratory and/or at a suitable contract  
3 analytical laboratory. Upon selection of an off-site contract laboratory, the Permittees will ensure  
4 that procured services conform to specified requirements. These measures generally will  
5 include one or more of the following: (1) evaluation of the supplier's capability to provide  
6 services in accordance with requirements, including a history of providing similar services;  
7 (2) evaluation of objective evidence of conformance, such as laboratory document submittals;  
8 and (3) examination of delivered services.

9 If the WIPP on-site analytical laboratory is utilized to conduct the sample analyses, then  
10 duplicate samples from each sampling station (Stations VOC-A and VOC-B) will be collected at  
11 an overall frequency of 10 percent. The duplicate samples will be analyzed by an independent  
12 off-site analytical laboratory (see Section N-5a).

13 N-4g Laboratory Procedures

14 Specific laboratories that perform analyses and sampler certification activities for the  
15 Confirmatory VOC Monitoring Program are required to develop and maintain the following SOPs  
16 as appropriate:

- 17 ● Canister cleaning and certification
- 18 ● Sampler cleaning and certification
- 19 ● Analyses of VOCs in SUMMA<sup>®</sup> canisters
- 20 ● Data QA and reporting

21 Analytical laboratories are required to maintain an internal program QA manual, and to develop  
22 and prepare a Quality Assurance Project Plan (QAPjP) covering cleaning and certification of  
23 canisters and laboratory analysis of canister samples.

24 N-5 Quality Assurance

25 The QA activities for the confirmatory VOC monitoring programs will be conducted in  
26 accordance with the documents: *EPA Requirements Guidance for Quality Assurance Project*  
27 *Plans for Environmental Data Operations QA/G-5* (EPA, 1994 2002), *Guidance for the Data*  
28 *Quality Objectives Process, QA/G-4* (EPA, 2000), and the *Interim Guidelines and Specifications*  
29 *EPA Requirements for Preparing Quality Assurance Project Plans, QA/R-5* (EPA, 1983 2001).  
30 The QA criteria for the confirmatory VOC monitoring programs are listed in Table N-42. This  
31 section addresses the methods to be used to evaluate the components of the measurement  
32 system and how this evaluation will be used to assess data quality. The QA limits for the  
33 sampling procedures and laboratory analysis shall be in accordance with the limits set forth in  
34 the specific EPA Method referenced in standard operating procedures employed by either the  
35 Permittees or the laboratory. The Permittees standard operating procedures will be in the facility  
36 Operating Record and available for review by NMED at anytime. The laboratory standard  
37 operating procedures will also be in the facility Operating Record and will be supplied to the  
38 NMED as indicated in Section N-4e of this Attachment.

1 ~~These data quality objectives are based on control criteria proposed by the EPA as presented in~~  
2 ~~the CLP-SOWA for the Volatile Organics Analysis of Ambient Air in Canisters (EPA, 1994).~~

3 N-5a Quality Assurance Objectives for the Measurement of Precision, Accuracy, Sensitivity, and  
4 Completeness

5 QA objectives for this plan will be defined in terms of the following data quality parameters.

6 **Precision.** For the duration of this program, precision will be defined and evaluated by the RPD  
7 values calculated between field duplicate samples and between laboratory duplicate samples.

$$RPD = \left( \frac{A-B}{(A+B)/2} \right) * 100 \quad (N-2)$$

9 where:           A = Original sample result  
10                    B = Duplicate sample result

11 **Accuracy.** Analytical accuracy will be defined and evaluated through the use of analytical  
12 standards. Because recovery standards cannot reliably be added to the sampling stream,  
13 overall system accuracy will be based on analytical instrument performance evaluation criteria.  
14 These criteria will include performance verification for instrument calibrations, laboratory control  
15 samples, sample surrogate recoveries, and sample internal standard areas. These criteria will  
16 constitute the verification of accuracy for target analyte quantitation (i.e., quantitative accuracy).  
17 Evaluation of standard ion abundance criteria for BFB will be used to evaluate the accuracy of  
18 the analytical system in the identification of targeted analytes, as well as the evaluation of  
19 unknown contaminants (i.e., qualitative accuracy).

20 **Sensitivity.** Sensitivity will be defined by the required MRLs for the program. Attainment of  
21 required MRLs will be verified by the performance of statistical method detection limit (**MDL**)  
22 studies in accordance with 40 *Code of Federal Regulations* § 136. The MDL represents the  
23 minimum concentration that can be measured and reported with 99 percent confidence that the  
24 analyte concentration is greater than zero. An MDL study will be performed by the program  
25 analytical laboratory prior to sampling and analysis, and annually thereafter.

26 **Completeness.** Completeness will be defined as the percentage of the ratio of the number of  
27 valid sample results received (i.e., those which meet data quality objectives) versus the total  
28 number of samples collected. Completeness may be affected, for example, by sample loss or  
29 destruction during shipping, by laboratory sample handling errors, or by rejection of analytical  
30 data during data validation.

31 N-5a(1) Evaluation of Laboratory Precision

32 Laboratory sample duplicates and blank spike/blank spike duplicates (**BS/BSD**) will be used to  
33 evaluate laboratory precision. QA objectives for laboratory precision are listed in Table N-42,  
34 and are based on precision criteria proposed by the EPA for canister sampling programs (EPA,  
35 1994). These values will be appropriate for the evaluation of samples with little or no matrix

1 effects. Because of the potentially high level of salt-type aerosols in the WIPP underground  
2 environment, the analytical precision achieved for WIPP samples may vary with respect to the  
3 EPA criteria. RPDs for BS/BSD analyses will be tracked through the use of control charts. RPDs  
4 obtained for laboratory sample duplicates will be compared to those obtained for BS/BSDs to  
5 ascertain any sample matrix effects on analytical precision. BS/BSDs and laboratory sample  
6 duplicates will be analyzed at a frequency of 10 percent, or one per analytical lot, whichever is  
7 more frequent.

#### 8 N-5a(2) Evaluation of Field Precision

9 Field duplicate samples will be collected at a frequency of 5 percent for both monitoring  
10 locations. The data quality objective for field precision is 35 percent for each set of duplicate  
11 samples.

#### 12 N-5a(3) Evaluation of Laboratory Accuracy

13 **Quantitative Accuracy.** Quantitative analytical accuracy will be evaluated through performance  
14 criteria on the basis of (1) relative response factors generated during instrument calibration,  
15 (2) analysis of laboratory control samples (LCS), and (3) recovery of internal standard  
16 compounds. The criteria for the initial calibration (5-point calibration) is  $\leq 30$  percent relative  
17 standard deviation for target analytes. After the successful completion of the 5-point calibration,  
18 it is sufficient to analyze only a midpoint standard for every 12 hours of operation. The midpoint  
19 standard will pass a 30 percent difference acceptance criterion for each target compound before  
20 sample analysis may begin.

21 A blank spike or LCS is an internal QC sample generated by the analytical laboratory by spiking  
22 a standard air matrix (humid zero air) with a known amount of a certified reference gas. The  
23 reference gas will contain the target VOCs at known concentrations. Percent recoveries for the  
24 target VOCs will be calculated for each LCS relative to the reference concentrations. Objectives  
25 for percent recovery are listed in Table N-2, and are based on accuracy criteria proposed by the  
26 EPA for canister sampling programs (EPA, 1994). LCSs will be analyzed at a frequency of  
27 10 percent, or one per analytical lot, whichever is more frequent.

28 Internal standards will be introduced into each sample analyzed, and will be monitored as a  
29 verification of stable instrument performance. In the absence of any unusual interferences,  
30 areas should not change by more than 40 percent over a 12-hour period. Deviations larger than  
31 40 percent are an indication of a potential instrument malfunction. If an internal standard area in  
32 a given sample changes by more than 40 percent, the sample will be reanalyzed. If the  
33 40 percent criterion is not achieved during the reanalysis, the instrument will undergo a  
34 performance check and the midpoint standard will be reanalyzed to verify proper operation.  
35 Response and recovery of internal standards will also be compared between samples, LCSs,  
36 and calibration standards to identify any matrix effects on analytical accuracy.

37 **Qualitative Accuracy.** Qualitative accuracy in the identification of target VOCs will be  
38 evaluated by the relative ion abundance criteria established for the internal standard compound  
39 BFB. For each 12 hours of sample analysis, a 50-nanogram injection of BFB must be made,  
40 and the requirements listed in Table N-3 will be met before the instrument may be used to  
41 analyze samples.

1 N-5a(d) Evaluation of Sensitivity

2 The presence of aerosol salts in underground locations may affect the MDL of the samples  
3 collected in those areas. The intake manifold of the sampling systems will be protected  
4 sufficiently from the underground environment to minimize salt aerosol interference.

5 The MDL for each of the nine target compounds will be evaluated by the analytical laboratories  
6 before sampling begins. The initial and annual MDL evaluation will be performed in accordance  
7 with 40 *Code of Federal Regulations* §136 and with EPA/530-SW-90-021, as revised and  
8 retitled, "Quality Assurance and Quality Control" (Chapter 1 of SW-846) (1996).

9 N-5a(e) Completeness

10 The expected completeness for this program is greater than or equal to 90 percent. Data  
11 completeness will be tracked monthly.

12 N-5b Sample Handling and Custody Procedures

13 Sample packaging, shipping, and custody procedures are addressed in Section N-4Gc.

14 N-5c Calibration Procedures and Frequency

15 Calibration procedures and frequencies for analytical instrumentation are listed in Section N-  
16 4e(4).

17 ~~N-5d Analytical Procedures~~

18 ~~The analytical procedures for the Confirmatory VOC Monitoring Program, which are based on~~  
19 ~~the draft *GLP-SOW for Volatile Organics Analysis of Ambient Air in Canisters* (EPA, 1994) and~~  
20 ~~EPA Method TO-14A (EPA, 1997), are outlined in Section N-4e.~~

21 N-5ed Data Reduction, Validation, and Reporting

22 A dedicated logbook will be maintained by the operators. This logbook will contain  
23 documentation of all pertinent data for the sampling. Sample collection conditions, maintenance,  
24 and calibration activities will be included in this logbook. Additional data collected by other  
25 groups at WIPP, such as ventilation airflow, temperature, pressure, etc., will be obtained to  
26 document the sampling conditions.

27 Data validation procedures will include at a minimum, a check of all field data forms and  
28 sampling logbooks will be checked for completeness and correctness. Sample custody and  
29 analysis records will be reviewed routinely by the QA officer and the laboratory supervisor.

30 Data will be reported as specified in Section N-3(e) and Permit Module IV.

31 Acceptable data for this VOC monitoring program plan will meet stated precision and accuracy  
32 criteria. The QA objectives for precision, accuracy, and completeness as shown in Table N-42  
33 can be achieved when established methods of analyses are used as proposed in this plan and



1 standard sample matrices are being assessed. However, because of the potential for the  
2 samples to contain high levels of salt-type aerosols, the degree to which the QA objectives for  
3 the program can be achieved is presently uncertain. The program data will be evaluated and QA  
4 objectives modified as necessary based on the results of the QC testing program. If the  
5 Permittees determine that alternate QA objectives are required, the Permittees will submit a  
6 request for a Permit modification to the Secretary for approval.

#### 7 N-5f e Performance and System Audits

8 System audits will initially address start-up functions for each phase of the project. These audits  
9 will consist of on-site evaluation of materials and equipment, review of canister and sampler  
10 certification, review of laboratory qualification and operation and, at the request of the QA  
11 officer, an on-site audit of the laboratory facilities. The function of the system audit is to verify  
12 that the requirements in this plan have been met prior to initiating the program. System audits  
13 will be performed at or shortly after to the initiation of the VOC monitoring programs and on an  
14 annual basis thereafter.

15 Performance audits will be accomplished as necessary through the evaluation of analytical QC  
16 data by performing periodic site audits throughout the duration of the project, and through the  
17 introduction of third-party audit cylinders (laboratory blinds) into the analytical sampling stream.  
18 Performance audits will also include a surveillance/review of data associated with canister and  
19 sampler certification, a project-specific technical audit of field operations, and a laboratory  
20 performance audit. Field logs, logbooks, and data sheets will be reviewed weekly. Blind-audit  
21 canisters will be introduced once during the sampling period. Details concerning scheduling,  
22 personnel, and data quality evaluation are addressed in the QAPJP.

#### 23 N-5g f Preventive Maintenance

24 Sampler maintenance is described briefly in Section N-4d Maintenance of analytical equipment  
25 will be addressed in the analytical SOP.

#### 26 N-5h g Corrective Actions

27 If the required completeness of valid data (90-95 percent) is not maintained, corrective action  
28 may be required. Corrective action for field sampling activities may include recertification and  
29 cleaning of samplers, reanalysis of samples, additional training of personnel, modification to  
30 field and laboratory procedures, and recalibration of test equipment.

31 Laboratory corrective actions may be required to maintain data quality. The laboratory  
32 continuing calibration criteria indicate the relative response factor for the midpoint standard will  
33 be less than 30 percent different from the mean relative response factor for the initial calibration.  
34 Differences greater than 30 percent will require recalibration of the instrument before samples  
35 can be analyzed. If the internal standard areas in a sample change by more than 40 percent,  
36 the sample will be reanalyzed. If the 40 percent criterion is not achieved during the reanalysis,  
37 the instrument will undergo a performance check and the midpoint standard reanalyzed to verify  
38 proper operation. Deviations larger than 40 percent are an indication of potential instrument  
39 malfunction.

1 The laboratory results for samples, duplicate analyses, LCSs, and blanks should routinely be  
2 within the QC limits. If results exceed control limits, the reason for the nonconformances and  
3 appropriate corrective action must be identified and implemented.

#### 4 N-5ih Records Management

5 The ~~Confirmatory~~ VOC Monitoring Programs will require administration of record files (both  
6 laboratory and field data collection files). The records control systems will provide adequate  
7 control and retention for program-related information. Records administration, including QA  
8 records, will be conducted in accordance with applicable DOE, MOC, and WIPP requirements.

9 Unless otherwise specified, VOC monitoring program plan records will be retained as  
10 permanent lifetime records. Temporary and permanent storage of QA records will occur in  
11 facilities that prevent damage from temperature, fire, moisture, pressure, excessive light, and  
12 electromagnetic fields. Access to stored ~~Confirmatory~~ VOC Monitoring Program QA Records will  
13 be controlled and documented to prevent unauthorized use or alteration of completed records.

14 Revisions to completed records (i.e., as a result of audits or data validation procedures) may be  
15 made only with the approval of the responsible program manager and in accordance with  
16 applicable QA procedures. Original and duplicate or backup records of project activities will be  
17 maintained at the WIPP site. Documentation will be available for inspection by internal and  
18 external auditors.

1     N-6 References

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## **TABLES**

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**Table N-1**  
**Target Analytes and Methods for Confirmatory Repository VOC (Station**  
**VOC-A and VOC-B) Monitoring and Disposal Room Monitoring During the**  
**WIPP Disposal Phase**

Target Analyte	Common Synonyms and Acronyms	Chemical	Molecular Weight (g/mol)	Boiling Point (°C)*
Carbon tetrachloride	Tetrachloromethane	CCl <sub>4</sub>	153.8	77
Chlorobenzene	Monochlorobenzene, Benzene chloride	C <sub>6</sub> H <sub>5</sub> Cl	112.6	132
Chloroform	Trichloromethane	CHCl <sub>3</sub>	119.4	61
1,1-Dichloroethylene	1,1-Dichloroethene, Vinylidene chloride, 1,1-DCE	C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub>	96.95	31
1,2-Dichloroethane	1,2-DCA, DCA, Ethylene dichloride, EDC, sym-Dichloroethane	C <sub>2</sub> H <sub>4</sub> Cl <sub>2</sub>	98.96	83
Methylene chloride	Dichloromethane	CH <sub>2</sub> Cl <sub>2</sub>	84.94	40
1,1,2,2-Tetrachloroethane	sym-Tetrachloroethane, Tetrachloroethane	C <sub>2</sub> H <sub>2</sub> Cl <sub>4</sub>	167.9	147
Toluene	Methyl benzene	C <sub>7</sub> H <sub>8</sub>	92.13	111
1,1,1-Trichloroethane	1,1,1-TCA, TCA, Methyl chloroform	C <sub>2</sub> H <sub>3</sub> Cl <sub>3</sub>	133.42	74

g/mol — grams per mole

°C — Degrees Celsius

\* — Handbook of Chemistry and Physics, 62nd Edition, CRC Press, 1982

Target Analyte	EPA Standard Analytical Method
Carbon tetrachloride	EPA TO-15 <sup>a</sup> EPA SW-846 <sup>b</sup> EPA SW-8260B <sup>b</sup>
Chlorobenzene	
Chloroform	
1,1-Dichloroethylene	
1,2-Dichloroethane	
Methylene chloride	
1,1,2,2 -Tetrachloroethane	
Toluene	
1,1,1- Trichloroethane	

<sup>a</sup> U.S. Environmental Protection Agency, 1999, Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air- Second Edition, <http://www.epa.gov/ttn/amtic/airtox.html>

<sup>b</sup> U.S. Environmental Protection Agency, SW-846 Test Methods for Evaluation Solid Wastes, Chemical and Physical Methods, <http://www.epa.gov/epaoswer/hazwaste/test/main.htm>

**Table N-2**  
~~**Volatile Organic Compound Concentrations of Concern\***~~

Compound	Molecular Weight (g/mol)	<del>Drift E-300 Concentration</del>	
		<del>µg/m<sup>3</sup></del>	<del>ppbv</del>
Carbon tetrachloride	153.8	1050	165
Chlorobenzene	112.6	1015	220
Chloroform	119.4	890	180
1,1-Dichloroethylene	96.95	410	100
1,2-Dichloroethane	98.96	175	45
Methylene chloride	84.94	6700	1930
1,1,2,2-Tetrachloroethane	167.9	350	50
Toluene	92.13	715	190
1,1,1-Trichloroethane	133.42	3200	590

µg/m<sup>3</sup> — micrograms per cubic meter

ppbv — parts per billion by volume

\* — Calculated at 25 degrees Celsius and 760 millimeters of mercury.

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**Table N-3**  
**Bromofluorobenzene Key Ions and Ion Abundance Criteria**

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Mass	Ion Abundance Criteria
50	8 to 40 percent of mass 95
75	30 to 66 percent of mass 95
95	Base Peak, 100 percent Relative Abundance
96	5 to 9 percent of mass 95
173	<2 percent of mass 174
174	50 to 120 percent of mass 95
175	4 to 9 percent of mass 174
176	93 to 101 percent of mass 174
177	5 to 9 percent of mass 176



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**Table N-4**  
**Quality Assurance Objectives for Accuracy, Precision, Sensitivity,**  
**and Completeness**

Compound	Accuracy (Percent Recovery)	Precision (RPD) Laboratory Field		Required MRL (ppbv)	Completeness (Percent)
Carbon tetrachloride	60 to 140	25	35	2	90
Chlorobenzene	60 to 140	25	35	2	90
Chloroform	60 to 140	25	35	2	90
1,1-Dichloroethylene	60 to 140	25	35	5	90
1,2-Dichloroethane	60 to 140	25	35	2	90
Methylene chloride	60 to 140	25	35	5	90
1,1,2,2-Tetrachloroethane	60 to 140	25	35	2	90
Toluene	60 to 140	25	35	5	90
1,1,1-Trichloroethane	60 to 140	25	35	5	90

14 MRL method reporting limit

15 RPD relative percent difference

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## FIGURES

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Figure N-1  
Panel Area Flow

Figure N-2  
VOC Monitoring System Design

Figure N-3  
~~Example Request for Analysis Form~~ Disposal Room VOC Monitoring

Figure N-4  
~~Example of Chain of Custody Form~~ VOC Sample Head Arrangement