ATTACHMENT 3

NMED COMMENTS ITEM 3

REVISE VOLATILE ORGANIC COMPOUND (VOC) TARGET ANALYTE LIST

OTHER CHANGES TO VOC MONITORING PROGRAM

3·1: PMR Section 3, Topic 1, Table 1 Recalculated Waste Matrix Code Group Weighting Factors based on the 2004 Compliance Recertification Contact Handled (CH) Transuranic (TRU) Waste Inventory (m^3)

The new weighting factors appear to be based on CH TRU waste only and do not include remote handled (RH) TRU waste. There was no discussion in the PMR addressing possible differences in Waste Matrix Code Group (WMCG) for RH TRU that could potentially impact the weighting factors. Please provide data characterizing the differences in emissions between the two types of waste, in support of the assertion that modeling data from CH TRU waste adequately characterizes RH TRU waste.

Response

There are several factors to consider in responding to this comment: the purpose of the source term, which is to facilitate risk screening to determine the initial list of target analytes, the anticipated volatile organic compound (**VOC**) contribution from remote handled (**RH**) transuranic (**TRU**) mixed waste, the number of RH TRU waste samples available to characterize the VOC content of RH TRU mixed waste and the amount of RH TRU mixed waste in the inventory used for the development of the source term.

First, regarding the purpose of the source term, the distribution of concentrations in the source term is used for risk screening. That is, it is used to develop a list of target analytes for monitoring the repository emissions. A U.S. Environmental Protection Agency (**EPA**) methodology[1] was used to screen compounds into the list that collectively contribute to 99 percent of the risk or individually contribute to more than one percent of the risk. Compounds can be removed from the list if they individually contribute less than one percent of the risk. Once this initial list is identified, the monitoring process itself has provisions for evaluating additional compounds appearing as tentatively identified compounds (**TICs**) in the analysis. These compounds would show up if future waste streams, including RH TRU mixed waste, contained a suite of VOCs different than those represented by the source term. If TICs show up, they must be evaluated upon receipt of validated data relative to their contribution to the overall risk to determine if they should be added to the target list or not, according to proposed language in Permit Attachment N. If a TIC is determined to contribute more than one percent of the risk, then it will be added to the target list and included in the routine monitoring program. The compound and its risk factor will be added to the Permit following the annual report that documents the identification of the TIC and discusses its significance. This Class 1 Permit Modification Notification (**PMN**) to add the compound will be submitted with the annual report. (Note that the Permittees do not propose to use this Class 1 PMN process to remove compounds.) Therefore, should RH TRU mixed waste contain high concentrations of other VOCs that pose a risk to human health, they will be identified in the samples at Station VOC-A and in the room-based monitoring samples. Text has been added to Permit Attachment N, Section N-3b of the

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[1] U.S. Environmental Protection Agency. (1989). Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A), Interim Final. EPA/540/1-89/002. Washington, D.C.: U.S. Environmental Protection Agency, p. 5-24.

revised proposed Permit text to require the submittal of an appropriate PMN with the annual report.

Second, with regard to the potential contribution to the overall VOC emission rates by RH TRU mixed waste, a footnote in the Overview of the submitted PMR acknowledges the fact that RH TRU waste is excluded and justifies this because of the low maximum volume of RH TRU waste that can be disposed in the WIPP facility.

The situation is similar to when the Permittees sought authorization to manage RH TRU mixed waste at the WIPP facility. At that time, the Permittees were aware that the original source term did not include RH TRU waste container headspace gas samples. To account for this, the Permittees performed an analysis to evaluate the potential impact of RH TRU mixed waste, making broad conservative assumptions regarding VOC concentration in the headspace of containers of RH TRU mixed waste. This analysis was submitted with the RH TRU mixed waste PMR in 2002 as Supplement 3 (attached as Appendix 3-B). The methodology is given below:

> *The processes that will contribute to VOC emissions from the RH canisters are the same as those evaluated for CH waste. Therefore, the calculations used to evaluate VOC emissions from emplaced RH canisters will use the same equations as those used to evaluate VOC emissions in the original permit application. However, because RH canisters are located in the walls of the rooms behind shield plugs, the actual methodology is the same as that used for waste in a closed room.*
>
> *RH canisters will not release VOCs into the underground ventilation the same way as CH waste containers in an active room. The RH waste is placed in a dead-end borehole that is capped by a low-permeability shield plug. Because the RH canister is in a dead-end borehole with a shield plug, mine ventilation will not pass over the canister as it does for containers on the floor of an active room. This lack of ventilation causes an emplaced RH canister with a shield plug to release VOCs similarly to releases from a closed room.*
>
> *A closed room uses ventilation barriers to restrict the flow of mine ventilation through a filled room. The shield plugs on each borehole containing an RH canister will function similarly to the ventilation barriers. The shield plugs will restrict the movement of mine ventilation and diffusion of VOCs from the borehole just as the ventilation barriers will restrict the movement of mine ventilation and diffusion from a filled room.*
>
> *The RCRA Part B permit application demonstrated that gas pressurization is the primary mechanism that might cause VOCs to migrate out of a closed room. Based on this analysis, the WIPP's Hazardous Waste Facility Permit establishes VOC limits for operations. Therefore, the analysis of the emissions from an emplaced canister in a shield plug capped dead-end borehole results in the maximum credible gas pressurization rate per borehole and the per room potential maximum VOC emission rates from the RH TRU waste following the existing closed room methodology.*
>
> *As a bounding conservative assumption, all canister headspaces are assumed to have saturated VOC concentrations at the temperature of WIPP. Pressurization within a borehole will be caused by a combination of gas generation and reduction of the*

borehole due to creep closure of the salt (DOE 1996a), which might result in VOC emissions from the canister into the room.

The result of the analysis indicates that the contribution ranges from 0.09 percent (chlorobenzene) to 8.23 percent (1,1–Dichloroethene, synonymous with 1,1-Dichloroethylene) of the room-based limit in the Permit. These assumed concentrations are not considered to be significant in light of the fact that the highest compound, 1,1–Dichloroethene, contributes to less than one percent of the risk and is screened out in the PMR.

Third, when the Permittees prepared the new VOC source term, there were 71 headspace gas samples of RH TRU mixed waste in the sample database. The number of samples is small because RH TRU waste was not subjected to the 100 percent sampling requirements that were in the Permit prior to 2006 and RH TRU mixed waste shipments were not initiated until 2007. The effect of these data on the raw (unweighted) averages is reflected in Table 3.1-1. It can be seen that in every case, the RH TRU mixed waste samples decreased the average. The largest effect is about one/tenth of a percent, indicating that the RH TRU waste contribution will be insignificant.

Table 3.1-1 Comparison of RH TRU Waste Headspace Gas Samples to the Source Term Raw Averages

ANALYTE	RAW AVERAGE CH TRU WASTE ONLY (ppmv)	RAW AVERAGE CH TRU and RH TRU WASTE (ppmv)	DIFFERENCE (PERCENT)
BENZENE	2.63	2.63	-0.05%
BROMOFORM	1.22	1.22	-0.05%
CARBON TETRACHLORIDE	273.10	272.95	-0.05%
CHLOROBENZENE	1.62	1.62	-0.05%
CHLOROFORM	6.55	6.54	-0.05%
CYCLOHEXANE	8.22	8.22	-0.07%
1,1-DICHLOROETHANE	9.42	9.42	-0.05%
1,2-DICHLOROETHANE	2.05	2.05	-0.05%
1,1-DICHLOROETHYLENE	11.00	11.00	-0.05%
CIS-1,2-DICHLOROETHYLENE	2.14	2.14	-0.05%
TRANS-1,2-DICHLOROETHYLENE	2.54	2.53	-0.06%
ETHYL BENZENE	2.68	2.68	-0.05%
ETHYL ETHER	2.41	2.41	-0.05%
METHYLENE CHLORIDE	50.86	50.84	-0.05%
1,1,2,2-TETRACHLOROETHANE	1.69	1.69	-0.05%
TETRACHLOROETHYLENE	3.65	3.65	-0.04%
TOLUENE	13.61	13.60	-0.04%
1,1,1-TRICHLOROETHANE	299.51	299.35	-0.05%
TRICHLOROETHYLENE	52.05	52.02	-0.05%
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	70.79	70.76	-0.05%
1,2,4-TRIMETHYLBENZENE	1.70	1.70	-0.06%
1,3,5-TRIMETHYLBENZENE	1.89	1.89	-0.07%
M,P-XYLENE	5.79	5.79	-0.04%

ANALYTE	RAW AVERAGE CH TRU WASTE ONLY (ppmv)	RAW AVERAGE CH TRU and RH TRU WASTE (ppmv)	DIFFERENCE (PERCENT)
O-XYLENE	2.47	2.47	-0.04%
ACETONE	50.29	50.27	-0.04%
BUTANOL	11.93	11.92	-0.05%
METHANOL	43.79	43.77	-0.04%
METHYL ETHYL KETONE	12.16	12.15	-0.04%
METHYL ISOBUTYL KETONE	11.88	11.87	-0.05%
METHYL CHLORIDE	11.26	11.25	-0.11%
CARBON DISULFIDE	17.22	17.21	-0.07%

Fourth, a second table can be prepared to evaluate the effect of the RH TRU waste inventory on the weighting factors used to determine the weighted headspace gas concentration source term. This is Table 3.1-2 which was derived from the same table in DOE, 2004[2] that was used for the CH TRU waste inventory in the PMR. The “Percent Change in Weighting Factor” column in Table 3.1-2 shows that the effect of adding the RH TRU waste inventory is to decrease the weights by 10 percent or less except for two waste forms, Solidified Inorganic Material and Uncategorized Metal, which increased. The increase indicates that the amount of RH TRU waste in the inventory for these Waste Matrix Code Groups (**WMCGs**) could increase the concentration of VOCs in the repository. However, the only compounds that may be affected by these increases are 1,1,1-trichloroethane and trichloroethylene. The increase in concentration in both cases is less than 1 ppmv, indicating that the impacts of the RH TRU waste inventory are minimal. This notwithstanding, both compounds are retained in the target analyte list.

Table 3.1-2 Percent Change in Source Term Weighting Factors with RH TRU Waste Inventory Estimates Included

Waste Matrix Code Group	Total CH Waste	Total RH Waste	Weighting Factor		Percent Change in Weighting Factor
	m^3	m^3	CH TRU WASTE	CH TRU and RH TRU Waste	
Combustible Material	6800	19	0.048	0.044	-10%
Filter Material	1900	18	0.014	0.012	-9%
Graphite	130	0	0.001	0.001	-10%
Heterogeneous Debris	59000	4400	0.420	0.406	-3%
Inorganic Non-Metal	12000	86	0.085	0.077	-9%
Lead/Cadmium Metal	260	19	0.002	0.002	-3%

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[2] Title 40 CFR Part 191 Subparts B and C Compliance Recertification Application 2004, March 2004, DOE/WIPP 2004-3231, Appendix DATA, Attachment F, Table DATA-F-9. Transuranic Waste Inventory By Final Waste Form For WIPP

Waste Matrix Code Group	Total CH Waste	Total RH Waste	Weighting Factor		Percent Change in Weighting Factor
	m³	m³	CH TRU WASTE	CH TRU and RH TRU Waste	
Salt	1800	0	0.013	0.012	-10%
Soil	6300	200	0.045	0.042	-7%
Solidified Inorganic Material	39000	4800	0.277	0.280	1%
Solidified Organic Material	5500	10	0.039	0.035	-10%
Uncategorized Metal	7900	6100	0.056	0.090	59%
Unknown	No Data	No Data	0.000	0.000	0

The low percentages of RH TRU waste in the inventory and the low average VOC concentrations in these wastes are supported by the low concentrations actually measured in the repository. These factors support the assumption that RH TRU waste will not significantly impact the source term. Should there be a VOC in RH TRU mixed waste that is persistent and that is not already a target, then the process in the Permit for evaluating TICs will ensure that it is recognized, measured, and included in the risk assessments.

3-2: PMR Section 3, Topic 1, Table 3

When identifying reference concentrations (RfCs) and inhalation unit risks (IURs) for use in chemical score derivation in cases where there is no EPA guidance, the Permittees default to the recommended hierarchy of sources of toxicity values (USEPA, 2003). Table 3 has blanks listed where no guidance was available, but it is unclear if there is no guidance available from any organization for these endpoints or if there were only no EPA data. As a result, the "blanks" propagate to "0" values in calculations, which could potentially underestimate the risk associated with these compounds. Please clarify the impact that missing risk values have on the resulting risk associated with the VOC inventory. Alternatively, the Permittees could examine the International Toxicity Estimates for Risk (ITER) as on Toxnet (http://toxnet.nlm.nih.gov/cgibinlsislhtmlgen? iter) for missing data to assess the impact that these missing values have on the resulting calculations.

Response

The Permittees did not examine data sources beyond what is recommended by the EPA when either the original Permit Application was prepared in 1996 or when the current PMR was prepared in 2012. The EPA hierarchy is described in EPA, 2003 as follows:

> *Tier 1- EPA's IRIS*
>
> *Tier 2- EPA's Provisional Peer Reviewed Toxicity Values (PPRTVs) – The Office of Research and Development/National Center for Environmental Assessment/Superfund Health Risk Technical Support Center (STSC) develops PPRTVs on a chemical specific basis when requested by EPA's Superfund program.*

> *Tier 3- Other Toxicity Values – Tier 3 includes additional EPA and non-EPA sources of toxicity information. Priority should be given to those sources of information that are the most current, the basis for which is transparent and publicly available, and which have been peer reviewed.*
>
> *Tier 3 includes but is not limited to:*
>
> *The California Environmental Protection Agency (Cal EPA) toxicity values are peer reviewed and address both cancer and non-cancer effects. Cal EPA toxicity values are available on the Cal EPA internet website at http://www.oehha.ca.gov/risk/chemicalDB//index.asp.*
>
> *The Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels (MRLs) are estimates of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse non-cancer health effects over a specified duration of exposure. The ATSDR MRLs are peer reviewed and are available at http://www.atsdr.cdc.gov/mrls.html on the ATSDR website.*
>
> *Health Effects Assessment Summary Tables (HEAST) toxicity values are Tier 3 values. As noted above, the STSC is conducting a batch wise review of HEAST toxicity values. The toxicity values remaining in HEAST are considered Tier 3 values.*

The Tier 3 hierarchy was recently updated in a white paper by EPA[3]. The current Tier 3 hierarchy, as applied by EPA in the Regional Screening Level (**RSL**) tables, is:

1. U.S. Agency for Toxic Substances and Disease Registry (**ATSDR**) Minimal Risk Levels ;
2. California Environmental Protection Agency (**Cal EPA**) toxicity values;
3. Provisional Peer Reviewed Toxicity Value (**PPRTV**) Appendix “Screening Toxicity Values”; and
4. Health Effects Assessment Summary Tables (**HEAST**).

The Permittees used the toxicity values provided in EPA’s RSL tables. These tables contain values that follow the EPA hierarchy, as determined by the EPA toxicologists. These values are also referenced in guidance that the New Mexico Environment Department (**NMED**) provides for cleanup activities within the state. (See for example Permit Part 8, Section 8.15 References.) When no value is presented, EPA has reviewed the sources and determined either that insufficient information is available to develop a value or that information is sufficient to conclude that risk is negligible by this route of exposure. This notwithstanding, in order to determine if any additional data are available, the Permittees examined TOXNET as recommended in the NMED comment to examine the International Toxicity Estimates for Risk (**ITER**) database. This database compares results from the following sources:

- ATSDR

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[3] EPA, 2013. Tier 3 Toxicity Value White Paper. May 16. OSWER 9285.7-86.

- Health Canada
- International Agency for Research on Cancer (**IARC**)
- Independent parties whose risk values have undergone peer review through a process outside ITER Peer Review process (listed under the independent party risk values (**IPRV)** column)
- Independent parties whose risk values have undergone peer review through the ITER Peer Review process (listed under the ITER PR column)
- NSF International (**NSF Intl**)
- The National Institute of Public Health & Environmental Protection (**RIVM**) (the Netherlands)
- EPA

This comparison confirmed that, with one exception, none of the other agency research produced alternative inhalation unit risk (**IUR**) or reference concentration (**RfC**) values that could be used in lieu of the blank entries in Table 3. The one exception is that the RIVM concluded that there was no difference between the 1, 2-Dichloroethylene isomers and assigned the same RfC for both. If this value is assigned to cis-1, 2-Dichloroethylene in Table 3, it will contribute 0.13 percent to the non-carcinogenic risk in Table 5 and would be screened out of the analyte list similar to the trans- 1, 2-Dichloroethylene.

This comparison ensures that risk is not underestimated. Furthermore, proposed language in the Permit requires the Permittees to review risk values annually and update the risk assessment accordingly if new values are identified. The Permittees realize that the footnote on the proposed change to Table 4.6.2.3 in the Permit should be clarified to explain that N/A means no EPA recommended values are available. This clarification is provided in the attached revised proposed Permit text.

In addition, the Permittees have identified changes to Permit Attachment H that are necessary to implement the monitoring and risk assessment strategy proposed in this PMR. The changes to Attachment H are included in the attached revised proposed Permit text.

3-3: PMR Section 3, Topic 1, Table 2

Table 2 presents the Updated VOC Weighted Average Source Term and provides weighted VOC concentrations based upon the 1999-2010 Headspace Gas (**HSG**) VOC data for the current inventory. The calculations are based on 2004 WMCG assignments, and it is unclear whether the 2004-2010 WMCG are comparable to the 2004 assignments and how any differences would impact calculations presented on Table 2. Also, Table 2 shows the weighted average carbon tetrachloride concentration to be 921 parts per million by volume (ppmv), which is very different from previous VOC projections. Please identify the waste stream(s), waste material groups, and waste quantities that contributed to the increased carbon tetrachloride values.

Response

The distribution of concentrations in the source term is used for risk screening. That is, it is used to develop a list of target analytes for monitoring the repository emissions. An EPA methodology (See comment response 3-1) was used to screen compounds into the list that collectively contribute to 99 percent of the risk or individually contribute to more than one percent of the risk. Compounds can be removed from the list if they individually contribute less than one percent of the risk. Once this initial list is identified, the monitoring process itself has provisions for evaluating additional compounds appearing as TICs in the analysis. These TICs must be evaluated relative to their contribution to the overall risk to determine if they should be added to the target list or not, according to language in Permit Attachment N. If a TIC is determined to contribute more than one percent of the risk, then, it will be added to the target list and included in the routine monitoring program. The compound and its risk factor will be added to the Permit following the annual report that documents the identification for the TIC and discusses its significance. This Class 1 PMN to add the compound will be submitted with the annual report. (Note that the Permittees do not propose to use this Class 1 PMN process to remove compounds.) Therefore, should TRU mixed waste contain some unusually high concentrations of VOCs that pose a risk to human health, they will be identified in the samples at Station VOC-A and in the room-based monitoring. It is worth noting that the NMED acknowledged this process in their general response to comments on a Class 2 PMR that added hexachlorobutadiene to the list of acceptable hazardous waste to the Permit. In responding to a comment that this compound should be added to the VOC target list, the NMED responded: "*NMED decided not to add hexachlorobutadiene to disposal room VOC limits or target analyte lists because the permit already has a mechanism for identifying "tentatively identified compounds" (TICs) that ensure such constituents would be regulated appropriately*." (John E. Kieling, *General Responses to Comments, Class 2 Modification Requests, WIPP Hazardous Waste Facility Permit, EPA I.D. Number NM4890139088*, March 15, 2004) Text has been added to Permit Attachment N, Section N-3b of the revised proposed Permit text to require the submittal of an appropriate PNM with the annual report.

Data generated by the sampling of the original sampled data set of 930 drums were reported in Appendix C2 of Revision 5 of the Part B Permit Application (1995). The unweighted (raw) average concentrations for carbon tetrachloride (CCl_4), the weighting factors, and the weighted average concentrations are reported in Table 3-3.1 for both the original source term and the one used in the PMR. These raw concentration values are generated by adding the concentration of CCl_4 in each of the containers then dividing by the number of containers. This is done for each Waste Matrix Code Group. The weights are shown in the adjacent column. These weights are generated by determining what percent of the inventory is expected to be shipped for each Waste Matrix Code Group. The weighted average concentration is generated by multiplying the raw concentration by the weight.

It can be seen from Table 3-3.1 that both the raw concentrations and the weights have changed between the original measurements based on 930 drums and early waste inventory information and the more recent results based on over 133,000 measurements and updated inventory information. An examination of Table 3-3.1 shows that the increase in the average weighted concentration for CCl_4 is due to the higher raw concentration and the greater volume of waste in the solidified organics Waste Matrix Code Group.

Table 3-3.1 Comparison of Raw Concentration and Weighting Factors for Carbon Tetrachloride

Waste Matrix Code Group	Original Source Term			New Source Term		
	Raw Average CCl_4 (ppmv)	Weight	Weighted Average CCl_4 (ppmv)	Raw Average CCl_4 (ppmv)	Weight	Weighted Average CCl_4 (ppmv)
Combustible Waste	567	0.353	200	44.3	0.048	2.14
Filters	1.54	0.015	0.02	21.9	0.014	0.30
Graphite	0.10	0.004	0.0004	0.73	0.001	0.00
Heterogeneous Debris Waste	97.8	0.222	21.7	8.37	0.420	3.51
Inorganic Non-Metal Waste	3.35	0.010	0.03	2.56	0.085	0.22
Lead/Cadmium Metal Waste	255	0.002	0.46	206	0.002	0.38
Salt Waste	4.32	0.001	0.004	0.27	0.013	0.00
Soils	0.00	0.007	No Data	8.30	0.045	0.37
Solidified Inorganics	317	0.194	61.4	11.5	0.277	3.18
Solidified Organics	8,320	0.012	99.8	23,287	0.039	911
Uncategorized Metal Waste	16.6	0.171	2.8	6.77	0.056	0.38
Unknown Waste	0.00	0.097	No Data	No Data	0	No Data

The comment requested a listing of specific waste streams that contributed to the increase in CCl_4. Containers in the original 930 group are not listed by waste stream on the data summary, only by container number. Therefore, it is not possible to correlate previous waste streams with current waste streams as requested. However, it is possible to identify the solidified organic waste streams that are the major source for CCl_4. Of the 11 solidified organic waste streams in Table 3-3.2 that have been shipped (or are being shipped) to the WIPP facility, only the first six, three from Rocky Flats and three from Idaho National Laboratory, have high concentrations of CCl_4 (information taken from approved waste stream profile forms and WIPP Waste Data System). None of the remaining waste streams, all from Savannah River Site, have high CCl_4 concentrations.

Table 3-3.2 Solidified Organic Waste Streams That that are Major Source of Carbon Tetrachloride

Waste Stream ID	Shipping Site	Description	Number of Containers	Shipping Period
RF107.04	Rocky Flats	This waste stream consists of solidified organic liquid.	499 55-gallon drums; all shipped	1/05 to 4/05
RF135.01	Rocky Flats	This waste stream consists of solidified organic waste.	11 55-gallon drums; all shipped	4/05
RF135.02	Rocky Flats	This waste stream consists of solidified organic waste.	50 55-gallon drums; all shipped	3/05
ID-RF-S3150A	Idaho National laboratory	Organic and sludge immobilization system (OASIS) waste consists of cutting oil and organic solvents solidified with Envirostone emulsifier, gypsum concrete, and an accelerator.	860 55-gallon drums; 760 shipped to date	5/06 to present

Waste Stream ID	Shipping Site	Description	Number of Containers	Shipping Period
ID-RF-S3114	Idaho National laboratory	This waste consists of various organic liquids that were transferred to Building 774 where they were immobilized using Micro-cel E (a synthetic calcium silicate) to form a grease or paste-like material. The organic liquids were primarily a mixture of oils and chlorinated solvents. Small amounts of Oil-Dri were sometimes added to the mixture as well. This process was shutdown in 1985 and replaced by the OASIS process.	9,880 55-gallon drums; 5,283 shipped to date	6/06 to present
ID-SDA-SLUDGE*	Idaho National laboratory	Pre-1970 buried waste retrieved for the Idaho Completion Project	25,013 55-gallon drums and 506 SWBs; 21,415 shipped to date	3/08 to present
SR-BCLDP.003.001	Savannah River Site	This waste consists of CH Hydraulic Sludge and Debris generated by the BCLDP program during the D&D of the Building JN-1 Hydraulic Room.	2 55-gallon drums; all shipped	6/13
SR-BCLDP.003	Savannah River Site	Hydraulic Room Sludge and Debris waste consists of rubble, sludge, and absorbent materials as well as the plastic bags that the waste is in. The hydraulic sludge was absorbed using greater than 50% NoChar and Radsorb polymers. Then the hydraulic sludge was packed in plastic bags with additional No Char, Radsorb, and Floor Dry. Prior to packaging, 10 pounds of absorbent (50:50 Floor Dry and Radsorb) was added to the liner to absorb water from condensation or dewatering.	7 RH canisters; all shipped	11/10
SR-BCLDP.001.001	Savannah River Site	Laundry sludge consists of a particulate sludge (dirt, debris, and lint) generated when the laundry system still box requires cleaning. The box is heated to boil off the water contained in the particulate material The resulting sludge is raked into plastic bags containing Radsorb (10%-20% by weight) to absorb any water from condensation or dewatering.	5 RH canisters; all shipped	10/10
SR-W027-321M-HOM	Savannah River Site	Waste stream SR-W027-321M-HOM is comprised primarily of a mixture of A-408 lubricating oil (International Organization for Standardization [ISO] 680 hydrocarbon oil) and powered lead absorbed with Oil-Dri (granular clay absorbent) as well as minor amounts of organic and inorganic debris waste items.	1 55-gallon drum; all shipped	6/13
SR-SDD-HOM-A	Savannah River Site	Absorbed organic homogeneous sludge removed during cleanout of Tanks 501, 802, and 812 in Building 211-F.	24 55-gallon drums; all shipped	3/13

*Includes both Solidified Organic and Solidified Inorganic Waste

3-4: PMR Proposed Permit Attachment N, Section N-3b

The PMR states: “The VOCs that have been identified for repository and disposal room VOC monitoring are listed in Table N-l. The analysis will focus on routine detection and quantification of these target analytes in collected samples. As part of the analytical evaluations, the presence of other compounds (i. e. , non-target VOCs) will also be monitored. Some non-targets may be included on the laboratory's target analyte list as additional requested analytes (ARAs) to gain a better understanding of potential concentrations and associated risk. The analytical laboratory will be directed to calibrate for ARAs when requested and classify and report other non-target VOCs as tentatively identified compounds (TICs) if tentative identification can be made. The evaluation of TICs in original samples will include those concentrations that are ≥10 percent of the relative internal standard. The evaluation of ARAs only includes concentrations that are ≥ the method reporting limit (MRL). The required MRLs for ARAs will be U.S. Environmental Protection Agency (EPA)-specified levels of quantitation proposed for EPA contract laboratories that analyze canister samples by gas chromatography/mass spectrometry (GC/MS) (EPA, 1991).

Non-targets classified as ARAs or TICs that meet the following criteria: (1) are VOCs listed in Appendix VIII of 40 Code of Federal Regulations (CFR) Part 261 (incorporated by reference in 20.4.1.200 New Mexico Administrative Code (NMAC), and (2) are detected in 10% percent or more of any original VOC monitoring samples collected over a 12-month timeframe, will be added, as applicable, to the analytical laboratory target analyte lists for both the repository and disposal room VOC monitoring programs, unless the Permittees can justify the exclusion from the target analyte list(s). Nontarget VOCs reported as "unknown" by the analytical laboratory are not evaluated due to indeterminate identifications.

Additional requested analytes and TICs detected in the repository and disposal room VOC monitoring programs will be placed in the WIPP Operating Record and reported to NMED in the annual reports as specified in Permit Part 4, Section 4.6.2.2. As applicable, the Permittees will also report the justification for exclusion from the target analyte list(s) (e.g., the compound does not contribute to more than one percent of the risk). If new targets are required the Permittees will submit a Class 1 Permit Modification Notification annually in accordance with 20.4.1.900 NMAC (incorporating 40 CFR 270.42(a)) to update Table 4.6.2.3 to include the new analyte and associated recommended EPA risk values for the inhalation unit risk (IUR) and reference concentration (RfC). Added compounds will be included in the risk assessment described in Section N-3e(1)."

The language of section N-3b in the proposed Attachment N contains language that is ambiguous. Please provide clarification for the following items:

a) The Permittees have introduced language that refers to additional requested analytes (ARAs). Based on the language in this passage it is unclear what the difference is between a tentatively identified compound (TIC) and an ARA. Provide additional clarification that distinguishes TICs from ARAs. Clarify who (i.e. Permittees, NMED) requests ARAs and criteria for said requests.

b) The PMR indicates that ARAs will be reported to contract laboratory Method Reporting Limits (MRL). The PMR did not include these MRLs and did not include the EPA 1991 reference in the reference section of the modified permit. There is reference to a Contract Required Quantitation Limit (CRQL) elsewhere in the permit. However, it is unclear if these two terms are synonymous. Please provide the EPA 1991 (or newer) reference, provide the actual MRLs, verify if the MRL and CRQL are synonymous, and justify that the MRLs are sufficiently low to ensure that human health and environment are not compromised. Additionally, based on the provided information, it was not clear if the referenced document is applicable to Resource Conservation and Recovery Act (**RCRA**) activities.

c) Clarify what is meant by the term "original VOC Monitoring samples".

d) Clarify why the term "running 12 month time frame" was replaced with "12 month timeframe". A running time frame indicates an ongoing monitoring process where the VOCs are monitored on an on-going basis, while the language proposed by the Permittees indicates a static program where monitoring will not occur on an on-going basis.

e) Specify the due dates for the proposed annual Class 1 Permit Modification Notification that would update Table 4.6.2.3 with new target analytes.

f) Clarify that if there is no annual change to the target analyte list as described above, the Permittees will submit notification to NMED. Specify the time frame for this notification.

Response

a) A VOC that is added to the laboratory's target analyte list but not listed as a target analyte in the Permit is considered an additional requested analyte (**ARA**). The Permittees will request the addition of VOCs to the laboratory's calibration method for internal assessment purposes. A multi-point calibration (minimum five points) is used for quantitation of the ARAs. Therefore, the concentrations of ARAs are considered to be actual concentrations and not estimates. The concentrations reported for TICs, on the other hand, are not based on a multi-point calibration, so TIC concentrations are reported as estimated values. Tentative identifications are made based on comparisons of the mass spectra of compounds in the sample with the mass spectral library used by the analytical laboratory. Estimated values are determined by comparing TIC responses with the relative internal standard. By requesting ARAs, data are generated to allow a better determination of the actual concentrations of non-target compounds.

The Permittees are proposing that ARAs may be identified at any point in the VOC Monitoring Program. For example, if a TIC meets the criteria in the Permit for addition to the target analyte list, the laboratory will be instructed to obtain the proper calibration standards and to add the compound as an ARA. If the Permittees determine that the compound should become a target because it contributes to more than one percent of the risk, the Permittees will track the compound as an ARA until the subsequent annual report at which time it will be added to the Permit as a target along with its EPA recommended risk factor. This allows the Permittees to collect actual concentration data at the earliest possible time and ensures that the data for any proposed target analyte is quantified properly (meets Quality Assurance Objectives in Permit Attachment N) and not based on laboratory estimates. Data collected as an ARA will become part of the database used in calculating the running annual average for the compound once it is added as a target.

b) The Permit states that the Contract Required Quantitation Limits (**CRQLs**) are set at the MRL for the VOC Monitoring Program. (The MRL is the lowest concentration that can be reliably measured and is determined by the analytical laboratory as a function of instrument performance, sample preparation, sample dilution, and all steps involved in the sample analysis process.) These will be specified when ARAs are requested from the analytical laboratory. The requested ARAs are subject to change and thus are not included in the Permit. The required MRLs will be the EPA-specified levels of quantitation proposed for EPA contract laboratories that analyze canister samples by gas chromatography/mass spectrometry (**GC/MS**). (A reference to EPA 1991 was added to the proposed Permit text in the PMR and a copy of this reference is being provided in electronic format with this response. See Appendix 3-C. Note that the cover of this document has a 1994 date; however, the document itself is dated 1991.) These specified levels of quantitation are within the same range for Permit-required target analytes. The ARAs along with MRLs will be reported in the annual reports.

The MRLs were evaluated to determine if they are sufficiently low to ensure that human health is not compromised. This evaluation was performed by substituting a value of 0.005 parts per million by volume (**ppmv**) for each VOC in the screening calculation. This value represents the highest MRL for undiluted samples in Permit Attachment N. The result is a risk to the surface worker of 3.4×10^{-8} and a hazard index of 0.0001. This indicates that if VOCs were present at or below the MRL, the impact on risk is miniscule. Therefore, the MRLs are protective.

c) The use of “original” in reference to a sample is used to indicate samples that are not collected or analyzed specifically for evaluation of precision (i.e., duplicate sample). See Attachment N, Section N-5a. These “original” or “regular” samples are equivalent to the “primary” samples collected in the groundwater program.

d) The language was changed to avoid confusion with the calculation of a “running-annual average” for determining compliance to the environmental performance standards. The requirement is simply to use the current consecutive 12-month period for determining if a TIC must be evaluated for addition to the target analyte list. This change does not affect the method in which the running annual average is calculated as specified in Permit Attachment N, Section N-3e(1). The change does not change the frequency of the monitoring program. Sample frequency is established in Permit Part 4 and Attachment N and is unaffected by the evaluation of TICs.

e) Language has been added to the revised proposed Permit text in Permit Part N, Section N-3b to require the Class 1 PMN be submitted with the annual report which is due in October of each year. This revised language is in Appendix 3-A.

f) Revised language in Permit Part N, Section N-3b requires the Permittees to report TICs in the annual report and to discuss those TICs that the Permittees have determined need not be added as targets. This language has been expanded to include cases where no TICs are identified and no changes to the target analyte list are made.

3-5: Permit Section 4.6.3.2 Notification Requirements

Line 4, "in any closed room in an active panel or" appears to need deletion to be consistent with other changes made by this PMR.

Response

The Permittees agree with this deletion and have revised the proposed Permit text to delete the text “in any closed room in an active panel or.” This change is included on the attached revised proposed Permit text.

3-6: Permit Section 4.6.3.3: Remedial Action

Please revise the last sentence: "The Permittees may implement an alternative remedial action plan in lieu of closing the active room." to include mandatory closing of the active room in the event that all proposed and implemented alternative remedial action plans) fail. The proposed permit language may be acceptable for a short time period, but cannot be left "open-ended". There must be some trigger that stops implementation of multiple, ineffective remedial action plans that otherwise could continue indefinitely.

<u>Response</u>

The Permittees realize that no detailed explanation was provided for the proposed language regarding alternative remedial actions for the Room-Based VOC Monitoring Program. In the PMR, the Permittees are seeking a change that allows them to implement the alternative remedial action prior to approval by the NMED. This is necessary because the risk in this case is associated with a possible acute exposure to a waste worker underground, causing immediate health effects as opposed to the multiple year chronic exposure associated with the surface worker exposure. As an example of a remedial action when the 95 percent level is reached, the Permittees could increase the active room ventilation rate. This would effectively dilute any release from the adjacent closed room for the remainder of time the active room is being filled, thereby mitigating the effect of a release. This action could be performed by the Permittees immediately and documented in the operating record. This alternative action of increased ventilation air in the active room would be allowed to continue until the active room is filled or until the NMED fails to approve such action. In this latter case, the room would be abandoned as required by the Permit.

The comment requests assurances that if the alternative actions fail, the Permittees will be required to close the active room and move into the next room. Such assurances are not necessary for two reasons. First, the language only allows the Permittees to propose one alternative plan to mitigate the condition. Second, the NMED has the final say regarding continuing implementation of the alternative remedial action and the conditions that apply should the alternative remedial action fail. The Permittees are proposing a revision to the language such that the alternative remedial actions will have to be proposed to the Secretary and approved prior to reaching the 95 percent action level. This revised language is in the attached revised proposed Permit text.

3-7: Permit Attachment N, Section N-3a(1)

First paragraph, next to last sentence: Briefly describe what a "designated sample day" is, and why the Permittees need flexibility as to the day of the week that the weekly sample is taken. Also clarify if the sample would ever be collected during a non-work day (such as weekends and holidays).

<u>Response</u>

The original language was intended to ensure both samples VOC-A and VOC-B were taken simultaneously on whatever day was designated for sampling. Since the value at VOC-B is subtracted from the value at VOC-A during the data interpretation process to remove background effects from the sample at VOC-A, it is important that the samples be taken at the same time. With the elimination of Station VOC-B in the PMR, the sentence is no longer needed and the Permittees are proposing that it be deleted. This change is included on the attached revised proposed Permit text.

Samples are collected on the same day of the week, each week. This avoids routine weekend sampling. If the sampling day is a holiday, the sampler can be programmed to start and stop unattended. Alternatively, the sample can be rescheduled for a work day. The only time a sample would not be taken would be if underground access is restricted for some reason. In this case, an alternate day will be selected for sampling. Furthermore, if a sample is taken and proves to be unusable, a subsequent sample will be taken during the same week.

3-8: Permit Attachment N, Section N-3a(2)(4)

Last sentence, please remove "As required below" and replace with "In accordance with Section N-3d(2)," or provide a discussion as to why the proposed language is appropriate.

Response

The Permittees are proposing to delete “As required below” and to add at the end of the sentence “as required by Permit Attachment N, Section N-3d(2).” This change is included on the attached revised proposed Permit text.

3-9: Permit Attachment N, Section N-3b

The second paragraph states: "Non-targets classified as ARAs or TICs that meet the following criteria: (1) are VOCs listed in Appendix VIII of 40 Code of Federal Regulations (CFR) Part 261 (incorporated by reference in 20.4.1.200 New Mexico Administrative Code (NMAC), and (2) are detected in 10 percent or more of any original VOC monitoring samples collected over a 12-month timeframe, will be added, as applicable, to the analytical laboratory target analyte lists for both the repository and disposal room VOC monitoring programs, unless the Permittees can justify the exclusion from the target analyte list(s). Nontarget VOCs reported as "unknown" by the analytical laboratory are not evaluated due to indeterminate identifications." (underline added for emphasis)

The context of "as applicable" is unclear and should be either deleted or further explained.

Response

The Permittees are proposing to revise the Permit text to delete “as applicable.” This change is included on the attached revised proposed Permit text.

3-10: Permit Attachment N, Section N-3c

Second paragraph, second sentence: Include an additional statement similar to that included in the PMR Item 3 Overview, p. 29, stating that the shorter duration disposal room samples will not be collected as a time-weighted average. Explain that TO-15 "is used to collect grab samples (duration of 10 to 30 seconds) or time-integrated samples (duration of 12-24 hours) taken through a flow restrictive inlet (e.g., mass flow controller, critical orifice)." (from Compendium Method TO-15, Section 8.2.1.1). According to the method, samples collected that are not time weighted averages are grab samples; WIPP may be using an approach where the sample duration is longer than that stated in the Method for grab samples but less than that for a time weighted average sample (1 hour duration minimum). If this is the case, the sampling approach, including duration, should be explained. If a site-specific procedure detailing the steps followed for short duration sampling is available, please include.

Response

The criterion for deciding which sample duration to use is related to the variability with time in the air stream being sampled. The greater the short-term temporal variability, the longer the sampling duration should be. Station VOC-A is expected to exhibit variability over the 24-hour period because it is in the active ventilation stream. Therefore, longer time-integrated samples are appropriate to capture the effects of the variability. Filled rooms on the other hand have been removed from the active ventilation and are considered to be stagnant. Therefore, short duration samples are suitable for determining the stagnant air concentration. Active disposal rooms, while in the repository ventilation circuit, are held at a relatively constant flow rate when workers are present. Therefore, with the lack of variability the shorter duration samples are suitable.

Time-integrated samples require devices to regulate the air flow of the sample into the canister. The sampling duration required for disposal room VOC monitoring is from 5 to 15 minutes. Sample duration is usually around 5 minutes for a sample. Sampling continues until an adequate sample is collected (to just below sub-atmospheric pressure) to maintain method sensitivity. The Permittees' standard operating procedures (**SOPs**) incorporate steps to take when samples take longer than 15 minutes to collect, as this may indicate the sampling line is blocked.

Sampler operation is in accordance with the Permittees **SOP** WP 12-VC1685: *Subatmospheric and Pressurized Air Sampling in Passivated Canisters* (see Appendix 3-D). This procedure delineates the sampling durations for the sample types in the sections listed shown below. Note that this procedure has not been edited to incorporate the changes proposed in this PMR.

> Section 1.3 Subatmospheric Short Duration Time-Integrated Sampling--5 to 15 minutes
>
> Section 1.4 Subatmospheric Time-Integrated Sampling--1 to 24 hours

The Permittees propose to change the language in the second paragraph of Permit Attachment N, Section N-3c to include the words “time-integrated” after the revised term “short duration.” This change is included on the attached revised proposed Permit text.

3-11: Permit Attachment N, Section N-5a

Equation N-7: neither the inner nor the outer parentheses appear as "vertical lines"; therefore the note following the equation stating that the A-B quantity is an absolute value is confusing and needs to be clarified.

Response

The Permittees agree that the proposed PMR text should be revised to show the absolute value signs on either side of “A-B.” This change is included on the attached revised proposed Permit text.

3-12: Permit Attachment N, section N-5a(3)

Clarification of the term "area" is necessary; NMED assumes this term refers to the area under the peak in an elution time vs. detector output plot from a gas chromatograph, and is generally linearly proportional to analyte concentration but this should be stated in the PMR.

Response

Each use of the term “area” in Attachment N, Section N-5a is related to the evaluation of instrument performance relative to the internal standards associated with the instrument. Internal standards are configured in accordance with the guidance in EPA, 1991. The text of the Permit was proposed to be changed in the PMR to cite this publication as the guidance document applicable to the VOC Monitoring Program. The changes recommended by the comment are not appropriate. Changes to the criteria relative to the evaluation of the internal standard area are not proposed in this PMR; therefore, the requested change is not within the scope of the PMR. A rather extensive discussion of the use of internal standards can be found in Exhibit E of EPA, 1991. This reference is included in electronic format with this response.

3-13: Permit Attachment N, Section N-5d

NMED would like an example field sampling data sheet with minimum data entry requirements highlighted as included in a site-specific procedure. Section N-5d should also specify that the field data sheets are to become records that are kept on site and available for NMED review upon request. The data validation procedures referred to in this section should identify, at least in general terms, who is responsible for checking all field data sheets for completeness and correctness. If this is included in the procedure, please state as such and provide the procedure.

Response

The VOC Monitoring Program currently uses three SOPs to conduct VOC sampling operations. Copies of these SOPs are enclosed. Note that these SOPs have not been edited to include program changes proposed by this PMR. (These are attached as Appendix 3-D.)

WP 12-VC1684: *VOC Monitoring Group – Air Sampling Equipment Operations*. This procedure provides instructions for maintaining air sampling equipment, handling (e.g., receipt, storage, use, and shipping) VOC Samplers, and handling certified canisters for obtaining VOC and hydrogen and methane air samples at the Waste Isolation Pilot Plant (**WIPP**).

WP 12-VC1685: *Subatmospheric and Pressurized Air Sampling in Passivated Canisters*. This procedure provides instructions for handling (e.g., use, storage, and shipping) sample canisters and obtaining subatmospheric or pressurized VOC and hydrogen and methane air samples in 6-

liter passivated stainless steel canisters and provides instructions for radiation assessment of sampling equipment by a Radiological Control Technician.

WP 12-VC3209: *VOC Monitoring Group – Data Handling and Program Reporting*. This is a multiple purpose procedure for the collection, processing, verification and validation, and reporting of data used in support of VOC monitoring and hydrogen/methane monitoring air sampling programs. This procedure also covers evaluation of sample line loss, notifications of program and/or system conditions, and program deliverables.

These SOPs implement completion of data sheets to ensure the proper recording and management of relevant VOC monitoring data and identify who is responsible for checking all field data sheets for completeness and correctness. Data sheets that are included in these SOPs are as follows:

- Sample Line Inspection Sheet (WP 12-VC1684)
- Sample Canister Receipt Form (WP 12-VC1684)
- Example of Chain of Custody Record (WP 12-VC1684, WP 12-VC1685)
- Subatmospheric Sampling Data Sheet (WP 12-VC1685)
- Pressurized Sampling Data Sheet (WP 12-VC1685)
- Example of Request for Analysis (WP 12-VC1685)
- Example of Canister Sample Tag (WP 12-VC1685)
- VOC Data Validation Checklist (WP 12-VC3209)
- Hydrogen and Methane Data Validation Checklist (WP 12-VC3209)
- EDD Review and Data Package Validation Table (WP 12-VC3209)
- Vacuum/Pressure Comparison between Field and Laboratory Receipt (WP 12-VC3209)
- Alternate Total Ventilation Rate Calculation (WP 12-VC3209)
- Evaluation of Non-target VOCs (WP 12-VC3209)

In addition, WP 12-VC3209 includes instructions to obtain the mine weather and ventilation flow data from the various sources for use in VOC data analysis and reporting.

Each of the SOPs includes a list of the records that will be generated and requires these records be managed in accordance with a written records inventory and disposition schedule (**RIDS**). This schedule defines those records that must remain on site and available for inspection. Further instructions regarding records can be found in two VOC Program documents (also in Appendix 3-D):

WP 12-VC.01 *Volatile Organic Compound Monitoring Plan* which specifically states: *Original and duplicate or backup records of project activities will be maintained at the WIPP site. Electronic records that cannot be altered by the user and capable of producing a paper copy shall be deemed to be a written record. Records of project activities will be maintained at or readily accessible from the WIPP site. Documentation will be available for inspection by internal and external auditors.*

WP 12-VC.02 *Quality Assurance Project Plan for Volatile Organic Compound Monitoring* addresses records management in programmatic terms.

Procedure WP 12-VC3209: *VOC Monitoring Group – Data Handling and Program Reporting* contains a completeness checklist to be completed during data validation.

The VOC program uses both logbooks and data sheets as described in VOC program SOPs. The VOC program Permit text associated with data logbooks and data sheets has been clarified in Permit Attachment N, Sections N-4c and N-5d to ensure consistency with SOPs. These changes are included on the attached revised proposed Permit text.

3-14: Permit Attachment N, Section N-5e

First Paragraph, Last Sentence: "System audits will be performed at or shortly after to the initiation of the VOC monitoring programs and on an annual basis thereafter." The word "to" appears extraneous and should be deleted.

Response

The Permittees agree that the word “to” should be deleted from the sentence. This change is included on the attached revised proposed Permit text.

3-15: Permit Attachment N, Section N-5g

Last paragraph: Rather than deleting the following sentence: "Original and duplicate or backup records of project activities will be maintained at the WIPP site.", the Permittees should keep majority of original text but clarify what is included in "project activities". All records (those without electronic format) should be kept on site in accordance with the permit.

Response

The Permittees agree that this change in Permit Attachment N, Section N-5h should be retained and reworded to reference the records requirements in the applicable SOPs. This change focuses the record retention on those needed to comply with the Permit. The sentence is proposed to be changed as follows: “Records associated with the VOC Monitoring Program will be maintained as specified in VOC program SOPs.” This change is included on the attached revised proposed Permit text.

3-16: Figure N-1

This figure should be retained but modified to show the location of VOC-A only and its physical relationship to ventilation intake/exhaust flow direction, proximity to open/closed panels, and proximity to intake/exhaust shafts.

Response

The Permittees have revised this figure as suggested. In the revision, the Permittees generally depict the ventilation flow into and out of the regulated unit. Flow within the regulated unit varies, depending on the ventilation needs for underground operations. Permit Attachment A2 describes the various modes of ventilation available to the Permittees for ventilating the disposal unit. In addition, the Permittees have made editorial corrections to update the figure to current

WIPP facility conditions. A revised figure is attached to this response. Portions of the figure that were changed are marked with red shading. This change is included on the attached revised proposed Permit text.

3-17: Figure N-2

This figure should be retained, but modified accordingly to show the layout of the proposed new VOC monitoring system design.

<u>Response</u>

The Permittees have revised this figure as suggested. The figure shows a schematic of the Subatmospheric VOC Sampler. A revised figure is attached to this response. This change is included on the attached revised proposed Permit text.

3-18: Figure N-3

This figure is being retained, but the symbol legend needs to be modified to provide horizontal alignment between symbol and symbol description. The figure title should be expanded to read "Typical Disposal Room VOC Monitoring Locations and Path of Ventilation Air Flow".

<u>Response</u>

The Permittees have revised this figure as suggested. In addition, the Permittees have made minor editorial corrections. A revised figure is attached to this response. Portions of the figure that were changed are marked with red shading. This change is included on the attached revised proposed Permit text.

3-19: Figure N-4

The title of this figure should be modified to read "Disposal Room VOC Sample Head Arrangement", in order to avoid confusing with any other type of sampling head (such as hydrogen/methane).

<u>Response</u>

The Permittees have revised this figure as suggested. In addition, the Permittees have made editorial corrections to update the figure to current WIPP facility conditions. A revised figure is attached to this response. Portions of the figure that were changed are marked with red shading. This change is included on the attached revised proposed Permit text.

3-20: PMR Appendix C, Attachment A: Air Dispersion Modeling Report

Please provide the AERMOD input files.

<u>Response</u>

The AERMOD input files are being provided in electronic format with this response. These are included in Appendix 3-E.

APPENDIX 3-A
REVISED PERMIT TEXT AND FIGURES

4.6.2.2 Reporting Requirements

The Permittees shall report to the Secretary ~~semi-~~annually in ~~April and~~ October the data and analysis of the VOC Monitoring Plan as specified in Permit Attachment N, Sections N-3b, N-3e, and N-5d.

Table 4.6.2.3 - VOC Toxicity Values~~Concentrations of Concern~~

Compound	**~~Drift E-300 Concentration~~Recommended EPA Risk Factors**	
	~~ug/m3~~ Carcinogenic IUR (ug/m^3)$^{-1}$	**~~ppbv~~Non-carcinogenic RfC (mg/m^3)**
Carbon Tetrachloride	~~6040~~6.0×10^{-6}	~~960~~1.0×10^{-1}
~~Chlorobenzene~~	~~1015~~	~~220~~
Chloroform	~~890~~2.3×10^{-5}	~~180~~9.8×10^{-2}
~~1,1-Dichloroethylene~~	~~410~~	~~100~~
1,2-Dichloroethane	~~175~~2.6×10^{-5}	~~45~~7.0×10^{-3}
~~Methylene Chloride~~	~~6700~~	~~1930~~
1,1,2,2-Tetrachloroethane	~~350~~5.8×10^{-5}	~~50~~N/A
~~Toluene~~	~~715~~	~~190~~
1,1,1-Trichloroethane	~~3200~~N/A	~~590~~5.0
Trichloroethylene	4.1×10^{-6}	2.0×10^{-3}

IUR = Inhalation Unit Risk ~~from~~ (EPA ~~Integrated Risk Information System (IRIS) Database~~recommended value)

RfC = Reference Concentration (EPA recommended value)~~from EPA IRIS Database~~

N/A = not applicable (No ~~value published in the IRIS Database~~EPA recommended value available)

4.6.3.2 Notification Requirements

The Permittees shall notify the Secretary in accordance with Permit Attachment N, Section N-3e(2)~~writing, within seven calendar days of obtaining validated analytical results,~~ whenever the concentration of any VOC specified in Table 4.4.1 ~~in any closed room in an active panel or~~ in the immediately adjacent closed room exceeds the action levels specified in Table 4.6.3.2 below. The Permittees shall post a link to the exceedance notice transmittal letter on the WIPP Home

Page and inform those on the e-mail notification list as specified in Permit Section 1.11.

4.6.3.3 Remedial Action

Upon receiving validated analytical results that indicate one or more of the VOCs specified in Table 4.4.1 in any active open room or the immediately adjacent closed room ~~of the closed rooms~~ in an active panel has reached the "50% Action Level" in Table 4.6.3.2, the sampling frequency for such ~~closed~~ rooms will increase to once per week. The once per week sampling will continue either until the concentrations ~~in the closed room(s)~~ fall below the "50% Action Level" in Table 4.6.3.2, or until closure of Room 1 of the panel, whichever occurs first. If one or more of the VOCs in Table 4.4.1 in the active open room or immediately adjacent closed room reaches the "95% Action Level" in Table 4.6.3.2, another sample will be taken to confirm the existence of such a condition. If the second sample confirms that one or more of VOCs in the immediately adjacent closed room have reached the "95% Action Level" in Table 4.6.3.2, the active open room will be abandoned, ventilation barriers will be installed as specified in Permit Section 4.5.3.3, waste emplacement will proceed in the next open room, and monitoring of the subject closed room will continue at a frequency of once per week until commencement of panel closure. ~~Alternatively, upon reaching the "95% Action Level," the Permittees can propose an alternative remedial action to the Secretary for ensuring no individuals are exposed to concentrations in excess of the limits. The Permittees may implement such plans in lieu of closing the active room.~~ Prior to reaching the 95% Action Level in the immediately adjacent disposal room, the Permittees may propose an alternative remedial action to implement in the event the 95% Action Level is reached. This alternative remedial action must be approved by the Secretary prior to implementation.

H-1 Post-Closure Plan

The Permittees will collect air samples ~~upstream of all open and closed panels, and~~ down stream of Panel 1 until after certification of the closure of the last underground HWDU.

LIST OF FIGURES

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

~~The initial configuration for the repository VOC monitoring stations is shown in Figure N-1. All mine~~Mine ventilation air which could potentially be impacted by VOC emissions from the Underground HWDUs identified as Panels 1 through 8 will pass monitoring Station VOC-A, located in the E-300 drift as it flows to the ~~exhaust shaft~~Exhaust Shaft. Air samples will be collected at ~~two locations in the facility~~VOC-A to quantify ~~airborne~~ VOCs in the ambient mine air (repository VOC concentrations). VOC concentrations ~~attributable to VOC~~including emissions from open and closed panels containing TRU mixed waste will be ~~measured~~ monitored by placing ~~one VOC monitoring station~~Station VOC-A just downstream from Panel 1~~ at VOC-A~~. The location of Station VOC-A as shown in Figure N-1 will remain the same throughout the term of this Permit. ~~The second station (Station VOC-B) will always be located upstream from the open panel being filled with waste (starting with Panel 1 at monitoring Station VOC-B (Figure N-1). In this configuration, Station VOC-B will measure VOC concentrations attributable to releases from the upstream sources and other background sources of VOCs, but not releases attributable to open or closed panels. The location of Station VOC-B will change when disposal activities begin in the next panel. Station VOC-B will be relocated to ensure that it is always upstream of the open panel that is receiving TRU mixed waste.~~ Station VOC-A will ~~also measure~~collect the upstream VOCs ~~concentrations measured at Station VOC-B,~~ plus any additional VOC concentrations resulting from releases from the closed and open panels. ~~A sample will be collected from each monitoring station on a designated sample days.~~ ~~For each quantified target VOC, the concentration measured at Station VOC-B will be subtracted from the concentration measured at Station VOC-A to assess the magnitude of VOC releases from closed and open panels.~~

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

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

1. ~~A~~Excluding Room 1, sample heads will be installed ~~inside the~~for each disposal room behind the ~~exhaust drift bulkhead and~~ designated ventilation barrier at the exhaust and inlet side of the disposal rooms. For Room 1, a sample head will be installed only at the exhaust location.

2. TRU mixed waste will be emplaced in the active disposal room.

3. VOC monitoring will begin within two weeks of waste emplacement in an active room. (Figures N-~~1~~3 and N-~~2~~4)

~~3. When the active disposal room is filled, another sample head will be installed to the inlet of the filled active disposal room. (Figure N-3 and N-4)~~

~~4. The exhaust drift bulkhead will be removed and re-installed in the next disposal room so disposal activities may proceed.~~

~~5~~4. When an active room is filled, a~~A~~ ventilation barrier will be installed ~~where the bulkhead was located~~ in the active disposal room's exhaust drift. Another ventilation barrier will be installed in the active disposal room's air inlet drift, thereby closing that active disposal room. ~~As required below,~~ VOC monitoring will begin at the inlet side of the disposal room within two weeks of closure as required by Permit Attachment N, Section N-3d(2).

~~6~~5. ~~Monitoring of VOCs will continue in the now closed disposal room.~~ Monitoring of VOCs will occur in the active disposal rooms and ~~all~~ immediately adjacent closed disposal rooms in which waste has been emplaced until commencement of panel closure activities (i.e., completion of ventilation barriers in Room 1) as described in Permit Attachment G, Section G-1d(1).

~~This sequence for installing sample locations will proceed in the remaining disposal rooms until the inlet air ventilation barrier is installed in Room 1. An inlet sampler will not be installed in Room 1 because disposal room sampling proceeds to the next panel.~~

N-3b Analytes to Be Monitored

The ~~nine~~ VOCs that have been identified for repository and disposal room VOC monitoring are listed in Table N-1. The analysis will focus on routine detection and quantification of these ~~compounds~~ target analytes in collected samples. As part of the analytical evaluations, the presence of other compounds (i.e., non-target VOCs) will also be ~~investigated~~ monitored. Some non-targets may be included on the laboratory's target analyte list as additional requested analytes (**ARAs**) to gain a better understanding of potential concentrations and associated risk. The analytical laboratory will be directed to calibrate for ARAs when requested and classify and report ~~all of these compounds~~other non-target VOCs as ~~T~~tentatively ~~I~~identified ~~C~~compounds (**TICs**) if tentative identification can be made. The evaluation of TICs in original samples will include those concentrations that are ≥10 percent of the relative internal standard. The evaluation of ARAs only includes concentrations that are ≥ the method reporting limit (**MRL**). The required MRLs for ARAs will be U.S. Environmental Protection Agency (**EPA**)-specified levels of quantitation proposed for EPA contract laboratories that analyze canister samples by gas chromatography/mass spectrometry (**GC/MS**) (EPA, 1991).

~~TICs~~ Non-targets classified as ARAs or TICs that meet the following criteria: (1) are VOCs listed in Appendix VIII of 40 Code of Federal Regulations (**CFR**) Part 261 (incorporated by reference in 20.4.1.200 New Mexico Administrative Code (**NMAC**), and (2) are detected in 10~~%~~ percent or more of any original VOC monitoring samples ~~(exclusive of those collected from Station VOC-B) that are VOCs listed in Appendix VIII of 20.4.1.200 NMAC (incorporating 40 CFR §261)~~, collected over a ~~running~~ 12-month timeframe, will be added~~, as applicable,~~ to the analytical laboratory target analyte lists for both the repository and disposal room VOC monitoring programs, unless the Permittees can justify the exclusion from the target analyte list(s). Non-target VOCs reported as “unknown” by the analytical laboratory are not evaluated due to indeterminate identifications.

Additional requested analytes and TICs detected in the repository and disposal room VOC monitoring programs will be placed in the WIPP Operating Record and reported to New Mexico Environment Department (**NMED**) in ~~the Semi-Annual VOC Monitoring Report~~annual reports as specified in Permit Part 4, Section 4.6.2.2. As applicable, the Permittees will also report the justification for exclusion from the target analyte list(s) (e.g., the compound does not contribute to more than one percent of the risk). If new targets analytes are not required, the Permittees will state such in the annual report provided in October of each year. If new target analytes are required the Permittees will submit a Class 1 Permit Modification Notification (**PMN**) annually in accordance with 20.4.1.900 NMAC (incorporating 40 CFR 270.42(a)) to update Table 4.6.2.3 to include the new analyte and associated recommended EPA risk values for the inhalation unit risk (**IUR**) and reference concentration (**RfC**). This PMN will be submitted with the annual report. Added compounds will be included in the risk assessment described in Section N-3e(1).

N-3c Sampling and Analysis Methods

The VOC monitoring programs include a comprehensive VOC monitoring program established at the facility; equipment, training, and documentation ~~for VOC measurements~~ are already in place.

The sampling methods used for repository and disposal room VOC ~~sampling is~~ monitoring are based on the concept of ~~pressurized~~ subatmospheric sample collection contained in the U.S. ~~Environmental Protection Agency (~~EPA~~)~~ Compendium Method TO-15 (EPA, 1999). The TO-15 sampling concept uses 6-liter ~~SUMMA~~®~~-~~passivated ~~(or equivalent)~~ stainless-steel canisters to collect 24-hour time integrated or time-weighted average air samples at~~ each sample location~~ Station VOC-A and short~~er~~ duration time-integrated samples for disposal room VOC monitoring. This conceptual method will be used as a reference for collecting the samples at WIPP. The samples will be analyzed using ~~gas chromatography/mass spectrometry (**GC/MS**)~~GC/MS under an established QA/quality control (**QC**) program. Laboratory analytical procedures have been developed based on the concepts contained in both TO-15 and 8260B. Section N-5 contains additional QA/QC information for this project.

The TO-15 method is an EPA-recognized sampling concept for VOC sampling and speciation. It can be used to provide subatmospheric~~integrated samples, or grab~~ samples~~,~~ and compound quantitation for a broad range of concentrations. ~~The sampling system can be operated unattended but requires detailed operator training.~~ This sampling technique is also viable for use while analyzing the sample using other EPA methods such as 8260B.

Sample collection units operate~~The field sampling systems will be operated~~ in the subatmospheric ~~pressurized~~ mode. ~~In this mode, air is drawn through the inlet and sampling system with a pump. The air is pumped into~~ A sample is collected into an initially evacuated ~~SUMMA~~®~~-~~passivated ~~(or equivalent)~~ canister. When the canister is opened to the atmosphere, the differential pressure causes the sample to flow into the canister. Flow rate and duration are regulated with a flow-restrictive inlet and/or mechanical or electronic flow controllers. The air will pass through two particulate filters installed in dual in-line filter holders to prevent sample and equipment contamination and for radiation assessment of sampling equipment, as needed. The use of passive tubing and canisters for VOC sampling inhibits adsorption of compounds on the surfaces of the equipment. ~~by the sampler, which regulates the rate and duration of sampling. The treatment of tubing and canisters used for VOC sampling effectively seals the inner walls~~

~~and prevents compounds from being retained on the surfaces of the equipment. By the end of each sampling period, the canisters will be pressurized to about two atmospheres absolute. In the event of shortened sampling periods or other sampling conditions, the final pressure in the canister may be less than two atmospheres absolute. Sampling duration will be approximately six hours, so that a complete sample can be collected during a single work shift.~~

~~The canister sampling system and GC/MS analytical method are particularly appropriate for the VOC Monitoring Programs because a relatively large sample volume is collected, and multiple dilutions and reanalyses can occur to ensure identification and quantification of target VOCs within the working range of the method. The~~ For repository VOC monitoring, the contract-required quantitation limits (**CRQL**) ~~for Repository Monitoring~~ are 5 parts per billion by volume (**ppbv**) or less for the ~~nine~~ target ~~compounds~~VOCs. Consequently, low concentrations can be measured. CRQLs are the EPA-specified levels of quantitation proposed for EPA contract laboratories that analyze canister samples by GC/MS~~.~~ (EPA, 1991). The CRQLs for disposal room VOC monitoring are 500 (ppbv) (0.5 parts per million-volume (ppmv)) to allow for sub-ppmv quantitation. For the purpose of this plan, the CRQLs will be defined as the ~~method reporting limits (**MRL**)~~MRL. The MRL is a function of instrument performance, sample preparation, sample dilution, and all steps involved in the sample analysis process. ~~The MRL for Disposal Room Monitoring is 500 ppbv or less for the nine target compounds.~~

Disposal room VOC monitoring ~~system in open panels~~ will employ ~~the same canister sampling method as used in the repository VOC monitoring~~ sample collection units that will provide a subatmospheric sample within a short duration. Passivated or equivalent sampling lines will be installed in the disposal room as described in Section N-3a(2) and maintained once the room is closed until the panel associated with the room is closed. The independent lines will run from the sample inlet point to a sampling manifold ~~the individual sampler~~ located in ~~the access drift to the disposal panel. The air will pass through dual particulate filters to prevent sample and equipment contamination~~ an area accessible to sampling personnel.

N-4a(2) Sample Collection Units~~Volatile Organic Compound Canister Samplers~~

The sample collection unit for Station VOC-A samples is a commercially available sample train (herein referred as PASK) comprised of components that regulate the rate and duration of sampling into a sample canister. It can be operated unattended using a programmable timer or manually using canister valves.

The sample collection unit for disposal room VOC monitoring samples is a designed subatmospheric sampling assembly that regulates the rate and duration of sampling into a sample canister (Figure N-2). The design of the subatmospheric sampling assembly also allows for purging of sample lines to ensure that a representative sample is collected.

Sample collection units will use passivated components for the sample flow path. This effectively seals the inner walls and prevents sample constituents from being retained on the surfaces of the equipment. When sample canisters installed on sample collection units are opened to the atmosphere, the differential pressure causes the sample to flow into the canister at a regulated rate. By the end of each sampling period, the canisters will be near atmospheric pressure. Additional detail on sample collection will be given in SOPs.

N-4b Sample Collection

Sample collection for VOCs in the WIPP repository will be conducted in accordance with written ~~standard operating procedures (~~SOPs~~)~~ that are kept on file at the facility. These SOPs will specify the steps necessary to assure the collection of samples that are of acceptable quality to meet the applicable data quality objectives in Section 5 of this Attachment.

N-4c Sample Management

Field sampling logbooks and data sheets will be used ~~to document the sampler conditions under which~~for each sample ~~is~~ collected as specified in SOPs for VOC sampling. These data sheets are included in the SOPs and have been developed specifically for VOC monitoring at the WIPP facility. Logbooks are used to document sampler information as required by SOPs. The individuals assigned to collect the specific samples will be required to fill in all of the appropriate sample data ~~and to maintain this record in sample logbooks~~. ~~The program team leader~~ A cognizant individual will review these forms for each sampling event and the completed data sheets will be maintained in with the departmental Records Inventory and Disposition Schedule (**RIDS**).

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

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

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

$$RPD = \left(\frac{|A - B|}{(A + B)/2} \right) * 100 \qquad \text{(N-}\cancel{2}\text{7)}$$

where: A = Original sample result

B = Duplicate sample result

~~Note: Vertical lines in the formula above indicate absolute value of A-B.~~

N-5d Data Reduction, Validation, and Reporting

~~A dedicated logbook will be maintained by the operators. This logbook~~ Field sampling data sheets and equipment logbooks will contain documentation of all pertinent data for the sampling according to applicable SOPs. ~~Sample collection conditions, maintenance, and calibration activities will be included in this logbook.~~ Additional data collected by other groups at WIPP, such as ventilation airflow, temperature, barometric pressure, ~~etc.~~ and relative humidity, will be obtained to document the sampling conditions.

Data validation procedures will include at a minimum, a check of all field data sheets/equipment logbooks ~~forms and sampling logbooks will be checked~~ for completeness and correctness according to the applicable SOP. Sample custody and analysis records will be reviewed ~~routinely~~ by the analytical laboratory QA officer and the analytical laboratory supervisor at a frequency of at least 10 percent.

N-5e Performance and System Audits

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

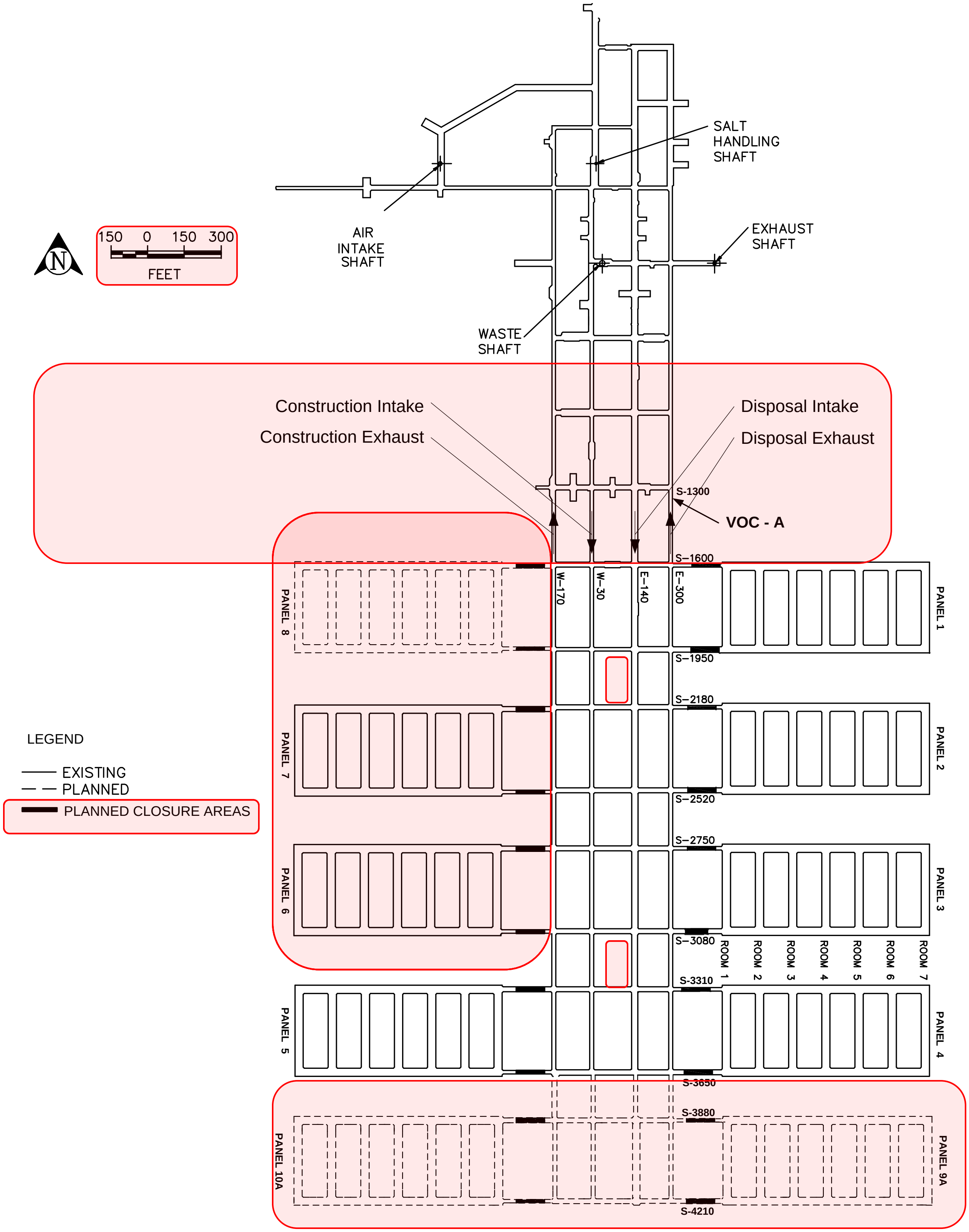
Performance audits will be accomplished as necessary through the evaluation of analytical QC data by performing periodic site audits throughout the duration of the project, and through the introduction of third-party audit cylinders (laboratory blinds) into the analytical sampling stream. Performance audits will also include a surveillance/review of data associated with canister ~~and sampler~~ certifications and measurement and test equipment, a project-specific technical audit of field operations, and a laboratory performance audit. ~~Field logs, logbooks, and data sheets will be reviewed weekly.~~ Blind-audit canisters will be introduced once during the sampling period. Details concerning scheduling, personnel, and data quality evaluation are addressed in the Quality Assurance Project Plan (**QAPjP**).

N-5h Records Management

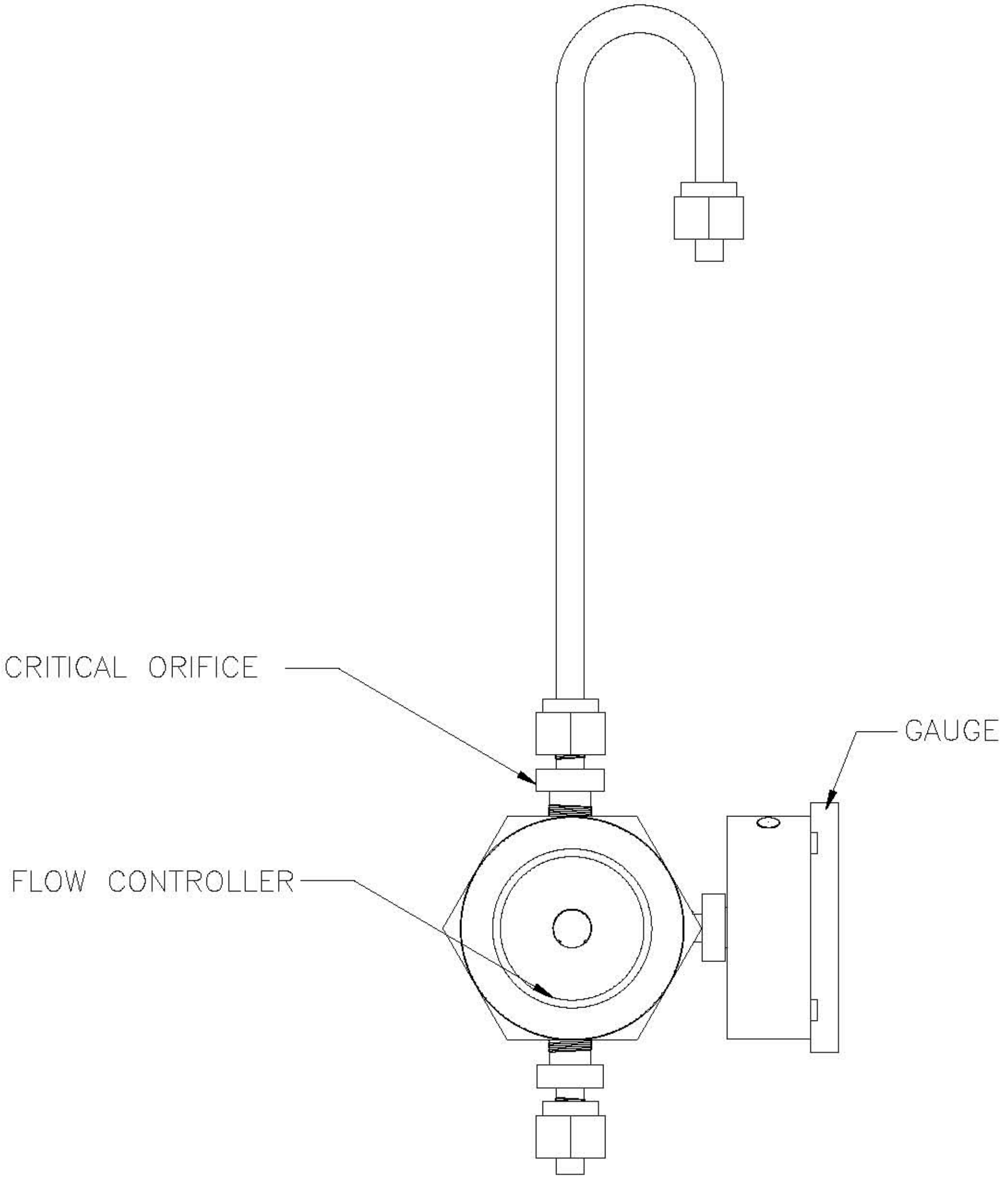
The VOC Monitoring Programs will require administration of record files (both laboratory and field data collection files). The records control systems will provide adequate control and retention for program-related information. Records administration, including QA records, will be conducted in accordance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

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

Revisions to completed records (i.e., as a result of audits or data validation procedures) may be made only with the approval of the responsible program manager and in accordance with applicable QA procedures. ~~Original and duplicate or backup records of project activities will be maintained at the WIPP site.~~ Records associated with the VOC Monitoring Program will be maintained as specified in VOC program SOPs. Electronic records that cannot be altered by the user and capable of producing a paper copy shall be deemed to be a written record. Records ~~of project activities~~ required to be retained by VOC program SOPs will be maintained at or readily accessible from the WIPP site. Documentation will be available for inspection by internal and external auditors.



~~Figure N-1~~ Figure N-1
~~Panel Area Flow~~Location of Station VOC-A



~~Figure N-2~~Figure N-2
Subatmospheric ~~VOC Monitoring System Design~~VOC Monitoring System

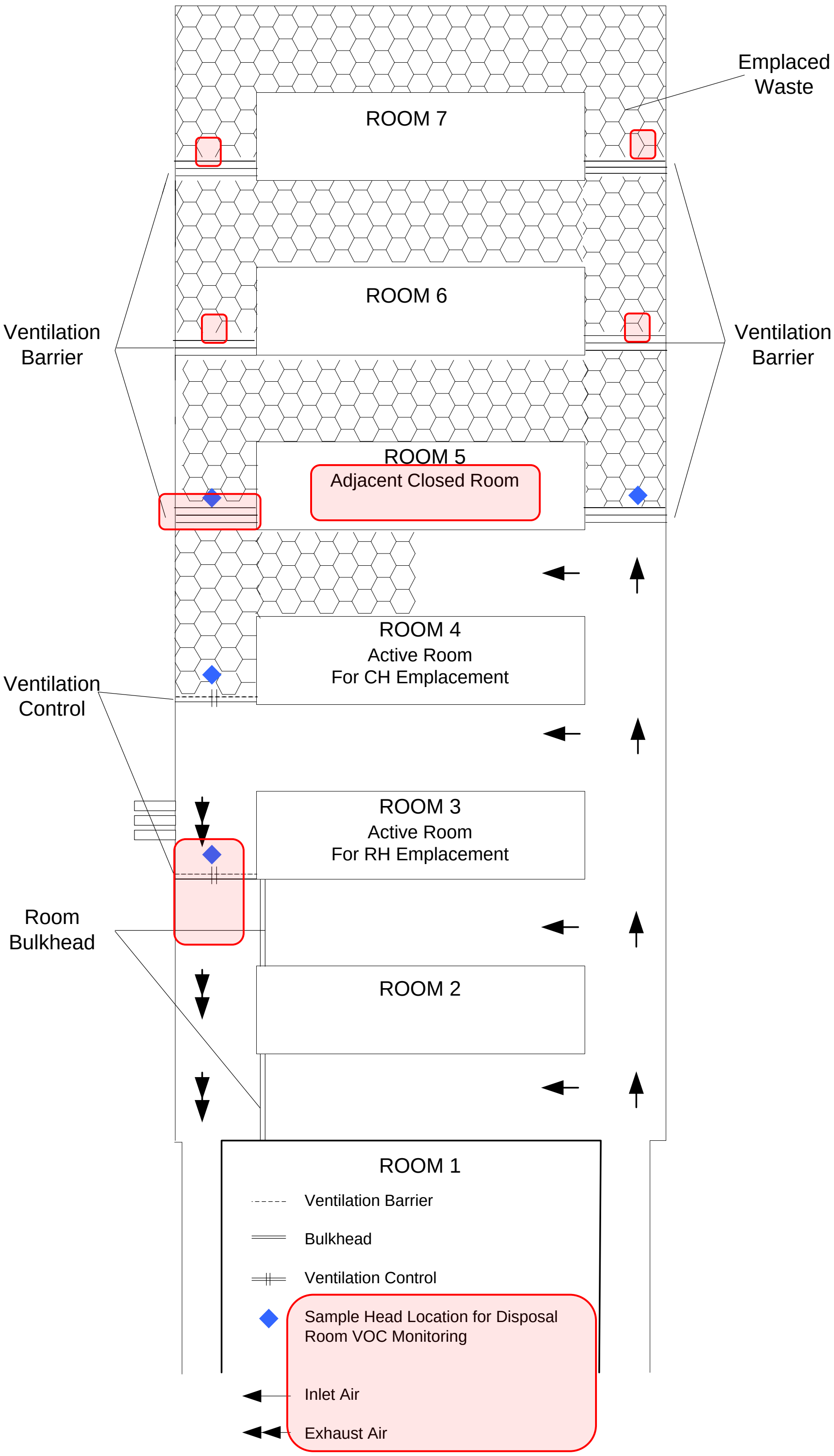
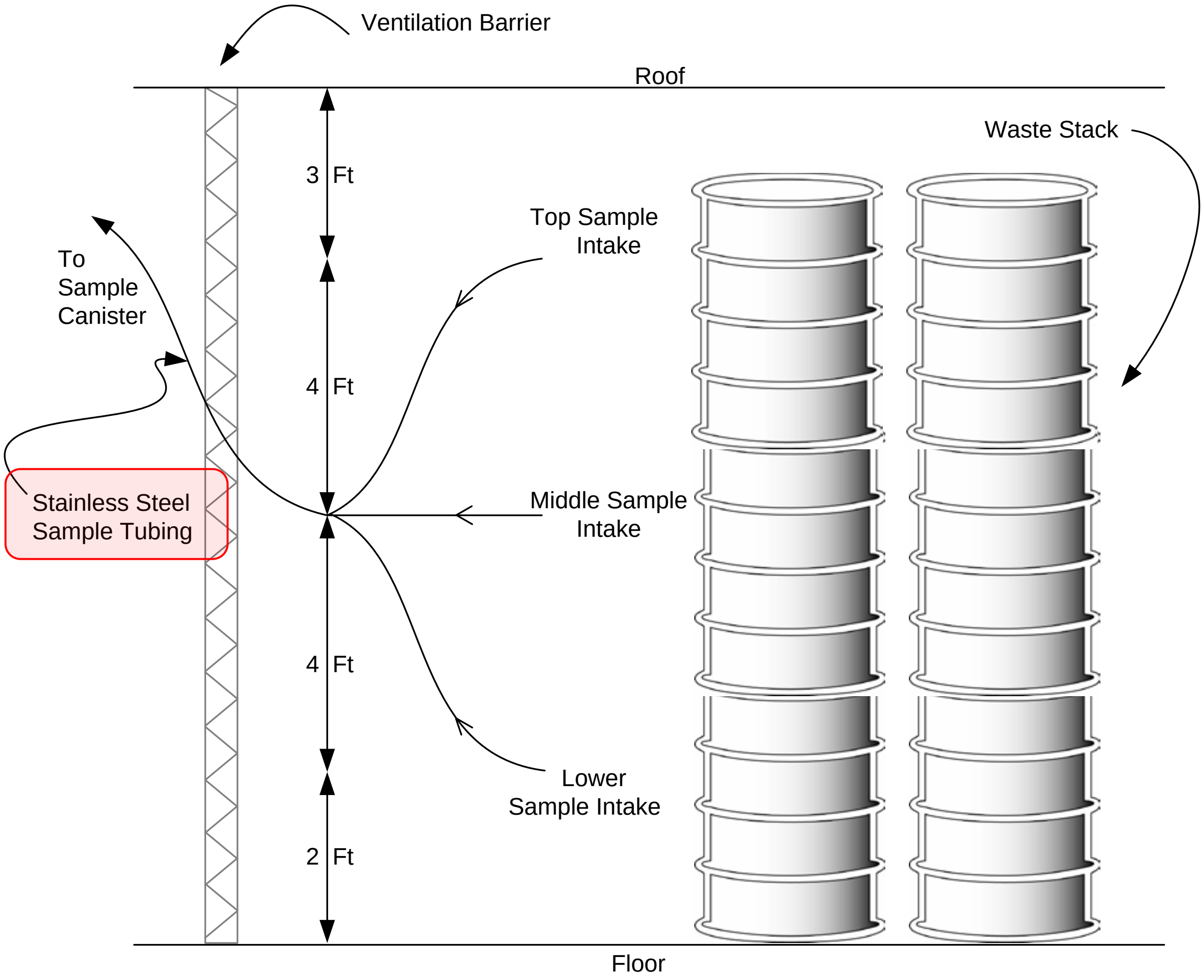


Figure N-1~~3~~3
Typical Disposal Room VOC Monitoring Locations and Path of Ventilation Air Flow



(not to scale, all measurements approximate)

Figure N-~~2~~4
Disposal Room VOC ~~Disposal Room~~ Sample Head Arrangement

APPENDIX 3-B
SUPPLEMENT 3 FROM THE RH TRU WASTE PERMIT MODIFICATION REQUEST SUBMITTAL

SUPPLEMENT 3

Maximum VOC Emission Rates from RH Canisters

MAXIMUM VOC EMISSION RATES FROM RH CANISTERS

1.0 INTRODUCTION

The Waste Isolation Pilot Plant (**WIPP**) is operating under a Resource Conservation and Recovery Act (**RCRA**) Hazardous Waste Facility Permit (**Permit**) that contains limitations on allowable emissions from contact-handled (**CH**) transuranic (**TRU**) waste. The environmental performance standard imposed on the WIPP consists of controlling volatile organic compound (**VOC**) emissions to ensure the public and facility worker safety. Meeting the environmental performance standard for VOC emissions is based on the container headspace gas concentration, filter type, number of containers emitting, and the mine ventilation rate.

TRU wastes that have a measured radiation dose rate equal to or greater than 200 mrem/hr are classified as remote-handled (**RH**) TRU wastes. These RH TRU wastes contain larger quantities of radionuclides that emit beta and gamma as well as alpha radiation. In fact, the main difference between the RH TRU waste and CH TRU waste is the presence of larger amounts of fission and activation products (e.g., Cesium-137, Strontium-90, Barium-137m, and Cobalt-60) in RH TRU waste. These fission and activation products emit penetrating X- and gamma radiation, and have relatively short half-lives (typically 30 years or less).

The WIPP Land Withdrawal Act (**LWA**) permits disposal volumes of 6.2 million cubic feet of TRU waste. Section 7(a) of the LWA limits the surface dose rate from RH waste to 1,000 rems per hour, and no more than 5% of the volume of RH waste can exceed 100 rems per hour. The final treated RH TRU waste inventory will contain primarily heterogenous waste, solidified inorganics, and metals.

TRU wastes will be transported to the WIPP by truck from the generator/storage sites. Upon arrival at the WIPP, each RH TRU shipment will be inspected and removed from the transport vehicles and positioned for waste transfer. The canister will then be removed from the shipping cask, loaded into a heavily shielded Facility Cask, and lowered underground through the Waste Shaft for emplacement. The Facility Cask will be transported to the disposal location and the canister will be emplaced with the Facility Cask held in position to provide adequate shielding at all times.

The waste disposal area within WIPP consists of eight panels, each containing seven rooms between access drifts. The RH TRU wastes will be emplaced in a manner different from that for the CH TRU wastes because of packaging, shielding, and loading requirements; operational equipment; and structural considerations. The current disposal configuration of the CH TRU inventory includes emplacement of the waste packages in disposal rooms that measure 33 ft wide, 13 ft high, and 300 ft long (DOE 1991). The current configuration for RH TRU disposal includes emplacement into the walls in horizontal boreholes. These boreholes will be drilled 4 feet from the floor on 8-foot centers (DOE 1991). There will be approximately 7,955 RH TRU waste boreholes. A shield plug capping each borehole after emplacement of the RH TRU canister in the room wall will provide the necessary shielding required for worker safety. Appendix A of the *Remote-Handled Transuranic Waste Study* (DOE 1995) includes a description of the RH TRU shield plug currently planned for implementation.

2.0 METHODOLOGY

The processes that will contribute to VOC emissions from the RH canisters are the same as those evaluated for CH waste. Therefore, the calculations used to evaluate VOC emissions from emplaced RH canisters will use the same equations as those used to evaluate VOC emissions in the original permit application. However, because RH canisters are located in the walls of the rooms behind shield plugs, the actual methodology is the same as that used for waste in a closed room.

RH canisters will not release VOCs into the underground ventilation the same way as CH waste containers in an active room. The RH waste is placed in a dead-end borehole that is capped by a low-permeability shield plug. Because the RH canister is in a dead-end borehole with a shield plug, mine ventilation will not pass over the canister as it does for containers on the floor of an active room. This lack of ventilation causes an emplaced RH canister with a shield plug to a release VOCs similarly to releases from a closed room.

A closed room uses ventilation barriers to restrict the flow of mine ventilation through a filled room. The shield plugs on each borehole containing an RH canister will function similarly to the ventilation barriers. The shield plugs will restrict the movement of mine ventilation and diffusion of VOCs from the borehole just as the ventilation barriers will restrict the movement of mine ventilation and diffusion from a filled room.

The RCRA Part B permit application demonstrated that gas pressurization is the primary mechanism that might cause VOCs to migrate out of a closed room. Based on this analysis, the WIPP's Hazardous Waste Facility Permit establishes VOC limits for operations. Therefore, the analysis of the emissions from an emplaced canister in a shield plug capped dead-end borehole results in the maximum credible gas pressurization rate per borehole and the per room potential maximum VOC emission rates from the RH TRU waste following the existing closed room methodology.

As a bounding conservative assumption, all canister headspaces are assumed to have saturated VOC concentrations at the temperature of WIPP. Pressurization within a borehole will be caused by a combination of gas generation and reduction of the borehole due to creep closure of the salt (DOE 1996a), which might result in VOC emissions from the canister into the room.

2.1 VOC Concentrations in the RH Canister Headspace

The VOC concentrations in the canister headspace are assumed to be equal to the saturated vapor pressure concentrations. This is the maximum concentration in the gas phase that can occur at the temperature in the underground at the WIPP. In addition, physical interactions of the VOCs within the liquid phase are ignored because these would reduce the concentrations in the gas phase. The saturated vapor concentrations of the VOCs are calculated from the vapor pressures at the temperature of WIPP (i.e., at 303 K) (DOE 1996b).

The vapor pressures of the VOCs at 303 K were calculated using Equation (1) of Appendix A of Reid et al. (1987) as:

$$1n(Pvp\ /\ Pc) = (1 - x)^{-1}\left[(VP\ A)x + (VP\ B)x^{1.5} + (VP\ C)x^{3} + (VP\ D)x^{6}\right]$$

where,

x = 1-T/Tc

Pvp = VOC vapor pressure at 303 K, (bars)
Pc = VOC critical pressure, (bars)
Tc = VOC critical temperature, (K)
T = Temperature of WIPP disposal room (303 K)

The critical pressures and temperatures of the VOCs as well as the coefficients VP A, VP B, VP C, VP D required for Equation (1) are listed in Table 2.

There are no vapor pressure coefficients available for 1,1-dichloroethene. The vapor pressure of this VOC was interpolated from a vapor pressure table for this compound from the *Handbook of Chemistry and Physics* (CRC 1978). The relevant values are listed in Table 1. In interpolating the vapor pressure at 303 K, the relationship that the logarithm of the vapor pressure is inversely proportional to the temperature (Treybal 1980) was used.

Table 1. 1,1-Dichloroethene Vapor Pressures

Temperature (°C)	Temperature (K)	Vapor Pressure (Pvp) (mmHg)
14.8	287.8	400
31.7	304.7	760

$$\frac{1/287.8 - 1/303}{1/287.8 - 1/304.7} = \frac{\log 400 - \log Pvp(303)}{\log 400 - \log 760}$$

Solving for the vapor pressure of 1,1-dichloroethene at 303 K, log *Pvp*(303) gives

log Pvp(303) = 6.572

Pvp(303) = 715 mm Hg = 715 mmHg/(760 mmHg/atm) = 0.9408 atm

The methodology used to calculate the vapor pressure concentration for each of the VOCs in the gas phase ignores the effects of the other VOCs present. This is another conservative assumption because, in reality, interference from other VOCs will cause the actual concentrations to be less than the saturated vapor pressure concentrations in air. In addition, no credit is taken for the diffusion of the filters or any source reduction resulting in a steady state concentration being assumed behind the shield plug. Therefore, the gas being emitted into the room is conservatively assumed to constantly be at the saturated vapor pressure concentrations.

2.2 Number of RH Canisters In a Room

The first step in establishing the total rate of gas pressurization from RH canisters is to establish the number of RH canisters per room. Based on Figure 4.2-7 of the WIPP RH PTSR (DOE 1999), a typical panel will have 731 RH boreholes. Room 1 of a panel will have the most boreholes i.e. 120 RH. As a conservative assumption, the calculations will use this maximum number.

Table 2. VOC Properties

Compound	Properties of Gases & Liquids Appendix A No.	MW (g/mol)	Tc (K)	Pc (bar)	VP A	VP B	VP C	VP D	x (Equation (1) for VP)	ln(Pvp/Pc) from Eq. 1 for VP	Pvp (bar)	Pvp (atm)	VOC Mole Fraction
Carcinogens													
Carbon Tetrachloride	94	153.84	556.4	45.6	-7.07139	1.71497	-2.8993	-2.49466	0.4554277	-5.4897228	0.1883	0.1858	0.1858
Chloroform	103	119.39	536.4	53.7	-6.95546	1.16625	-2.1397	-3.44421	0.435123	-5.1186177	0.3214	0.3172	0.3172
1,1-Dichloroethene	None	96.95	513	48.1							0.9533	0.9408	0.9408
1,2-Dichloroethane	158	98.97	566	53.7	-7.36864	1.76727	-3.34295	-1.4353	0.4646643	-6.0037215	0.1326	0.1309	0.1309
Methylene Chloride	107	84.94	510	63	-7.35739	2.17546	-4.07038	3.50701	0.4058824	-4.511202	0.6921	0.6830	0.6830
1,1,2,2-Tetrachloroethane	143	167.86	661.2	58.4	-7.98542	2.49931	-4.07076	-0.6918	0.5417423	-8.7160059	0.0096	0.0094	0.0094
1,1,1-Trichloroethane	149	133.42	545	43	-7.31317	2.04642	-3.77747	-0.45475	0.4440367	-5.3528837	0.2036	0.2009	0.2009
Noncarcinogens													
Chlorobenzene	340	112.56	632.4	45.2	-7.587	2.26551	-4.09418	0.17038	0.5208729	-7.6709981	0.0211	0.0208	0.0208
Toluene	400	92.13	591.8	41	-7.28607	1.38091	-2.83433	-2.79168	0.4880027	-6.7421505	0.0484	0.0478	0.0478

2.3 Gas Generation Mechanisms

Based on existing studies, potential gas generation mechanisms include:

- Microbial degradation of plastics
- Anoxic corrosion of metal
- Radiolysis of waste materials
- Gas displacement due to creep closure of the salt borehole

The potential for and magnitude of each mechanism on VOC emissions from the RH TRU waste canisters are discussed below.

2.3.1 Microbial Gas Generation

Microbial gas generation due to degradation of plastics produces 0 to 0.04 mole/kg cellulosics/yr. under humid conditions. (DOE 1996b). The total mass of equivalent cellulosics is given by Equation (6) of *Gas Generation Information* (DOE 1996b) as:

$$Total\ cellulosics\left(kg\right) = actual\ cellulosics\ \left(kg\right) + 1.7\,plastics\left(kg\right) + rubbers\left(kg\right)$$

The materials in the RH inventory are obtained from the *Transuranic Waste Baseline Inventory Report, Revision 3* (DOE 1996c) and are summarized in Table 3.

Table 3. Mass of Cellulose, Rubber, Plastic and Cellulosics Equivalents in RH Inventory

Material	Mass in RH Inventory (kg)	Equivalent Cellulosics (kg)
Cellulose	1.2036 x 10^5	1.2036 x 10^5
Rubber	0.2336 x 10^5	0.2336 x 10^5
Plastic	1.2815 x 10^5	2.1786 x 10^5
Total	**2.7187 x 10^5**	**3.6158 x 10^5**

The number of RH canisters to be disposed at WIPP is assumed to be 7,955 (DOE 1995). Therefore the average mass of cellulosics per RH canister is 3.6158 x 10^5 kg cellulosics / 7,955 canisters or 45.4 kg cellulosics / RH canister. Assuming a microbial gas generation rate of 0.01 mole/kg cellulosics/year, which is the same rate used for CH TRU waste under humid conditions in Appendix D9 of the *WIPP RCRA Part B Permit Application* (DOE 1996a), the microbial gas generation rate (**MGGR**) of a single RH canister is:

$$MGGR = \left(0.01\,mole\ /\ kg\ cellulosics\ /\ yr\right)45.4\,kg\ cellulosics\ /\ RH\ canister$$

$$MGGR = 0.45\ mole\ /\ yr\ /\ RH\ canister$$

2.3.2 Anoxic Corrosion

Anoxic corrosion of iron and aluminum alloys in TRU waste has the potential to consume water and produce hydrogen, assuming several repository conditions are present (DOE 1996b). The primary conditions that must be satisfied for anoxic corrosion to occur are (1) sufficient quantities of brine from the surrounding Salado Formation enter the WIPP disposal rooms after closure and/or (2) initial water in the waste is available. Gas generation rates from anoxic corrosion for CH TRU and RH TRU wastes are similar because there are no significant differences between these waste forms that would directly influence corrosion.

RH TRU corrodible metals (i.e., RH TRU iron, aluminum, and waste packaging) will contribute 6 percent by mass and 31 percent by weight assuming a corrodible shield plug to the total corrodible metal content (i.e., all TRU iron, aluminum, and waste packaging) of the repository (DOE 1995). However, if sufficient brine is available, microbial degradation will produce carbon dioxide and/or hydrogen sulfide (in addition to other gases) that could potentially passivate steels and other iron-base alloys and thus prevent additional hydrogen production and water consumption from anoxic corrosion of these waste metals. Further, small amounts of brine could initiate anoxic corrosion, which will produce hydrogen, consume water, increase the pressure, and perhaps slow or prevent additional brine inflow or even cause brine outflow, thus impeding additional anoxic corrosion and hydrogen generation. Thus, the availability of water in the WIPP repository will limit anoxic corrosion and therefore hydrogen generation, regardless of the quantity of CH TRU and RH TRU steels and other iron-base alloys and packaging materials included in the WIPP inventory (DOE 1995). Therefore, the anoxic humid steel corrosion rate during the operational period of the WIPP for the cases with microbial gas generation is 0.0 mm/yr. or 0.0 mole/yr. (DOE 1996b).

2.3.3 Radiolysis of Waste Materials

Gas generation from alpha radiolysis is not as important as anoxic corrosion and anaerobic microbial degradation because results from radiolysis studies indicate that gas generation rates from alpha radiolysis are substantially lower than rates from anoxic corrosion and anaerobic microbial degradation (DOE 1995). Given the high energies of the gamma rays and the fairly low density of the waste matrix, only a small fraction of the gamma energy will actually be deposited within the waste. The majority of radiolytic gas production is attributable to alpha and beta radiation, similar to that for CH TRU wastes. Because the RH TRU waste contains lower percentages of cellulosics, rubber, and plastic materials than in CH TRU wastes, the potential for radiolysis in RH wastes is actually somewhat lower than that for CH wastes. Preliminary data on gas generation measurements of RH TRU waste canisters at the Los Alamos National Laboratory (LANL 1999) indicate very low rates of gas generation and in fact the consumption rate of oxygen in the canisters may be higher than the net rate of gas generation. Because radiolysis of CH TRU waste materials has been shown to be insignificant relative to anoxic corrosion and microbial gas generation, radiolysis of RH TRU waste materials will also be insignificant relative to these mechanisms.

2.3.4 Gas Displacement

The rate of gas displacement within the RH canister borehole excavation is based on the data from the WIPP Part B Permit Application, Appendix D9 *Exposure Assessment for Protection of the Atmosphere* (DOE 1996a). Specifically, the percentage volume reduction rate of the borehole is conservatively assumed to be the same percentage as the reduction in panel volume. Because the borehole geometry is cylindrical and the dimensions are much smaller than the panel, the actual borehole volume reduction rate will actually be smaller than that based on the panel value.

According to Appendix D9, the reduction of the panel void volume is 812 m^3/yr/panel.

The initial panel volume is calculated from the following equation (DOE 1991)

$$V(0)_{panel} = 7hwl + 12hwd + 14hw^2$$

where,

h = height of room (13 ft)
w = width of room (33 ft)
l = length of room (300 ft)
d = width of pillar (100 ft)

and the initial panel volume is:

$$V(0)_{panel} = 1{,}613{,}898 \ ft^3 \ / \ panel = 45{,}700 \ m^3 \ / \ panel$$

The percentage volume reduction, PVR is calculated as:

$$PVR = \frac{812 \ m^3 \ / \ panel \ / \ yr}{45{,}700 \, m^3} \ x \ 100\% = 1.778\% \ / \ year$$

This percentage volume reduction will be applied to the borehole to calculate the molar (gas) displacement rate.

Volume of Borehole

The diameter of a borehole excavation will be 30 in or 76.2 cm. Thus the radius of the excavation, $r_{borehole}$, will be 38.1 cm. The length of a borehole, $l_{borehole}$, is 16 ft or 487.68 cm (DOE 1995). Thus, the initial volume of the borehole excavation will be:

$$V(0)_{borehole} = \pi \ r_{borehole}{}^2 l_{borehole} = \pi(38.1 cm)^2 (487.68 \, cm)(1 m^3 \ / \ 10^6 cm^3) = 2.2240 \ m^3$$

External Volume of Canister

The dimensions of the canister and pintle are shown in Figure 1 (DOE 1995).

The external volume of the canister is calculated as:

$$V_{canister} = \pi \; r_{canister}{}^{2} l_{canister} = \pi\left(26\,in/2\right)^{2}\left(121in - 6.2\,in\right) = 60{,}951\; in^{3}$$

The volume occupied by the pintle is:

$$V_{pintle} = \pi\left[\left(6.6\;\; in/2\right)^{2}\left(5.1\; in\right) + \left(9.1\;\; in/2\right)^{2}\left(1.1\;\; in\right)\right] = 246\, in^{3}$$

Thus, the total volume occupied by the canister and pintle is 61,197 in^3 or 1.0028 m^3.

External Volume of Shield Plug

The dimensions of the shield plug and pintle are shown in Figure 2 (DOE 1995).

The external volume of the shield plug is calculated as:

$$V_{shieldplug} = \pi \; r_{shieldplug}{}^{2} \; l_{shieldplug} = \pi\,(29\;\; in/2)^{2}(70\;\; in) = 46{,}236\, in^{3} = 0.7577\, m^{3}$$

The volume occupied by the pintle is 246 in^3. Thus, the total volume occupied by the shield plug and pintle is 46,482 in^3 or 0.7617 m^3.

Void Volume Inside Borehole

The void volume within the excavation at time, t, is calculated as:

$$V_{V}(t) = V_{borehole}(t) - \left(V_{canister} + V_{pintle}\right) - \left(V_{shield\;plug} + V_{pintle}\right)$$

The initial void volume is calculated as:

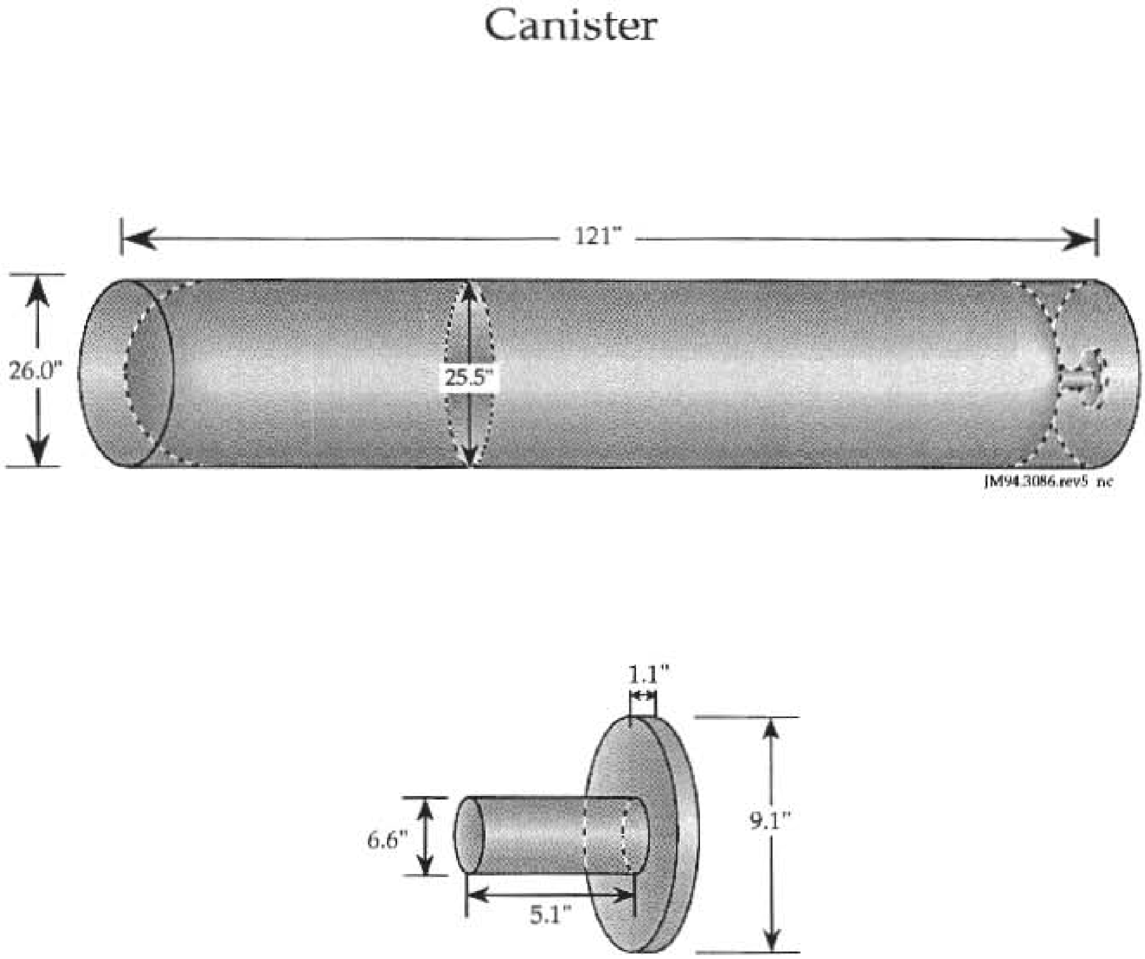
$$V_{V}(0) = 2.2240\, m^{3} - 1.0028\, m^{3} - 0.7617\;\; m^{3} = 0.4595\, m^{3}$$

The borehole volume at 1 year is calculated assuming a percentage volume reduction of 1.778% as:

$$V_{borehole}\left(1\, yr\right) = (1 - 0.01778)\, V_{borehole}(0) = 0.98222\left(2.2240\, m^{3}\right) = 2.1844\;\; m^{3}$$

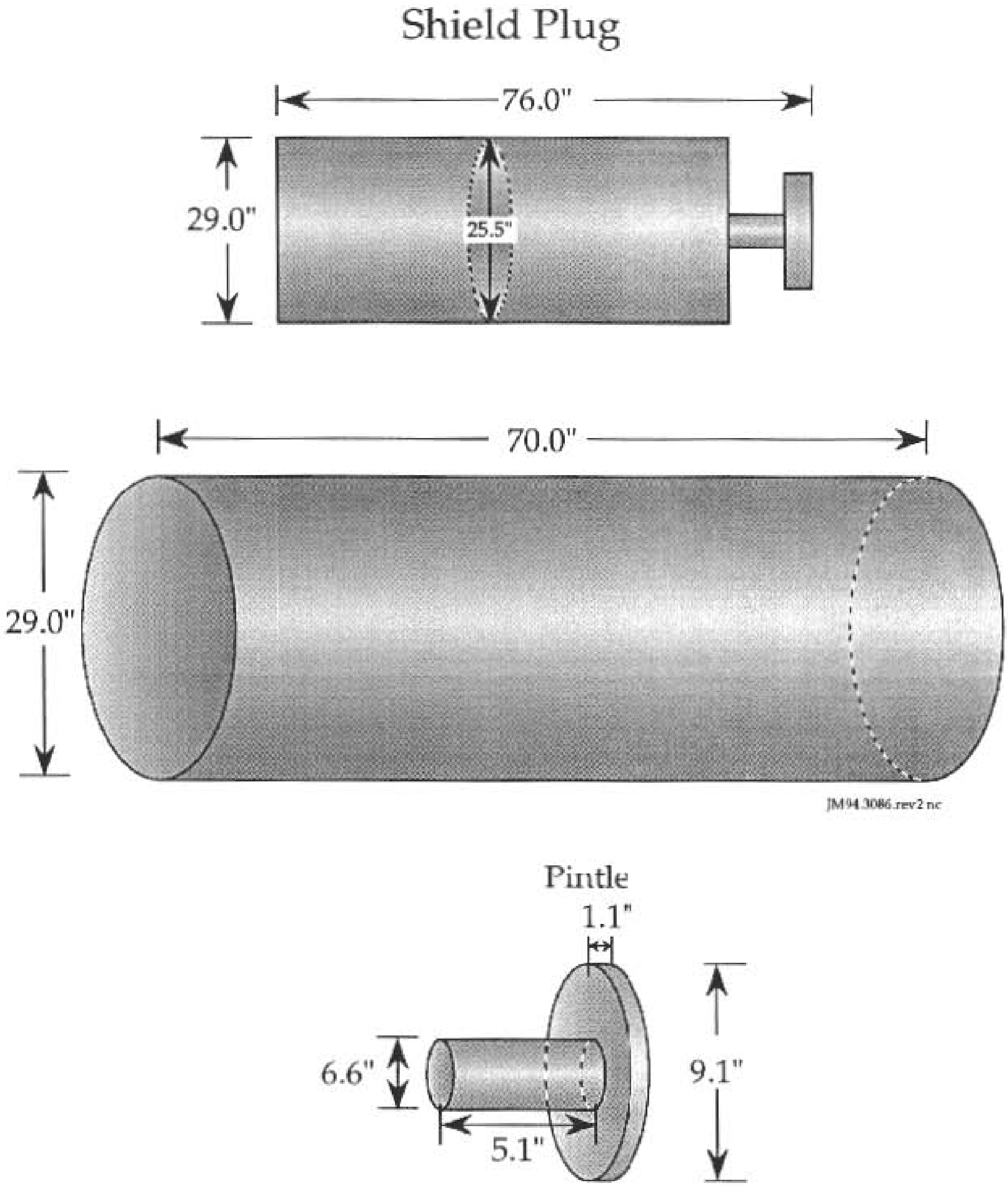
The borehole void volume at 1 year is calculated as:

$$V_{V}\left(1yr\right) = 2.1844\, m^{3} - 1.0028\, m^{3} - 0.7617\;\; m^{3} = 0.4199\, m^{3}$$



Note:
Drawing Not to Scale
* These are nominal estimates which support the
inventory assessment for corrodible metals.

Figure 1. Dimensions of Canister and Pintle



Shield Plug

Pintle

Note:
Drawing Not to Scale
* These are nominal estimates which support the
inventory assessment for corrodible metals.

Figure 2. Dimensions of Shield Plug and Pintle

The reduction of the borehole excavation void volume in one year is therefore 0.4595 m^3 – 0.4199 m^3 or 0.0396 m^3/yr.

The volumetric reduction rate is converted into a molar (gas) displacement rate (**GDR**) using the ideal gas law as:

$$GDR = 0.0396\ m^3\ /\ yr\ \ x\frac{P}{RT}$$

$$GDR = \left(0.0396\ m^3\ /\ yr\right)\left(10^3\ \ L\ /\ m^3\right)\ x\ \frac{1 atm}{(\frac{0.08206 atm\ L}{mol\ K})(303 K)}$$

$$GDR = 1.59\ mol\ /\ yr$$

2.3.5 Total Gas Pressurization Rate

The total gas pressurization rate or effective gas generation rate (microbial gas generation rate plus gas displacement rate) per RH canister borehole is calculated as follows, which is analogous to Equation D9-3 from Appendix D9, *Exposure Assessment for Protection of the Atmosphere* (DOE 1996a):

$$GR = MGGR + GDR$$

or

$$GR = 0.45\ mol\ /\ yr + 1.59\ mol\ /\ yr = 2.04 mol\ /\ yr$$

2.4 Maximum RH Canister VOC Emission Rates

The individual canister VOC emission rate is calculated as:

$$ICER_{VOC} = GR\ MF_{VOC}$$

where,

$ICER_{VOC}$ = Individual canister VOC emission rate (mole/canister/year)
GR = Effective canister total gas generation (i.e., pressurization) rate (2.04 mole/canister/year)
MF_{VOC} = VOC mole fraction in canister headspace (dimensionless)

The total emission rate of a VOC into a room from all canisters is calculated as:

$$TCER_{VOC} = N_c\ \ ICER_{VOC}$$

where,

N_C = Number of RH canisters per room (120 canisters).

3.0 RESULTS

The allowable room emission rates for the VOCs from a disposal room are summarized in Table 4. VOC concentrations in the canister headspace based on saturated vapor pressure values are listed in the third column of Table 4. The individual RH TRU waste canister VOC emission rates, ICER, and the maximum potential VOC emission rates for all RH TRU waste canisters in a room, TCER, are listed in Columns 4 and 5 of the table. The individual TCER values were divided by the allowable VOC room emission rates to establish the magnitude of the RH canister emissions contributions. The percentages contributions range from 0.09% for chlorobenzene to 8.23% for 1,1-dichloroethene.

Table 4. Maximum RH Canisters VOC Emission Rates

Compound	Current Maximum Allowable VOC Emission Rate (mole/room/year)	Vapor Pressure VOC Concentration (ppmv)	Canister Emission Rate (ICER) (mole/canister/year)	Room Emission Rate (TCER) (mole/room/year)	Percentage of Current Maximum Allowable Room Emission Rate
Carcinogens					
Carbon Tetrachloride	4,250	185,800	0.379	45.5	1.07%
Chloroform	4,860	317,200	0.650	77.6	1.60%
1,1-Dichloroethene	2,800	940,800	1.930	230	8.23%
1,2-Dichloroethane	1,160	130,900	0.268	32.0	2.76%
Methylene Chloride	53,650	683,000	1.40	167	0.31%
1,1,2,2-Tetrachloroethane	1,300	9,400	0.0194	2.3	0.18%
1,1,1-Trichloroethane	14,880	200,900	0.412	49.2	0.33%
Noncarcinogens					
Chlorobenzene	5,500	20,800	0.0426	5.10	0.09%
Toluene	4,780	47,800	0.0979	11.7	0.24%

4.0 IMPLEMENTATION

To conservatively account for potential VOC emissions from RH TRU waste, the current maximum allowable VOC emission rate values must be reduced by subtracting the maximum potential room emission rate from RH TRU waste (TECR from Table 4) from the current maximum allowable VOC emission rate for a room. Therefore, the maximum allowable VOC emission rates currently in the permit must be adjusted to reflect the potential contributions from RH TRU waste as shown in Table 5.

5.0 CONCLUSION

A conservative approach to calculating the potential VOC emissions from RH TRU waste in a room was developed to bound the effects of RH TRU waste on total room emissions. Based upon the conservative assumptions used to bound the RH TRU waste VOC emissions, the RH TRU waste could contribute a maximum of 0.09% (for chlorobenzene) to 8.23% (for 1,1-Dichloroethene) for any of the VOCs of concern. Because the contributions from the RH TRU waste are so small, the existing maximum VOC emissions rates were reduced to account for the RH-emissions indirectly. This approach eliminates the need for any direct measurements of the headspace gases in RH TRU waste canisters by conservatively incorporating the maximum possible VOC contribution from RH TRU waste in the maximum allowable VOC emission limit in the Permit.

Table 5. Maximum VOC Emission Rates Accounting for Potential RH TRU Waste Emissions

Compound	Current Maximum Allowable VOC Emission Rate (mole/room/year)	Adjusted Maximum Allowable VOC Emission Rate (mole/room/year)
Carcinogens		
Carbon Tetrachloride	4,250	4,204
Chloroform	4,860	4,782
1,1-Dichloroethene	2,800	2,569
1,2-Dichloroethane	1,160	1,127
Methylene Chloride	53,650	53,482
1,1,2,2-Tetrachloroethane	1,300	1,297
1,1,1-Trichloroethane	14,880	14,830
Noncarcinogens		
Chlorobenzene	5,500	5,494
Toluene	4,780	4,768

6.0 REFERENCES

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APPENDIX 3-C
EPA 1991 (Only the first page is included. The document is provided in electronic format)

United States
Environmental Protection
Agency

Office of
Solid Waste and
Emergency Response

Publication 9240.1-18
EPA/540/R/94/085
PB95-963524
December 1994

Superfund

USEPA CONTRACT LABORATORY PROGRAM

VOLATILE ORGANICS ANALYSIS OF AMBIENT AIR IN CANISTERS

VCAAO 1.0

APPENDIX 3-D
VOC PROGRAM PROCEDURES

WP 12-VC1684

Revision 9

VOC Monitoring Group – Air Sampling Equipment Operations

Technical Procedure

EFFECTIVE DATE: 12/06/12

Rick Salness
APPROVED FOR USE

TABLE OF CONTENTS

CHANGE HISTORY SUMMARY

REVISION NUMBER	DATE ISSUED	DESCRIPTION OF CHANGES
6	11/30/10	• Added wording to first bullet in the Precautions and Limitations on trainees
7	04/08/11	• Extensive changes made and to reduce redundancy, combined all VOCs, Hydrogen, and Methane sample collection processes described in WP 12-VC1684, WP 12-VC1685, and WP 12-VC1686 into Rev. 5 of WP 12-VC1685. WP 12-VC1686 is now obsolete and Rev. 7 of WP 12-VC1684 describes only air sampling equipment operations.
8	06/01/12	• Extensive minor changes were made to procedure for general improvement and to meet criteria specified in WP 15-PS.2. Other minor changes include added wording for clarification. • Added to Precautions and Limitations and section 3.0 - exclusion (i.e., L-16 not required) for review of canister or PASK cleaning and certification documentation. • Added to section 2.0 a note and step modified to emphasize the requirement to perform a pre-use check of electrical power cords.
9	12/06/12	• Removed Passive Air Sampling Kits (PASK) from the introduction, section 3.0, substep 3.1.5 through 3.1.7 Note, and Attachment 2. • Added to Precautions and Limitations – 6th bullet “Maintenance of passive air sampling kits …”. • Updated Precautions and Limitations – 7th bullet (previously 6th bullet). • Added to Precautions and Limitations – 8th bullet (previously 7th bullet) “via commercial carrier” added to the end of the sentence. • Replaced substep 2.4.5 Note – includes “recorded on CofC documentation maintained for records” in place of “indicated on the records copy (yellow copy) of the CofC for certified …”. • Updated substep 2.4.7, 1st bullet – removed “Yellow copy of the” and added “documentation”. • Removed step 3.2 and substep 3.2.1 through substep 3.2.5.

INTRODUCTION[1]

This procedure provides instructions for maintaining air sampling equipment, handling (e.g., receipt, storage, use, and shipping) Volatile Organic Compound (VOC) Samplers, and handling certified canisters for obtaining VOC and hydrogen and methane air samples at the Waste Isolation Pilot Plant (WIPP). Procedure WP 12-VC1685 provides the instructions for obtaining subatmospheric or pressurized air samples. The activities in this procedure may not necessarily be performed at one time, or in the order listed.

Hydrogen/methane and VOC air sampling is administered by the VOC Monitoring Group of Environmental Monitoring and Hydrology (EM&H) in compliance with the hydrogen/methane and VOC monitoring requirements described in the WIPP Hazardous Waste Facility Permit (Permit).

Unintentional procedure deviations, equipment malfunctions, and other problems that do not conform to established requirements are nonconformances. Nonconformances must be documented and recorded in the project files.[1] The disposition and documentation of nonconformances will be handled according to requirements described in WP 13-1.

This procedure will be in the facility Operating Record and available for review by New Mexico Environment Department (NMED) at anytime. All field logbooks/data sheets must be incorporated into WIPP's records management program.[1] Records generated are handled in accordance with departmental Records Inventory and Disposition Schedule (RIDS).

Performance of this procedure generates the following records, as applicable.

- Sample Line Inspection Sheet (attachment 1)
- Sample Canister Receipt Form (attachment 2)
- Chain of Custody Record (example attachment 3)
- VOC Sampler Logbook
- Shipping Documents (shipping authorization and bill of lading and/or air waybill, as applicable)
- Sampler Certification Report Including Resource Conservation and Recovery Act (RCRA) Inspection Form

REFERENCES			
DOCUMENT NUMBER AND TITLE	BASELINE DOCUMENT	REFERENCED DOCUMENT	KEY STEP
Hazardous Waste Facility Permit Waste Isolation Pilot Plant, Permit Number NM4890139088-TSDF issued by the New Mexico Environment Department	✓		1
EPA Compendium Method TO-15, Determination of Volatile Organic Compounds (VOCs) in air collected in specially prepared canisters and analyzed by gas chromatography/mass spectrometry (GC/MS)	✓		
EPA 540/R-94/085, *USEPA Contract Laboratory Program Volatile Organics Analysis of Ambient Air in Canisters* (Draft)		✓	
WP 02-EM.02, *Integrated Sample Control Plan*	✓		
WP 10-WC3011, *Work Control Process*		✓	
WP 12-IS.01-7, *Industrial Safety Program – General Electrical Safety*		✓	
WP 12-VC.01, *Volatile Organic Compound Monitoring Plan*	✓		
WP 12-VC.02, *Quality Assurance Project Plan for Volatile Organic Compound Monitoring*	✓		
WP 12-VC.03, *Hydrogen and Methane Monitoring Plan*	✓		
WP 12-VC.04, *Quality Assurance Project Plan for Hydrogen and Methane Monitoring*	✓		
WP 12-VC1685, *Subatmospheric and Pressurized Air Sampling in Passivated Canisters*		✓	
WP 12-VC3209, *VOC Monitoring Group - Data Handling and Program Reporting*		✓	
WP 13-1, *Nuclear Waste Partnership LLC Quality Assurance Program Description*	✓	✓	2
WP 13-QA1003, *Quality Assurance Receipt/Source Inspections*		✓	
WP 15-PM3525, *Preparation and Processing of Shipping Authorizations*		✓	
EA15PM3525-1-0, *Shipping Authorization*		✓	
WP 15-RM, *WIPP Records Management* Program	✓	✓	
Qualification Card L-16 (VOC, Hydrogen, Methane Sampling Operations)		✓	
Sample Line Inspection Sheet		✓	

REFERENCES			
DOCUMENT NUMBER AND TITLE	BASELINE DOCUMENT	REFERENCED DOCUMENT	KEY STEP
Sample Canister Receipt Form		✓	
Chain of Custody Record		✓	
Sampler Certification Report Including RCRA Inspection Form		✓	
VOC Sampler Logbook		✓	

EQUIPMENT LIST

- Wrenches, 9/16-inch and 1/2-inch open end
- 6-liter passivated stainless steel canisters
- VOC Samplers
- VOC Sampler enclosures
- Passivated stainless steel sample line components and tubing
- Air compressor
- Air compressor filters (general purpose, high efficiency, activated carbon)
- Leak detecting solution (e.g., Snoop®) and MSDS
- Shipping containers
- Packaging tape
- Custody seal tape

PRECAUTIONS AND LIMITATIONS

- Excluding personnel performing data completeness reviews or as otherwise indicated, individuals performing this procedure must be qualified per Qualification Card L-16, (VOC, Hydrogen, Methane Sampling Operations) or be a trainee working to Qualification Card L-16 under an individual with current L-16 qualifications. Reviewers shall be independent of the data collector.[2]
- When feasible, tubing connections will be capped or plugged to minimize salt or dust contamination.

- At a minimum, VOC Samplers will be certified for cleanliness initially and annually thereafter upon initial use, after any parts that are included in the sample flow path are replaced, or any time analytical results indicate potential contamination.[1] A VOC Sampler in use for sampling is installed in a secure enclosure to prevent tampering. Only certified samplers are used for sampling. Before installation verify that certification and calibration criteria have been met as indicated by final signature on the RCRA Inspection Form of the Sampler Certification Report for the individual sampler. Recertification will be required for each individual sampler one year after being placed in service (indicated as recall date). The recall date is determined after initial use for collecting a sample since accuracy is not expected to degrade when a VOC sampler is stored unused for extended periods of time. This recall date, when determined, indicates when recertification is required and will be logged in the VOC Sampler Logbook, the Sampler Certification Report, and indicated on a sticker on the front of the VOC Sampler. The certification of VOC Samplers expires at midnight on the recall date. Equipment requiring recertification is tagged with an "Out-of-Service" tag.

- A VOC Sampler in use at a specific location can be moved to a new location if the recall date has not expired; with the exception that samplers used for disposal room VOC monitoring cannot be installed for repository (ambient air) VOC monitoring without completing a new cleaning and certification of the sampler.

- All sample canisters will be certified prior to each usage. Canisters will be cleaned and certified prior to their use, in a manner similar to that described by EPA Compendium Method TO-15. Additional detail on analytical techniques and methods will be given in laboratory standard operating procedures (SOPs). The laboratory SOPs will be in the facility operating record and will be supplied to the NMED.[1] Recertification of sample canisters for additional use is performed after validated sample data is provided to EM&H. . For certified canisters not directly received from analytical laboratory personnel, if custody seal indicates tampering or is missing, a Cognizant Individual is notified and an "Out-of-Service" tag installed. The canister is stored in an "Out-of-Service" cabinet and equipment returned for cleaning and certification. Laboratory Chain of Custody (CofC) records and certification documentation will be included with certified canisters. .

- Maintenance of passive air sampling kits (PASK) used for subatmospheric time-integrated sampling will be performed as needed. The cleaning and certification requirement prescribed for VOC Samplers is not required for PASK.

- A VOC Monitoring Program CofC record is initiated for certified canisters. An individual CofC is preprinted with a unique CofC number located on the top right corner on each of two forms (white and yellow). The white copy (original) will accompany samples or certified clean canisters, as applicable. The yellow copy will be retained for program records. The CofC record shall provide a document trail of all persons who have custody of a given sample canister including the date and time of its transfer. As described in part in EPA 540/R-94/085, a sample is under custody if (1) it is in your possession; (2) it is in your view after being in your possession; (3) it was in your possession and you locked it up or sealed it with tamper evident custody seal; or (4) it is in a designated secure area (secure areas shall be accessible to authorized personnel only).

- Shipping documents will serve to track the physical transfer of sample canisters in secured/sealed shipping containers via commercial carrier.

- All performers responsible for data entry or step completion on the CofC **SHALL** enter their printed names, signatures, and initials in the appropriate section of the CofC.

- Steps are incorporated into the procedure to show probable times when a CofC transfer may occur. Additional transfers may occur that are not specifically indicated in the procedure. The custody documentation will indicate any additional custody transfers.

- When personnel obtain custody of a sample canister from a designated secure area or sealed shipping container, the last person having custody of the sample canister will be indicated in the applicable "Relinquished By" section of the CofC. As needed, date and time entry can be completed by the person **receiving** custody for both the "Relinquished By" and "Received By" sections of the CofC.

PREREQUISITE ACTIONS

- The initialing/signing of CofC record (example attachment 3) demonstrates the verification of sample and canister identification (ID).

- To aid in process efficiency, canisters, VOC Samplers, and other sampling equipment may be stored where needed (e.g., underground, surface). Certified canisters and VOC Samplers **SHALL** be stored in a VOC Monitoring secure storage area accessible to authorized personnel only when not in use at a sample location.

PERFORMANCE

1.0 SAMPLE LINE MAINTENANCE

NOTE

Accessible portions of sample lines are inspected weekly to identify any damage or deficiencies that may have occurred throughout the week as a result of contact with mine equipment or other conditions. Additional inspections are required if a sample line is determined to be possibly obstructed.

1.1 Sample Line Inspection

1.1.1 Visually inspect accessible portions of "in service" sample lines for damage and deficiencies.

1.1.2 Log the sample lines inspected and observations on Sample Line Inspection Sheet.

1.1.3 Print name, sign, and date "Inspection Personnel" section of Sample Line Inspection Sheet.

1.1.4 Submit Sample Line Inspection Sheet to Cognizant Individual.

1.1.5 Cognizant Individual, perform the following, as applicable:

- When damage or deficiencies is not reported or does not require action, indicate N/A in "Remedial Actions" and "Outcome" sections of Sample Line Inspection Sheet, print name, sign, date and file in accordance with departmental RIDS.

- **IF** damage or deficiencies are reported that requires remedial action
  THEN coordinate performance of section 1.2 or 1.3, as applicable.

- **IF** a determination was made during sampling that the sample line is possibly obstructed
  THEN coordinate performance of section 1.3.

1.2 Sample Line Replacement

NOTE

Sample line replacement is applicable only for areas that are accessible (e.g., areas underground designated as white or blue areas). Blue areas are restricted areas that can be accessed under certain conditions. White areas are general access areas.

1.2.1 Cognizant Individual, perform ONE of the following:

- When the sample location is Station VOC-A or VOC-B, replace the sample line with a single length of line (i.e., no union fittings used), log the remedial actions and outcome, print name, sign, and date Sample Line Inspection Sheet. File records in accordance with departmental RIDS.
- When the sample location is not Station VOC-A or VOC-B, continue to step 1.2.2.

NOTE

A Cognizant Individual coordinates the development and completion of a work package (procedure WP10-WC3011) with a Cognizant Engineer to replace damaged, deficient, or obstructed sample lines located in accessible locations. The work package will include a Quality Assurance (QA) independent flow verification and leak test of unions (as applicable).

1.2.2 Replace sample line as described in the work package.

1.2.3 Connect an air compressor (with compressed air filters) to the new line and coordinate with QA personnel to pressurize the line, verify flow, and perform a leak test using a leak detecting solution (e.g., Snoop®), as applicable.

1.2.4 If needed, troubleshoot any leak test and flow verification failures until the sample line passes.

1.2.5 Log required information in the work package and return the package to Cognizant Individual.

1.2.6 Cognizant Individual, log the remedial actions, outcome, print name, sign, and date Sample Line Inspection Sheet. File records in accordance with departmental RIDS.

1.2.7 Cognizant Individual, review the work package and relinquish it to a Cognizant Engineer.

1.3 Sample Line Clearing

NOTE

Step 1.3.1 in this section can also be performed, as desired, as a preventative maintenance tool. A Cognizant Individual determines appropriate actions if the line is determined to be obstructed during preventative maintenance.

1.3.1 Connect an air compressor (with compressed air filters) to the sample line and pressurize the line to attempt to clear possible obstructions.

1.3.2 **IF** the line cannot be cleared,
THEN, tag the line "Out-of-Service."

1.3.3 Inform a Cognizant Individual of the outcome.

1.3.4 Cognizant Individual, perform **ONE** of the following:

- **IF** the determination was made that the sample line is obstructed and cannot be replaced (inaccessible).
  THEN continue section **AND GO TO** WP 12-VC3209 to process a sample line loss.

- **IF** the determination was made that the sample line is obstructed and can be replaced (accessible),
  THEN GO TO WP 12-VC3209 to process a sample line loss **AND** coordinate performance of section 1.2 to replace the lost sample line.

1.3.5 Cognizant Individual, perform the following:

[A] Log the remedial actions, outcome, print name, sign, and date Sample Line Inspection Sheet;

[B] File records in accordance with departmental RIDS;

2.0 VOC SAMPLER HANDLING

2.1 Certified VOC Sampler Receipt

NOTE

QA inspectors are in attendance during receipt and inspection of certified VOC Sampler as prescribed in WP 13-QA1003. This is documented in the Sampler Certification Report. If tamper evident seal shows evidence of tampering or is missing, a Cognizant Individual or QA inspector verifies the condition and an "Out-of-Service" tag is installed, as applicable. "Out-of-Service" equipment is stored in an "Out-of-Service" cabinet and VOC Samplers are processed for cleaning and certification.

2.1.1 VOC Monitoring personnel, perform the following:

[A] Verify the shipping container is not damaged;

[B] Verify the tamper evident seal has not been tampered with;

[C] Break the tamper evident seal and packaging tape of each shipping container and verify contents against the enclosed Sampler Certification Report;

[D] Verify that there is a current completed calibration sticker for each calibrated item;

[E] Verify that the VOC Sampler Logbook has been returned.

2.1.2 Indicate any problems encountered in step 2.1.1 in the VOC Sampler Logbook and Sampler Certification Report.

2.1.3 Place VOC Sampler and VOC Sampler Logbook in secure storage.

2.1.4 Provide the Sampler Certification Report to a Cognizant Individual.

2.1.5 Cognizant Individual, perform the following:

- Verify that the VOC Sampler met all cleaning and certification criteria detailed in the Sampler Certification Report.

- Verify that calibration of all gauges has met the requirements, and that certificates of calibration are included for each gauge within the Sampler Certification Report.

- Determine if the sampler has been certified as “limited use”. If so, ensure that the sampler has been labeled as such and will not be used for repository VOC monitoring.

2.1.6 Cognizant Individual, perform **ONE** of the following:

- **WHEN** it is determined that criteria identified in step 2.1.5 were met,
  THEN sign and date RCRA Inspection Form of the Sampler Certification Report.

- **IF** criteria identified in step 2.1.5 were not met,
  THEN resolve the issues if possible; otherwise, process the sampler for recertification.

2.2 VOC Sampler Installation

NOTE

Steps for VOC Sampler installation can be performed concurrently with VOC Sampler removal, as applicable.

2.2.1 Obtain certified VOC Sampler and VOC Sampler Logbook.

NOTE

Sequential performance of steps 2.2.2 – 2.2.10 is not required.

2.2.2 Obtain sample line components (if applicable).

2.2.3 Install VOC Sampler in VOC Sampler enclosure.

2.2.4 Install sample line as follows:

- Assemble sample line and components (removing tubing caps and/or plugs when making connections);

- Connect sample line to "Sample In" port on the VOC Sampler.

2.2.5 Connect bleed air line to "Bleed Air Out" port.

2.2.6 Connect the banana plug to VOC Sampler, as applicable.

NOTE

Power cords found to have cracking, fraying, signs of wear or faults in cord insulation, or plugs with missing, loose or faulty prongs must not be used. Proper handling of nonconforming cords is prescribed in WP 12-IS.01-7.

2.2.7 Using a power cord that passes pre-use inspection connect the power cord to VOC Sampler and plug the cord into an available receptacle (as applicable).

2.2.8 Program VOC Sampler smart relay with correct time.

2.2.9 Log installation date and location in the VOC Sampler Logbook.

2.2.10 Use the ink stamp to add sampling data sheet sections to the VOC Sampler Logbook (as applicable).

2.2.11 Place VOC Sampler Logbook inside VOC Sampler enclosure.

2.3 VOC Sampler Removal

NOTE

VOC Samplers are removed from service for recertification, if troubleshooting doesn’t rectify equipment malfunctions, or if there are quality concerns. Spare VOC Samplers are kept on hand to ensure that there are sufficient units to continue sampling in the unexpected event of instrument failure or quality concerns.

NOTE

Steps for VOC Sampler removal can be performed concurrently with VOC Sampler installation, as applicable.

2.3.1 Disconnect power cord from VOC Sampler.

NOTE

Sequential performance of steps 2.3.2 – 2.3.10 is not required.

2.3.2 Remove sample line components as follows (as applicable):

- Disconnect tubing connected to VOC Sampler "Sample In" port;

- Secure all sample line components;
- As applicable, replace damaged or deficient parts.

2.3.3 Connect caps and/or plugs on the VOC Sampler, as applicable.

2.3.4 Remove VOC Sampler from enclosure.

2.3.5 In the VOC Sampler Logbook, enter the date of removal and reason for removal.

2.3.6 If removal is not for recertification, place in secure storage or proceed to section 2.2 to reinstall as needed; otherwise continue.

2.3.7 Remove the calibration/certification stickers.

2.3.8 Tag VOC Sampler indicating "Out-of-Service."

2.3.9 Store VOC Sampler in an "Out-of-Service" cabinet.

2.3.10 Submit VOC Sampler Logbook to Cognizant Individual for review.

2.4 VOC Sampler Shipment

NOTE

A new VOC Sampler Logbook must accompany the VOC Sampler during shipment in shipping container. Certified clean canisters that will be used by the vendor for VOC Sampler certification can be sent along with the VOC Sampler or prepared as a separate shipment.

2.4.1 Submit CofCs for certified clean canisters to a Cognizant Individual for review.

2.4.2 Complete a Shipping Authorization form (EA15PM3525-1-0) to include canister serial numbers, VOC Sampler numbers, and VOC Sampler property numbers, as applicable, **AND THEN** obtain required signatures.

2.4.3 Perform the following, as applicable:

- Place VOC Sampler and new logbook in appropriate shipping container.
- Place certified clean canisters in appropriate shipping containers.

- For certified clean canisters, ensure custody transfers and remarks are documented on CofCs, as applicable, and place original (white copy) of CofCs in respective shipping containers.

2.4.4 Tape shipping containers with packaging tape.

2.4.5 As applicable, place tamper evident custody seal over packaging tape on containers containing certified clean canisters and initial and date the custody seal.

NOTE

The warehouse will provide address labels and assign a shipping authorization number for the shipment after receiving the completed shipping authorization form, as described in WP 15-PM3525. The shipping authorization number will be recorded on CofC documentation maintained for records . Documentation on the white copy is not required since it is irrelevant to the vendor’s sampler cleaning and certification processes.

2.4.6 Transport sealed shipping containers and shipping authorization form to the warehouse for final preparation by warehouse personnel.

2.4.7 File the following in accordance with departmental RIDS:

- CofC, documentation as applicable.
- Copy of shipping documents including bill of lading and/or air waybill, as applicable.

3.0 CERTIFIED CANISTER HANDLING

3.1 Sample Canister Receiving

NOTE

A Cognizant Individual determines appropriate actions if problems are encountered in steps 3.1.1 and 3.1.2.

3.1.1 If the canisters were shipped, verify the shipping container is not damaged and custody seal was used.

3.1.2 Open the shipping container and perform the following:

- Verify contents against laboratory CofC form and cleaning and certification documentation.
- Ensure the cleaning and certification documentation includes review signature and date completed for demonstration of laboratory completion of certification.

3.1.3 Inspect each sample canister for the following conditions:

- Tag attached showing cleaning certification processes;
- Sample canister valve fully closed/sealed;
- Plug is tightened on sample canister valve inlet (cannot be rotated clockwise with hand).

3.1.4 **IF** any conditions identified in step 3.1.3 are **NOT** as specified, **THEN**, void the nonconforming canister; install "Out-of-Service" tag, store in an "Out-of-Service" cabinet, and return equipment for cleaning and certification.

3.1.5 Complete the following sections of the Sample Canister Receipt Form:

- Cleaning and Certification Package (i.e., batch identification number)
- Certification Date (i.e., the "Date Completed" indicated on the cleaning and certification documentation)
- Receipt Date/Time
- Storage Date/Time
- Storage Location
- Serial Number(s)
- Remarks (e.g., voided canisters, as applicable)
- Received by (printed name, signature, and date)

3.1.6 Submit the Sample Canister Receipt Form, laboratory CofC, and cleaning and certification documentation to a Cognizant Individual (L-16 training not required) for review.

3.1.7 Place canisters in a secure storage area, for canisters pending CofC, until a Cognizant Individual completes the review and indicates acceptance.

NOTE

The CofC may be filled out using information contained in the Sample Canister Receipt Form. As long as the canisters are stored appropriately, CofCs may be initiated at a later time. The receiving personnel listed on the Sample Canister Receipt form must complete the first "Received By" section of the relevant CofC(s). A recall date is assigned on the CofC as one year from Cleaning Cert. Date. The certification of clean canisters expires at midnight on the recall date.

3.1.8 Log the following on the CofC for each sample canister:

- Date and time, and sign or initial first available "Received By" line;
- Canister serial number on Canister Serial No. line;
- Cleaning Cert. Date and recall date (one year from 3
- Cleaning Cert. Date) on appropriate lines.

3.1.9 Place canister in VOC Monitoring Group secure storage area and log the following on the CofC for each sample canister:

- Storage location;
- Sign or initial next available "Relinquished By" line (date and time not entered until custody transfer occurs).

3.1.10 File the CofC in individual canister files in secure storage area.

Attachment 1 – Sample Line Inspection Sheet

Attachment 1 – Sample Line Inspection Sheet

Date:
Sample Lines Inspected:
Observations:
Remedial Actions:
Outcome:
Inspection Personnel (Print Name): ______________________ ______________________ Signature Date
Cognizant Individual (Print Name): ______________________ ______________________ Signature Date

Attachment 2 – Sample Canister Receipt Form

Cleaning and Certification Package: ______________________________

Certification Date: ______________________________

Receipt Date / Time: ______________________________

Storage Date / Time: ______________________________

Storage Location: ______________________________

The information above is applicable to the following "CERTIFIED" Canister Serial Numbers:

Remarks:

Received by: ______________________________
Printed Name Signature Date

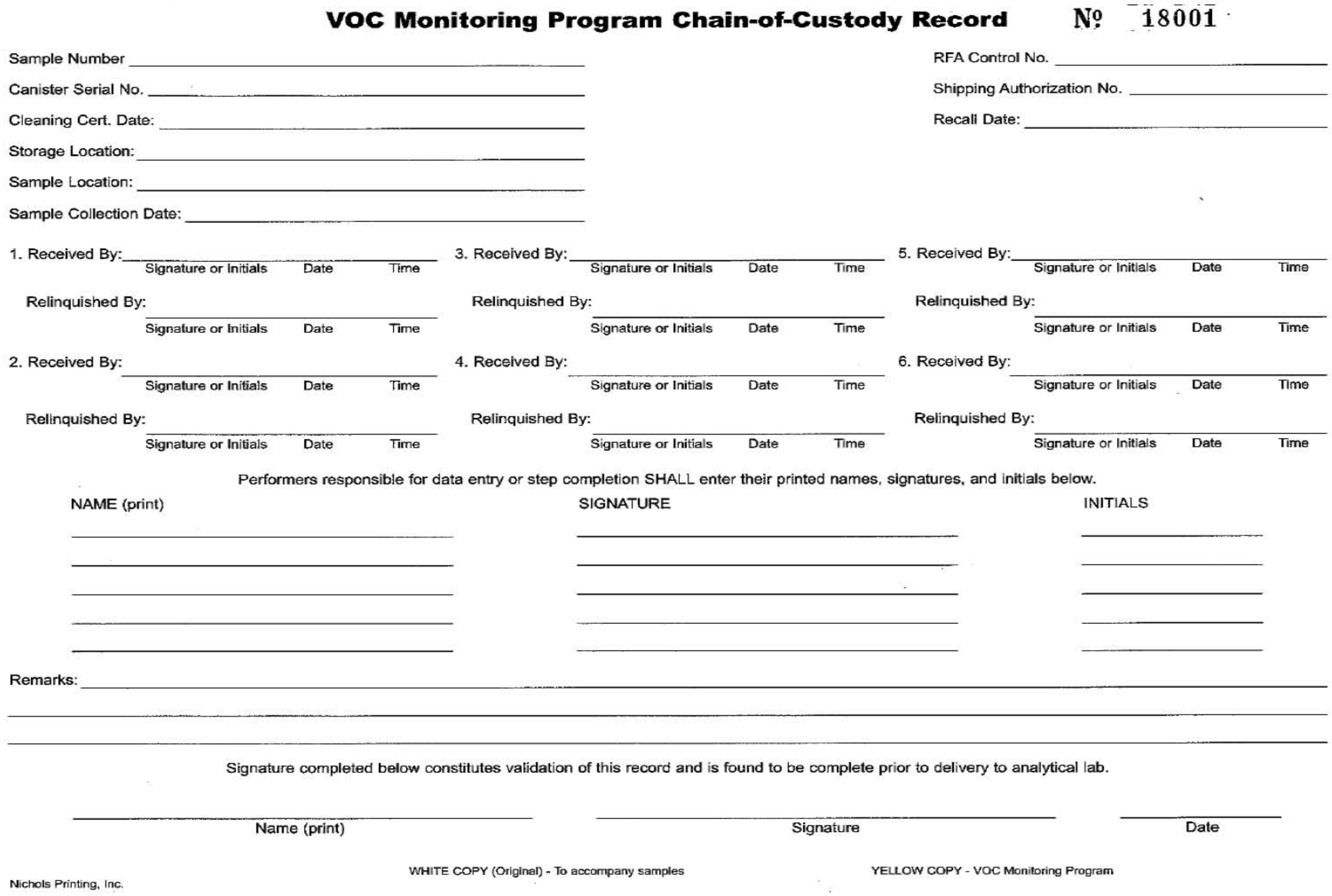
Cognizant Individual Review: (review the following in the cleaning and certification documentation)

Cleaning process performed?	Yes	No
Hydrogen and Methane are ≤ MDLs in representative canister(s)?	Yes	No
Individual target VOCs are <0.2 ppbv in representative canister(s)?	Yes	No
Leak check performed?	Yes	No
Evacuated to < 50 mtorr (0.05 mmHg)?	Yes	No
Certification accepted?	Yes	No

Cognizant Individual: ______________________________
Printed Name Signature Date

Attachment 3 – Example of Chain of Custody Record

Attachment 3 – Example of Chain of Custody Record



VOC Monitoring Program Chain-of-Custody Record № 18001

Sample Number ______

Canister Serial No. ______

Cleaning Cert. Date: ______

Storage Location: ______

Sample Location: ______

Sample Collection Date: ______

RFA Control No. ______

Shipping Authorization No. ______

Recall Date: ______

1. Received By: ______ Signature or Initials Date Time
Relinquished By: ______ Signature or Initials Date Time

2. Received By: ______ Signature or Initials Date Time
Relinquished By: ______ Signature or Initials Date Time

3. Received By: ______ Signature or Initials Date Time
Relinquished By: ______ Signature or Initials Date Time

4. Received By: ______ Signature or Initials Date Time
Relinquished By: ______ Signature or Initials Date Time

5. Received By: ______ Signature or Initials Date Time
Relinquished By: ______ Signature or Initials Date Time

6. Received By: ______ Signature or Initials Date Time
Relinquished By: ______ Signature or Initials Date Time

Performers responsible for data entry or step completion SHALL enter their printed names, signatures, and initials below.

NAME (print)	SIGNATURE	INITIALS

Remarks: ______

Signature completed below constitutes validation of this record and is found to be complete prior to delivery to analytical lab.

______ Name (print) ______ Signature ______ Date

WHITE COPY (Original) - To accompany samples YELLOW COPY - VOC Monitoring Program

Nichols Printing, Inc.

WP 12-VC1685

Revision 7

Subatmospheric and Pressurized Air Sampling in Passivated Canisters

Technical Procedure

EFFECTIVE DATE: 12/06/12

Rick Salness
APPROVED FOR USE

TABLE OF CONTENTS

CHANGE HISTORY SUMMARY

REVISION NUMBER	DATE ISSUED	DESCRIPTION OF CHANGES
4	11/30/10	• Added wording to first bullet in the Precautions and Limitations on trainees • Added new step 1.3.4 • Added a Note above steps 1.3.14, 1.3.16, and 1.3.24
5	04/08/11	• Extensive changes made and to reduce redundancy, combined all VOCs, Hydrogen, and Methane sample collection processes described in WP 12-VC1684, WP 12-VC1685, and WP 12-VC1686 into Rev. 5 of WP 12-VC1685. WP 12-VC1686 is now obsolete and Rev. 7 of WP 12-VC1684 describes only air sampling equipment operations.
6	06/01/12	• Extensive minor changes were made to procedure for general improvement and to meet criteria specified in WP 15-PS.2. • Other minor changes include added wording for clarification. • Added to Prerequisite Actions a bullet to emphasize the requirement to perform a pre-use check of electrical power cords. • Deleted in step 1.1.10 the requirement to log equipment type; applicable to canister only as shown on revised CofC (example, attachment 4). • Updated section 1.4 (Subatmospheric Time-Integrated Sampling) to emphasize a desirable range for ending vacuum reading (i.e., ≤10 inHg and ≥ 5 inHg). • Added to section 1.5 a Note to emphasize capping and firmly tightening duplicate sample line when duplicate sampling is not being performed.
7	12/06/12	• Introduction, bullet 3 changed “attachment 5” to “attachment 4”. • Introduction, bullet 4 changed “attachment 6” to “attachment 5”. • Added to reference table, Referenced Document “WP 12-IS.01-8, *Industrial Safety Program – Vehicle Safety*”. • Added to reference table, Referenced Document “WP 12-VC3209, *VOC Monitoring Group – Data*

		Handling and Program Reporting". • Added to reference table, Referenced Document "WP 15-PM3505, *Acquisition, Use, and Control of Government Vehicles*". • Added to Precautions and Limitations – 14th bullet sentences added to the end "The CI has the discretion to void samples for …". • Added 16th bullet to Precautions and Limitations "The sample collection …". • Updated Precautions and Limitations, 19th bullet (previously 18th bullet) • Added to Precautions and Limitations – 20th bullet (previously 19th bullet) includes "via commercial carrier" at the end of the sentence. • Prerequisite Actions – first two paragraphs of this section were changed to bullets • Removed from substep 1.4.1 – 1st bullet "certified clean" • Substep 1.4.23 – Note was deleted • Section 2.0 – Note added "Personnel delivering samples must comply with …" • Updated substep 2.1.8 – bullets 1 & 2 • Updated substep 2.2.8 – Note was updated • Updated substep 2.2.11 – bullets 1 & 2 • Added to attachment 1 – asterisk referenced note "Date entry is optional when the start date is the same …" to "Collection Start Date/Time"

INTRODUCTION

This procedure provides instructions for handling (e.g., use, storage, shipping) sample canisters and obtaining subatmospheric or pressurized Volatile Organic Compound (VOC) and hydrogen and methane air samples in 6-liter passivated stainless steel canisters. Section 1.6 provides instructions for radiation assessment of sampling equipment by a Radiological Control Technician (RCT). The activities in this procedure may not necessarily be performed at one time, or in the order listed.

Hydrogen/methane and VOC air sampling is administered by the VOC Monitoring Group of Environmental Monitoring and Hydrology (EM&H) in compliance with the hydrogen/methane and VOC monitoring requirements described in the Waste Isolation Pilot Plant (WIPP) Hazardous Waste Facility Permit (Permit).

Specific Permit elements prescribed for compliance monitoring (e.g., flow rates and duration) may be modified as necessary for assessment purposes. Other air sampling events may be performed at various locations not indicated in the Permit. These samples may be collected at any accessible location in the underground or on surface. The sample type for these samples will indicate "NR" for Non-Regulatory.

Sampling steps presented in sections 1.2 and 1.4 are currently not used for compliance monitoring sampling under the current Permit, thus the sample type will indicate "NR" for Non-Regulatory.

For any sample type indicated as "NR," all sampling and analysis processes are exempt from specific elements of monitoring prescribed in the Permit.

Unintentional procedure deviations, equipment malfunctions, and other problems that do not conform to established requirements are nonconformances. Nonconformances must be documented and recorded in the project files.[1] The disposition and documentation of nonconformances will be handled according to requirements described in WP 13-1.

This procedure will be in the WIPP facility Operating Record and available for review by New Mexico Environment Department (NMED) at anytime. All field logbooks/data sheets must be incorporated into WIPP's records management program.[1]Records generated are handled in accordance with departmental Records Inventory and Disposition Schedule (RIDS).

Performance of this procedure generates the following records, as applicable.

- Subatmospheric Sampling Data Sheet (attachment 1)
- Pressurized Sampling Data Sheet (attachment 2)
- Chain of Custody Record (Example attachment 4)

- Request for Analysis (example attachment 5)
- Sample Tracking Logbook
- VOC Sampler Logbook
- Passive Air Sampling Kit (PASK) Logbook
- Shipping Documents (shipping authorization and bill of lading and/or air waybill, as applicable)

REFERENCES			
DOCUMENT NUMBER AND TITLE	BASELINE DOCUMENT	REFERENCED DOCUMENT	KEY STEP
Hazardous Waste Facility Permit (HWFP), Waste Isolation Pilot Plant, Permit Number NM4890139088-TSDF issued by the New Mexico Environment Department	✓		1
EPA Compendium Method TO-15, Determination of Volatile Organic Compounds (VOCs) in air collected in specially-prepared canisters and analyzed by gas chromatography/mass spectrometry (GC/MS).	✓		
EPA 540/R-94/085, *USEPA Contract Laboratory Program Volatile Organics Analysis of Ambient Air in Canisters* (Draft)		✓	
WP 02-EM.02, *Integrated Sample Control Plan*	✓		
WP 12-IS.01-8, *Industrial Safety Program-Vehicle Safety*		✓	
WP 12-VC.01, *Volatile Organic Compound Monitoring Plan*	✓	✓	
WP 12-VC.02, *Quality Assurance Project Plan for Volatile Organic Compound Monitoring*	✓		
WP 12-VC.03, *Hydrogen and Methane Monitoring Plan*	✓	✓	
WP 12-VC.04, *Quality Assurance Project Plan for Hydrogen and Methane Monitoring*	✓		
WP 12-VC1684, *VOC Monitoring Group – Air Sampling Equipment Operations*		✓	
WP 12-VC3209, *VOC Monitoring Group – Data Handling and Program Reporting*		✓	
WP 12-IS.01-7, *Industrial Safety Program – General Electrical Safety*		✓	

REFERENCES			
DOCUMENT NUMBER AND TITLE	BASELINE DOCUMENT	REFERENCED DOCUMENT	KEY STEP
WP 13-1, *Nuclear Waste Partnership LLC Quality Assurance Program Description*	✓	✓	2
WP 15-PM3505, *Acquisition, Use, and Control, of Government Vehicles*		✓	
WP 15-PM3525, *Preparation and Processing of Shipping Authorizations*		✓	
EA15PM3525-1-0, *Shipping Authorization*		✓	
WP 15-RM, *WIPP Records Management Program*	✓		
Qualification Card L-16 (VOC, Hydrogen, Methane Sampling Operations)		✓	
Sampling Data Sheet (Subatmospheric, Pressurized)		✓	
Chain of Custody Record		✓	
Request for Analysis		✓	

EQUIPMENT LIST

- Wrenches, 9/16-inch and 1/2-inch open end
- 1/8-inch Allen/hex key
- 6-liter passivated stainless steel canister(s)
- Certified VOC Samplers
- Passive air sampling kit (PASK), Restek Corporation type or equivalent
- Vacuum pump and inlet tubing
- Subatmospheric Sampling Assembly
- Vacuum/pressure (V/P) gauge
- Mass Flow Instrument (MFI), sccm range
- Glass fiber (GF) filters (type A/E, 47 mm, 1µm)
- In-line filter holders (47-mm, stainless steel)
- Petri dishes

- Passivated stainless steel sample line components and tubing
- Tweezers
- Elastomeric Gloves
- Shipping containers
- Packaging tape
- Custody seal tape

PRECAUTIONS AND LIMITATIONS

- Excluding personnel performing data completeness reviews and RCTs, individuals performing this procedure must be qualified per Qualification Card L-16, (VOC, Hydrogen, Methane Sampling Operations) or be a trainee working to Qualification Card L-16 under an individual with current L-16 qualifications. Reviewers shall be independent of data collectors.[2]
- A qualified RCT must perform the RCT steps of section 1.6.
- When feasible tubing connections will be capped or plugged to minimize salt or dust contamination.
- Certified equipment used for a sampling event must not have a recall date that is overdue. Certified equipment expires at midnight on the recall date. Tag any equipment not meeting this specification with an "Out-of-Service" tag.
- Only certified VOC Samplers **SHALL** be used during performance of pressurized air sampling. Sampler recall date will be not more than 1 (one) year after the post-certification initial use date. The certification of VOC Samplers expires at midnight on the recall date. Samplers are installed in secure enclosures to prevent tampering.
- The electronic digital V/P gauge should be checked for adequate battery power prior to use. This gauge is typically set to display pressure units in "inHg" (inches of mercury) or "psi" (pound per square inch). Pressures less than atmospheric pressure (subatmospheric/vacuum conditions) are shown as negative (-) inHg on the gauge. These pressure readings will be indicated as absolute value (i.e., positive) where results are indicated as vacuum.

- MFI measuring units are typically either standard liters per minute (slpm) or standard cubic centimeters per minute (sccm). When using a MFI, maintain the proper orientation (usually indicated on the MFI) and allow adequate "warm-up" time (i.e., ≥ 2 minutes). To prevent overheating and possibly damage to an MFI that controls air flow, set points should not be applied for an extended period of time without air flow.

- After sampling, a RCT will perform a radiation assessment of sampling equipment using the GF filters for sampling performed in areas isolated from ambient mine ventilation air. Sampling equipment shall be stored underground and handled accordingly until radiation assessment is completed.

- If the Central Monitoring Room (CMR) Operator indicates that a potential or actual release of radioactive material occurred during a particular sample collection event, a RCT will perform a radiation assessment of relevant sampling equipment via GF filters used during the sampling process. Sampling equipment shall be stored underground and handled accordingly until radiation assessment is completed.

- GF filters shall be inspected before installing in the dual in-line filter holders. After sampling, personnel will wear elastomeric gloves when removing GF filters when the filters are to be relinquished to RCT for use in assessing radioactive contamination of the sampling equipment. The gloves will be temporarily stored until radiation assessment of the sampling equipment is completed. The gloves can be discarded as common waste after the RCT releases the equipment.

- The procedure for installation of GF filters in the in-line filter holders is demonstrated during on-the-job training (OJT).

- The exhaust from the vacuum pump and VOC sampler pump shall be directed to a location that is not in the immediate vicinity of sampling personnel when air entering the pump is air that is isolated from ambient mine ventilation air.

- Tag and store voided canisters in an "Out-of-Service" cabinet or other secure location to prevent use until they can be sent off for cleaning and certification. Shipping of voided canisters does not require a Request for Analysis (RFA) form or a Chain of Custody (CofC). Voided canisters will be shipped separately as general freight or directly delivered to the subcontract laboratory.

- Documentation must be completed and maintained for any sample attempted but voided including Sampling Data Sheet and CofC.

Depending on the circumstances, radiation assessment of sampling equipment may still be applicable for voided samples. The CI has the discretion to void samples for circumstances determined to compromise sample integrity or reporting of results that may have occurred before, after, or during sampling that may not be specifically listed in this procedure. The CI will determine if sample collection can be re-attempted or if it will count against completeness as described in WP 12-VC3209.

- VOC Samplers used at monitoring locations VOC-A and VOC-B will sample ambient air on the same programmed schedule. The sample pump will be programmed to sample continuously over a six-hour period during the workday.[1]

- The sample collection date recorded on field sampling data sheets is the date of completion of sample collection.

- For Underground Hazardous Waste Disposal Unit (Underground HWDU) sample location line identification tags:

  - "Exit" is synonymous with "Exhaust" and Sample Location on Sampling Data Sheet will indicate an "e or E,"

  - "Entry" is synonymous with "Intake" or "Inlet" and Sample Location on Sampling Data Sheet will indicate an "i or I."

- Repository monitoring as required by the Permit at stations VOC-A and VOC-B will be identified as sample type "RP" for Repository. Disposal room VOC monitoring as required by the Permit will be identified as sample type "HWDU-A." Ongoing disposal room VOC monitoring and hydrogen and methane monitoring as required by the Permit will be identified as sample type "HWDU-O." Samples not collected for compliance monitoring will be identified as sample type "NR" for Non-Regulatory.

- A VOC Monitoring Program CofC record shall be maintained for sample canisters. An individual CofC is preprinted with a unique CofC number located on the top right corner on each of two forms (white and yellow). The white copy (original) will accompany samples or certified clean canisters, as applicable. The yellow copy will be retained for program records. The CofC record shall provide a document trail of all persons who have custody of a given sample canister including the date and time of its transfer. As described in part in EPA 540/R-94/085, a sample is under custody if (1) it is in your possession; (2) it is in your view after being in your possession; (3) it was in your possession and you locked it up or sealed it with tamper evident custody seal; or (4) it is in a designated secure area (secure areas shall be accessible to authorized personnel only).

- Shipping documents will serve to track the physical transfer of sample canisters in secured/sealed shipping containers via commercial carrier.

- All performers responsible for data entry or step completion on the CofC **SHALL** enter their printed names, signatures, and initials in the appropriate section of the CofC.

- Steps are incorporated into the procedure to show probable times when a CofC transfer may occur. Additional transfers may occur that are not specifically indicated in the procedure. The custody documentation will indicate any additional custody transfers.

- When personnel obtain custody of a sample canister from a designated secure area or sealed shipping container, the last person having custody of the sample canister will be indicated in the applicable "Relinquished By" section of the CofC. As needed, date and time entry can be completed by the person **receiving** custody for both the "Relinquished By" and "Received By" sections of the CofC.

- Any spaces/sections on the Sampling Data Sheet where information is not applicable or as otherwise indicated, shall be indicated with "N/A." Sampling personnel may log remarks (e.g., unusual conditions, issues, or observations) between RCT and EM&H signature lines of the Sampling Data Sheet (as applicable).

- Field sampling data sheets will be used to document the sampler conditions under which each sample is collected. The individuals assigned to collect the specific samples will be required to fill in all of the appropriate sample data and to maintain this record in sample logbooks.[1]

PREREQUISITE ACTIONS

- Ensure power is available for sampling equipment requiring 120V AC power. Equipment power cords found to have cracking, fraying, signs of wear or faults in cord insulation, or plugs with missing, loose or faulty prongs must not be used. Proper handling of nonconforming cords is prescribed in WP 12-IS.01-7.

- Air sampling equipment, VOC Samplers, and certified canisters used for obtaining air samples are maintained and handled as described in WP 12-VC1684 for use in this procedure.

- Verify that VOC Samplers used for pressurized air sampling are cleaned and certified and that the recall date (in VOC Sampler Logbook or recall sticker) will not expire before or during use. The certification of VOC Samplers expires at midnight on the recall date. Tag any equipment not meeting specifications with "Out-of-Service" tags.

- Verify that the VOC Sampler day/time setting is correct. This setting will have to be re-set after certification, extended power outages (i.e., >150 hours or 6.25 days), and to reflect Daylight Saving Time, as applicable.

- Verify that canisters used for air sampling are cleaned and certified and that the recall date (on CofC) will not expire before or during use. The certification of clean canisters expires at midnight on the recall date. Tag any canisters not meeting specifications with "Out-of-Service" tags.

- The initialing/signing of CofC record (example attachment 4) demonstrates the verification of sample and canister identification (ID).

- To aid in process efficiency, canisters, VOC Samplers, and other sampling equipment may be stored in the underground or surface in secure storage areas accessible to authorized personnel only.

- For compliance sampling, ensure the sampling locations, sampling frequencies, and duplicate sampling frequencies meet the requirements of the monitoring plans, WP 12-VC.01 and WP 12-VC.03.

- When "in-service," exchange data storage module and/or battery in the mine weather station (MWS) near monitoring location VOC-A sampler enclosure (S1300 and b/w E-140 & E300) as needed. This MWS is known as MWS9 (equipment # 534-MWS-002-009).

PERFORMANCE

1.0 SAMPLE COLLECTION AND CANISTER HANDLING

1.1 Sample Canister Preparation

1.1.1 Obtain certified sample canister(s) and assigned CofC(s) from secure storage area.

1.1.2 Ensure that canisters are cleaned and certified as indicated by "Cleaning Cert. Date" on the CofC. Void any canisters with a recall date (on CofC) that has expired.

1.1.3 Ensure custody transfers are documented on CofC(s), as applicable.

1.1.4 Inspect each sample canister for the following conditions:

- Tag attached showing cleaning certification processes;

- Sample canister valve fully closed/sealed;

- Plug is tightened on sample canister valve inlet (cannot be rotated clockwise with hand).

1.1.5 **IF** problems are encountered in step 1.1.4,
THEN, void the nonconforming canister and **RETURN TO** the beginning of section 1.1; otherwise, continue.

1.1.6 Attach Canister Sample Tag(s) to canister(s), as applicable.

NOTE

Sequential performance of steps 1.1.7 through 1.1.12 is not required.

1.1.7 Based on the last entry in the Sample Tracking Logbook, assign a sample number to each sample canister and log on the Canister Sample Tag(s).

1.1.8 Additionally, log the following on Canister Sample Tag(s):

- Canister Serial Number
- Sample Location
- Sample Collection Date

1.1.9 Log the following in the Sample Tracking Logbook for each assigned Sample Number:

- Canister Serial Number
- Sample Location
- Sample Collection Date
- Sample Type (e.g., RP, HWDU-A, HWDU-O, NR)
- Initials

1.1.10 Ensure the following items on the CofC(s) are complete:

- Canister Serial Number
- Cleaning Cert. Date
- Storage Location
- Recall Date (one year from Cleaning Cert. Date)

1.1.11 Log the following on CofC for each sample canister:

- Sample Number
- Sample Location
- Sample Collection Date
- Remarks (as applicable)

1.1.12 Perform the following, as applicable:

- Proceed to section 1.2 for performing subatmospheric grab sampling (no purge required, sample location line length is ≤ 5 feet). Sample type: NR

- Proceed to section 1.3 for subatmospheric short duration time-integrated sampling (for hydrogen and methane monitoring and ongoing disposal room VOC monitoring). This sampling uses the Subatmospheric Sampling Assembly (attachment 3). A purge of sample lines is required. Sample types: HWDU-O, NR

- Proceed to section 1.4 for subatmospheric time-integrated sampling (no purge required, sample location line length is ≤ 5 feet). This sampling uses the PASK. Sample type: NR

- Proceed to section 1.5 for pressurized sampling (for repository VOC monitoring and disposal room VOC monitoring in open/active panels). This sampling uses a certified VOC Sampler. A purge of sample lines is only required for disposal room VOC monitoring. Sample types: RP, HWDU-A, NR

1.2 Subatmospheric Grab Sampling

1.2.1 Log the following on Subatmospheric Sampling Data Sheet for each sample canister:

- Sample Type (i.e., NR)
- Sample Number

- Canister Serial Number
- Sample Location
- Sample Collection Date
- V/P Gauge Number
- V/P Gauge Recall Date

1.2.2 Install a flow control valve set in the closed position on a tee fitting.

1.2.3 Install dual in-line filter holders (see attachment 3) containing GF filters on the inlet of the flow control valve.

1.2.4 At sample location, ensure sample canister valve is closed, remove the canister plug, and install the tee to the canister inlet.

1.2.5 Turn on the digital V/P gauge and install the gauge on the remaining opening of the tee.

1.2.6 Zero the V/P gauge.

1.2.7 Ensuring flow control valve is closed, open sample canister valve and observe the initial vacuum reading.

1.2.8 Close the sample canister valve.

1.2.9 **IF** the observed vacuum reading was < 24 inHg,
THEN void the canister and **GO TO** section 1.1 and repeat steps as applicable; otherwise, continue.

1.2.10 Log the initial vacuum reading on Subatmospheric Sampling Data Sheet.

1.2.11 If required for sample location, connect dual in-line filter holders to sample location line or sample port; otherwise, continue.

1.2.12 Log collection start time on Subatmospheric Sampling Data Sheet.

1.2.13 Open the sample canister valve.

1.2.14 Open the flow control valve enough to control the flow rate to allow the sample canister to draw air in to within 10 and 5 inHg vacuum (~10 to 30 second duration).

1.2.15 Close flow control valve and log collection end time and ending vacuum reading on Subatmospheric Sampling Data Sheet.

1.2.16 Close sample canister valve.

1.2.17 Disconnect the dual in-line filter holders from sample location line or sample port (as applicable).

1.2.18 Remove the tee, flow control valve, dual in-line filter holders, and V/P gauge **THEN** install a plug on the sample canister valve inlet.

1.2.19 Sign the Canister Sample Tag as performer to document the name of the sampler collecting final sample.

1.2.20 If radiation assessment is required, remove GF filters from dual in-line filter holders with tweezers and place in Petri dishes labeled with Sample Location and indicate "P" for primary or "S" for secondary; otherwise, remove and dispose of GF filters in any trash receptacle.

1.2.21 Print, sign, and date Subatmospheric Sampling Data Sheet (all performers).

1.2.22 Perform **ONE** of the following:

- When additional subatmospheric grab samples are to be collected, proceed with additional sampling.
- When sampling is complete **AND** radiation assessment is required, proceed to section1.6; otherwise, proceed to section 1.7.

1.3 Subatmospheric Short Duration Time-Integrated Sampling

NOTE

Field duplicate sampling information is logged on same Subatmospheric Sampling Data Sheet as the original sample in sequential order, unless otherwise indicated. It may optionally show "FD" to indicate field duplicate. If the duplicate sample is not being collected for regulatory compliance purposes "NR" is indicated for the sample type. A single entry for sample type indicates it is applicable to both samples.

1.3.1 Log the following on Subatmospheric Sampling Data Sheet:

- Sample Type(s) (e.g., HWDU-O, NR)
- Sample Number(s)
- Canister Serial Number(s)
- Sample Location

- Sample Collection Date
- MFI No.
- MFI Recall Date
- V/P Gauge Number
- V/P Gauge Recall Date

1.3.2 Plug in power cords for MFI and vacuum pump.

1.3.3 While allowing the MFI to "warm-up" for at least 2 minutes, perform the following:

- Ensure GF filters are installed in dual in-line filter holders of the sampling assembly;
- Remove caps or plugs to open sample flow path, as applicable;
- Attach vacuum pump inlet tubing to sampling assembly's MFI;
- Open valves 1 and 2 on sampling assembly;
- Turn metering valve fully counter-clockwise.

NOTE

The MFI used for subatmospheric short duration time-integrated sampling is usually already set to control flow to 2 slpm. Adjustments are allowed if this is not the case.

1.3.4 Activate vacuum pump and verify flow rate of ~2 slpm using MFI.

1.3.5 **IF** flow rate criterion is not achieved in step 1.3.4 and troubleshooting doesn’t provide the required flow rate,
THEN deactivate the sampling equipment and notify a Cognizant Individual at the earliest opportunity; otherwise, continue.

1.3.6 Deactivate vacuum pump.

1.3.7 Turn on digital V/P Gauge.

1.3.8 In no specific order, perform the following:

- Attach sample location line to sampling assembly at primary filter side of dual in-line filter holders;

- Remove one plug from the sample port tee of the sampling assembly, remove the canister plug, and attach sample canister to the sample port tee using stainless steel tubing;
- Close all valves on the sample location manifold or line and ensure both valves on sampling assembly are open.

1.3.9 Zero V/P gauge.

1.3.10 Activate vacuum pump.

NOTE

If the target vacuum cannot be achieved, this may be due to a leak in the sample flow path. Troubleshooting is allowed to achieve the desired vacuum.

1.3.11 Upon reaching ~20 inHg vacuum, close valve 2 on sampling assembly, then deactivate vacuum pump.

1.3.12 Close valve 1 on the sampling assembly.

1.3.13 Open sample canister valve, and observe initial vacuum reading.

1.3.14 Close sample canister valve.

1.3.15 **IF** the observed vacuum reading was < 24 inHg,
THEN void the canister and **GO TO** section 1.1 and repeat steps as applicable; otherwise, continue.

1.3.16 Log the initial vacuum reading on Subatmospheric Sampling Data Sheet.

1.3.17 Open both sampling assembly valves.

1.3.18 When field duplicate sampling, remove other plug from sample port tee and install additional sample canister using same method as the primary, then repeat steps 1.3.9 to 1.3.17 for the duplicate sample canister; otherwise, continue**.**

1.3.19 Open the valve on the sample location manifold for the applicable sample line.

1.3.20 Activate vacuum pump.

1.3.21 Wait ~30 seconds for the flow rate to stabilize and perform **ONE** of the following:

- **WHEN** a line can be purged (flow rate ≥ 1 slpm), purge as indicated in the following chart,
  THEN continue to step 1.3.22.

Flow rate (slpm)	≥2.0	1.9 – 1.5	1.4 – 1.2	1.1 – 1.0
Minimum Purge time needed (minutes)	6	8	10	12

- **IF** a line cannot be purged (flow rate <1 slpm),
  THEN secure equipment, and stop this procedure for the individual sample line,
  THEN notify Cognizant Individual, GO TO WP 12-VC1684 and perform section 1.0 at the earliest opportunity to determine if sampling can be reattempted for the individual sample line.

1.3.22 Log flow rate (slpm) and collection start time on Subatmospheric Sampling Data Sheet and open the valve on the sample canister(s) to initiate sample collection.

NOTE

The typical time it takes to obtain a sample is ~5 minutes. If the sample is not obtained after 15 minutes the sampling equipment may need troubleshooting or the issue may be an obstructed sample location line. A Cognizant Individual is notified of a possibly obstructed sample location line to schedule Sample Line Maintenance as described in WP 12-VC1684. If a higher sample line flow is restored after maintenance, the sampling can be reattempted.

1.3.23 Allow ~5 to 15 minutes for the sample canister(s) to draw air in to within 10 and 5 inHg vacuum.

1.3.24 **IF** the required vacuum is not obtained after 15 minutes,
THEN void the sample and continue.

1.3.25 Close both sampling assembly valves.

1.3.26 Deactivate vacuum pump.

NOTE

For field duplicate sampling, ending vacuum will be identical due to sampling assembly design.

1.3.27 Log collection end time and ending vacuum reading on Subatmospheric Sampling Data Sheet.

1.3.28 Close sample canister(s) valve.

1.3.29 Remove sample canister(s) from the stainless steel tubing and plug the canister valve inlet.

1.3.30 Sign the Canister Sample Tag as performer to document the name of the sampler collecting final sample.

1.3.31 When radiation assessment is required, remove GF filters from dual in-line filter holders with tweezers and place in Petri dishes labeled with Sample Location and indicate "P" for primary or "S" for secondary; otherwise, remove and dispose of GF filters in any trash receptacle.

1.3.32 Close the valve on the sample location manifold for the applicable sample line and disconnect sampling assembly from the sample location line.

1.3.33 Print, sign, and date Subatmospheric Sampling Data Sheet (all performers).

1.3.34 Perform **ONE** of the following:

- When additional samples are to be collected, install GF filters in the dual in-line filter holders and proceed with additional sampling.
- When sampling is complete, continue.

1.3.35 Disconnect vacuum pump inlet tubing from the sampling assembly and plug and/or cap tubing connections of the sampling assembly and sample location manifold or line, as applicable.

1.3.36 When radiation assessment is required, proceed to section1.6; otherwise, proceed to section 1.7.

1.4 Subatmospheric Time-Integrated Sampling

NOTE

A field canister is an evacuated canister (certification not required) that is used to simulate a sample canister for purpose of setting flow rate using the set screw of the flow controller.

1.4.1 In no specific order, perform the following:

- Obtain PASK(s) from secure storage area;
- Obtain a MFI in the sccm range, plug in power cord, and allow a "warm-up" time for at least 2 minutes;
- Connect vacuum pump inlet tubing to a field canister;
- Plug in pump power cord.

1.4.2 Activate vacuum pump and open field canister valve.

1.4.3 After reaching minimum 20 inHg vacuum as determined with a V/P gauge, close field canister valve **THEN** deactivate pump.

1.4.4 In no specific order, perform the following:

- Connect PASK to field canister and remove flow controller set screw cover;
- Connect MFI to inlet of PASK

1.4.5 Open valve on field canister.

NOTE

To collect a 6 hour time-integrated sample in a 6L canister, a critical orifice with a flow range of 8-15 mL/min and flow controller set screw set at 10.5 ± 1.5 sccm (i.e., 9 to 12 sccm) will typically result in an ending vacuum of > 5 inHg. A critical orifice with a different flow rate range will be needed for longer or shorter time-integrated samples (duration of 1-24 hours allowed by method). The objective is to obtain a sample with a final vacuum reading within 10 and 5 inHg.

1.4.6 With a 1/8-inch Allen/hex key, adjust PASK flow controlling set screw to obtain desired flow rate based on MFI readout.

1.4.7 **IF** desired flow rate criterion cannot be achieved,
THEN install an "Out-of-Service" tag on the PASK and **RETURN TO** beginning of section 1.4 to try another PASK.

1.4.8 Close valve on field canister.

1.4.9 In no specific order, perform the following:

- Log PASK Serial No. and Flow Rate (sccm) on Subatmospheric Sampling Data Sheet;

- Install cover for flow controller set screw;

- Disconnect MFI and install dual in-line filter holders (see attachment 3) containing GF filters on the PASK inlet;

- Disconnect PASK from field canister;

- Plug and/or cap tubing connections of the PASK and dual in-line filter holders, as applicable, and package for transport to the sample location.

1.4.10 Log the following additional items on Subatmospheric Sampling Data Sheet for each sample canister:

- Sample Type (i.e., NR)
- Sample Number
- Canister Serial Number
- Sample Location
- Sample Collection Date
- MFI No.
- MFI Recall Date
- V/P Gauge Number
- V/P Gauge Recall Date

1.4.11 Log the following in the PASK logbook:

- Sample Type (i.e., NR)
- Sample Number(s)
- Canister Serial Number(s)
- Sample Location
- Sample Collection Date
- PASK Serial No. and Flow Rate

1.4.12 At sample location, turn on the V/P gauge.

1.4.13 Ensure sample canister valve is closed, remove the canister plug, and install the V/P gauge on the sample canister inlet.

1.4.14 Zero the V/P gauge, open sample canister valve and observe the initial vacuum reading.

1.4.15 Close sample canister valve.

1.4.16 **IF** the observed vacuum reading was < 24 inHg,
THEN void the canister and **GO TO** section 1.1 and repeat steps as applicable; otherwise, continue.

1.4.17 Log the initial vacuum reading on Subatmospheric Sampling Data Sheet.

1.4.18 Remove the V/P gauge.

1.4.19 Install PASK and dual in-line filter holders on the sample canister.

1.4.20 Place sample canister, PASK, and dual in-line filter holders in desired sampling location.

1.4.21 Remove plugs and/or caps and if required for sample location, connect dual in-line filter holders to sample location line or sample port; otherwise, continue.

1.4.22 If an automatic timer will be used, set the timer for the desired sampling period; otherwise, continue.

1.4.23 Open sample canister valve and log collection start time on Subatmospheric Sampling Data Sheet.

1.4.24 Ensure custody transfers are documented on CofC(s), as applicable.

NOTE

If an automatic timer that operates an electric valve is used, sampling personnel may close the sample canister valve manually anytime after the end of the sampling period.

1.4.25 At or near the end of the sampling period, close valve on sample canister, and log collection end time on Subatmospheric Sampling Data Sheet.

1.4.26 Ensure custody transfers are documented on CofC(s), as applicable.

1.4.27 Remove PASK and dual in-line filter holders from sample canister.

1.4.28 Install a V/P gauge on the sample canister.

1.4.29 Open the sample canister valve and observe the ending vacuum reading.

1.4.30 Close the sample canister valve.

1.4.31 Log observed ending vacuum reading on Subatmospheric Sampling Data Sheet and perform **ONE** of the following:

- **IF** ending vacuum is >10 inHg or < 5 inHg, detach sampling equipment
  THEN continue to next step **AND** consult with a Cognizant Individual at the earliest opportunity.

- When ending vacuum is in the range of ≤10 inHg and ≥ 5 inHg, continue to next step.

1.4.32 Remove the V/P gauge.

1.4.33 Install plug on sample canister.

1.4.34 Sign the Canister Sample Tag as performer to document the name of the sampler collecting final sample.

1.4.35 Print, sign, and date Subatmospheric Sampling Data Sheet (all performers).

1.4.36 Perform **ONE** of the following:

- **IF** radiation assessment is required, remove GF filters from dual in-line filter holders with tweezers and place in Petri dishes labeled with Sample Location and indicate "P" for primary or "S" for secondary
  THEN proceed to section1.6.

- When radiation assessment is not required, remove GF filters from dual in-line filter holders with tweezers, dispose of in any trash receptacle, and proceed to section 1.7.

1.5 Pressurized Sampling

NOTE

Field duplicate sampling information is logged on same Pressurized Sampling Data Sheet as the original sample in sequential order, unless otherwise indicated. It may optionally show "FD" to indicate field duplicate. The VOC Sampler is designed to collect two samples simultaneously when set up for duplicate sampling. If the duplicate sample is not being collected for regulatory compliance purposes "NR" is indicated for the sample type. A single entry for sample type indicates it is applicable to both samples.

1.5.1 Log the following on Pressurized Sampling Data Sheet:

- Sample Type(s) (e.g., RP, HWDU-A, NR)
- Sample Number(s)
- Canister Serial Number(s)
- Sample Location
- Sample Collection Date
- Sampler Serial Number

NOTE

GF filters are typically installed at the end of sample collection and are already in place for a subsequent sampling event. Installation of GF filters is indicated in the VOC Sampler Logbook.

1.5.2 Perform the following:

- Ensure GF filters are installed in the dual in-line holders. Configure valves to sample from the desired sample location line (as applicable).
- Remove cap(s) from sample port tubing(s)

1.5.3 Manually activate VOC Sampler pump using the smart relay.

NOTE

1 sccm is equal to 1 standard milliliter per minute. The nominal flow rate of 33.3 actual milliliters per minute as required in the Permit is approximately 28.9 standard milliliter per minute or sccm. For compliance sampling, VOC sampler flow rates are set at a set point of 28.9 ± 1 sccm for a single canister or 57.8 ± 1 sccm for two canisters.

1.5.4 Perform the following:

- Set the flow rate to the desired set point by turning the knob below the flow readout.
- Set pumphead pressure to read within 20 and 25 psig by turning the adjustment knob located above the gauge.

1.5.5 **IF** desired flow rate and/or pumphead pressure cannot be achieved and troubleshooting does not rectify the issues,
THEN deactivate the sampling equipment and notify a Cognizant Individual at the earliest opportunity; otherwise, continue.

1.5.6 Perform the following:

- Using the smart relay, manually deactivate VOC Sampler pump and bleed pressure, as applicable.
- Log start flow rate and start pumphead pressure on Pressurized Sampling Data Sheet.

1.5.7 Install sample canister(s) on sample port tubing(s).

1.5.8 Log date and time installed on the Pressurized Sampling Data Sheet.

1.5.9 Using smart relay, manually activate sample port for an installed canister.

1.5.10 Open sample canister valve and observe the vacuum reading (inHg) on the "sample pressure" gauge.

1.5.11 Close the canister valve.

1.5.12 **IF** the observed vacuum reading was < 24 inHg,
THEN void the canister and **GO TO** section 1.1 and repeat steps as applicable; otherwise, continue.

1.5.13 Log the initial vacuum reading on Pressurized Sampling Data Sheet.

1.5.14 Manually deactivate sample port.

NOTE

The duplicate sample line is capped and firmly tightened when duplicate sampling is not being performed.

1.5.15 If duplicate sampling, repeat steps 1.5.9 to 1.5.14; otherwise, continue.

NOTE

It is preferable to program the sample collection start time on the hour, 15 minutes after the hour, 30 minutes after the hour, or 45 minutes after the hour to correspond with MWS9 logging intervals. Exclusive of Stations VOC-A and VOC-B, the VOC Sampler pump is programmed to start 10 minutes prior to actual sample collection to purge the sample lines. This is to ensure that the air collected is not air that has been stagnant in the tubing. For compliance sampling, VOC Samplers are programmed to sample continuously over a six-hour period during the workday.

1.5.16 Program the smart relay to sample, as desired.

1.5.17 Log the following on the Pressurized Sampling Data Sheet:

- Pump Start Time (i.e., programmed pump start time)
- Start Time (i.e., programmed sample collection start time)
- End Time (i.e., programmed sample collection end time)
- Performer's printed name, signature, and date

1.5.18 Log items appearing on the top portion of the Pressurized Sampling Data Sheet into the stamped sections of the applicable VOC Sampler Logbook.

1.5.19 Perform the following:

- Reset Elapsed Time button (as applicable)
- Open the valve on sample canister(s)
- Run the smart relay program

1.5.20 Secure the sampler enclosure.

1.5.21 After the end of the desired sampling period, stop the smart relay program.

NOTE

When a field duplicate sample is installed, each solenoid valve is activated independently to read end sample pressure. As needed, solenoid and canister valves are utilized and pressure within the sampler is allowed to decay to achieve accurate readings.

1.5.22 Using the smart relay to activate pump and sample port(s), retrieve data and log the following on the Pressurized Sampling Data Sheet:

- End sample pressure (psig)
- End flow rate (sccm)
- End pumphead pressure (psig)
- Elapsed Time (hours)
- Performer's printed name, signature, and date (as applicable)

1.5.23 Ensure manual programming on the smart relay is stopped.

1.5.24 Ensure canister valve(s) are closed.

1.5.25 Disconnect the sample canister(s) from VOC Sampler and log date and time removed on the Pressurized Sampling Data Sheet.

1.5.26 Install a plug on the sample canister(s) valve inlet.

1.5.27 Sign the Canister Sample Tag as performer to document the name of the sampler collecting final sample.

1.5.28 Perform **ONE** of the following:

- When the end sample pressure is at or greater than 8 psig, continue to step 1.5.29.

- When the end sample pressure is greater than atmospheric pressure (i.e., > 0 psig) but less than 8 psig, continue to step 1.5.29 and notify a Cognizant Individual at the earliest opportunity.

- **IF** the canister is at or below atmospheric pressure, **THEN** void the sample, continue the procedure, and complete CofC and Pressurized Sampling Data Sheet through validation **AND** inform a Cognizant Individual that sample collection must be reattempted.

1.5.29 Log remarks, as applicable, in VOC Sampler Logbook.

1.5.30 When radiation assessment is required, remove GF filters from dual in-line filter holders with tweezers and place in Petri dishes labeled with Sample Location and indicate "P" for primary or "S" for secondary; otherwise, remove and dispose of GF filters in any trash receptacle.

1.5.31 Install GF filters in dual in-line filter holders and log in VOC Sampler Logbook.

1.5.32 Place cap(s) into sample port tubing(s).

1.5.33 When radiation assessment is required, proceed to section1.6; otherwise, proceed to section 1.7.

1.6 Radiation Assessment

NOTE

RCT performs a radiation assessment of EM&H sampling equipment via analysis of GF filter(s) used during the sampling process. The GF filters are either controlled as RAD waste or returned to EM&H, depending on analysis results.

1.6.1 EM&H sampling personnel, transfer GF filters (in labeled Petri dishes) and sampling data sheet(s) to RCT to use for the radiation assessment of sampling equipment, as applicable.

NOTE

Detections in the primary (P) filter that are ≥MDA for alpha and beta/gamma may be due to Radon (a naturally occurring radioactive element) that requires time to decay. The RCT will control filters with detections ≥MDA and may reanalyze after an appropriate decay time. The secondary (S) filter may also be used to determine if radioactivity is < MDA for alpha and beta/gamma. The sampling data sheet indicates the filters analyzed and the results. If the results of the radiation assessment indicate EM&H sampling equipment radioactivity at a level ≥MDA for alpha and beta/gamma, the RCT consults with the Radiological Control Manager to determine appropriate action.

NOTE

Remarks (e.g., unusual conditions, issues, or observations) may be indicated by the RCT above the RCT signature line (as applicable).

1.6.2 RCT, analyze the primary (P) filter (required), the secondary (S) filter (optional), to determine if EM&H sampling equipment has a level of activity that is less than minimum detectable activity (MDA) for alpha and beta/gamma.

1.6.3 RCT, log results of the radiation assessment on the sampling data sheet (RCT section), and print, sign, and date the signature line on sampling data sheet to release the sampling equipment, as applicable.

1.6.4 RCT, perform **ONE** of the following:

- When additional filters require counting, **RETURN TO** step 1.6.2.
- If analysis of filters is complete, transfer uncontrolled filters and all sampling data sheets to EM&H sampling personnel.

1.6.5 EM&H sampling personnel, after the release of equipment, indicated by a completed RCT signature line on sampling data sheet, transfer sample canister(s) for interim storage (section 1.7).

1.7 Sample Canister Interim Storage

1.7.1 Transport the following to the VOC Monitoring interim storage area:

- Filled sample canister(s)
- sampling data sheet(s)
- CofC(s)

1.7.2 Ensure custody transfers are documented on CofC(s), as applicable.

NOTE

The final steps of this section may be performed at a later time as long as the canisters are stored appropriately. Sequential performance is not required.

1.7.3 Obtain sturdy box(es) and inner box(es) for sample canister(s), as applicable.

1.7.4 Ensure Canister Sample Tag is connected to the correct sample canister and each canister is part of the intended delivery or shipment before placement in box(es).

1.7.5 Place the filled sample canister(s) inside the box(es), leaving them accessible to inspection.

1.7.6 Complete RFA(s) for the batch of samples by following the instructions on the back "INSTRUCTIONS FOR COMPLETING REQUEST FOR ANALYSIS FORM."

1.7.7 Log Control Number of the RFA(s) on the applicable CofC(s).

1.7.8 Log remarks (as applicable) on the CofC(s).

2.0 SAMPLE CANISTER DELIVERY AND SHIPMENT

NOTE

Personnel delivering samples must comply with WP 12-IS.01-8 and WP 15-PM3505, as applicable.

2.1 Delivering Samples to Subcontract Laboratory

2.1.1 For a batch of samples, retrieve the RFA(s), CofC(s), and sampling data sheet(s) from the interim storage area.

2.1.2 Log "N/A" on the CofC(s) for Shipping Authorization No.

2.1.3 Give the following forms to a Cognizant Individual for completeness review:

- CofC(s)
- RFA(s)
- sampling data sheets(s)

2.1.4 After performance of the completeness reviews, return the CofC(s) and RFA(s) to the interim storage area.

2.1.5 Ensure custody transfers are documented on CofC(s), as applicable, and deliver sample canisters, CofC(s), and RFA(s) to the laboratory.

2.1.6 At the laboratory, ensure custody transfers are documented on CofC(s), as applicable.

2.1.7 After the laboratory personnel complete their required entries on the CofC(s) and RFA(s), verify all entries.

2.1.8 File the following in accordance with departmental RIDS:

- CofC documentation
- RFA documentation
- Sampling data sheet(s)

2.2 Shipping Samples via Commercial Carrier

2.2.1 For a batch of samples, retrieve the RFA(s), CofC(s), and sampling data sheet(s) from the interim storage area.

2.2.2 Complete a Shipping Authorization form (EA15PM3525-1-0) to include canister serial numbers and sample numbers **THEN** obtain required signatures.

2.2.3 Give the following forms to a Cognizant Individual for completeness review:

- CofC(s)
- RFA(s)
- Sampling data sheets(s)

2.2.4 After performance of the completeness reviews, return the CofC(s) and RFA(s) to the interim storage area.

2.2.5 Perform the following:

- Place sample canisters in appropriate shipping containers

- Ensure custody transfers and remarks are documented on CofCs, as applicable, and place original (white copy) of CofCs in respective shipping containers.

- Insert RFA(s) into one of the shipping containers

2.2.6 Tape the box(es) with packaging tape.

2.2.7 Place tamper evident custody seal over packaging tape.

2.2.8 Initial and date the tamper evident custody seal.

NOTE

The warehouse will provide address labels and assign a shipping authorization number for the shipment after receiving the completed shipping authorization form, as described in WP 15-PM3525. The shipping authorization number will be recorded on CofC documentation maintained for records. Documentation on the white copy is not required since it is irrelevant to analytical laboratory processes.

2.2.9 Transport sealed shipping containers and shipping authorization form to the warehouse for final preparation by warehouse personnel.

2.2.10 Retain copy of shipping documents including copy of bill of lading and/or air waybill, as applicable.

2.2.11 File the following in accordance with departmental RIDS:

- CofC documentation
- RFA documentation
- Sampling data sheet(s)
- Copy of shipping documents including bill of lading and/or air waybill, as applicable

Attachment 1 – Subatmospheric Sampling Data Sheet

Attachment 1 – Subatmospheric Sampling Data Sheet

Sample Number(s): ____________________

Initial Vacuum(s): ≥24 inHg ____________________

Canister Serial Number(s): ____________________

Collection Start Date/Time*: ____________________

Sample Location: ____________________

Collection End Time: ____________________

Sample Collection Date: ____________________

Ending Vacuum (inHg): ____________________

Sample Type: ____________________

V/P Gauge No./Recall Date __________ / __________

MFI No. (ID): ____________________

PASK Serial No.: ____________________

MFI Recall Date: ____________________

Flow Rate (circle units): ____________ sccm or slpm

*Date entry is optional when the start date is the same as the sample collection date.

RCT SECTION	**Equip. #**	**Cal. Due**	**MDA (dpm) α / β-γ**	**Activity (dpm) α / β-γ**
Primary Filter α / β-γ			/	/
[1]**Secondary Filter analyzed for α / β-γ** **☐ Yes ☐ No**			/	/

[1] If "No" is indicated, data will not appear in the remaining sections of the row.

RCT: ____________________ / ____________________ / ____________

Printed Name **Signature** **Date**

EM&H: ____________________ / ____________________ / ____________

Printed Name Signature Date(s)

EM&H: ____________________ / ____________________ / ____________

Printed Name Signature Date(s)

EM&H: ____________________ / ____________________ / ____________

Printed Name Signature Date(s)

EM&H: ____________________ / ____________________ / ____________

Review Printed Name Signature Date(s)

Attachment 2 – Pressurized Sampling Data Sheet

Sample Number(s): ____________________ Sample Type: ____________________

Canister Serial Number(s): ____________________ Sampler Serial No.: ____________________

Sample Location: ____________________ Initial Vacuum(s) ≥ 24 inHg: ____________________

Sample Collection Date: ____________________ End Sample Press (psig): ____________________

DATE/TIME INSTALLED	PUMP START TIME	START TIME	START FLOW RATE (sccm)	START PUMPHEAD PRESS. (psig)

END FLOW RATE (sccm)	END PUMPHEAD PRESS. (psig)	END TIME	ELAPSED TIME (hours)	DATE/TIME REMOVED

RCT SECTION	Equip. #	Cal. Due	MDA (dpm) α / β-γ	Activity (dpm) α / β-γ
Primary Filter α / β-γ			/	/
[1]Secondary Filter analyzed for α / β-γ ☐ Yes ☐ No			/	/

[1] If "No" is indicated, data will not appear in the remaining sections of the row.

RCT: ____________________ / ____________________ / ____________
Printed Name **Signature** **Date**

EM&H: ____________________ / ____________________ / ____________
Printed Name Signature Date(s)

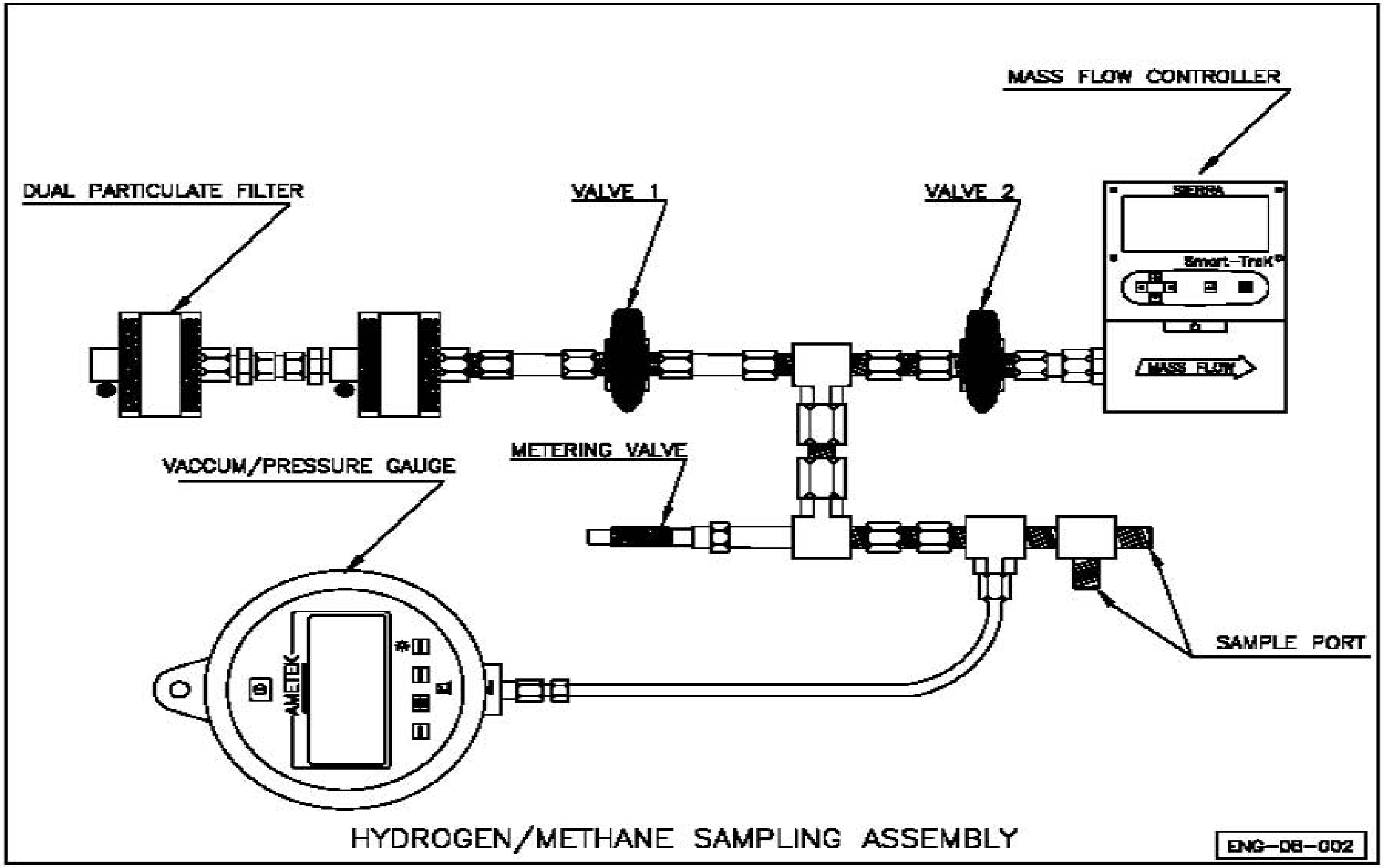
EM&H: ____________________ / ____________________ / ____________
Printed Name Signature Date(s)

EM&H: ____________________ / ____________________ / ____________
Printed Name Signature Date(s)

EM&H: ____________________ / ____________________ / ____________
Review Printed Name Signature Date(s)

Attachment 3 – Subatmospheric Sampling Assembly

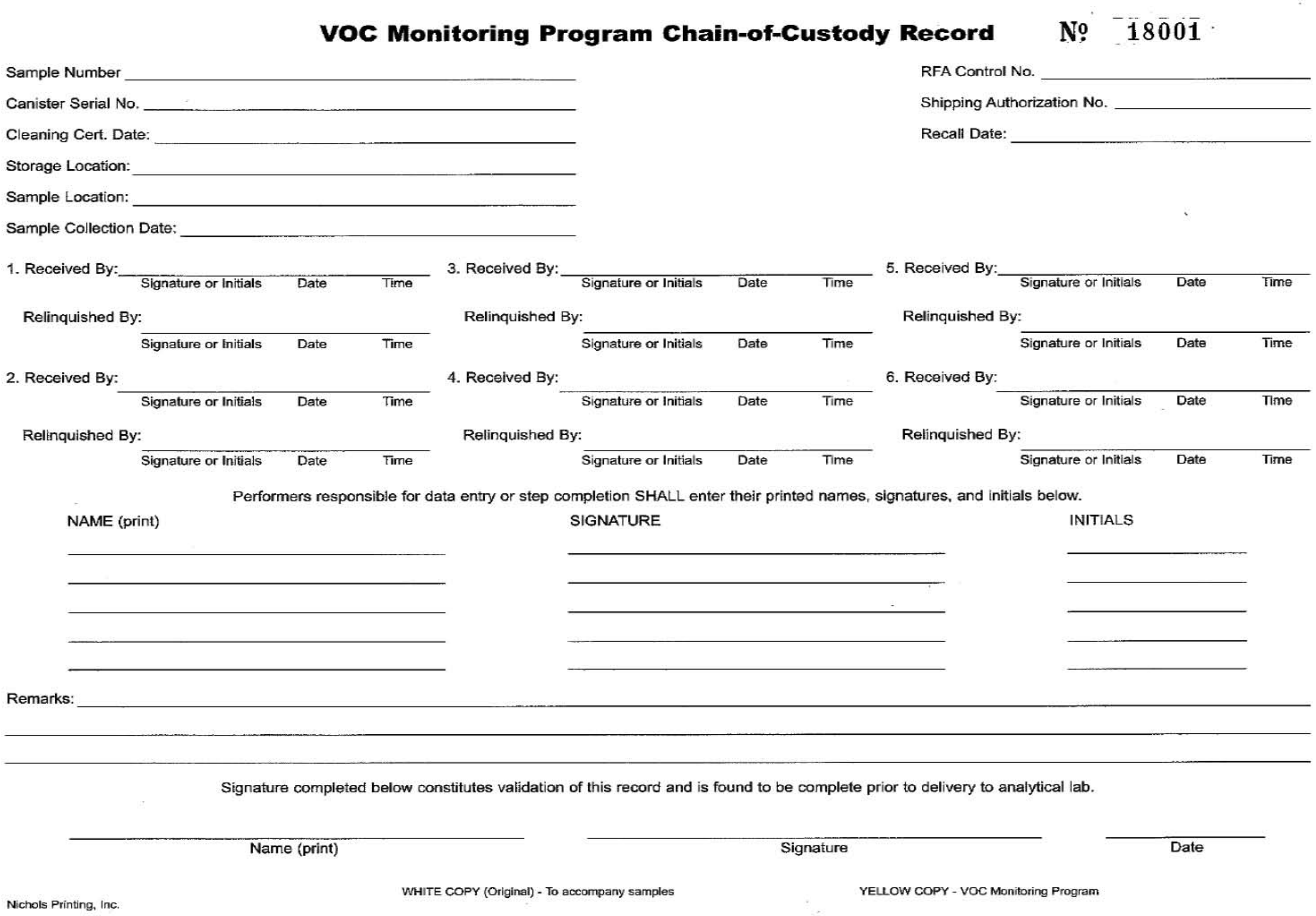
Attachment 3 – Subatmospheric Sampling Assembly



HYDROGEN/METHANE SAMPLING ASSEMBLY

Attachment 4 – Example of Chain of Custody Record

Attachment 4 – Example of Chain of Custody Record



VOC Monitoring Program Chain-of-Custody Record № 18001

Sample Number ______________________

Canister Serial No. ______________________

Cleaning Cert. Date: ______________________

Storage Location: ______________________

Sample Location: ______________________

Sample Collection Date: ______________________

RFA Control No. ______________________

Shipping Authorization No. ______________________

Recall Date: ______________________

1. Received By: ______ Signature or Initials Date Time	3. Received By: ______ Signature or Initials Date Time	5. Received By: ______ Signature or Initials Date Time
Relinquished By: ______ Signature or Initials Date Time	Relinquished By: ______ Signature or Initials Date Time	Relinquished By: ______ Signature or Initials Date Time
2. Received By: ______ Signature or Initials Date Time	4. Received By: ______ Signature or Initials Date Time	6. Received By: ______ Signature or Initials Date Time
Relinquished By: ______ Signature or Initials Date Time	Relinquished By: ______ Signature or Initials Date Time	Relinquished By: ______ Signature or Initials Date Time

Performers responsible for data entry or step completion SHALL enter their printed names, signatures, and initials below.

NAME (print)	SIGNATURE	INITIALS

Remarks: ______________________

Signature completed below constitutes validation of this record and is found to be complete prior to delivery to analytical lab.

Name (print) ______ Signature ______ Date ______

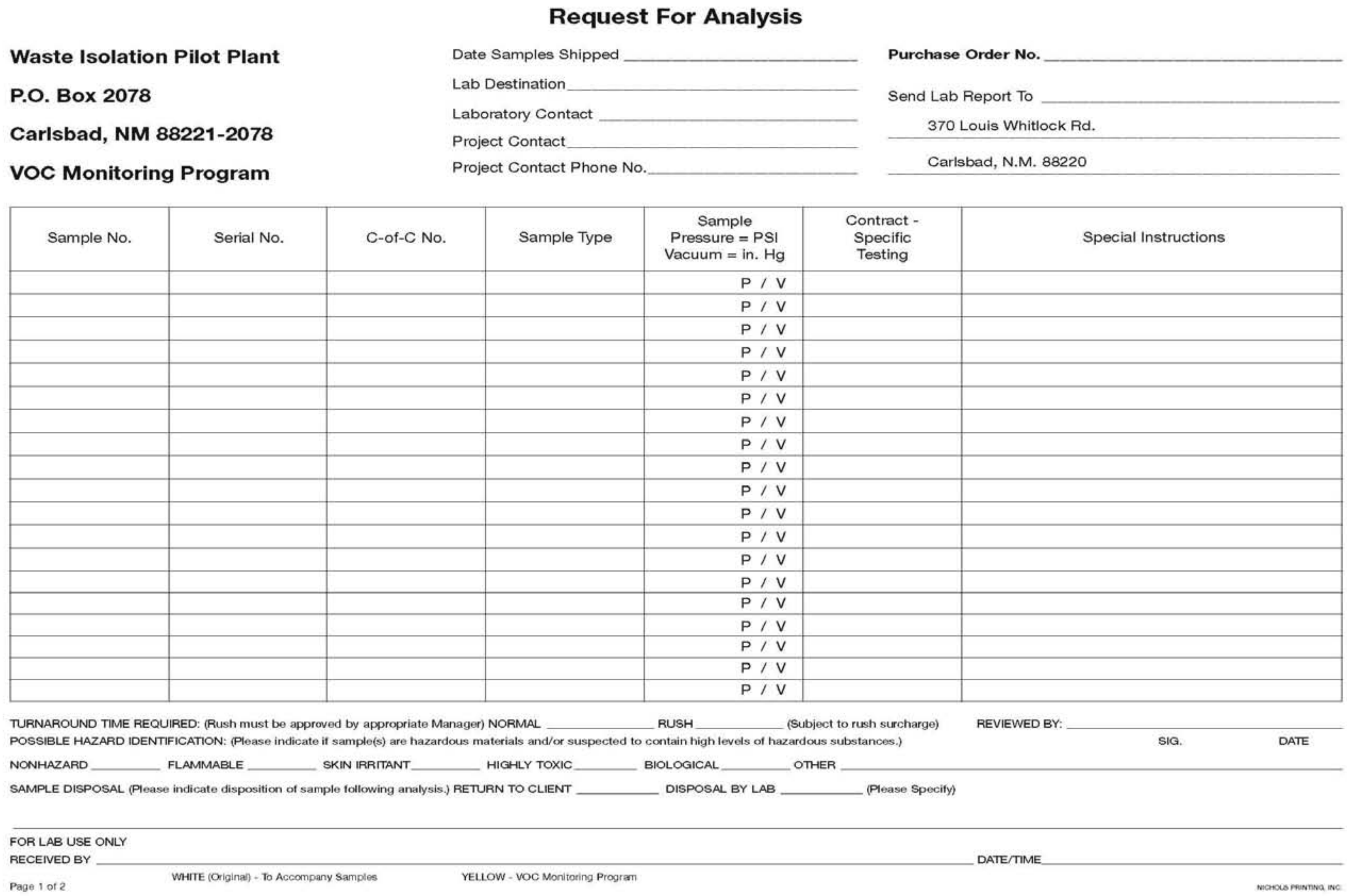
Nichols Printing, Inc.

WHITE COPY (Original) - To accompany samples

YELLOW COPY - VOC Monitoring Program

Attachment 5– Example of Request for Analysis

Attachment 5 – Example of Request for Analysis



Request For Analysis

Waste Isolation Pilot Plant
P.O. Box 2078
Carlsbad, NM 88221-2078
VOC Monitoring Program

Date Samples Shipped ____________________
Lab Destination ____________________
Laboratory Contact ____________________
Project Contact ____________________
Project Contact Phone No. ____________________

Purchase Order No. ____________________
Send Lab Report To ____________________
370 Louis Whitlock Rd.
Carlsbad, N.M. 88220

Sample No.	Serial No.	C-of-C No.	Sample Type	Sample Pressure = PSI Vacuum = in. Hg	Contract - Specific Testing	Special Instructions
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		

TURNAROUND TIME REQUIRED: (Rush must be approved by appropriate Manager) NORMAL ____________ RUSH ____________ (Subject to rush surcharge) REVIEWED BY: ____________________

SIG. DATE

POSSIBLE HAZARD IDENTIFICATION: (Please indicate if sample(s) are hazardous materials and/or suspected to contain high levels of hazardous substances.)

NONHAZARD ________ FLAMMABLE ________ SKIN IRRITANT ________ HIGHLY TOXIC ________ BIOLOGICAL ________ OTHER ____________________

SAMPLE DISPOSAL (Please indicate disposition of sample following analysis.) RETURN TO CLIENT ________ DISPOSAL BY LAB ________ (Please Specify)

FOR LAB USE ONLY
RECEIVED BY ____________________ DATE/TIME ____________________

Page 1 of 2 WHITE (Original) - To Accompany Samples YELLOW - VOC Monitoring Program NICHOLS PRINTING, INC.

Attachment 6 – Example of Canister Sample Tag

Attachment 6 – Example of Canister Sample Tag

Sample Number: ___________________

Canister Serial Number: _____________

Sample Location: ____

Sample Collection Date: ____

Performed By: ____

WP 12-VC3209

Revision 17

VOC Monitoring Group – Data Handling and Program Reporting

Technical Procedure

EFFECTIVE DATE: 11/27/12

Rick Salness
APPROVED FOR USE

TABLE OF CONTENTS

CHANGE HISTORY SUMMARY

REVISION NUMBER	DATE ISSUED	DESCRIPTION OF CHANGES
12	07/15/10	• Added last two bullets to Equipment List. • Removed wording in steps 4.1.2 [N], 4.1.4 [A], 4.1.4 [B], and 4.1.8 referencing Attachments and put in title instead. • Added word Example to the title for Attachment 6 and 7 and put in watermark with same on attachments. • Removed columns 3 and 4 from first table of Attachment 5. • Defined ppmv under third table of Attachment 5. • Removed reference to Temporary COCs and redundant units column. • Replaced COC values for carbon tetrachloride with updated values.
13	12/29/10	• Changed carbon tetrachloride measurements in Attachment 5 HWFP Repository Concentrations of Concern.
14	05/23/11	• Multiple editorial changes and updates throughout. The major changes (i.e., changes that add or alter responsibilities, requirements or actions) are indicated below: • In introduction, added statement to clarify that the procedure does not have to be performed at one time, or in the order listed. • In introduction, added statement to clarify EDD review is performed to determine data package validation timeline. • In introduction, assigned data validation responsibility to a Cognizant Individual. • In section 1.0, the process was re-developed for repository samples to evaluate EDD data after normalization by hand calculation or validated spreadsheet before it is uploaded to the VOC database. The EDD review is initially reviewed to establish a timeline for data package validation. Once the data package is validated, then the data from the EDD and associated data collection is uploaded to the database and normalized values are produced here for records and reporting. • In section 1.0, added reference to section 5.0 of WP 02-EM3001, the procedure describing the review process for reporting the results of field activities.

REVISION NUMBER	DATE ISSUED	DESCRIPTION OF CHANGES
14 Cont.		• In sections 2.0 and 3.0, provided information that the U.S. Environmental Protection Agency (EPA) Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review will be consulted when items do not conform to technical acceptance criteria and listed the document in referenced documents. • In section 2.0, updated technical acceptance criteria to criteria specified in the relevant QAPjP. • In section 3.0, updated minimum calibration levels required from five to three and updated technical acceptance criteria to criteria specified in the relevant QAPjP. • In section 4.0, clarification was provided for associated data collection and handling. • Section 5.0 revised to allow sample line loss evaluation of all available data of an individual sample line and removes the combined average option. • Removed section 7.2 and all references to annual report.
15	06/01/12	Extensive changes made. The major changes (i.e., changes that add or alter responsibilities, requirements or actions) are as follows: • Changed the procedure title to VOC Monitoring Group - Data Handling and Program Reporting from VOC Monitoring and Hydrogen/Methane Process, Evaluation, Validation and Notification. • Added in introduction a paragraph on nonconformances. • Removed from section 4.0 the requirement to process density data from MWS9. Density for standardizing E-300 flow will be calculated in the Air Conversion workbook. • Added to section 10.0, to provide direction for semi-annual reporting, and section 11.0, to provide direction for submitting laboratory, SOPs to NMED. These requirements and actions were previously covered (in part) in WP 02-EM3001. • Added in steps 7.1, 7.2, and 7.3, a requirement to post a link to the WIPP web page for notifications. • Added in step 7.1, a reference to required remedial actions.

REVISION NUMBER	DATE ISSUED	DESCRIPTION OF CHANGES
16	09/21/12	• Clarification of wording for the 5th bullet of the Change History for revision 14 is as follows: — In section 1.0, the process was re-developed for repository samples to evaluate EDD data after normalization by hand calculation or validated spreadsheet. The EDD is initially reviewed to establish a timeline for data package validation. Once the data package is validated, then the validated sample and air flow data is uploaded to the database and normalized values are produced here for records and reporting. • Added "annually in October" to 4th bullet of Precautions and Limitations. • Added Note above step 1.5 to note the EDD file is printed to document actual data submitted by the analytical laboratory. • Deleted steps 4.1.12 to 4.1.14 and steps 4.2.2 and 4.2.3, instructions on how to input data. • Added wording to steps 4.1.11, 4.1.12 and 4.2.3 to input data into the compilation workbook. • Added new Note above step 9.3 for compounds that may not be specifically listed in Appendix VIII. • Removed wording in step 9.4 on using EDDs and/or the VOC database. • Deleted data qualifier UJ from attachment 7. • Deleted wording "by the analytical laboratory" from paragraphs 2 & 3 of attachment 10.

REVISION NUMBER	DATE ISSUED	DESCRIPTION OF CHANGES
17	11/2712	• Updated Reference Table to match document titles. • Substep 3.2.7 is now the first bullet in substep 3.2.6. • Step 4.3 – First bullet is now the fourth bullet in step. • Step 4.3 – bullet added to the beginning of bullet list. • Moved step 4.4 – 1st bullet is now the 3rd bullet in step. • Step 4.10 Note – sentence added "A qualifier tag will be used when air flow data is determined to be …". • Added step 10.6 – "Obtain document number from document services …". • Replaced step 10.8 Note – Note now includes "The linking document database (LDD) screen is the only…". • Deleted former steps 10.8 through 10.11 . • Added step 10.9 – new step added after new step 10.8 "Process the draft report in accordance …". • Attachment 4 – note added to the bottom of attachment "Note: ppm indicated here is …". • Attachment 7 – Added data qualifier "V" to list • Changed" Attachment 9 – title changed to "Evaluation Non-target VOCs". • Added Attachment 10 – "BFB Key Ions and Abundance Criteria".

INTRODUCTION

This is a multiple purpose procedure for the collection, processing, verification and validation, and reporting of data used in support of volatile organic compound (VOC) monitoring and hydrogen/methane monitoring air sampling programs. This procedure also covers evaluation of sample line loss, notifications of program and/or system conditions, and program deliverables. The following activities may not necessarily be performed at one time, or in the order listed.

Hydrogen/methane and VOC air sampling is administered by the VOC Monitoring Group of Environmental Monitoring and Hydrology (EM&H) in compliance with the hydrogen/methane and VOC monitoring requirements described in the Waste Isolation Pilot Plant (WIPP) Hazardous Waste Facility Permit (Permit).

Section 1.0 provides direction on how to review electronic data deliverables (EDDs) to determine if target analyte concentrations may exceed concentrations of concern (COCs) or action levels listed in attachment 5 in order to determine a timeline for data package validation.

Sections 2.0 and 3.0 provide direction on VOC data validation and hydrogen and methane data validation, respectively. Data validation will be performed by the Permittees.[1]

Section 4.0 provides direction for collection and processing of data used to normalize repository VOC monitoring sample concentrations reported by the analytical laboratory.

Section 5.0 provides direction for comparing/evaluating sample canister vacuum/pressure measurements taken in the field and at the analytical laboratory.

Section 6.0 provides direction for evaluating a sample line loss as determined during performance of section 1.0 of WP 12-VC1684.

Section 7.0 provides direction for notifications to communicate exceedances, sample line loss, and sample line loss evaluations.

Section 8.0 provides direction for preparing completeness reports.

Section 9.0 provides direction on the evaluation of other VOCs detected in VOC monitoring samples (i.e., non-targets) that are not specifically listed in attachment 5.

Section 10.0 provides direction for semi-annual reporting.

Section 11.0 provides direction for submitting subcontract laboratory standard operating procedures (SOPs) to New Mexico Environment Department (NMED).

Nonconformances must be documented and recorded in the project files.[1] The disposition and documentation of nonconformances will be handled according to requirements described in WP 13-1.

This procedure will be in the facility Operating Record and available for review by NMED at anytime.[1] Records generated are handled in accordance with departmental records inventory and disposition schedule (RIDS). Copies of the data validation report will be kept on file in the operating record for review upon request by NMED. [1]

Performance of this procedure generates the following records, as applicable:

- VOC Data Validation Checklist (attachment 1)
- Hydrogen and Methane Data Validation Checklist (attachment 2)
- EDD Review and Data Package Validation Table (attachment 3)
- E-mail message and Microsoft® Excel EDD printout
- Meteorological Data Summary worksheet hard copies and any pertinent supporting documentation (e.g., intermediate worksheets, applicable Central Monitoring Room (CMR) logbook pages, attachment 8, manual anemometer readings)
- Air Conversion workbook and hard copies of flow data
- Vacuum/Pressure Comparison Between Field and Laboratory Receipt (attachment 6)
- Evaluation of Non-target VOCs (attachment 9)
- Monthly completeness reports
- Validation Aid workbook hard copies
- VOC database
- Semi-annual VOC, Hydrogen, and Methane Data Summary Reports
- Sample line loss evaluations
- Notifications
- Transmittal letters

REFERENCES			
DOCUMENT NUMBER AND TITLE	BASELINE DOCUMENT	REFERENCED DOCUMENT	KEY STEP
EPA-540-R-08-01, *USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review*		✓	
EPA540/R-94/085, *USEPA Contract Laboratory Program, Volatile Organics Analysis of Ambient Air in Canisters* (Draft)	✓	✓	
EPA Compendium Method TO-15, *Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)*	✓		
U.S. Environmental Protection Agency, 1996. SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*. Third Edition. Office of Solid Waste and Emergency Response, Washington, D.C.		✓	
Hazardous Waste Facility Permit, Waste Isolation Pilot Plant Permit No. NM4890139088-TSDF, issued by the New Mexico Environment Department	✓	✓	1
DOE/WIPP-99-2194, *Waste Isolation Pilot Plant Environmental Monitoring Plan*	✓		
CBFO MP 4.4, *Document Preparation and Control*		✓	
WP 02-EM.02, *Integrated Sample Control Plan*	✓		
WP 02-PC.03, *WIPP Hazardous Waste Facility Permit Reporting and Notifications Compliance Plan*	✓		
WP 04-CO.01-7, *Conduct of Operations Program- Notifications*	✓		
WP 12-VC.01, *Volatile Organic Compound Monitoring Plan*	✓	✓	
WP 12-VC.02, *Quality Assurance Project Plan for Volatile Organic Compound Monitoring*	✓		
WP 12-VC.03, *Hydrogen and Methane Monitoring Plan*	✓		
WP 12-VC.04, *Quality Assurance Project Plan for Hydrogen and Methane Monitoring*	✓		
WP 12-VC1684, *VOC Monitoring Group – Air Sampling Equipment Operations*		✓	
WP 13-1, *Nuclear Waste Partnership LLC Quality Assurance Program Description*	✓	✓	

REFERENCES			
DOCUMENT NUMBER AND TITLE	BASELINE DOCUMENT	REFERENCED DOCUMENT	KEY STEP
WP 15-PS3002, *NWP Controlled Document Processing*	✓	✓	
WP 15-RM, *WIPP Records Management Program*	✓	✓	
McPherson, Malcolm J., 1993, *Subsurface Ventilation and Environmental Engineering*, First Edition		✓	
Statement of Work (SOW) for analytical laboratory services		✓	
Sample Tracking Logbook		✓	
Sampling Data Sheets		✓	
Chain of Custody records		✓	

EQUIPMENT LIST

- Microsoft® Excel Validation Aid workbook template
- Microsoft® Excel Air Conversion workbook
- Microsoft® Excel Meteorological Data Summary worksheet template
- Microsoft® Excel completeness report template
- Computer
- SC12 connector cable

PRECAUTIONS AND LIMITATIONS

- Only validated VOC air sampling data is entered in the VOC database maintained as prescribed in Attachment N of the Permit. This database is the source for reporting repository VOC monitoring Underground Hazardous Waste Disposal Unit (Underground HWDU) emission concentrations. Normalized concentrations and emissions are determined as described in attachment 11. These are incorporated into the VOC database design.

- For sections 2.0 and 3.0, non-regulatory samples and additional requested analytes (requested analytes included for calibration but not listed in attachment 5) may have differing quality assurance (QA) /quality control (QC) objectives based on client/laboratory arrangements, where allowed by the SOW, or as specified in U.S. Environmental Protection Agency (EPA) guidance documents. This practice is not a regulatory issue.

- When items do not conform to QA objectives and/or technical acceptance criteria as described in sections 2.0 and 3.0, it may be necessary to refer to USEPA-540-R-08-01. The decision to use data not passing criteria will be solely to expedite activities requiring use of the data. Use of data not meeting all specified criteria does not indicate full acceptance of those data. The laboratory submitting the data may be required to reanalyze the sample(s) and/or resubmit data with errors. In all cases, the final objective of a Cognizant Individual (CI) is to obtain technically valid data that are defensible and documented. Attachment 7 contains data qualifiers that can be used to flag data that does not meet QA objectives and/or technical acceptance criteria.

- Permit Part 1, condition 1.7.14 addresses the reporting of other instances of noncompliance not otherwise required to be reported pursuant to Permit Part 1, conditions 1.7.10 through 1.7.13. Permit condition 1.7.14 requires that this information be reported to the NMED Secretary annually in October with the submittal of monitoring reports. Beginning with the Semi-annual VOC Data Summary Report of October 2008, other noncompliance information has been submitted with semi-annual reports due in October. These semi-annual reports will continue to be the means for reporting other noncompliance.

- The actions of this procedure will be conducted by individuals meeting the qualification and competency criteria of WP 13-1.

PREREQUISITE ACTIONS

- An analytical sensitivity determination, or a method detection limitMDL study, will be performed by the program analytical laboratory prior to sampling and analysis, and annually thereafter. Documentation describing the sensitivity of laboratory instrumentation will be retained in the facility operating record and will be available for review upon request by NMED.[1]

PERFORMANCE

1.0 EDD REVIEW

1.1 Print e-mail message and Microsoft® Excel EDD file received from the analytical laboratory.

NOTE

EDDs will be evaluated within five calendar days of receipt to determine if VOC concentrations are at or above action levels in Permit Part 4, table 4.6.3.2 for disposal room VOC monitoring data or concentrations of concern in Permit Part 4, table 4.6.2.3 for repository VOC monitoring data.[1] The evaluation timeframe is also routinely applied to hydrogen and methane data, but is not a requirement. Action levels for hydrogen and methane monitoring are listed in Permit Part 4, table 4.6.5.3. Original sample results are used to determine compliance with the Permit limits (repeated in attachment 5). The EDD evaluation requirement does not apply to non-regulatory samples.

1.2 Enter the data package#, date of EDD receipt, and EDD review due date on an EDD Review and Data Package Validation Table (attachment 3).

NOTE

Station VOC-A (repository VOC monitoring location) analytical results with target analyte(s) ≥ 1/3 of the respective COC shown in attachment 5 are normalized as prescribed by the Permit to determine the possibility of an exceedance. Section 4.0 is performed to provide airflow data for use in the normalization calculation. Normalized results are not logged but only used to make a determination of a possible exceedance of the Underground HWDU VOC emission concentration in order to determine the timeline for data package validation. The VOC database is updated only with validated sample and airflow data. The database is designed to calculate the Underground HWDU VOC emission concentrations and running annual averages for compliance reporting.

1.3 Perform the following, as applicable (see attachment 5 for reference):

- For repository VOC monitoring location Station VOC-A, with target analyte(s) reported by the analytical laboratory at ≥ 1/3 of the respective COC shown in attachment 5: using the formula described in WP 12-VC.01 and the EDD results in ppbv, perform hand calculations or use validated Microsoft® Excel worksheet, if available, to determine if the Underground HWDU VOC emission concentration may exceed the COC.

- For disposal room VOC monitoring, ongoing disposal room VOC monitoring, and hydrogen and methane monitoring samples: determine if the EDD indicates a possible exceedance of action levels by reviewing the analytical laboratory results indicated in ppbv or ppmv units.

1.4 Indicate the results of the determination (Yes or No) and enter date of EDD review on an EDD Review and Data Package Validation Table (attachment 3).

NOTE

The EDD file is printed to document the actual data submitted by the analytical laboratory. Data in the EDD file may then be revised and/or reformatted by the CI, for importing into a database for maintaining validated sample data.

1.5 Sign and date printed e-mail message, and store e-mail message along with printed Microsoft® Excel EDD file in accordance with departmental RIDS.

NOTE

For Permit compliance monitoring samples - when the Permittees receive laboratory analytical data from an air sampling event, the data will be validated within 14 calendar days. If the EDD indicates that VOC concentrations are at or above action levels or concentrations of concern (see attachment 5), the hard copy data package will be validated within five calendar days as opposed to the fourteen (14) calendar day time frame.[1] The analytical data package is stamped to indicate the date of receipt.

1.6 Referring to the date stamped on the data package, enter the receipt date and data package validation due date on the EDD Review and Data Package Validation Table (attachment 3) and validate the data within the allowed timeframe using applicable sections (2.0 or 3.0) of this procedure.

1.7 After completion of data validation, enter the data package validation date and initials on the EDD Review and Data Package Validation Table (attachment 3).

1.8 Determine if any of the following occurred, as applicable:

- For repository VOC monitoring –the Underground HWDU VOC emission concentration reached or exceeded the COC for a target analyte in the original sample
- For repository VOC monitoring – the running annual average of the Underground HWDU VOC emission concentrations for original samples reached or exceeded the COC for a target analyte
- For disposal room VOC monitoring - target analyte reached or exceeded an action level in an individual original sample

- For ongoing disposal room VOC monitoring - target analyte reached or exceeded an action level in an individual original sample

- For hydrogen and methane monitoring - target analyte reached or exceeded an action level in an individual original sample

---

NOTE

For exceedances in Permit compliance monitoring samples, a written notification to NMED is required within seven calendar days of validating analytical results. Written notification to NMED will also be performed if a COC or action level is reached.

1.9 **IF** a COC or action level is reached or exceeded
THEN GO TO step 7.1.

2.0 VOC DATA VALIDATION

2.1 Log the analytical laboratory's data package number on each page of a VOC Data Validation Checklist (attachment 1).

2.2 Perform the following and log on checklist, as applicable.

2.2.1 Holding Times

- Verify the following:
  - — Sample(s) analyzed within 30 days of collection.
  - — Analysis and sample collection date(s) were reported correctly.

2.2.2 Gas Chromatography/Mass Spectrometry (GC/MS) Instrument Performance Check

- Verify the following:
  - — Instrument performance check using Bromofluorobenzene (BFB) was performed initially and every 24 hours thereafter during calibration and sample analysis.
  - — BFB key ions and abundance criteria listed in attachment 10 were met for an injection of ≤50 ng BFB.

- Mass assignments were correct.

2.2.3 Initial Calibration

- Verify the following:
  - A minimum of five different concentrations used for calibration of each target analyte.
  - Calibration performed for all target VOCs listed in attachment 5 and any additional requested analytes.
  - Scan range of the GC/MS at least 35 to 300 atomic mass units.
  - For each target analyte, lowest concentration used for calibration was ≤ required Method Reporting Limit (MRL) specified in SOW.
  - Relative standard deviations (RSDs) of the relative response factors (RRFs) are ≤ 30 percent for target analytes.
  - The percent area response change (%ARC) at each calibration level is within ±40% of the mean area response over the initial calibration range for each internal standard.

NOTE

The recalculated RRFs and RSDs may be slightly different from the laboratory results due to rounding formats. Slight differences are acceptable.

- Recalculate the RRFs and RSDs using Validation Aid workbook and verify the following:
  - Recalculated RRFs agree with analytical laboratory reported values.
  - Recalculated percent RSDs agree with analytical laboratory reported values.

NOTE

Daily calibrations for VOC analysis are performed prior to the analysis of samples and required method blanks and after BFB tuning criteria have been met. When BFB is a component of the internal standard mix, BFB and daily calibration checks may be concurrent.

2.2.4 Daily Calibration

- Verify the following:
  - Daily calibration performed with a midpoint standard (mid-level of the calibration curve; sample ID indicates CCAL or CCV) initially and at least once every 24-hour time period of operation.
  - RRF of each target analyte in the midpoint standard met the precision criteria of ≤ 30 percent difference (%D or %Dev) from the mean RRF from the initial calibration.

2.2.5 Method Blanks

- Verify the following:
  - Method blank analyzed initially and at least once every 24-hour time period of operation.
  - Technical acceptance criteria were met, as specified in SOW.

2.2.6 Sample Analysis

- Verify the following:
  - Samples analyzed after and within 24 hours of meeting the BFB tuning criteria.
  - Samples analyzed after and within 24 hours of acceptable daily calibration and method blank.
  - Target analytes, in the sample introduced to the analytical instrument, within the calibration range of the analytical method.

- Correct initial calibration quantitation method used to quantify each sample.
- Sample dilution factors are correct.
- Samples analyzed within one year of the MDL date.
- Verify results reported in the EDD match the data package results.

2.2.7 Laboratory and Field Precision

NOTE

Laboratory sample duplicates and blank spike/blank spike duplicates (BS/BSD) will be used to evaluate laboratory precision. BS/BSDs and laboratory sample duplicates will be analyzed at a frequency of 10 percent, or one per analytical lot, whichever is more frequent, with a QA objective for laboratory precision of ≤ 25 RPD (only applicable if one or both values not flagged "U" or "J").[1] Hereafter, blank spike/blank spike duplicates are referred as laboratory control sample/laboratory control sample duplicates (LCS/LCSDs). Field duplicate samples are collected at a frequency of at least 5 percent for each sampling location and compared to the original sample to assess field sampling precision. When a field duplicate is included in the batch, the QA objective for field precision is ≤ 35 relative percent difference (RPD) (only applicable if one or both values not flagged "U" or "J"). The field duplicate technical acceptance criterion is not a QA objective required by the laboratory that would necessitate reanalysis if not met. This QA objective is used to evaluate whether the monitoring systems are functioning properly. Frequent exceedance of the technical acceptance criterion for field precision is a quality concern that may require troubleshooting or recertification of an individual sampler or assessment of the sampling methods and counts toward completeness (see section 8.0).

NOTE

The probability that sample matrix does not have an effect on analytical precision is substantiated when both LCS/LCSD and laboratory sample duplicate RPDs meet technical acceptance criteria.

- Using Validation Aid workbook, recalculate RPDs for LCS/LCSDs, and laboratory sample duplicates, and calculate RPDs for field duplicates.

- Verify the following:
  - Appropriate number of laboratory control samples and duplicates analyzed.
  - Laboratory precision is ≤ 25 RPD (only applicable if one or both values not flagged "U" or "J").
  - When included in the batch, field duplicate RPD is ≤ 35 (only applicable if one or both values not flagged "U" or "J").
  - Recalculated RPDs matched results reported in data package for laboratory precision.

2.2.8 Laboratory Control Sample Accuracy

- Verify the following:
  - LCS/LCSD analyzed with each batch of samples and is a reference gas of a different vendor or same vendor, different lot# than the reference gas used for the initial calibration and contains all target analytes.
  - LCS/LCSD percent recovery is in range of 60 to 140 percent.
- Using Validation Aid workbook, recalculate % recoveries for LCS/LCSD and verify recalculated data matches laboratory reported results.

2.2.9 Internal Standard Responses and Retention Time

- Verify the following:
  - Verify volume of internal standard added in all field and QC analyses is the same from run to run.
  - Area responses for each internal standard within 60-140 percent of the area responses from the daily calibration for all field and QC analyses.

- Retention times of each internal standard within 0.33 minutes (20 seconds) of the retention time from the daily calibration for all field and QC analyses.

NOTE

When Bromoflurobenzene (BFB) is a component of the internal standard mix, BFB may appear in the tentatively identified compound (TIC) report or library search compound (LSC) report but is not actually present in the sample or method blank. Variations on chemical nomenclature for BFB appearing in the report may include BFB, 4-Bromofluorobenzene, 4-BFB, p-Bromofluorobenzene, etc., but the Chemical Abstracts Service registry number (CAS#) will always be 460-00-4.

NOTE

The TIC or LSC report summarizes the unclassified non-target VOCs present in a sample when ≥10% of the area response of the relative internal standard. Internal standards, target analytes, and additional requested analytes included in the quantitation method will not appear in the report. Indeterminate identifications are reported as "unknown," thus not a TIC and not included in the EDD or laboratory sample results summary but may appear in the TIC or LSC report.

2.2.10 Library Search for TICs in Samples and Method Blanks

- Verify the following:
  - A library search of the reference mass spectral library performed on unclassified non-target peaks in the method blanks and samples.
  - VOCs that are <u>identified</u> in the library search are classified as TICs and reported with appropriate qualifiers (see attachment 7).

2.3 Perform VOC data validation checklist closeout as follows:

2.3.1 Indicate on checklist if data is acceptable.

2.3.2 **IF** data is **NOT** acceptable,
THEN inform subcontract laboratory **AND** Cognizant Manager of problems or deficiencies.

2.3.3 Verify all items on the VOC Data Validation Checklist have a check mark (✓) or is marked with **N/A**.

2.3.4 Indicate on checklist any necessary remarks on nonconforming items or explain any difficulties/qualifications associated with the VOC data.

2.3.5 Verify all printed worksheets are signed and dated to indicate independent data validation of laboratory results.

2.3.6 File validation worksheets and EDD e-mail contents with the data package.

3.0 HYDROGEN AND METHANE DATA VALIDATION

3.1 Log the analytical laboratory's data package number on each page of a Hydrogen and Methane Data Validation Checklist (attachment 2).

3.2 Perform the following and log on checklist, as applicable.

3.2.1 Holding Times

- Verify the following:
  - Sample(s) analyzed within 30 days of collection.
  - Analysis and sample collection date(s) were reported correctly.

3.2.2 Initial Calibration

- Verify the following:
  - A minimum of three different concentrations used for calibration of each target analyte.
  - Calibration performed for hydrogen and methane.
  - For each target analyte, lowest concentration used for calibration was ≤ required MRL specified in SOW.
  - RSDs of the response factors (RFs) are ≤ 30 percent for target analytes.

NOTE

The recalculated RFs and RSDs may be slightly different from the laboratory results due to rounding errors. Slight differences are acceptable.

- Recalculate the RFs and RSDs using Validation Aid workbook and verify the following:
    - Recalculated RFs agree with analytical laboratory reported values.
    - Recalculated percent RSDs agree with analytical laboratory reported values.

NOTE

Daily calibrations for hydrogen/methane analysis are performed prior to the analysis of samples and required method blanks.

3.2.3 Daily Calibration

- Verify the following:
    - Daily calibration performed with a midpoint standard (mid-level of the calibration curve; sample ID indicates CCAL or CCV) initially and at least once every 24-hour time period of operation.
    - Retention times of hydrogen and methane in the midpoint standard are within 0.075 minutes (4.5 seconds) of the mean retention times from the initial calibration.
    - RF of each target analyte in the midpoint standard met the precision criteria of ≤ 30 percent difference (%D or %Dev) from the mean RF from the initial calibration

3.2.4 Method Blanks

- Verify the following:
    - Method blank analyzed initially and at least once every 24-hour time period of operation.

  - Technical acceptance criteria were met, as specified in SOW.

3.2.5 Sample Analysis

- Verify the following:
  - Samples analyzed after and within 24 hours of acceptable daily calibration and method blank.
  - Target analytes, in the sample introduced to the analytical instrument, within the calibration range of the analytical method.
  - Correct initial calibration quantitation method used to quantify each sample.
  - Sample dilution factors are correct.
  - Sample(s) analyzed within one year of the MDL date.
  - Verify results reported in the EDD match the data package results.

3.2.6 Laboratory and Field Precision

NOTE

Laboratory sample duplicates and LCS/LCSD will be used to evaluate laboratory precision. LCS/LCSD analysis and laboratory duplicate analysis of a sample is performed at a frequency of one per analytical batch with a QA objective for laboratory precision of ≤25 RPD (only applicable if one or both values not flagged "U" or "J"). Field duplicate samples (typically room 1 exhaust location of a filled panel) are collected at a frequency of at least 5 percent and compared to the original sample to assess field sampling precision. When a field duplicate is included in the batch, the QA objective for field precision is ≤ 35 RPD (only applicable if one or both values not flagged "U" or "J"). The field duplicate technical acceptance criterion is not a QA objective required by the laboratory that would necessitate reanalysis if not met. This QA objective is used to evaluate whether the monitoring systems are functioning properly. Frequent exceedance of the technical acceptance criterion for field precision is a quality concern that may require troubleshooting or recertification of an individual sampler or assessment of the sampling methods and counts toward completeness (see section 8.0).

NOTE

The probability that sample matrix does not have an effect on analytical precision is substantiated when both LCS/LCSD and laboratory sample duplicate RPDs meet technical acceptance criteria.

- Using Validation Aid workbook, recalculate RPDs for LCS/LCSDs, and laboratory sample duplicates, and calculate RPDs for field duplicates.
- Verify the following:
    - Appropriate number of laboratory control samples and duplicates analyzed.
    - Laboratory precision is ≤ 25 (only applicable if one or both values not flagged "U" or "J".
    - When included in the batch, field duplicate RPD is ≤ 35 (only applicable if one or both values not flagged "U" or "J").
    - Recalculated RPDs matched results reported in data package for laboratory precision.

3.2.7 Laboratory Control Sample Accuracy

- Verify the following:
  - LCS/LCSD analyzed with each batch of samples and is a reference gas of a different vendor or same vendor, different lot# than the reference gas used for the initial calibration and contains all target analytes.
  - LCS/LCSD standard percent recovery is in range of 70 to 130 percent.
- Using Validation Aid workbook, recalculate % recoveries for LCS/LCSD and verify recalculated data matches laboratory reported results.

3.3 Perform hydrogen and methane data validation checklist closeout as follows:

3.3.1 Indicate on checklist if data is acceptable.

3.3.2 **IF** data is **NOT** acceptable,
THEN inform subcontract laboratory **AND** Cognizant Manager of problems or deficiencies.

3.3.3 Verify all items on the Hydrogen and Methane Data Validation Checklist have a check mark (✓) or is marked with **N/A**.

3.3.4 Indicate on checklist any necessary remarks on nonconforming items or explain any difficulties/qualifications associated with the hydrogen/methane data.

3.3.5 Verify all printed worksheets are signed and dated to indicate independent data validation of laboratory results.

3.3.6 File validation worksheets and EDD e-mail contents with the data package.

4.0 NORMALIZATION DATA HANDLING

NOTE

An underground mine weather station (MWS) measures the psychrometric conditions of the air and includes an enclosure, rechargeable battery, data logger, analog output device, temperature/relative humidity probe, and barometric pressure transducer. Additionally, storage modules may be employed at a MWS (e.g., MWS9).

NOTE

The underground velocity air flow stations (V) employ FloSonic Ultrasonic Air Flow Sensors that are used to measure volumetric flow rate (Q) in thousands of actual cubic feet per minute (kacfm). The psychrometric conditions of the air are used in calculating density to convert kacfm to thousands of standard cubic feet per minute (kscfm) for normalization calculations.

NOTE

The primary sources of data for normalization calculations are identified as follows:

Overall (total), at bottom of the exhaust shaft:

- V15 – equipment# 534-FI-160-524, located at S400/E420
- MWS8 – equipment# 534-MWS-002-008 , located at S400/E400
- E-300, at repository Station VOC-A (S1300/E300):
- V17 – equipment# 534-FI-160-545, "logged at MWS9"
- MWS9 – equipment# 534-MWS-002-009, "no Central Monitoring System (CMS) readings are available, data downloaded manually by VOC monitoring personnel"

NOTE

Secondary sources of data for normalization calculations (all available from CMS) may include:

- MWS7 – equipment# 534-MWS-002-007, located at S400/E40
- V2 – equipment# 534-FI-160-522, located at S400/E220, "measures waste circuit Q"
- V12 – equipment# 534-FI-160-529, located at S300/E300, "measures north circuit Q"
- V13 – equipment# 534-FI-160-530, located at S475/E300, "measures disposal circuit Q"

NOTE

Air flow rate, temperature, barometric pressure, and relative humidity are measured for use in normalization calculations. Readings corresponding with the actual repository VOC monitoring sampling event can be averaged using the Meteorological Data Summary worksheet. Collection of data from MWS9 data logger and CMS primary sources is described in steps 4.1 and 4.2, respectively. If primary sources of data or individual sensor data are not available or questionable, alternative sources can be used for Q data (as allowed in steps 4.3 and 4.4). Psychrometric conditions used for calculating density are limited to the MWSs listed in this procedure. Collection of data from MWS7 is similarly processed as described in section 4.2. As needed, an average of prior measurements determined to be similar for psychrometric conditions can be used. The Meteorological Data Summary worksheet can be used to calculate the average for a sampling event regardless of source of data. The source of the data will be indicated on the worksheet. Also, a CI has the discretion to remove or substitute any questionable data points for calculating average.

NOTE

There may be differences in the time stamp for a MWS/V due to possible differences in observance of daylight saving time. As appropriate, the Meteorological Data Summary worksheet will indicate MDT for mountain daylight time or MST for mountain standard time. When identifying the time period that corresponds with the sampling event times, differences in time must be considered.

NOTE

If desired, data may be downloaded directly from data logger as described below while using the appropriate connection options.

4.1 At user's computer, perform the following for download of data logged at MWS9:

4.1.1 Connect SC12 connector cable to the storage module of MWS9 and to the SC532 interface.

4.1.2 Connect interface to an open COM port on the back of the computer.

4.1.3 Open the interface software.

4.1.4 Select the Storage Module option at the top of the screen.

4.1.5 Choose the SM192/SM716 option.

4.1.6 Verify COM port selected on the left is the same one as the cable connected to user's computer.

4.1.7 Connect to the storage module using the green connect button at the bottom of the screen.

4.1.8 Select the “Data” option on the top tool bar.

4.1.9 Choose the "Get New" option.

4.1.10 After the download is complete, exit the interface program.

4.1.11 Open the "Monthly MWS9 Data" Microsoft® Excel workbook located in "Working File" network folder and copy and paste the new data to the compilation workbook.

4.1.12 If there are known issues with the data or evaluation of the data indicates data is questionable, invalid, or not acceptable; use the strikethrough font effect to mark the substandard data in the compilation workbook, as applicable.

4.1.13 Save the updated compilation workbook.

NOTE

Any density data appearing in the data set will not be used. Density will be calculated using the Air Conversion workbook.

4.1.14 In Monthly MWS9 Data workbook, find the time period that corresponds with the sampling event times and select the year, Julian date, time, and approved barometric pressure, temperature, relative humidity, and air flow.

4.1.15 Copy and paste approved data to the Meteorological Data Summary worksheet.

4.1.16 Update the data source and "remarks," as applicable.

4.1.17 Close the compilation workbook.

4.2 Obtain CMS data for primary sources and perform the following:

4.2.1 Copy the data/file to the "CMS MWS_V" folder in the "Working File" network folder and rename file to include data source identifier and date range (month, days, & year), as applicable.

4.2.2 Open the "Monthly MWS8_V15 Data" compilation workbook located in "Working File" network folder and copy and paste the new data to the workbook.

4.2.3 If there are known issues with the data or evaluation of the data indicates data is questionable, invalid, or not acceptable; use the strikethrough font effect to mark the substandard data in the compilation workbook, as applicable.

4.2.4 Save the updated compilation workbook.

4.2.5 Select the time and approved air flow data, temperature, relative humidity, and barometric pressure data (do not select the date) that corresponds with the sampling event (there should be approximately 25 time intervals for a programmed 6-hour sampling event), and copy and paste it to the applicable section of the Meteorological Data Summary worksheet.

4.2.6 Close the compilation workbook.

4.2.7 Manually input the year and date in respective cells of the Meteorological Data Summary worksheet.

4.2.8 Update the data source and "remarks," as applicable.

4.2.9 Input the corresponding original sample numbers in the upper left-hand corner and save the file as these sample numbers inside the "Normalize" folder located in the "Working File" network folder.

4.3 If V15 Q data are unavailable, use air flow from **ONE** of the following alternative sources (listed in the order of preference):

- If all are available, calculate the average of air flow measurements on an intermediate worksheet for V2, V12, and V17 and combine to obtain a total air flow in kacfm. This source (indicated as V2, V12, V17) total will be entered into a Meteorological Data Summary worksheet and the "Total flow, KACFM" section of the Air Conversion workbook.

- If all are available, calculate the average of air flow measurements on an intermediate worksheet for V2, V12, and V13 and combine to obtain a total air flow in kacfm. This source (indicated as V2, V12, V13) total will be entered into a Meteorological Data Summary worksheet and the "Total flow, KACFM" section of the Air Conversion workbook.

NOTE

When CMR logbook data is used, the total flow ventilation rate in kscfm will be entered into the "Total flow/1.Ratio Calc. KSCFM" section of the Air Conversion workbook. "N/A" will be indicated in the corresponding Temp., %RH, barometric pressure, density, and air flow (KACFM) cells in the Air Conversion workbook. The relevant Meteorological Data Summary worksheet will indicate source of data as "CMRLOG" and indicate the total flow in kscfm. All remaining entries of the section will indicate N/A.

- Obtain copies of CMR logbook pages for the sampling event and use attachment 8 to determine total flow ventilation rate.

- Hand-calculated average of manual anemometer readings taken (at least two readings) during or near the sampling event period. This source (indicated as ANEM) average will be entered into a Meteorological Data Summary worksheet and the "Total flow, KACFM" section of the Air Conversion workbook.

- Average of prior measurements under similar ventilation configuration.

4.4 If V17 Q data are unavailable, use air flow average from **ONE** of the following alternative sources (listed in the order of preference):

- Data from V13. The average will be calculated in a Meteorological Data Summary worksheet and entered in the "E-300, KACFM" section of the Air Conversion workbook.

- If data is available from V2, V12, and V15: calculate the average of air flow measurements on an intermediate worksheet for each V. Subtract the combined calculated averages of V2 and V12 from V15 to obtain the E-300 air flow in kacfm. This source (indicated as V15–V2, V12) result will be entered into the Meteorological Data Summary worksheet and the "E-300, KACFM" section of the Air Conversion workbook.

- Hand-calculated average of manual anemometer readings taken (at least two readings) during or near of the sampling event period. This source (indicated as ANEM) average will be entered into a Meteorological Data Summary worksheet and the "E-300, KACFM" section of the Air Conversion workbook.

- Average of prior measurements under similar ventilation configuration.

NOTE

Density calculations are based on *Subsurface Ventilation and Environmental Engineering*, Malcolm J. McPherson, pg. 512, equations numbered 14.43, 14.53, and 14.51. The Air Conversion workbook is designed to calculate density using these equations.

4.5 Data collector - transfer applicable results to the Air Conversion workbook from the appropriate Meteorological Data Summary worksheet and enter initials in the appropriate section either before or after printing hard copy.

4.6 Data collector, sign and date hard copy of the Meteorological Data Summary worksheet(s) and submit worksheet(s) and any supporting documentation (e.g., intermediate worksheets, applicable CMR logbook pages, attachment 8, manual anemometer readings) to an independent data reviewer for review and validation of the record.

4.7 Independent data reviewer, review submittals, resolve discrepancies with data collector as applicable, and sign and date as data reviewer.

4.8 Independent data reviewer – review the data entries in the Air Conversion workbook and enter initials in the appropriate section either before or after printing hard copy.

4.9 Print a hard copy of the Air Conversion workbook entries (typically after completion of a page of entries) and review and validate the record.

4.10 File hard copy of Meteorological Data Summary worksheet(s), hard copy of the Air Conversion workbook entries, and any supporting documentation (e.g., intermediate worksheets, applicable CMR logbook pages, attachment 8, manual anemometer readings) in accordance with departmental RIDS.

NOTE

Validated air flow data in kscfm from the Air Conversion workbook is entered in the VOC database in scfm. The database is designed to normalize validated repository VOC monitoring sample concentrations reported by the analytical laboratory using this air flow data. Normalization for a field duplicate uses the same air flow data as the respective original sample. A qualifier flag will be used when air flow data is determined to be insufficient as presented in attachment 7. Data entry verification is performed during internal and/or technical reviews of semi-annual reports. The VOC database will be backed up as prescribed in WP 15-RM.

4.11 As needed, enter the normalization data (in scfm) into the VOC database.

5.0 CANISTER VACUUM/PRESSURE VERIFICATION

5.1 Upon receipt of information from laboratory containing sample canister vacuum/pressure measurements, use attachment 6 to compare the field vacuum/pressure to the laboratory-reported vacuum/pressure for each sample to confirm that significant losses or gains did not take place during shipping and storage.

5.2 On attachment 6, circle either "V" for vacuum or "P" for pressure and enter the following:

- Sample number
- Canister number
- Field measurement
- Laboratory measurement
- Difference

5.3 Perform the following, as applicable:

- For pressurized samples, if the pressure measured by the laboratory is at atmospheric pressure (i.e., 0 psig), void the unacceptable sample.
- For samples under vacuum, if the vacuum in the canister has lost more than 2.5 inches of mercury (inHg) or is at atmospheric pressure, void the unacceptable sample.

5.4 Indicate acceptance on attachment 6 by marking "Yes" or "No."

5.5 Enter initials on attachment 6.

6.0 SAMPLE LINE LOSS EVALUATION

NOTE

Any loss of the ability to purge a sample line will be evaluated. The steps presented in this section are based on the logic diagram (attachment 4) for evaluating sample line loss.

NOTE

When a sample line cannot be purged and is determined to be a sample line loss after performance of section 1.0 of WP 12-VC1684, a written notification to NMED is required within seven calendar days of the discovery of loss of sampling line(s)[1]. Even though bulkhead lines are typically accessible hence can be inspected/replaced as described in WP 12-VC1684, written notification and evaluation of the loss (as presented in attachment 4) is still required.

6.1 Perform one of the following:

6.1.1 **IF** a line has been determined as lost and cannot be replaced **GO TO** step 7.2
AND THEN RETURN TO step 6.2.

6.1.2 **IF** a line has been determined as lost and can be replaced, **GO TO** step 7.2
AND THEN RETURN TO step 6.6.

6.2 Determine if sample line(s) adjacent to the lost sample line are working and perform the following, as applicable:

6.2.1 **IF** adjacent sample location line(s) are working,
THEN GO TO step 6.3.

6.2.2 **IF** the adjacent line(s) are NOT working,
THEN GO TO step 6.4.

6.3 Perform "Student's t- test" to determine if the lost line can be grouped with another line (i.e., statistical similarity) as follows:

NOTE

In performing the "Student's t-test," prior concentrations of original samples from the lost sample line and line(s) adjacent to the lost line will be evaluated to determine if they are statistically similar. In performing this test the magnitude of ***t*** will be compared to the critical ***t*** value from SW-846, Table 9-2 (found in Chapter 9 – Sampling Plan.[1])

6.3.1 Determine which adjacent sample line(s) are working.

6.3.2 Gather the concentration data from the lost line and all working adjacent line(s) for sampling events prior to the sample line loss.

- For results listed as "U" or "ND" a value of one half of the dilution corrected MDL will be assigned.
- Perform the following for each individual working adjacent sample line:
  - — Calculate the difference, d or delta, between the adjacent sample line and the lost sample line for each sampling event.
  - — Calculate the average, d-bar, of all differences calculated in previous step.
  - — Calculate the standard deviation, "s."
  - — Calculate "t" [d-bar/ (standard error)] Standard error = standard deviation of calculated differences/square root of the number of calculated differences, n.

— Determine T crit from Table 9-2 of SW-846 based on n, the number of calculated differences.

6.3.3 Perform **ONE** of the following:

[A] **IF** the test determines that the lines are statistically similar, **THEN** no action is necessary, **GO TO** step 6.5.

[B] **IF** the lines cannot be statistically compared, **THEN** proceed to step 6.4.

6.4 Determine if the most recent sample result from the lost line was above the first action level listed in attachment 4 (also presented in attachment 5) and perform **ONE** of the following.

6.4.1 **IF** the most recent sample result from the lost line is above the first action level,
THEN notify Cognizant Manager that results indicate the explosion isolation wall must be installed **AND** proceed to step 6.5.

6.4.2 **IF** the most recent sample result from the lost line is below the first action level,
THEN no action is necessary, proceed to step 6.5.

6.5 Provide evaluation results to a CI for independent verification of line loss evaluation conclusions and statistical test including confirming the correctness and accuracy of any calculations, as applicable.

6.6 Provide evaluation results for review by Cognizant Manager and/or assigned reviewers.

6.7 Provide evaluation results for review by U.S. Department of Energy Carlsbad Field Office (DOE-CBFO) and/or assigned reviewers.

6.8 **GO TO** step 7.3 to perform notification of evaluation results and impact of sample line loss.

7.0 NOTIFICATION PROCESS

NOTE

As required in Permit Part 1, condition 1.11, the Permittees provide members of the public a link on the WIPP web page for viewing actions identified in the Permit that require e-mail notification and submitting requests to be placed on the public e-mail notification list.

NOTE

Notifications are documented via transmittal letters.

7.1 For concentrations measured at or over COCs or action levels in original samples, including running annual averages, notify the applicable organizations. This notification shall include:

- Type of notification
- Date of occurrence
- Location of occurrence
- Description of occurrence
- Remedial actions required, as applicable (refer to Permit Part 4, conditions 4.6.2.4, 4.6.3.3, 4.6.5.4)

NOTIFY:

- Regulatory and Environmental Services (RES) Manager
- Management and Operating Contractor (MOC)-Operations
- DOE-CBFO

Within seven calendar days of obtaining validated analytical results, in writing, NOTIFY:

- NMED

- Within seven days of the notification submittal date to NMED, provide written notification to the e-mail list with a direct link to the specific document (notification letter to NMED) and provide a link on the WIPP web page whereby members of the public may review the actions requiring e-mail notification.

7.2 For notifications of sample line loss, notify the applicable organizations. This notification shall include:

- Type of notification
- Date of occurrence
- Location of occurrence
- Description of occurrence

NOTIFY:

- RES Manager
- MOC-Operations
- DOE-CBFO

Within seven calendar days of the discovery of loss of sample line(s), in writing, NOTIFY:

- NMED

- Within seven days of the notification submittal date to NMED, provide written notification to the e-mail list with a direct link to the specific document (notification letter to NMED) and provide a link on the WIPP web page whereby members of the public may review the actions requiring e-mail notification.

7.3 For notification of sample line loss evaluation and impact of sample line loss, notify the applicable organizations. This notification shall include:

- Type of notification
- Results of evaluation
- Actions to be taken

NOTIFY:

- RES Manager
- MOC-Operations
- DOE-CBFO

Within seven calendar days of completion of evaluation (i.e., review and approval by DOE-CBFO), in writing, NOTIFY:

- NMED

- Within seven days of the notification submittal date to NMED, provide written notification to the e-mail list with a direct link to the specific document (notification letter to NMED) and provide a link on the WIPP web page whereby members of the public may review the actions requiring e-mail notification.

8.0 COMPLETENESS REPORTS

NOTE

The expected completeness for the program is greater than or equal to 95 percent. Data completeness will be tracked monthly[1]. Completeness reports are generated monthly for both the VOC Monitoring and Hydrogen and Methane Monitoring Programs. Completeness is defined as the percentage of the ratio of the number of valid sample results received (i.e., those which meet data quality objectives [DQOs]) versus the total number of samples collected. Completeness may be affected, for example, by sample loss or destruction during shipping, by laboratory sample handling errors, or by rejection of analytical data during data validation.[1] Prescribed sampling frequencies will be verified when evaluating completeness. Field duplicates, with a prescribed frequency of at least 5 percent, are included in the total. Overall completeness is calculated for each reporting period by dividing the number of samples that met DQOs by the number of completed samples for the reporting period and expressed as percent (%). If the required completeness of valid data (95 percent) is not maintained, corrective action may be required. Corrective action for field sampling activities may include recertification and cleaning of samplers, reanalysis of samples, additional training of personnel, modification to field and laboratory procedures, and recalibration of test equipment.[1]

8.1 Monthly Sample Completion Report

8.1.1 Open completion report template from "Completeness Reports" folder located in the "Working File" network folder and save the file (save as), with name indicating month, year, and other indication of significance, in an appropriate location.

8.1.2 Compile monthly completeness information from sampling records (e.g., Sample Tracking Logbook, Sampling Data Sheets, Chain of Custody records, etc.).

8.1.3 Log required information on sample completion report.

8.1.4 When report is complete, sign and send to CI.

8.1.5 Cognizant Individual, review sample completion report.

8.1.6 Approve sample completion report with signature and date.

8.1.7 Place reports in the sample completeness report book with other monthly completion reports.

9.0 EVALUATION OF NON-TARGET VOCS

NOTE

Permit Part 4 prescribed target VOCs are listed in attachment 5. Excluding repository VOC monitoring samples from Station VOC-B and samples of the non-regulatory type, the evaluation of non-target VOCs in VOC monitoring original samples is required. Evaluations are performed and reported in conjunction with semi-annual reports as described in section 10.0.

NOTE

Non-target VOCs reported as "unknown" are not evaluated due to indeterminate identifications.

NOTE

The evaluation of non-target VOCs includes evaluation of TICs and additional requested analytes. The subcontract laboratory may be directed to add VOCs that are not specifically listed in attachment 5 to the quantitation method (i.e., laboratory's target analyte list). These are reported as additional requested analytes. Identification and reporting of these additional VOCs are not based on tentative identifications yet assumes the Permit requirements prescribed for TICs.

NOTE

The evaluation of TICs in original samples only includes those that are ≥ 10% of the area response of the relative internal standard. The analytical laboratory's quantitation software is setup to show only those TICs that meet that criterion. The evaluation of additional requested analytes in original samples only includes concentrations that are ≥ MRL. The required MRLs for additional requested analytes will be specified in the SOW for the subcontract laboratory.

9.1 Determine the 12-month timeframe for evaluation and indicate on attachment 9.

9.2 Determine the total number of applicable samples that will be evaluated and indicate on attachment 9.

NOTE

Some compounds may not be specifically listed in Appendix VIII but may fall in a category indicated as N.O.S. or not otherwise specified

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9.3 Determine if the evaluated non-targets are listed in the current edition of Appendix VIII of 40 Code of Federal Regulations [CFR] Part 261 (incorporated by reference in 20.4.1.200 NMAC) and perform **ONE** of the following:

9.3.1 **IF** none of the applicable non-targets are a listed VOC, indicate "N/A" in appropriate sections of attachment 9;
THEN GO TO step 9.7.

9.3.2 **IF** any of the reported non-targets are a listed VOC;
THEN enter the name and CAS# on attachment 9 and **GO TO** step 9.4.

9.4 Determine number of samples non-target(s) found and indicate on attachment 9.

9.5 Calculate the percentage and indicate on attachment 9.

NOTE

Non-targets detected in ≥10 percent of the original samples collected over the 12-month timeframe and listed in the current edition of Appendix VIII of 40 CFR Part 261 qualify for inclusion on the target analyte list(s) as prescribed in Permit Attachment N, section N-3b, unless an exclusion exist. TICs detected in the repository and disposal room VOC monitoring programs will be placed in the WIPP Operating Record and reported to NMED in the Semi-Annual VOC Monitoring Report.[1]

9.6 Based on the results of step 9.5, determine the final disposition of the non-target(s) and indicate on attachment 9.

9.7 Print name, sign, and date as data collector.

9.8 Provide the completed form to the EM&H Manager for independent verification of calculations and approval of determined disposition of non-target(s), as applicable.

10.0 SEMI-ANNUAL REPORTING

NOTE

Validated results of all Permit regulatory compliance VOC monitoring samples are reported to the NMED Secretary semi-annually in April and October as specified in Permit Part 4. Hydrogen and methane data are reported concurrently with reporting of VOC data.

10.1 Originator - prepare an initial draft for reporting the data and analysis of the VOC and Hydrogen and Methane Monitoring Plans to include (1) results for repository VOC monitoring target VOCs; (2) results for disposal room VOC monitoring target VOCs; (3) results for ongoing disposal room VOC monitoring target VOCs; (4) identified non-targets detected in the VOC monitoring programs; and (5) results of hydrogen and methane monitoring.

10.2 **IF** preparing the semi-annual for October,
THEN include reporting of other noncompliance as required by Permit Part 1, condition 1.7.14.

10.3 Include results of QC samples.

NOTE

All technical documents produced for the Department of Energy (DOE) are required to be submitted to the DOE's Office of Scientific and Technical Information (OSTI). Each DOE-CBFO technical document must contain an OSTI statement as prescribed in CBFO MP 4.4.

10.4 Include the required OSTI statement on the inside front cover of the report.

10.5 Prepare pertinent data for inclusion within attachments.

10.6 Obtain document number from document services and include in draft semi-annual report.

NOTE

During initial development of a Semi-annual VOC, Hydrogen, and Methane Data Summary Report, the report will be routed within the originating organization for internal review prior to the formal review process in the electronic document management system (EDMS). The reviewer(s) performing internal reviews will be technically competent in the subject area being reviewed. Reviews shall be performed by individual(s) other than the originator. Reviewers will provide written comments.

10.7 Provide initial draft report and attachment(s) to internal reviewer(s) and request a review using the following review criteria:

- Contents meet regulatory requirements for report (listed in steps 10.1 – 10.2)
- Report is technically adequate
- Report is accurate and complete
- Organization, design, and conceptual components are clear
- Arguments are amply supported by evidence
- Qualifier descriptions are included
- Normalization and emission determinations adequately explained (see attachment 11)
- QC sample results are included
- Results of evaluation of non-targets included
- Report of completeness included (calculated for the reporting period)
- Report of EDD and data package validation compliance included
- Graphics are used effectively
- Plain language is employed
- Grammar and punctuation are correct

10.8 Evaluate comments from internal reviewer(s) and make any changes as needed to the initial draft report.

NOTE

Formal reviews will be performed within the EDMS and will include technical, validation, reviews by DOE-CBFO and/or DOE-CBFO's designated reviewer(s), and Cognizant Manager. Personnel performing reviews for DOE-CBFO may enter comments within the EDMS, attach a document review record (DRR) in the EDMS system, or may submit a DRR outside the system directly to the originator. The DRRs will become part of the records package when completed (signed off).

NOTE

The linking document database (LDD) screen is the only screen required for the semi-annual report.

10.9 Process the draft report in accordance with WP15-PS3002.

NOTE

Submittals of semi-annual reports are documented via transmittal letters.

10.10 Originator - ensure final semi-annual report is submitted to NMED and copies provided to DOE-CBFO.

11.0 SOP SUBMITTAL TO NMED

NOTE

All subcontract laboratories are required to provide an initial set of applicable SOPs to EM&H. In addition, all subcontract laboratories are required to provide updates/revisions of SOPs to EM&H by December 1st of each year. The initial set and all updates/revisions will be maintained in the WIPP operating record and will be submitted to DOE-CBFO and NMED. If SOPs contain proprietary information, copies of SOPs can be provided with the proprietary portions of the procedures blacked out. All SOPs must be made available for viewing at laboratory and by secure internet portal as requested without any blackouts.

11.1 Perform the following, as applicable:

- For an initial set of applicable SOPs, prepare transmittal letters, descriptive outline or summary of SOPs, electronic attachments or hard copies of SOPs, and provide to DOE-CBFO and NMED for information purposes.

- For updated/revised SOPs, prepare transmittal letters, descriptive outline or summary of SOPs, electronic attachments or hard copies of SOPs, and provide annually to DOE-CBFO by December 15th and NMED by December 31st of each year.

- For SOPs that have not been revised, prepare transmittal letters that indicate no revisions, descriptive outline or summary of SOPs, and provide annually to DOE-CBFO by December 15th and NMED by December 31st of each year.

Attachment 1 – VOC Data Validation Checklist

Data Package # ______________

HOLDING TIMES (step 2.2.1)	YES	NO
Were the sample(s) analyzed within 30 days of collection?		
Were the analysis and sample collection date(s) reported correctly?		

GC/MS INSTRUMENT PERFORMANCE CHECK (step 2.2.2)	YES	NO
Was an instrument performance check using BFB performed initially and every 24 hours thereafter during calibration and sample analysis?		
Did the GC/MS instrument meet the BFB key ions and abundance criteria?		
Were the mass assignments correct?		

INITIAL CALIBRATION (step 2.2.3)	YES	NO
Were a minimum of five (5) different concentrations used for calibration of each target analyte?		
Did the calibration include all of the VOC target analytes and any additional requested analytes?		
Was the scan range of the GC/MS at least 35 to 300 atomic mass units?		
For each target analyte, was the lowest concentration used for calibration ≤ required MRL specified in SOW?		
Were the RSDs of the RRFs ≤30 percent for target analytes?		
Was the percent area response change (%ARC) at each calibration level within ± 40% of the mean area response over the initial calibration range for each internal standard?		
Did recalculated RRFs agree with analytical laboratory reported values?		
Did recalculated percent RSDs agree with analytical laboratory reported values?		

DAILY CALIBRATION (step 2.2.4)	YES	NO
Was a midpoint standard analyzed initially and at least once every 24-hour time period of operation?		
Did the RRF of each target analyte in the midpoint standard meet the precision criteria of ≤ 30 percent difference (%D or %Dev) from the mean RRF from the initial calibration?		

Attachment 1 – VOC Data Validation Checklist

Data Package # ______________

METHOD BLANKS (step 2.2.5)	YES	NO
Was a method blank analyzed initially and at least once every 24-hour time period of operation?		
Did the blank meet technical acceptance criteria as specified in SOW?		

SAMPLE ANALYSIS (step 2.2.6)	YES	NO
Were the samples analyzed after and within 24 hours of meeting the BFB tuning criteria?		
Were the samples analyzed after and within 24 hours of an acceptable daily calibration and method blank?		
Were target analytes in the sample introduced to the analytical instrument within the calibration range of the analytical method?		
Was the correct initial calibration quantitation method used to quantify each sample?		
Were the sample dilution factors correct?		
Were sample(s) analyzed within one year of the MDL date?		
Do the EDD results match the reported results in the data package?		

LABORATORY AND FIELD PRECISION (step 2.2.7)	YES	NO
Did the laboratory analyze the appropriate number of laboratory control samples and duplicates?		
Did the laboratory duplicate analysis results meet the precision objective of ≤25 RPD (only applicable if one or both values not flagged "U" or "J"?		
When included in the batch, did the field duplicate results meet the precision objective of ≤35 RPD (only applicable if one or both values not flagged "U" for "J")?		
Did recalculated RPDs agree with the analytical laboratory reported values?		

LABORATORY CONTROL SAMPLE ACCURACY (step 2.2.8)	YES	NO
Was the LCS/LCSD from a second source standard containing all target analytes and analyzed with each batch of samples?		
Did the LCS/LCSD recoveries meet the accuracy objective of 60-140 percent recovery?		
Did recalculated percent recoveries agree with the analytical laboratory reported values?		

Attachment 1 – VOC Data Validation Checklist

Data Package # ______________

INTERNAL STANDARD RESPONSES AND RETENTION TIMES (step 2.2.9)	YES	NO
Was the volume of internal standard, added in all field and QC analyses, the same from run to run?		
Were the area responses for each internal standard within 60-140 percent of the area responses from the daily calibration for all field and QC analyses?		
Were the retention times of each internal standard within 0.33 minutes (20 seconds) of the retention time from the daily calibration for all field and QC analyses?		

TENTATIVELY IDENTIFIED COMPOUNDS (step 2.2.10)	YES	NO
Was a library search of the reference mass spectral library performed on unclassified non-target peaks in the method blanks and samples?		
Were the VOCs identified in the library search classified as TICs and reported with appropriate qualifiers?		

DATA PACKAGE CHECKLIST CLOSEOUT (step 2.3)	YES	NO
Are the data acceptable for the intended purpose? If no, inform subcontract laboratory AND Cognizant Manager of problems or deficiencies.		
Are all items on this checklist indicated with a check mark (✓) or marked with **N/A**?		
Are all printed worksheets signed and dated?		
Are the validation worksheets and e-mail contents combined with the data package for filing?		

If applicable, explain any difficulties/qualifications associated with the VOC data, or remark on nonconforming items:

Printed Name Signature Date

Attachment 2 – Hydrogen and Methane Data Validation Checklist

Data Package # ___________________

HOLDING TIMES (step 3.2.1)	YES	NO
Were the sample(s) analyzed within 30 days of collection?		
Were the analysis and sample collection date(s) reported correctly?		

INITIAL CALIBRATION (step 3.2.2)	YES	NO
Were a minimum of three (3) different concentrations used for calibration of each target analyte?		
Did the calibration include both hydrogen and methane?		
For each target analyte, was the lowest concentration used for calibration ≤ required MRL specified in SOW?		
Were the RSDs of the RFs ≤ 30 percent?		
Did recalculated RFs agree with the analytical laboratory reported values?		
Did recalculated percent RSDs agree with analytical laboratory reported values?		

DAILY CALIBRATION (step 3.2.3)	YES	NO
Was a midpoint standard analyzed initially and at least once every 24-hours time period of operation?		
Were the retention times of hydrogen and methane in the midpoint standard within 0.075 minutes (4.5 seconds) of the mean retention times from the initial calibration?		
Did the RFs of hydrogen and methane in the midpoint standard meet the precision criteria of ≤ 30 percent difference (%D or %Dev) from the mean RF from the initial calibration?		

METHOD BLANKS (step 3.2.4)	YES	NO
Was a method blank analyzed initially and at least once every 24-hour time period of operation?		
Did the blank meet technical acceptance criteria, as specified in SOW?		

Attachment 2 – Hydrogen and Methane Data Validation Checklist

Data Package # ___________________

SAMPLE ANALYSIS (step 3.2.5)	YES	NO
Were the samples analyzed after and within 24 hours of an acceptable daily calibration and method blank?		
Were target analytes in the sample introduced to the analytical instrument within the calibration range of the analytical method?		
Was the correct initial calibration quantitation method used to quantify each sample?		
Were sample dilution factors correct?		
Were the sample(s) analyzed within one year of the MDL date?		
Do the EDD results match the reported results in the data package?		

LABORATORY AND FIELD PRECISION (step 3.2.6)	YES	NO
Did the laboratory analyze the appropriate number of laboratory control samples and duplicates?		
Did the laboratory duplicate analysis results meet the precision objective of ≤ 25 RPD (only applicable if one or both values not flagged "U" or "J")?		
When included in the batch, did the field duplicate results meet the precision objective of ≤35 RPD (only applicable if one or both values not flagged "U" or "J")?		
Did recalculated RPDs agree with the analytical laboratory reported values?		

LABORATORY CONTROL SAMPLE ACCURACY (step 3.2.7)	YES	NO
Was the LCS/LCSD from a second source standard containing all target analytes and analyzed with each batch of samples?		
Did the LCS/LCSD recoveries meet the accuracy objective of 70-130 percent recovery for both hydrogen and methane?		
Did recalculated percent recoveries agree with the analytical laboratory reported values?		

Attachment 2 – Hydrogen and Methane Data Validation Checklist

Data Package # ___________________

DATA PACKAGE CHECKLIST CLOSEOUT (step 3.3)	YES	NO
Are the data acceptable for the intended purpose? If no, inform subcontract laboratory AND Cognizant Manager of problems or deficiencies.		
Are all items on this checklist indicated with a check mark (✓) or marked with **N/A**?		
Are all printed worksheets signed and dated?		
Are the validation worksheets and e-mail contents combined with the data package for filing?		

If applicable, explain any difficulties/qualifications associated with the hydrogen/methane data, or remark on nonconforming items:

Printed Name Signature Date

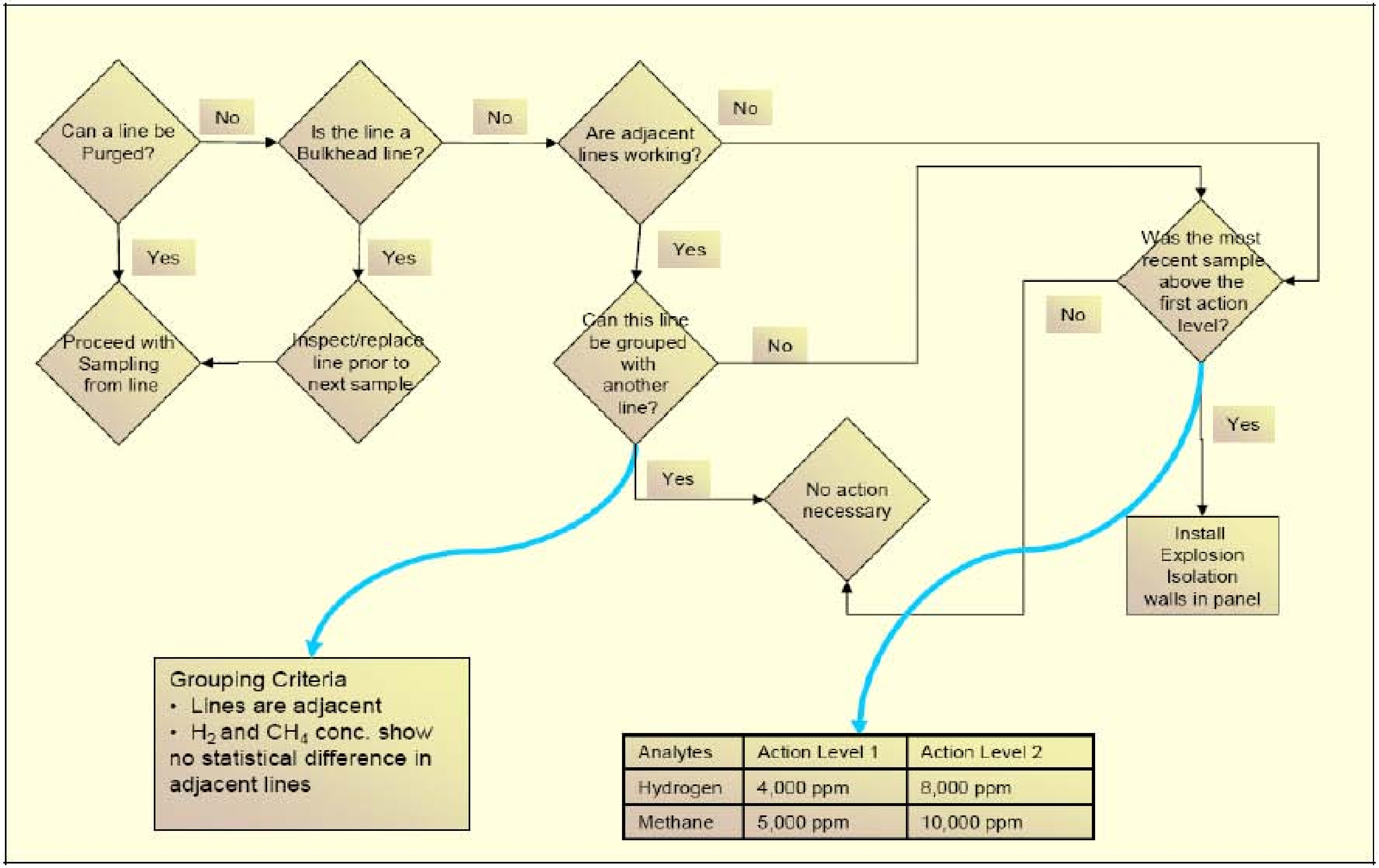
Attachment 3 – EDD Review and Data Package Validation Table

Data Package #	**Date of EDD Receipt**	**EDD Review Due Date**	**Date of EDD Review**	***Results of EDD review indicate possible exceedance.**		**Data Package Receipt Date**	**Data Package Validation Due Date**	**Data Package Validation Date**	**Initials**
				Yes	**No**				

*For repository VOC monitoring samples, with target analyte(s) reported by the analytical laboratory at ≥ 1/3 of the respective COC shown in attachment 5, results reported on the EDD are normalized as prescribed by the Permit to determine the possibility of an exceedance. Normalized results are not logged but only used to make a determination of a possible exceedance of the Underground HWDU VOC emission concentration in order to determine the timeline for data package validation.

Reviewed by:________________________/____________________________/______________
Printed Name Signature Date

Attachment 4 – Logic Diagram for Evaluating Sample Line Loss



Grouping Criteria
- Lines are adjacent
- H_2 and CH_4 conc. show no statistical difference in adjacent lines

Analytes	Action Level 1	Action Level 2
Hydrogen	4,000 ppm	8,000 ppm
Methane	5,000 ppm	10,000 ppm

Note: ppm indicated here is specifically ppmv.

Attachment 5 – COCs and Action Levels Prescribed in Permit Part 4

REPOSITORY CONCENTRATIONS OF CONCERN (COCs)

	COCs (ppbv)
Carbon Tetrachloride	960
Chlorobenzene	220
Chloroform	180
1,1-Dichloroethylene	100
1,2-Dichloroethane	45
Methylene Chloride	1,930
1,1,2,2-Tetrachloroethane	50
Toluene	190
1,1,1-Trichloroethane	590

ppbv = parts per billion by volume

ACTION LEVELS FOR DISPOSAL ROOM MONITORING

Compound	50% Action Level for VOC Constituents of Concern in Any Closed Room, ppmv	95% Action Level for VOC Constituents of Concern in Active Open or Immediately Adjacent Closed Room, ppmv
Carbon Tetrachloride	4,813	9,145
Chlorobenzene	6,500	12,350
Chloroform	4,965	9,433
1,1-Dichloroethylene	2,745	5,215
1,2-Dichloroethane	1,200	2,280
Methylene Chloride	50,000	95,000
1,1,2,2-Tetrachloroethane	1,480	2,812
Toluene	5,500	10,450
1,1,1-Trichloroethane	16,850	32,015

HYDROGEN AND METHANE ACTION LEVELS

Analyte	Action Level 1	Action Level 2
Hydrogen	4,000 ppmv	8,000 ppmv
Methane	5,000 ppmv	10,000 ppmv

ppmv = parts per million by volume

Attachment 6 – Vacuum/Pressure Comparison between Field and Laboratory Receipt

Sample #	Canister #	Field	Laboratory	Difference	Acceptable for Use		Initials
					Yes	No	
		V / P	V / P				
		V / P	V / P				
		V / P	V / P				
		V / P	V / P				
		V / P	V / P				
		V / P	V / P				
		V / P	V / P				
		V / P	V / P				
		V / P	V / P				
		V / P	V / P				
		V / P	V / P				
		V / P	V / P				
		V / P	V / P				
		V / P	V / P				
		V / P	V / P				
		V / P	V / P				
		V / P	V / P				
		V / P	V / P				
		V / P	V / P				

(V) Vacuum (inHg) - Subatmospheric Sampling
(P) Pressure (psig) - Pressurized Sampling

Form Completeness and Validation:

_______________________/_______________________/_______________
Printed Name Signature Date

Attachment 7 – Data Qualifiers

Data Qualifiers

Following is a list of data qualifiers that may be used by the analytical laboratory and/or data reviewer.

U - Indicates target analyte was analyzed for but not detected above MDL.

J - Estimated value; the target analyte was detected at a concentration below the MRL but above the MDL.

B - This flag is used when the analyte is found in the associated laboratory method blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action. This flag must be used for a TIC as well as for a positively identified target analyte.

R - Sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte may or may not be present in the sample. This qualifier may also be used for data anomalies.

Q - Results are useable, but were not associated with analyses that met all QA/QC requirements for precision, accuracy, or completeness.

E - This flag identifies compounds that were introduced to the analytical system at a concentration that exceeded calibration range.

NJ - Presumptive evidence of the presence of the material at an estimated quantity. Only used for TICs.

V - Sampling and analytical processes met all QA/QC requirements but ventilation data used for normalizing repository VOC monitoring results determined as insufficient. The concentration results reported are a conservative estimate.

Attachment 8 – Alternate Total Ventilation Rate Calculation

Sample Date:__________

Ventilation Mode	**Ventilation Rate in kscfm**	**Minutes in Mode**	**Volume of Air for Mode [1] in kscf**
Normal	425		
Alternate	260		
Maintenance Bypass [2]			
Reduced	120		
Minimum	60		
Filtration	60		
Total Volume			kscf
[3] Total Flow Ventilation Rate:		kscfm	

Remarks:

Data Collector:

Print Name Signature Date

Reviewed by:

Print Name Signature Date

1 Volume of Air for Mode = ventilation rate x minutes in mode
2 TBD based on fan configuration, Range – 260 to 425 kscfm
3 Total Flow Ventilation Rate = Total Volume / 360 min. (Programmed 6-hour sampling event)

Attachment 9 – Evaluation of Non-target VOCs

Evaluation of Non-target VOCs			
12-Month timeframe:			
Total number of compliance samples evaluated:			
Non-target*	**CAS #**	**# of Samples Found**	**Calculated Percentage**
Determined disposition of non-target(s):			

Data Collector:

Print Name Signature Date

EM&H Manager:

Print Name Signature Date

* Does not include Station VOC-B samples and only includes VOCs listed in the current edition of Appendix VIII of 40 Code of Federal Regulations [CFR] Part 261 (incorporated by reference in 20.4.1.200 NMAC). Non-targets may include additional requested analytes and/or TICs.

Attachment 10 – BFB Key Ions and Abundance Criteria

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

Attachment 11 – Normalization and Emission Determinations for Repository VOC Monitoring Reporting

For Permit-specified target analytes:

Analytical results not qualified as "U" are normalized to the typical operating conditions, in accordance with Permit Attachment N, section N-3e(1). The normalized concentration of each target VOC detected at Station VOC-B is subtracted from the normalized concentration detected at Station VOC-A and the difference is the Underground HWDU VOC emission concentration. The resulting concentration for each target analyte is compared to its COC listed in the WIPP RCRA Permit Part 4, table 4.6.2.3.

Results qualified as "U" indicate that the laboratory’s quantitative results were not greater than the method detection limit (MDL) and are assigned a value of zero for determination of emission concentrations.

Analytical results qualified as "J" indicate that the laboratory’s quantitative results were at a concentration greater than the MDL but less than the laboratory’s method reporting limit (MRL). Results qualified as "J" are normalized but are considered to be estimated values and are assigned a value of zero for determination of emission concentrations.

When the normalized concentration at Station VOC-A is less than Station VOC-B, the emission concentration is reported as zero.

The running annual average concentration for each target VOC is determined, in accordance with Permit Attachment N section N-3e(1), by averaging the Underground HWDU VOC emission concentration for each target VOC for each sampling event with concentrations for the previous 12 months. The running annual average concentrations are compared to the COC listed in Permit Part 4, table 4.6.2.3.

Effective Date: 12/17/12

WP 12-VC.01
Revision 11

Volatile Organic Compound Monitoring Plan

Cognizant Section: Environmental Monitoring and Hydrology

Approved By: Rick Salness

NWP
Nuclear Waste Partnership LLC

A URS-led partnership with B&W and AREVA

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHANGE HISTORY SUMMARY

REVISION NUMBER	DATE ISSUED	DESCRIPTION OF CHANGES
8	07/15/10	• Changed from 12-hour period to 24-hour period in second paragraph of step 5.1.3 • Changed Carbon Tetrachloride concentrations in Table 3
9	08/30/10	• Removed Confirmatory from the title • Added to the Acronym and Abbreviations list • Changed reference to Table 3 to Table 1 in steps 2.0, 3.8.1, 3.8.2, and 4.1.1 • Changed wording in steps 3.1, 3.2, 3.8.1, 4.1.1, 4.1.2, 4.1.3, 4.2, 5.1.3, 5.5 for clarification • Corrected errors in dates for references in steps 5.0 and 5.1.1 • Changed Completeness percent from 95 to 90 in Table 2
10	12/29/10	• Added HWFP to the Acronym List • Removed wording on baseline VOC monitoring in last paragraph from step 1.1 • Removed Note from step 1.2 • Made last bullet of step 1.1 into a note at beginning of the step • In step 5.1.2 changed wording to define which rooms samples will be collected • Added wording “at least” to percentages in steps 5.1.1 through 5.1.3 • Added ≤ symbol to steps 5.1.3 and 5.7 in front of percentages and in Table 2 in front of 25, 35, and 95 • Added ≥ symbol step 5.7 - in front of 95 percent • Removed reference to RCRA, Part B • For the HWFP renewal: — Changed all references to condition 1.D.3 to section 1.5.3 — Changed all references Module IV - to Part 4 — Changed all references to Condition IV.F.2.d to section 4.6.2.4 — Changed all references to Condition IV.F.3.c to section 4.6.3.3 — Changed all references to Condition IV.F.2.b to section 4.6.2.2

11	12/17/12	• Provided clarification of program language, removed unnecessary detail and made editorial changes/corrections • Editorial changes include: — Clarification on filled panel monitoring requirements was provided in section 1.2. — Clarification on sequence for installing sample heads was provided in section 3.1.2. — Clarification on handling of non-targets in section 3.2. — Globally changed the specification SUMMA® - type canisters to passivated canisters • The major changes are: — Provided flexibility to add additional requested analytes to laboratory target analyte list in section 3.2. — Updated canister cleaning certification criterion to <0.2 ppbv for target VOCs in section 4.1.1. — Provided flexibility to use a multi-point calibration that may be greater than five points in section 5.1.3. — Flexibility for using electronic records in section 5.8.

ABBREVIATIONS, ACRONYMS, AND UNITS

ARA	additional requested analyte
BFB	bromofluorobenzene
BS/BSD	blank spike/blank spike duplicate
CAS#	Chemical Abstracts Service registry number
CFR	Code of Federal Regulations
CH	contact-handled
COC	concentration of concern
CRQL	contract-required quantitation limit
DOE	U.S. Department of Energy
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
ft	feet
GC/MS	gas chromatography/mass spectrometry
HWDU	Hazardous Waste Disposal Unit (panel)
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
m	meter
MDL	method detection limit
MOC	Management and Operating Contractor
MRL	method reporting limit
NIST	National Institute of Standards and Technology
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
Permit	Hazardous Waste Facility Permit, NM4890139088-TSDF
ppbv	parts per billion by volume
ppmv	parts per million by volume
QA	quality assurance
QAPjP	Quality Assurance Project Plan
QC	quality control
RCRA	Resource Conservation and Recovery Act

RFA	request for analysis
RH	remote-handled
RPD	relative percent difference
scfm	standard cubic feet per minute
SOP	standard operating procedure
TIC	tentatively identified compound
TRU	transuranic
VOC	volatile organic compound
WIPP	Waste Isolation Pilot Plant

1.0 INTRODUCTION [1]

This document describes the plan for disposal phase monitoring of volatile organic compounds (VOCs) at the U.S. Department of Energy (DOE) Waste Isolation Pilot Plant (WIPP). The purpose of VOC monitoring is to ensure compliance with the VOC limits specified in the Hazardous Waste Facility Permit (Permit) Part 4. This VOC monitoring plan consists of two programs as follows: (1) Repository VOC Monitoring Program, which assesses compliance with the environmental performance standards; and (2) Disposal Room VOC Monitoring Program (includes ongoing disposal room VOC monitoring), which assesses compliance with the disposal room performance standards. This plan includes the monitoring design, a description of sampling and analysis procedures, quality assurance (QA) objectives, and reporting activities.

1.1 Background [2]

The WIPP facility includes a mined geologic repository located approximately 2,150 feet (ft) (655 meters [m]) below ground surface within a bedded salt formation. The repository's underground structures for disposal of transuranic (TRU) mixed waste that may contain VOCs include the Underground Hazardous Waste Disposal Units (Underground HWDUs). As defined for the Permit, an Underground HWDU is a single excavated panel consisting of seven rooms and two access drifts designated for disposal of contact-handled (CH) and remote-handled (RH) TRU mixed waste. Each disposal room is approximately 300 ft (91 m) long, 33 ft (10 m) wide, and 13 ft (4 m) high. Access drifts connect the rooms and have the same cross section. The Permittees shall dispose of TRU mixed waste in Underground HWDUs designated as Panels 1 through 8.

This plan addresses the following elements:

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

   - Possible pathways from WIPP during the active life of the facility
   - Demonstrating compliance with the disposal room performance standards by monitoring VOCs in Underground HWDUs
   - VOC sampling operations at WIPP
   - Optimum locations for sampling

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

   - The type of monitoring conducted
   - Sampling locations
   - The monitoring interval

- The specific hazardous constituents monitored
- VOC monitoring schedule
- Sampling equipment
- Sampling and analytical techniques
- Data recording/reporting procedures
- Action levels for remedial action

The technical basis for disposal room VOC monitoring is discussed in detail in the Technical Evaluation Report for WIPP Room-Based VOC Monitoring (Washington Regulatory and Environmental Services, 2003).

Compliance with the disposal room performance standards shall be demonstrated exclusively by monitoring airborne volatile organic compounds in underground disposal rooms in which waste has been emplaced until panel closure.[2]

1.2 Objectives of the VOC Monitoring Plan

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

- VOCs released from waste panels will be monitored to confirm that the running annual average concentration of VOCs in the air emissions from the Underground HWDUs do not exceed the VOC concentrations of concern (COC) identified in table 3. Appropriate remedial action, as specified in Permit Part 4, section 4.6.2.4, will be taken if the limits in table 3 are reached.

- VOCs released from waste containers in disposal rooms of active waste panels 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 table 3. Appropriate remedial action, as specified in Permit Part 4, section 4.6.3.3, will be taken if the original sample results are greater than or equal to the action levels in table 4.

- VOCs released from waste containers will be monitored in Room 1 of a filled panel that requires monitoring as prescribed in Permit Part 4, section 4.4.3, to confirm that the concentration of VOCs in the air do not exceed the VOC disposal room limits identified in table 3. Appropriate remedial action, as specified in Permit Part 4, section 4.6.3.3 and attachment G, section G-1d (1), will be taken if the original sample results are greater than or equal to the action levels in table 4.

2.0 TARGET VOCS

The target VOCs for repository VOC monitoring (Stations VOC-A and VOC-B) and disposal room VOC monitoring are presented in table 1.

These target VOCs were selected because together they represent approximately 99 percent of the risk due to air emissions.

3.0 MONITORING DESIGN

Detailed design features of this plan are presented in this section. This plan uses available sampling and analysis techniques to monitor VOC concentrations in air. Sampling equipment includes VOC Samplers, the sample collection units used for repository VOC monitoring and disposal room VOC monitoring in active (open) panels and the subatmospheric sampling assembly, the sample collection unit for ongoing disposal room VOC monitoring. These sample collection units and other sampling equipment are described in greater detail in section 4.1.

3.1 Sampling Locations

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

3.1.1 Sampling Locations for Repository VOC Monitoring

An example of repository VOC monitoring configuration is shown in figure 2. Mine ventilation air which could potentially be impacted by VOC emissions from the Underground HWDUs identified as Panels 1 through 8 will pass monitoring Station VOC-A, located in the E-300 drift as it flows to the Exhaust Shaft. Air samples will be collected at two locations in the facility to quantify VOCs in the ambient mine air (repository VOC concentrations). VOC concentrations attributable to VOC emissions from open and closed panels containing TRU mixed waste will be monitored by placing one VOC monitoring station just downstream from Panel 1 at VOC-A. The location of Station VOC-A will remain the same throughout the term of the Permit. The second station, Station VOC-B, will always be located upstream from the open panel being filled with waste. In this configuration, Station VOC-B will be used to monitor VOC concentrations attributable to releases from the upstream sources and other background sources of VOCs, but not releases attributable to open or closed panels. The location of Station VOC-B will change when disposal activities begin in the next panel. Station VOC-B will be relocated to ensure that it is always upstream of the open panel that is receiving TRU mixed waste. Station VOC-A will collect the upstream VOC concentrations collected at Station VOC-B, plus any additional VOC concentrations resulting from releases from the closed and open panels. A sample will be collected from each monitoring station on designated sample days. For each quantified target

VOC, the concentration at Station VOC-B will be subtracted from the concentration at Station VOC-A to assess the magnitude of VOC releases from closed and open panels.

The sampling locations were selected based on operational considerations. There are several different potential sources of release for VOCs into the WIPP mine ventilation air. These sources include incoming air from above ground and facility support operations, as well as open and closed waste panels. In addition, because of the ventilation requirements of the underground facility and atmospheric dispersion characteristics, any VOCs that are released from open or closed panels may be difficult to detect and differentiate from other sources of VOCs at any underground or above ground location further downstream of Panel 1. By measuring VOC concentrations close to the potential source of release (i.e., at Station VOC-A), it will be possible to differentiate potential releases from background levels (monitored at Station VOC-B).

3.1.2 Sampling Locations for Disposal Room VOC Monitoring

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

1. Excluding Room 1, sample heads will be installed for each disposal room behind the designated ventilation barrier at the exhaust and inlet side of the disposal rooms. For Room 1, a sample head will be installed only at the exhaust location.

2. TRU mixed waste will be emplaced in the active disposal room.

3. VOC monitoring will begin at the exhaust side within two weeks of waste emplacement in an active room.

4. When an active room is filled, a ventilation barrier will be installed in the active disposal room's exhaust drift. Another ventilation barrier will be installed in the active disposal room's air inlet drift, thereby closing that active disposal room. As required below, VOC monitoring will begin at the inlet side of the disposal room within two weeks of closure.

5. Monitoring of VOCs will occur in the active disposal room and all closed disposal rooms in which waste has been emplaced until commencement of panel closure activities (i.e., completion of ventilation barriers in Room 1) as described in Permit attachment G, section G-1d(1).

Figures 3 and 4 show disposal room sample head arrangement and example of disposal room VOC monitoring locations, respectively.

3.1.3 Sampling Locations for Ongoing Disposal Room VOC Monitoring in Panels 3 Through 8

The Permittees shall continue VOC monitoring in Room 1 of filled Panels 3 through 8 until final panel closure unless an explosion-isolation wall is installed in the panel. A filled panel is an Underground HWDU that will no longer receive waste for emplacement.

3.2 Analytes to Be Monitored

The nine VOCs that have been identified for repository and disposal room VOC monitoring are listed in table 1. The analysis will focus on routine detection and quantification of these target analytes in collected samples. As part of the analytical evaluations, the presence of other compounds (i.e., non-target VOCs) will also be monitored. Some non-targets may be included on the laboratory's target analyte list as additional requested analytes (ARA) to gain a better understanding of potential concentrations and associated risk. The analytical laboratory will be directed to calibrate for ARAs when requested, and classify and report other non-target VOCs as Tentatively Identified Compounds (TICs), if tentative identification can be made. The evaluation of TICs in original samples will include those concentrations that are ≥10% of the relative internal standard. The evaluation of ARAs only includes concentrations that are ≥ the method reporting limit (MRL). The required MRLs for ARAs will be U.S. Environmental Protection Agency (EPA)-specified levels of quantitation proposed for EPA contract laboratories that analyze canister samples by gas chromatography/mass spectrometry (GC/MS) (EPA, 1991).

Non-targets classified as ARAs or TICs that meet the following criteria: (1) are VOCs listed in Appendix VIII of 40 Code of Federal Regulations [CFR] Part 261 (incorporated by reference in 20.4.1.200 NMAC), and (2) detected in 10 percent or more of any original VOC monitoring samples (exclusive of those collected from Station VOC-B), collected over a 12-month time frame, will be added, as applicable, to the analytical laboratory target analyte lists for both the repository and disposal room VOC monitoring programs, unless the Permittees can justify the exclusion from the target analyte list(s). Non-target VOCs reported as "unknown" by the analytical laboratory are not evaluated due to indeterminate identifications.

Additional requested analytes and TICs detected in the repository and disposal room VOC monitoring programs will be placed in the WIPP Operating Record and reported to New Mexico Environment Department (NMED) in the Semi-Annual VOC Monitoring Report as specified in Permit Part 4, section 4.6.2.2. As applicable, the Permittees will also report the justification for exclusion from the target analyte list(s).

3.3 Sampling and Analysis Methods

The VOC monitoring programs include a comprehensive VOC monitoring program established at the facility; equipment, training, and documentation are already in place.

The sampling methods used for VOC monitoring are based on the concept of pressurized and subatmospheric sample collection contained in the U.S. Environmental Protection Agency (EPA) Compendium Method TO-15 (EPA, 1999). The pressurized sampling method uses VOC Samplers and 6-liter passivated stainless-steel canisters to collect 6-hour time-integrated or time-weighted average air samples for repository VOC monitoring and disposal room VOC monitoring in active (open) panels. Sampling for ongoing disposal room VOC monitoring also uses 6-liter passivated stainless-steel canisters but are short duration samples collected with a subatmospheric sampling assembly. This TO-15 method will be used as a reference for collecting the samples at WIPP. The samples will be analyzed using gas chromatography/mass spectrometry (GC/MS) under an established QA/Quality Control (QC) program. Laboratory analytical procedures have been developed based on the concepts contained in both TO-15 and 8260B. Section 5.0 contains additional QA/QC information for this project.

The TO-15 method is an EPA-recognized sampling concept for VOC sampling and speciation. It can be used to provide time-integrated samples or short duration samples and compound quantitation for a broad range of concentrations. This sampling technique is also viable for use while analyzing the sample using other EPA methods, such as 8260B.

The VOC Samplers will be operated in the pressurized mode. In this mode, air is drawn through the inlet and sampling system with a pump. The air is pumped into an initially evacuated passivated canister by the sampler, which regulates the rate and duration of sampling (see figure 1). The air will pass through two particulate filters installed in dual in-line filter holders to prevent sample and equipment contamination and for radiation assessment of sampling equipment, as needed. The use of passive tubing and canisters for VOC sampling inhibits adsorption of compounds on the surfaces of the equipment. By the end of each sampling period, the canisters will be pressurized to about two atmospheres absolute. In the event of shortened sampling periods or other sampling conditions, the final pressure in the canister may be less than two atmospheres absolute. Sampling duration will be approximately six hours, so that a complete sample can be collected during a single work shift.

The VOC Sampler and GC/MS analytical method are particularly appropriate for the VOC monitoring programs because a relatively large sample volume is collected, and multiple dilutions and analyses can occur to ensure identification and quantification of target VOCs within the working range of the method. The contract-required quantitation limits (CRQLs) for repository VOC monitoring are 5 parts per billion by volume (ppbv) or less for the nine target compounds. Consequently, low concentrations can be measured. CRQLs are the EPA-specified levels of quantitation proposed for EPA contract laboratories that analyze canister samples by GC/MS (EPA, 1991). The CRQLs for disposal room VOC monitoring are 500 parts per billion-volume (ppbv) (0.5 parts per million-volume (ppmv) to allow for sub-ppmv quantitation. For the purpose of this plan, the CRQLs will be defined as the method reporting limits (MRLs). The MRL is a function of instrument performance, sample preparation, sample dilution, and all steps involved in the sample analysis process.

Disposal room VOC monitoring in active (open) panels employ VOC Samplers for sample collection. Passivated sample lines will be installed in the disposal room as described in section 3.1.2 and maintained once the room is closed until the panel associated with the room is closed. The independent lines will run from the sample inlet point (sample head arrangement shown in figure 3) to a VOC Sampler located in an area accessible to sampling personnel. Ongoing disposal room VOC samples in filled panels will be collected using the subatmospheric short duration sampling technique. This method uses an evacuated passivated canister that is under vacuum to draw the air sample from the sample lines into the canister. The sample lines will be purged prior to sampling to ensure that a representative sample is collected. By the end of each sampling period, the canisters will be near atmospheric pressure.

3.4 Sampling Schedule

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

3.4.1 Sampling Schedule for Repository VOC Monitoring

Repository VOC sampling at Stations VOC-A and VOC-B began with initial waste emplacement in Panel 1. Sampling will continue until the certified closure of the last Underground HWDU. Routine collection of a 6-hour time-integrated sample at Stations VOC-A and VOC-B will be conducted two times per week.

3.4.2 Sampling Schedule for Disposal Room VOC Monitoring and Ongoing Disposal Room VOC Monitoring

Disposal room VOC monitoring in open panels will occur once every two weeks, unless the need to increase the frequency to weekly occurs in accordance with Permit Part 4, section 4.6.3.3.

Ongoing disposal room VOC monitoring in filled panels will occur monthly until final panel closure, unless an explosion-isolation wall is installed. The Permittees will sample VOCs in Room 1 of panels requiring monitoring.

3.5 Data Evaluation and Reporting

Validation of sampling data and validation time-frame is discussed in section 5.4. The following sections detail the actions required after data is validated.

3.5.1 Data Evaluation and Reporting for Repository VOC Monitoring

When the Permittees receive laboratory analytical data from an air sampling event, the data will be validated as specified in section 5.4. After obtaining validated data from an original repository VOC monitoring sample obtained during an air sampling event, the data will be evaluated to determine whether the VOC emissions from the Underground HWDUs exceed the COCs. The COCs for each of the nine target VOCs are presented in table 3. The values are presented in terms of micrograms per cubic meter ($\mu g/m^3$) and ppbv.

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

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

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

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

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

Where: $NVOC_{AB}$ = Normalized target VOC concentration from Station VOC-A or VOC-B
VOC_{AB} = Concentration of the target VOC detected at Station VOC-A or VOC-B under non-typical mine ventilation rates
scfm = Standard cubic feet per minute
Vo = Sampling event overall mine ventilation rate (in scfm)
$V_{E\text{-}300}$ = Sampling event mine ventilation rate through the E-300 drift (in scfm)

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

The Underground HWDU VOC emission concentration for each target VOC that is calculated for each sampling event will be compared directly to its COC listed in table 3. This will establish whether any of the concentrations of VOCs in the emissions from the Underground HWDUs exceeded the COCs at the time of the sampling.

As specified in Permit Part 4, the Permittees shall notify the Secretary in writing, within seven calendar days of obtaining validated analytical results, whenever the concentrations of any target VOC listed in table 1 exceeds the COC specified in table 3.

The Underground HWDU VOC emission concentration for each target VOC that is calculated for each sampling event will then be averaged with the Underground HWDU VOC emission concentrations calculated for the air sampling events conducted during the previous 12 months (e.g., the results of a sampling event occurring on 10/27/2010 would be averaged with the results of all sampling events to and including the date 10/28/2009). This will be considered the running annual average concentration for each target VOC. For the first year of air sampling, the running annual average concentration for each target VOC will be calculated using all the previously collected data.

As specified in Permit Part 4, the Permittees shall notify the Secretary in writing, within seven calendar days of obtaining validated analytical results, whenever the running annual average concentration (calculated after each sampling event) for any target VOC exceeds the COC specified in table 3. Remedial action will be taken as specified in section 1.2.

If the results obtained from an individual air sampling event do not trigger the notification requirements of Permit Part 4, then the Permittees will maintain a database with the VOC air sampling data and the results will be reported to the Secretary as specified in Permit Part 4.

3.5.2 Data Evaluation and Reporting for Disposal Room VOC Monitoring and Ongoing Disposal Room VOC Monitoring

When the Permittees receive laboratory analytical data from an air sampling event, the data will be validated as specified in section 5.4. After obtaining validated data from an air sampling event, the data will be evaluated to determine whether the VOC concentrations in the air of any closed room, the active open room, or the immediately adjacent closed room of an active (open) panel and Room 1 of a filled panel exceeded the action levels in table 4.

The Permittees shall notify the Secretary in writing, within seven calendar days of obtaining validated analytical results, whenever the concentration of any VOC specified in table 1, exceeds the action levels specified in table 4. Remedial action will be taken as specified in section 1.2.

The Permittees shall report disposal room VOC monitoring and ongoing disposal room VOC monitoring results to the Secretary in the Semi-Annual VOC Monitoring Report specified in Permit Part 4, section 4.6.2.2

4.0 SAMPLING AND ANALYSIS PROCEDURES

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

4.1 Sampling Equipment

The sampling equipment that will be used includes the following: 6-liter stainless-steel passivated canisters, sample collection units, passivated stainless-steel tubing, and dual in-line stainless steel filter holders. A discussion of each of these items is presented below.

4.1.1 Sample Canisters

Six-liter, stainless-steel canisters with passivated interior surfaces will be used to collect and store all ambient air and disposal room samples for VOC analyses collected as part of the monitoring processes. These canisters will be cleaned and certified (batch certification acceptable) prior to their use, in a manner similar to that described by EPA

Compendium Method TO-15. The canisters will be certified clean to below 0.2 ppbv for the target VOCs (see table 1). The vacuum of certified-clean canisters will be verified as adequate upon initiation of a sample cycle as described in sampling standard operating procedures (SOPs). The sample canisters are initially evacuated at the analytical laboratory to <0.05 mm Hg (50 mtorr).

4.1.2 Sample Collection Units

Sample collection units will use passivated components for the sample flow path. This effectively seals the inner walls and prevents sample constituents from being retained on the surfaces of the equipment. Periodic maintenance for sample collection units and associated equipment will be performed as needed. This maintenance may include, but not be limited to, cleaning, replacement of damaged or malfunctioning parts without compromising the integrity of the sample collection unit, leak testing, and calibration. Additionally, complete spare sample collection units will be maintained on-site to minimize downtime because of equipment malfunction.

VOC Samplers will be used at monitoring Stations VOC-A and VOC-B and at sampling locations for disposal room VOC monitoring of active (open) panels. The sampling unit consists of a sample pump, flow controller, sample inlet, inlet filters in series to remove particulate matter, vacuum/pressure gauge, electronic timer, inlet purge vent, two sampling ports, and sufficient collection canisters so that any delays attributed to laboratory turnaround time and canister cleaning and certification will not result in canister shortages. Knowledge of sampler flow rates and duration of sampling will allow calculation of sample volume. The set point flow rate will be verified before and after sample collection from the mass flow indication. Prior to their initial use and annually thereafter, VOC Samplers will be tested and certified to demonstrate that they are free of contamination above the reporting limits of the VOC analytical method. Ultra-high purity humidified zero air (or ultra-high purity nitrogen) will be pumped through the inlet line and VOC Sampler and collected in previously certified canisters as sampler blanks for analysis. The cleaning and certification procedure is derived from concepts contained in the EPA Compendium Method TO-15 (EPA 1999). Periodic maintenance will be performed during each cleaning cycle. At a minimum, VOC Samplers will be certified for cleanliness initially and annually thereafter upon initial use, after any parts that are included in the sample flow path are replaced, or any time analytical results indicate potential contamination. Details of certification requirements are described in monitoring plans and SOPs.

The sample collection unit for ongoing disposal room VOC monitoring samples is a designed subatmospheric sampling assembly that regulates the rate and duration of sampling into a sample canister. The design of the subatmospheric sampling assembly also allows for purging of sample lines to ensure that a representative sample is collected. The sample collected is a short duration time-integrated sample that is analyzed for VOCs and also analyzed for hydrogen and methane as required by the hydrogen and methane monitoring plan (WP 12-VC.03). The subatmospheric sampling assembly is a much simpler design that does not require cleaning certification.

4.1.3 Sample Tubing

Passivated stainless-steel tubing is used as a sample path, from the desired sample point to the sample collection unit. This tubing is passivated to prevent the inner walls from adsorbing sample constituents when they are pulled from the sample point to the sample collection unit.

4.2 Sample Collection

Six-hour time-integrated samples will be collected for each sampling event for repository VOC monitoring and disposal room VOC monitoring in active panels. Alternative sampling durations may be defined for assessment purposes and to meet the data quality objectives. The VOC Samplers at Stations VOC-A and VOC-B will sample ambient air on the same programmed schedule. The sample pump will be programmed to sample continuously over a six-hour period during the workday. The units will sample as described in sampling SOPs to yield a final sample volume of approximately 12 liters over a six-hour sample period. Flow rates and sampling duration may be modified as necessary for assessment purposes and to meet the data quality objectives.

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

Samples will be collected twice each week (at Stations VOC-A and VOC-B). Samples collected at the panel locations should represent the same matrix type (e.g., elevated levels of salt aerosols). To verify the matrix similarity and assess field sampling precision, field duplicate samples will be collected (two canisters filled simultaneously by the same sample collection unit) for each VOC monitoring program at an overall frequency of at least 5 percent (see section 5.1 for QA objective).

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

4.3 Sample Management

Field sampling data sheets will be used for each sample collected. These data sheets have been developed specifically for VOC monitoring at the WIPP facility. The individuals assigned to collect the specific samples will be required to fill in all of the appropriate sample data and to maintain this record in sample logbooks. A cognizant individual will review these forms for each sampling event. All field logbooks/data sheets must be incorporated into WIPP's records management program.

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

All samples will be maintained at ambient temperatures. Collected samples will be transported in appropriate containers. Prior to leaving the underground for analysis, sample containers may undergo radiological screening. No potentially contaminated samples or equipment will be transported to the surface. No samples will be accepted by the receiving laboratory personnel unless they are properly labeled and custody maintained.

An important component of the sampling program is a demonstration that collected samples were obtained from the locations stated and that they reached the laboratory without alteration. To satisfy this requirement, evidence of collection, shipment, laboratory receipt, and custody will be documented with a Chain-of-Custody Form. Chain-of-custody procedures will be followed in accordance with sampling SOPs, and additional requirements imposed by the laboratory for sample analysis will be included as necessary.

Individuals collecting samples will be responsible for the initiation of custody procedures. The chain-of-custody will include documentation as to the canister certification, location of sampling event, sample collection date, and individual(s) handling the samples. Unintentional procedure deviations, equipment malfunctions, and other problems that do not conform to established requirements are nonconformances. The disposition and documentation of nonconformances will be handled according to QA requirements (WP 13-1).

4.4 Analytical Procedures

Analytical procedures used in the analysis of VOC samples from canisters are based on concepts contained in Compendium Method TO-15 (EPA 1999) and in SW-846 Method 8260B (EPA 1996).

Analysis of samples shall be performed by a laboratory that the Permittees select and approve through established QA processes. Analytical methods will be specified in procurement documents and will be selected to be consistent with Compendium Method

TO-15 (EPA 1999) or EPA recommended procedures in SW-846 (EPA 1996). Additional details on analytical techniques and methods will be given in laboratory SOPs.

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

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

Data validation will be performed by cognizant individuals. Copies of the data validation records will be kept on file in the operating record for review upon request by NMED.

5.0 QUALITY ASSURANCE

The QA activities for the VOC monitoring programs will be conducted in accordance with the documents: *Guidance for Quality Assurance Project QA/G-5* (EPA 2002), and *EPA Requirements for Quality Assurance Project Plans, QA/R*-5 (EPA 2001). The QA criteria for VOC monitoring programs are listed in table 2, Quality Assurance Objectives for Accuracy, Precision, Sensitivity, and Completeness. This section addresses the methods to be used to evaluate the components of the measurement system and how this evaluation will be used to assess data quality. The QA limits for the sampling procedures and laboratory analysis shall be in accordance with the limits set forth in the specific EPA Method referenced in SOPs employed by either the Permittees or the laboratory. The Permittees’ SOPs will be in the facility operating record and available for review by NMED at anytime. The laboratory SOPs will also be in the facility operating record and will be supplied to the NMED as indicated in section 4.4.

5.1 QA Objectives for the Measurement of Precision, Accuracy, Sensitivity, and Completeness

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

Precision. For the duration of this program, precision will be defined and evaluated by the relative percent difference (RPD) values calculated between field duplicate samples and between laboratory duplicate samples.

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

Where: A = Original sample result
B = Duplicate sample result
Note: vertical lines in the formula above indicate absolute value of A-B.

Accuracy. Analytical accuracy will be defined and evaluated through the use of analytical standards. Because recovery standards cannot reliably be added to the sampling stream, overall system accuracy must be based on analytical instrument performance evaluation criteria. These criteria will include performance verification for instrument calibrations, laboratory control samples, sample surrogate recoveries (when required by method or laboratory SOPs), and sample internal standard areas. These criteria will constitute the verification of accuracy for target analyte quantitation (i.e., quantitative accuracy). Evaluation of standard ion abundance criteria for bromofluorobenzene (BFB), Chemical Abstracts Service registry number (CAS#) 460-00-4, will be used to evaluate the accuracy of the analytical system in the identification of targeted analytes, as well as the evaluation of unknown constituents (i.e., qualitative accuracy).

Sensitivity. Sensitivity will be defined by the required MRLs for the program. Attainment of required MRLs will be verified by the performance of statistical method detection limit (MDL) studies in accordance with 40 CFR Part 136 (Appendix B). The MDL represents the minimum concentration that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. An MDL study will be performed by the program analytical laboratory prior to sampling and analysis, and at least annually thereafter.

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

5.1.1 Evaluation of Laboratory Precision

Laboratory sample duplicates and blank spike/blank spike duplicates (BS/BSD) will be used to evaluate laboratory precision. Hereafter, blank spike/blank spike duplicates are referred to as laboratory control sample/laboratory control sample duplicates (LCS/LCSDs). QA objectives for laboratory precision are listed in table 2, and are based on precision criteria proposed by the EPA for canister sampling programs (EPA, 1991). These values will be appropriate for the evaluation of samples with little or no matrix effects. Because of the potentially high level of salt-type aerosols in the WIPP underground environment, the analytical precision achieved for WIPP samples may vary with respect to the EPA criteria. RPDs for LCS/LCSD analyses will be tracked by the analytical laboratory through the use of control charts. RPDs obtained for laboratory sample duplicates will be compared to those obtained for LCS/LCSDs to ascertain any sample matrix effects on analytical precision. LCS/LCSDs and laboratory sample duplicates will be analyzed at a frequency of at least 10 percent, or one per analytical lot, whichever is more frequent.

5.1.2 Evaluation of Field Precision

Field duplicate samples will be collected at a frequency of at least 5 percent for each VOC monitoring program. The data quality objective for field precision is ≤35 percent for each set of field duplicate samples.

5.1.3 Evaluation of Laboratory Accuracy

Quantitative analytical accuracy will be evaluated through performance criteria on the basis of (1) relative response factors generated during instrument calibration, (2) analysis of LCS, and (3) recovery of internal standard compounds. The criterion for the initial calibration (minimum 5-point calibration) is ≤30 percent relative standard deviation for target analytes. After the successful completion of the calibration, it is sufficient to analyze only a midpoint standard for every 24 hours of operation. The midpoint standard must pass a ≤30 percent difference acceptance criterion for each target VOC before sample analysis may begin.

A LCS is an internal QC sample generated by the analytical laboratory by spiking a standard air matrix (humid zero air or ultra-high purity nitrogen) with a known amount of a certified reference gas. The reference gas will contain the target VOCs at known concentrations. Percent recoveries for the target VOCs will be calculated for each LCS relative to the reference concentrations. Objectives for percent recovery are listed in table 2, and are based on accuracy criteria proposed by the EPA for canister sampling programs (EPA 1991). LSCs will be analyzed at a frequency of at least 10 percent, or one per analytical lot, whichever is more frequent.

Internal standards will be introduced with each sample analyzed, and will be monitored as a verification of stable instrument performance. In the absence of any unusual interference, areas should not change by more than 40 percent over a 24-hour period. Deviations larger than 40 percent are an indication of a potential instrument malfunction. If an internal standard area in a given sample changes by more than 40 percent, the sample must be reanalyzed. If the 40 percent criterion is not achieved during the reanalysis, the instrument must undergo a performance check and the midpoint standard must be reanalyzed to verify proper operation. Response and recovery of internal standards will also be compared between samples, LCSs, and calibration standards to identify any matrix effects on analytical accuracy.

5.1.4 Evaluation of Sensitivity

The presence of aerosol salts in underground locations may affect the MDL of the samples collected in those areas. The sample inlet of the sample collection units will be protected sufficiently from the underground environment to minimize salt aerosol interference. Two filters inert to VOCs will be installed in dual in-line filter holders in the sample flow path to minimize particulate interference.

The MDL for each of the nine target compounds will be evaluated by the analytical laboratories before sampling begins. The initial and subsequent MDL evaluations will be performed in accordance with 40 CFR Part 136 (Appendix B) and with Chapter 1 of SW-846 (EPA, 1996).

5.1.5 Completeness

The expected completeness for this program is greater than or equal to 95 percent. Data completeness will be tracked monthly.

5.2 Sample Handling and Custody Procedures

Sample packaging, shipping, and custody procedures are addressed in section 4.3.

5.3 Calibration Procedures and Frequency

Calibration procedures and frequencies for analytical instrumentation are addressed in section 5.1.3.

5.4 Data Reduction, Validation, and Reporting

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

Data validation procedures will include, at a minimum, a check of all field data sheets and sampling logbooks to verify for completeness and correctness. Sample custody and analysis records will be reviewed routinely by the analytical laboratory QA officer and the analytical laboratory supervisor.

Electronic Data Deliverables (EDDs) are provided by the laboratory prior to receipt of hard copy data packages. EDDs will be evaluated as described in Permittees' SOPs within five calendar days of receipt to determine if VOC concentrations are at or above action levels in table 3 for disposal room VOC monitoring data or COC for repository VOC monitoring data. If VOC concentrations are at or above these action levels or concentrations, the hard copy data package will be validated within five calendar days. If VOC concentrations are below action levels or concentrations listed in table 3, the hard copy data package will be validated within fourteen calendar days.

Data will be evaluated and reported as specified in section 3.5 and Permit Part 4.

Acceptable data for this VOC monitoring plan will meet stated precision and accuracy criteria. The QA objectives for precision, accuracy, and completeness as shown in table 2 can be achieved when established methods of analyses are used as proposed in this plan and standard sample matrices are being assessed.

5.5 Performance and System Audits

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

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

5.6 Preventive Maintenance

Maintenance of sample collection units is described briefly in section 4.1.2. Maintenance of analytical equipment is addressed in the analytical laboratory SOP.

5.7 Corrective Actions

If the required completeness of valid data (≥95 percent) is not maintained, corrective action may be required. Corrective action for field sampling activities may include recertification and cleaning of VOC Samplers, general maintenance or troubleshooting, reanalysis of samples, additional training of personnel, modification to field and laboratory procedures, and recalibration of test equipment.

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

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

5.8 Records Management

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

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

Revisions to completed records (e.g., as a result of audits or data validation procedures) may be made only with the approval of the responsible program manager and in accordance with applicable QA procedures. Original and duplicate or backup records of project activities will be maintained at the WIPP site. Electronic records that cannot be altered by the user and capable of producing a paper copy shall be deemed to be a written record. Records of project activities will be maintained at or readily accessible from the WIPP site. Documentation will be available for inspection by internal and external auditors.

REFERENCES	
DOCUMENT NUMBER AND TITLE	KEY STEP
40 CFR Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants	
U.S. Environmental Protection Agency, 1991. *Contract Laboratory Program, Volatile Organics Analysis of Ambient Air in Canisters* (Draft), EPA540/R-94-085, December 1991, Washington, D.C.	
U.S. Environmental Protection Agency, 1996. SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.* Third Edition. Office of Solid Waste and Emergency Response, Washington, D.C.	
U.S. Environmental Protection Agency, 1999. *Compendium Method TO-15: Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially- Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS),* EPA/625/R-96/010b. Center for Environmental Research Information, Office of Research and Development, Cincinnati, OH, January 1999.	
U.S. Environmental Protection Agency, 2002. *Guidance for Quality Assurance Project Plans, QA/G-5,* EPA/240/R-02/009, December 2002, Washington, D.C.	
U.S. Environmental Protection Agency, 2001. *EPA Requirements for Quality Assurance Project Plans, QA/R-5,* EPA/240/B-01/003, March 2001, Washington D.C.	
Section 310 of the Consolidated Appropriations Act for 2005 (Public Law 108-447)	**2**
Hazardous Waste Facility Permit Waste Isolation Pilot Plant, Permit Number NM4890139088-TSDF issued by the New Mexico Environment Department	**1**
Washington Regulatory and Environmental Services, 2003. *Technical Evaluation Report for WIPP Room-Based VOC Monitoring*	
WP 13-1, *Nuclear Waste Partnership LLC Quality Assurance Program Description*	
WP 12-VC.03, *Hydrogen and Methane Monitoring Plan*	

Table 1, Target Analytes and Methods for Repository VOC Monitoring (Stations VOC-A and VOC-B) and Disposal Room VOC Monitoring

Target Analyte	EPA Standard Analytical Method
Carbon Tetrachloride	EPA TO-15[A] EPA SW-846, Method 8260B[B]
Chlorobenzene	
Chloroform	
1,1-Dichloroethylene	
1,2-Dichloroethane	
Methylene Chloride	
1,1,2,2-Tetrachloroethane	
Toluene	
1,1,1-Trichloroethane	

[A] 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.

[B] U.S. Environmental Protection Agency, SW-846, *Test Methods for Evaluating Solid Wastes, Chemical/Physical Methods*; http://www.epa.gov/epaoswer/hazwaste/test/main.html.

Table 2, Quality Assurance Objectives for Accuracy, Precision, Sensitivity, and Completeness

Target VOC	Accuracy (Percent Recovery)	Precision (RPD)		Required Repository Monitoring MRL (ppbv)	Required Disposal Room MRL (ppbv)	Completeness (Percent)
		Laboratory	Field			
Carbon Tetrachloride	60 to 140	≤25	≤35	2	500	≥95
Chlorobenzene	60 to 140	≤25	≤35	2	500	≥95
Chloroform	60 to 140	≤25	≤35	2	500	≥95
1,1-Dichloroethylene	60 to 140	≤25	≤35	5	500	≥95
1,2-Dichloroethane	60 to 140	≤25	≤35	2	500	≥95
Methylene Chloride	60 to 140	≤25	≤35	5	500	≥95
1,1,2,2-Tetrachloroethane	60 to 140	≤25	≤35	2	500	≥95
Toluene	60 to 140	≤25	≤35	5	500	≥95
1,1,1-Trichloroethane	60 to 140	≤25	≤35	5	500	≥95

MRL	maximum method reporting limit for undiluted samples
RPD	relative percent difference, allowances for conditions that may produce non-representative RPD values will be specified in the Permittees' SOPs

Table 3, VOC Regulatory Limits

REPOSITORY VOC MONITORING CONCENTRATIONS OF CONCERN		
Compound	**Drift E-300 Concentration**	
	μg/m^3	**ppbv**
Carbon Tetrachloride	**6040**	**960**
Chlorobenzene	**1015**	**220**
Chloroform	**890**	**180**
1,1-Dichloroethylene	**410**	**100**
1,2-Dichloroethane	**175**	**45**
Methylene Chloride	**6700**	**1930**
1,1,2,2-Tetrachloroethane	**350**	**50**
Toluene	**715**	**190**
1,1,1-Trichloroethane	**3200**	**590**

VOC ROOM-BASED LIMITS	
Compound	**VOC Room-Based Concentration Limit (ppmv)**
Carbon Tetrachloride	9625
Chlorobenzene	13000
Chloroform	9930
1,1-Dichloroethylene	5490
1,2-Dichloroethane	2400
Methylene Chloride	100000
1,1,2,2-Tetrachloroethane	2960
Toluene	11000
1,1,1-Trichloroethane	33700

Table 4, Action Levels for Disposal Room VOC Monitoring

ACTION LEVELS FOR DISPOSAL ROOM VOC MONITORING		
Compound	**50% Action Level for VOC Constituents of Concern in Any Closed Room, ppmv**	**95% Action Level for VOC Constituents of Concern in Active Open or Immediately Adjacent Closed Room, ppmv**
Carbon Tetrachloride	4,813	9,145
Chlorobenzene	6,500	12,350
Chloroform	4,965	9,433
1,1-Dichloroethylene	2,745	5,215
1,2-Dichloroethane	1,200	2,280
Methylene Chloride	50,000	95,000
1,1,2,2-Tetrachloroethane	1,480	2,812
Toluene	5,500	10,450
1,1,1-Trichloroethane	16,850	32,015

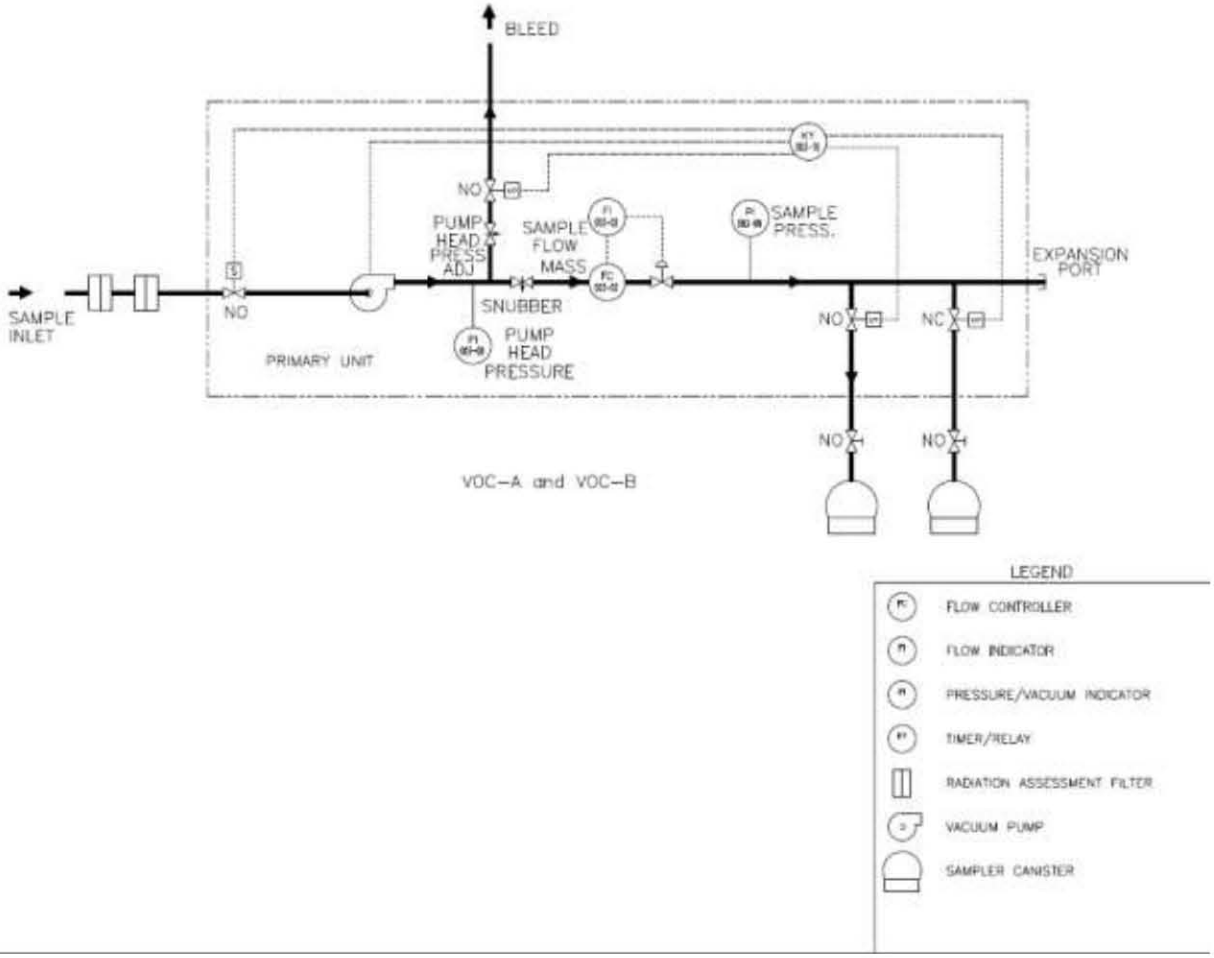


Figure 1, VOC Sampler Design

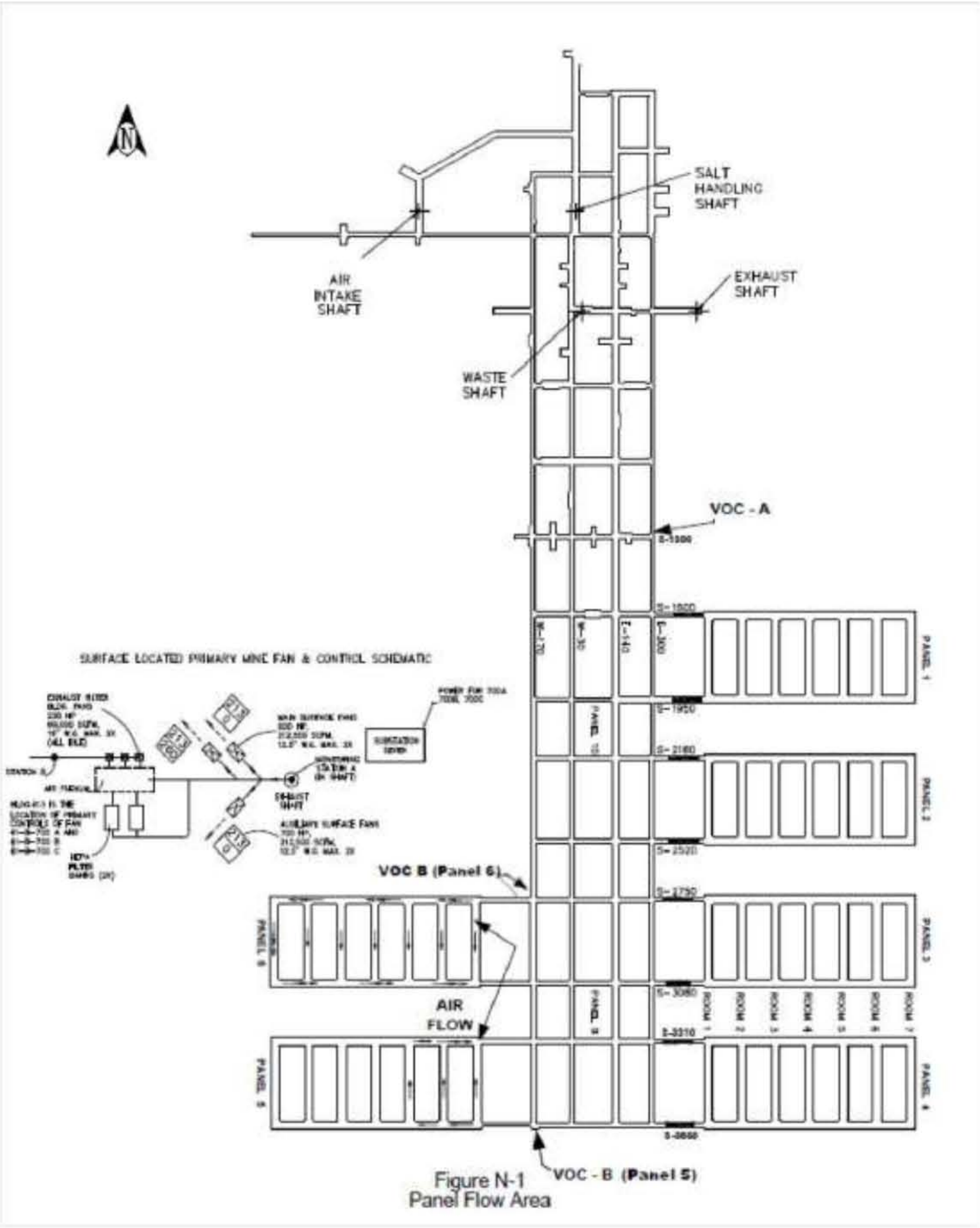


Figure 2, Example Repository VOC Monitoring Configuration

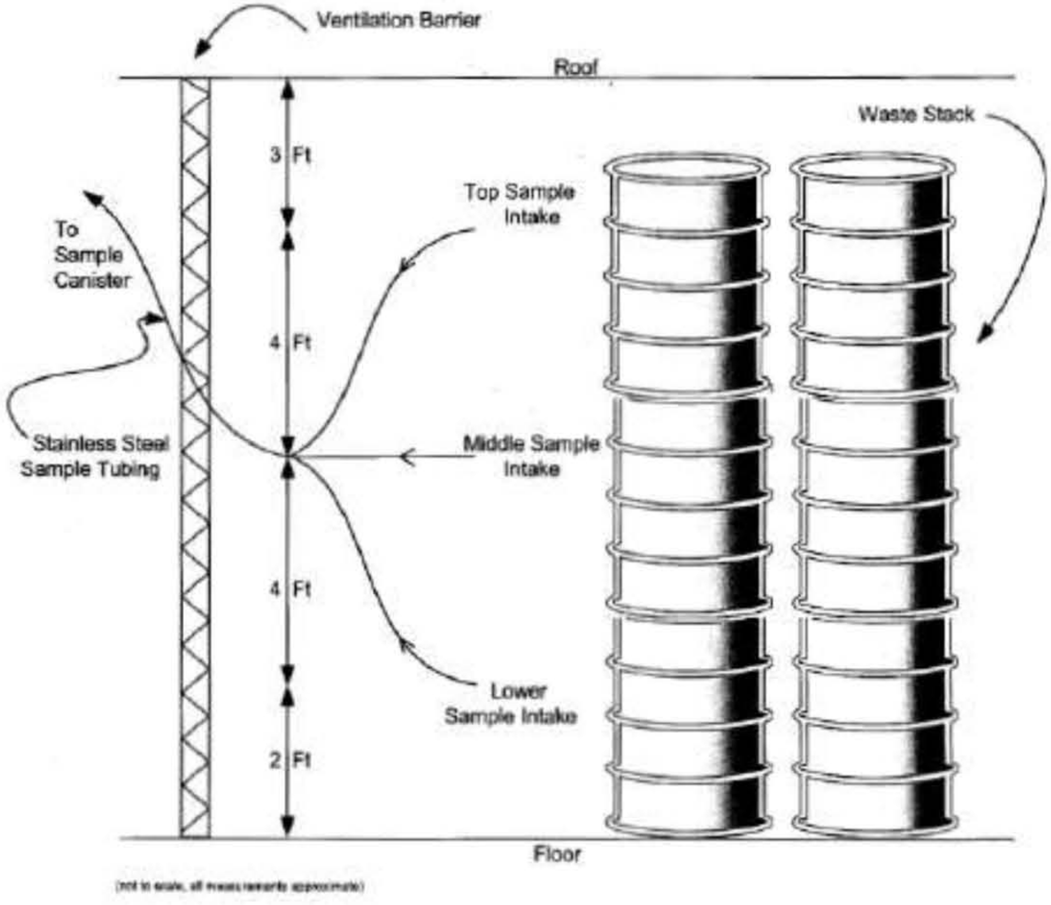


Figure 3, Disposal Room Sample Head Arrangement

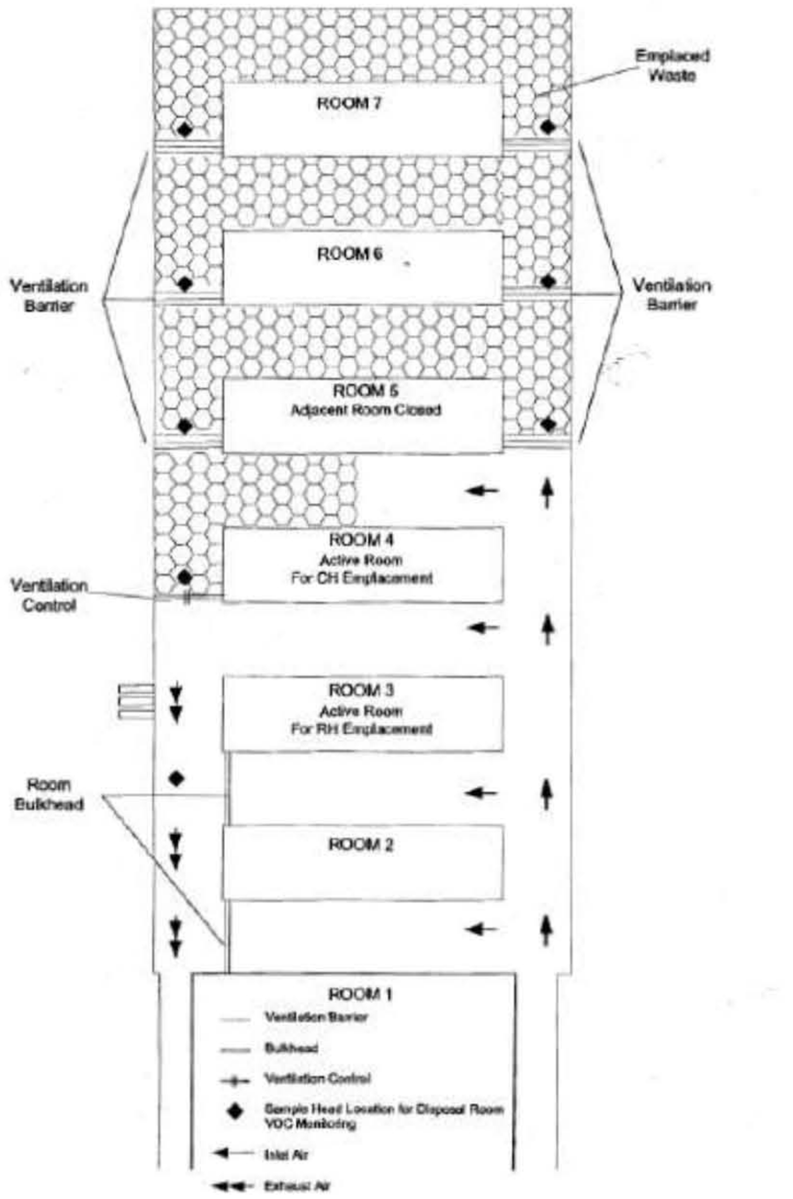


Figure 4, Example Disposal Room VOC Monitoring Locations

Working Copy

Effective Date: 01/22/13

WP 12-VC.02
Revision 13

Quality Assurance Project Plan for Volatile Organic Compound Monitoring

Cognizant Section: Environmental Monitoring & Hydrology

Approved By: Rick Salness

NWP
Nuclear Waste Partnership LLC

A URS-led partnership with B&W and AREVA

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CHANGE HISTORY SUMMARY

REVISION NUMBER	DATE ISSUED	DESCRIPTION OF CHANGES
10	07/15/10	• Changed Carbon Tetrachloride concentrations in Table 3
11	12/29/10	• Changed Carbon Tetrachloride in Table 3
12	05/09/11	• Updated Acronyms list to reflect changes in document. • 1.0 - changed reference doc “Quality Assurance…EPA” to SW-846 • -Modified wording throughout section and added new responsibility regarding “non-regulatory sampling.” • 2.0 - Changed VOC Monitoring Program Services manager to EM&H manager. • -Added new responsibility for RCTs in 2.2.7 and Subcontract vendors in 2.2.9, modified wording throughout section. • 3.0 – New references – EPA QA/G-5, SW-846 8260B • 6.0 – New reference – 10-AD.01 • 7.0 – Modified requirements in sections 7.1, 7.2, and 7.4 • 9.0 – Added new requirements in 9.2.1, 9.2.3, 9.2.5, 9.2.6, 9.2.7, and 9.3.1 • 10.0 – Updated Table 2 and “Qualitative Accuracy” subsection • 11.0 – Deleted Table 3 • 16.0 – Added 4 new reference docs, deleted 4 no longer used • Added New attachments 1 & 2
13	1/22/13	• Provided clarification of program language, removed unnecessary detail and made editorial changes/corrections. • The major changes are: — Provided flexibility to add additional requested analytes to laboratory target analyte list and removed PASK in section 9.0. — Provided clarification on certified canister recall date in section 9.2.1. — Provided flexibility for using electronic records in section 15.0.

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

ANSI	American National Standards Institute
ARA	additional requested analyte
ASME	American Society of Mechanical Engineers
ASTM	ASTM International
BFB	bromofluorobenzene
BS/BSD	blank spike/blank spike duplicate
CAS#	Chemical Abstracts Service registry number
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
CofC	chain-of-custody
DOE	U.S. Department of Energy
EM&H	Environmental Monitoring and Hydrology
EPA	U.S. Environmental Protection Agency
GC	gas chromatography
HWDU	hazardous waste disposal unit (panel)
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
MDL	method detection limit
MRL	method reporting limit
MS	mass spectrometry
M&TE	measurement & test equipment
NIST	National Institute of Standards and Technology
NMED	New Mexico Environment Department
NWP	Nuclear Waste Partnership LLC
Permit	Hazardous Waste Facility Permit, NM4890139088-TSDF
ppbv	parts per billion by volume
QA	quality assurance
QAPD	Quality Assurance Program Description
QAPjP	Quality Assurance Project Plan
QC	quality control

RCRA	Resource Conservation and Recovery Act
RCT	Radiological Control Technician
RPD	relative percent difference
SEC	Site Environmental Compliance
SOP	standard operating procedure
STP	standard temperature and pressure
TIC	tentatively identified compound
TRU	transuranic
VOC	volatile organic compound
WIPP	Waste Isolation Pilot Plant

1.0 INTRODUCTION [1, 2]

The U.S. Department of Energy (DOE) Carlsbad Field Office holds overall responsibility for the Waste Isolation Pilot Plant (WIPP) Project. The DOE is supported by Nuclear Waste Partnership LLC (NWP), the WIPP management and operating contractor; and by Sandia National Laboratories, the scientific advisor for the project.

This Quality Assurance Project Plan for Volatile Organic Compound Monitoring, or "QAPjP," (as described by the U.S. Environmental Protection Agency [EPA] in Chapter 1 of SW-846 [EPA, 1996]) has been prepared to document the measures that will be implemented by NWP for the DOE so that analytical data from monitoring of volatile organic compounds (VOCs) at WIPP will be of sufficient quality while complying with monitoring requirements described in the WIPP Hazardous Waste Facility Permit (Permit) (also known as "RCRA [Resource Conservation and Recovery Act] Permit"). Specifically, this plan describes the quality assurance (QA) program to be implemented and the quality control (QC) activities to be followed by NWP and its subcontractors during the course of equipment procurement, design, and installation, and air monitoring for VOCs during the waste disposal phase at WIPP.

QAPjPs are supporting documents required by the EPA for environmental monitoring and sampling programs conducted under the RCRA. Accordingly, this QAPjP addresses QA/QC activities for monitoring program elements. A brief description of the WIPP VOC Monitoring Program follows.

1.1 Waste Isolation Pilot Plant

WIPP is designed to receive, handle, and dispose of defense-generated transuranic (TRU) waste. This waste, generated by and currently stored at other DOE facilities, will be shipped to the WIPP. By definition, TRU waste contains radionuclides with an atomic number greater than 92, that of uranium (e.g., plutonium, americium, curium), a half-life greater than 20 years, and an alpha activity of 100 nanocuries per gram or greater. Some of the waste to be disposed of at WIPP is mixed TRU waste, which contains hazardous constituents regulated by the RCRA. The waste will be emplaced at WIPP in a deep, bedded salt formation approximately 2,150 feet (655 meters) below the land surface.

The design of the WIPP facility is characterized as a "room and pillar" arrangement, which allows containerized solids or solidified waste to be placed in the excavations. Equipment and personnel enter the underground facility through designated shafts. Each Underground Hazardous Waste Disposal Unit (Underground HWDU) consists of seven rooms and two access drifts. Each room is approximately 300 feet (91 meters) long, 33 feet (10 meters) wide, and 13 feet (4 meters) high. Access drifts connect the rooms and have the same cross-section.

1.2 VOC Monitoring Program

Measureable quantities of VOCs could be released from open and closed panels located at WIPP during the disposal phase of the project. The VOC Monitoring Program has been designed to monitor VOC emissions from the open and closed panels to assess compliance with the regulatory limits listed in the WIPP RCRA Permit. The VOC Monitoring Plan is responsive to requirements of 20.4.1.500 New Mexico Administrative Code, and addresses repository, disposal room, and ongoing disposal room monitoring of VOCs during the WIPP disposal phase. The technical basis for disposal room VOC monitoring is discussed in detail in the Technical Evaluation Report for Room-Based VOC monitoring (WRES, 2003).

The monitoring program will be capable of quantifying VOC concentrations in ambient mine air (i.e., Repository Monitoring) within all rooms of an active panel (i.e., disposal room monitoring), as well as for ongoing disposal room monitoring activities. Other media are not considered viable contaminant transport pathways during the WIPP operational time frame and are not addressed in this program. By the nature of WIPP operations, there is no credible mechanism for direct release of hazardous constituents to water or soil during the operational time frame.

This monitoring program will provide data for final panel closure system determination and will also allow for the detection of potentially rising concentrations from a safety standpoint.

Specific Permit elements prescribed for compliance monitoring may be modified as necessary for assessment purposes. Other air sampling events may be performed at various locations not indicated in the Permit. These samples may be collected at any accessible location in the underground or on the surface. The sample type for these samples will indicate “NR” for Non-Regulatory. For any sample type indicated as “NR,” all sampling and analysis processes are exempt from specific elements of monitoring prescribed in the Permit.

2.0 VOC MONITORING PROGRAM ORGANIZATION

The overall structure of the VOC Monitoring Program and its interfaces with applicable departments are described in WP 13-1, *Nuclear Waste Partnership LLC Quality Assurance Program Description* (QAPD). Specific QC and operational responsibilities for the VOC Monitoring Program are assigned to individual groups as described in sections 2.1-2.2.

2.1 Manager, Quality Assurance Department

The NWP QA Department has the primary oversight responsibility for all aspects of the VOC Monitoring Program. The manager of this department is responsible for establishing, maintaining, and monitoring the overall NWP QA program. The manager is responsible for establishing and implementing appropriate and effective corrective actions for reported conditions that are adverse to quality and regulatory compliance. NWP QA personnel receive technical direction from and are under the administrative control of the NWP QA manager. The NWP QA manager has the primary responsibility for verifying that personnel comply with and understand QA program objectives when conducting VOC monitoring activities. Additional responsibilities of the QA manager and the QA Department include:

- Developing and maintaining overall QA policy.
- Preparing or reviewing QA program and quality-related implementation plans, procedures, and instructions.
- Verifying that a management assessment of quality-related functions is performed on a periodic basis.
- Interfacing with VOC Monitoring Program personnel on quality-related matters.
- Planning and participating in audits and/or surveillance of quality-related activities.
- Maintaining liaison on quality matters with management and suppliers.
- Ensuring that necessary training, indoctrination, and qualification for QA personnel are provided.
- Participating in evaluation and approval of the disposition of nonconforming items, nonconformance reports, and requests for corrective actions.
- Ensuring that disagreements regarding quality problems and proposed solutions are resolved. If they cannot be resolved at the lowest level possible, they will be referred to a higher level of management for resolution.

2.2 Program Operations

The organizational responsibilities for specific aspects of program operations are described in sections 2.2.1-2.2.10.

2.2.1 Manager, Regulatory Environmental Services

The Regulatory and Environmental Services Manager has the responsibility of ensuring that VOC monitoring operations comply with applicable state and federal regulations. The Manager is also responsible for ensuring that all program reporting requirements are met.

2.2.2 Manager, Environmental Monitoring and Hydrology

The Environmental Monitoring and Hydrology (EM&H) manager is a Cognizant Manager responsible for implementing VOC monitoring activities, which includes the VOC Monitoring Program, required to ensure compliance with applicable federal and state environmental regulations. The Regulatory and Environmental Services Manager will designate the EM&H Manager. Specific VOC Monitoring Program duties of the EM&H Manager will include oversight of monitoring activities, coordination of performance activities between operations groups, control of program changes, and interface with regulatory agencies and the DOE.

The EM&H manager will ensure that trainees are closely supervised by qualified personnel when performing duties until training and qualification requirements are met.

2.2.3 Program Scientists

Program scientists are Cognizant Individuals (e.g., Environmental Scientists, Environmental Specialists) responsible for performance of the administration of the program. Primary duties include:

- Complying with this QAPjP.
- Implementing program changes.
- Coordinating laboratory activities for the VOC Monitoring Program.
- Communicating with the DOE, the New Mexico Environment Department, and the EPA with regard to this program.
- Preparing the VOC Monitoring Program semi-annual reports.
- Coordinating procurement of supplies and materials for this program.
- Preparing standard operating procedures (SOPs).
- Coordinating corrective actions.
- Verifying adequacy of the training program.
- Defining and initiating the sampling schedule.
- Facilitating laboratory performance audits.
- Requisitioning materials/equipment.

- Managing database and records and preparing data reports.
- Developing training materials for NWP personnel, as directed by management.
- Revising and updating training materials as program changes are developed and implemented.
- Developing and maintaining materials related to on-the-job training activities.

2.2.4 Field Technicians

Field sampling activities will be conducted by field technicians under the direction of the EM&H manager or Program Scientists. The field sampling staff will also be responsible for routine maintenance of VOC Monitoring Program equipment. Other duties of the field technicians include but are not limited to:

- Initiating sampling and removal of completed samples.
- Installation of sample lines.
- Troubleshooting of equipment malfunctions.
- Maintaining sample canister chain-of-custody.
- Completing field data forms.
- Maintaining sampling logbooks.
- Collecting duplicate samples on a minimum frequency of five (5) percent.
- Managing, handling, storing, and delivering/shipping samples to the laboratory.
- Identifying training needs to line management.
- Inputting data from analytical deliverables into evaluation software.
- Providing notification of conditions adverse to quality.

2.2.5 VOC Monitoring System Engineer

The VOC monitoring system Cognizant Engineer has the ultimate responsibility for the physical systems of the VOC monitoring program. This individual designs the VOC monitoring systems and controls the implementation of approved system modifications. Specific activities for this program include:

- Preparing detailed engineering design specifications.
- Requisitioning materials/equipment.
- Overseeing system construction.
- Approving action requests for VOC monitoring systems.
- Coordinating engineering change orders.
- Preparing work packages as needed.

2.2.6 Manager, Site Environmental Compliance

The Site Environmental Compliance (SEC) manager is responsible for ensuring compliance with applicable state and federal environmental regulations. The SEC manager ensures submittal of reports to the DOE and the NMED, as required by the Permit.

2.2.7 Manager, Radiological Control

The Radiological Control Manager is responsible for radiological surveys of the VOC monitoring systems and equipment. When possible radioactive contamination of samples or sampling systems exists, Radiological Control Technicians (RCTs), under the direction of the Radiological Control Manager, will perform radiological surveys on filter(s) associated with the VOC monitoring systems to determine equipment disposition. Results of these surveys will be documented and provided to EM&H. The RCTs will also be responsible for conducting canister and external contamination surveys for alpha and beta/gamma radiation, as applicable.

2.2.8 Manager, Subcontract Laboratory

The Subcontract Laboratory manager provides interface between program requirements and laboratory performance. The subcontract laboratory manager provides assistance to the EM&H manager and program technical personnel in establishing and complying with sample canister cleaning, certification, labeling, shipping, storage, and chain-of-custody procedures and analytical methods. The Subcontract Laboratory manager will establish laboratory and analytical procedures, including QA/QC procedures, and provides oversight for reporting of laboratory results.

2.2.9 Subcontract Vendor

The Subcontract Vendor has responsibility for VOC Sampler system maintenance and certification. The Subcontract Vendor is responsible for the following activities:

- Performing VOC Sampler cleaning and certification.
- Establishing equipment inventory.
- Developing on-site calibration procedures.
- Performing on-site equipment calibration.
- Preparing on-site calibration reports.
- Notifying program personnel regarding equipment calibration failures.
- Performing maintenance as required.
- Ensuring adequate sample integrity is maintained for certification samples until relinquished to the Subcontract Laboratory.

2.2.10 Manager, Technical Training

The Technical Training manager is responsible for identifying training needs associated with VOC monitoring programs and establishing related curriculums. Duties associated with this activity include:

- Maintaining training-related records.
- Providing EM&H personnel with training support during the qualification process.

3.0 QUALITY ASSURANCE PROGRAM

3.1 NWP Quality Assurance Program

The purpose of the NWP QA Program for WIPP is to establish policies to facilitate the compliance of regulatory requirements and to provide an internal means for control and review so that the work performed by NWP and its subcontractors meets or exceeds applicable requirements.

The NWP President & Project Manager is responsible for the overall direction of the NWP QA Program. A full-time professional QA staff is responsible for maintaining the QA Program and for verifying its implementation through methods that include periodic audits and surveillances.

3.2 NWP Quality Assurance Documents

The NWP QAPD and implementing procedures direct the quality-related activities at WIPP. The QAPD and implementing procedures define acceptable practices to be employed by NWP personnel and its subcontractors.

3.3 Quality Assurance Objectives for the VOC Monitoring Program

The VOC Monitoring Program will be performed in conformance with NWP QA Program requirements, DOE Orders and applicable federal (e.g., RCRA), state, and contract laws. The program objectives require the collection of quality data as follows:

- Scientific data will be of sufficient or greater quality to meet scientific and legal scrutiny.

- Data will be gathered or developed in accordance with procedures appropriate for the intended use of the data.

- Data will be of known and acceptable precision, accuracy, representativeness, completeness, traceability, and comparability as required by the project. Data quality requirements will be based on current standards established by the EPA for highly technical data.

- This QAPjP has been prepared in direct response to these goals using concepts contained in the following documents:

  - *EPA Requirements for Quality Assurance Project Plans*, EPA QA/R-5

  - *Guidance for Quality Assurance Project Plans*, EPA QA/G-5

  - Chapter 1.0 of EPA SW-846

  - WP 13-1, *Nuclear Waste Partnership LLC Quality Assurance Program Description*

Monitoring is to be performed using the concept of pressurized and subatmospheric sample collection in passivated stainless steel canisters described in the U.S. EPA Compendium Method TO-15, *Determination of Volatile Organic Compounds (VOCs) in Air Collected In Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)*, and the specifications in the WIPP RCRA Permit.

Laboratory analytical procedures have been developed based on the concepts contained in the following EPA documents:

- Compendium Method TO-15
- SW-846 8260B
- Contract Laboratory Program (CLP) document- *Volatile Organics Analysis of Ambient Air in Canisters* (Draft)

The analytical process developed specifically for samples collected at WIPP is presented in section 9.0 of this QAPjP.

3.4 Training and Indoctrination

A formal training program and documented indoctrination has been established for VOC monitoring personnel for this program. The training program was developed and implemented by VOC monitoring personnel with the support of Technical Training.

Training requirements are coordinated between the manager of Technical Training and the EM&H manager. Records generated by this training are maintained by Technical Training as quality records.

4.0 PROCUREMENT AND CONTROL OF SUBCONTRACTORS

The controls placed on subcontractor procurements of quality-related items and/or services will be based on the effect an item or service will have on program results (e.g., the design class or quality code assigned to an item or service). Procurement activities will be planned, documented, performed, and verified in accordance with the requirements of the QAPD.

To verify subcontractor conformance to program QA/QC requirements, NWP QA or its subcontractor will, as necessary, review subcontractor-prepared documentation and perform subcontractor evaluations, surveys, and audits. Subcontractors will provide access to their work areas and records for inspections and auditing. Audits of subcontractor project activities will be performed and documented as discussed in section 14.0 of this plan.

4.1 Acceptance of Item or Service

The QA Department, in conjunction with other departments, will establish methods for the acceptance of materials, equipment, and/or services in accordance with written detailed procedures. Methods for accepting material or equipment from a supplier may include source verification, receiving inspection, supplier certificate of conformance, post-installation test, or a combination thereof.

The method for accepting engineering and consulting services (installation, repair, overhaul, or maintenance work) will include any or all of the following:

- Technical verification of data produced.
- Surveillance, inspection, or audit of the activity.
- Review of objective evidence of conformance to the procurement document requirements (i.e., certifications).
- Review of qualifications and certifications of supporting personnel.

Receiving inspection will be performed in accordance with established procedures to verify proper physical characteristics, freedom from shipping damage, and cleanliness. The inspection will also verify conformance to specified requirements, considering source verification, audit activities, and the demonstrated quality performance of the supplier.

4.2 Control of Supplier Nonconformances

Supplier nonconformances will be controlled as described in section 13.0 of this plan. In addition, the supplier's QA Program shall include a nonconformance control system as required by the purchase order and/or contract.

5.0 PROCEDURES

All activities affecting the operation of the VOC Monitoring Program will be performed in accordance with documented and approved procedures. If the need arises to create or revise procedures, the procedures will be written or revised in accordance with the NWP QAPD and other applicable documents.

5.1 General Requirements

Procedures have been prepared to ensure that quality-related activities are performed under controlled conditions that include use of appropriate equipment, suitable environmental conditions, and appropriately trained personnel. These activities also comply with WIPP site safety standards and requirements as well as other safety-related documentation as required by the DOE or other governing agencies. Existing procedures, plans, and drawings contain defined acceptance criteria that verify the satisfactory accomplishment of quality-related activities.

Program-specific procedures are prepared as specified by the appropriate WIPP guidelines. The review and approval of procedures, as well as action requests for modifications and repairs, will follow established procedural guidance and published standards of the National Institute of Standards and Technology (NIST), ASTM

International (ASTM), the American National Standards Institute (ANSI), and the EPA where applicable.

5.2 Program Procedures

Program-specific procedures address individual work activities. Each procedure may include the following:

- Objective or the need for the procedure and goals of the activity.
- Scope of the activity.
- Work and/or test methods to be used and required sequential actions.
- Evaluation of data by authorized personnel.
- Technical definitions.
- Prerequisites and precautions.
- Required equipment to perform the activity.
- Calibration and performance requirements for equipment, as well as methods for recording specified data.
- Required education, training, experience, and/or certification of personnel.
- Subcontractor services and evaluation.
- Forms for the acquisition and recording of required data.
- Schedule and scope of inspections that must be completed before work continues.
- Data processing requirements - method for reduction of data and requirements for verification of the reduction process.
- Criteria for satisfactory completion.
- Corrective actions to be followed.
- Performance frequency for testing or monitoring.
- Required analyses, interpretations, judgments, and calculations.

- Documentation and reporting requirements - required documentation of equipment calibration, performance, data acquisition, data reduction, inspection, and analyses. Records will include date(s) of test(s) and actions taken in connection with any deviation noted.

- QA hold/witness points.

6.0 EQUIPMENT CALIBRATION/MAINTENANCE

Measurement and test equipment (M&TE) used in the field and laboratory will be controlled by a formal calibration program in accordance with the requirements of the NWP QAPD and applicable procedures and standards. Equipment calibration requirements for subcontractor-provided equipment are established by this QAPjP and by subcontractor SOPs. Control and calibration of installed plant equipment will conform with established requirements for equipment type, range, accuracy, and precision to provide data compatible with the specified requirements and desired results. Calibration of M&TE may be performed internally using primary reference standards or externally by laboratories, agencies, manufacturers, or other suppliers.

6.1 Responsibilities

The EM&H manager has the primary responsibility for the monitoring systems. It is the responsibility of the EM&H manager to provide the maintenance subcontractor with the information required for the development of calibration procedures for use in equipment calibration (e.g., vendor specifications, calibration frequencies). It is the responsibility of the maintenance subcontractor to develop calibration procedures and to calibrate the equipment. Procedures for equipment calibrated off-site are documented in the subcontractor QAPjPs and SOPs. The EM&H manager is responsible for ensuring that field equipment is submitted on time for calibration and that properly calibrated equipment is used in the field.

6.2 Off-Site Calibration Procedures

The calibration functions regarding the VOC canister samplers (mass flow controllers and gauges) will be performed by the subcontractor that cleans and certifies the VOC samplers. The calibration procedures for these types of equipment are documented by the subcontractor in its SOPs and QAPjPs, and must be approved by the cognizant engineer prior to use. Each VOC sampler mass flow controller, pressure gauge, and vacuum/pressure gauge will be calibrated/certified as a part of each VOC sampler cleaning and certification. Calibration of other M&TE used will be arranged through WIPP Metrology as described in WP 10-AD.01.
The cognizant engineer is responsible for specifying calibration requirements for all system-related instruments.

Calibration and control of M&TE will be managed in accordance with the QAPD.

6.3 Preventive Maintenance

Periodic preventive maintenance for critical sampling equipment will be performed during each cleaning and certification cycle and as needed. Maintenance of the VOC canister samplers and associated monitoring equipment will include, but not be limited to, replacement of damaged or malfunctioning parts, leak testing, and cleaning of samplers and associated equipment. Spare VOC Samplers are kept on hand to ensure that there are sufficient units to continue sampling in the unexpected event of instrument failure or quality concerns.

7.0 SAMPLING PROGRAM

Sampling activities, such as collection, packaging, handling, shipping, and sample storage, will be performed in accordance with approved procedures based on the concepts described in EPA Compendium Method TO-15.

The basic concepts of the method included in the sampling program are:

- Use of VOC canister samplers to produce pressurized samples in passivated stainless steel canisters.

- Use of air sampling equipment to produce subatmospheric samples in passivated stainless steel canisters.

7.1 Sampling Activities

The VOC Monitoring Program involves the collection of air samples in passivated stainless steel canisters. Air samples will be collected in these canisters in accordance with applicable WIPP procedures. Certified VOC canister samplers are programmed to collect time-weighted average/time-integrated six-hour air samples at multiple sampling locations for repository and disposal room VOC monitoring. Performance is described in the sampling SOP as pressurized sampling. Subatmospheric samples will be obtained for ongoing disposal room VOC monitoring in room 1 of a filled panel. A filled panel is an Underground HWDU no longer receiving waste for emplacement. Monthly sampling of filled panels is required unless an explosion-isolation wall is installed. Performance is described in the sampling SOP as subatmospheric short duration time-integrated sampling.

Sampling activities and data collection will be documented and records retained as described in section 15.0. Field operations staff will maintain records appropriate to the activities.

Any logs, data collection/recording tools, including photographs, will be identified with sufficient information to allow retention and retrieval. Photographs will be taken in accordance with NWP procedures. Field data forms will be designed to meet program data and records retention requirements.

7.2 Sample Collection Procedures for VOC Sampling

Sample collection is described in the Permit and applicable sampling procedures. The Permit and VOC Monitoring Plan (WP 12-VC.01) define the location and frequency of sampling at WIPP to ensure effective representation of site conditions. Sampling station locations are shown in Figure 7-1 and Figure 7-2. Design information for VOC canister sampler is contained in engineering documentation.

Six-liter passivated stainless steel sample canisters will be used in the VOC monitoring process. These canisters will undergo rigorous cleaning and certification procedures prior to being used to obtain a sample. Cleaning and certification of canisters is described in section 9.2.1. The vacuum of certified clean canisters will be verified as adequate upon initiation of a sample cycle as described in sampling SOPs.

For pressurized VOC sampling, the specific air sampling units to be used at the stations are automated ambient air VOC canister samplers. The sampling systems use a diaphragm pump, an electronic mass flow controller, a vacuum/pressure gauge, a pumphead pressure gauge, a programmable smart relay, an elapsed time indicator, and two ports (allows for duplicate sampling) for connecting sample canisters. The samplers will be operated in a pressurized mode, and should yield sample volumes of approximately 12 liters. The sample is pumped into the passivated stainless-steel canisters by the sampling system, which regulates the rate and duration of the sampling event and the final canister pressure.

The pressurized sampling equipment will be certified clean prior to initial use. For continued use, recertification will be required for each individual sampler one year after being placed in service. Cleaning and certification of the sampling equipment will be performed by the on-site or contracted laboratory using zero air and humid calibration gas standard. The cleaning and certification procedure is derived from concepts contained in EPA Compendium Method TO-15.

Subatmospheric samples collected for hydrogen/methane monitoring of Room 1 of a filled panel may also be analyzed to monitor ongoing disposal room VOC concentrations. Sampling processes and sampling QA requirements are therefore identified in WP 12-VC.04.

As part of sampling system designs, air samples must first pass through two particulate filters. As described in sampling procedures, these filters may be counted by Radiological Control Technicians for contamination prior to removing the sample canister from the underground. If the filters or sample canisters are determined to be contaminated with TRU radioactive material, the Radiological Control Manager will be contacted to determine equipment disposition.

7.3 Sample Identification

Sample canisters will be marked with identification at the time of collection of the sample. Sample identification will include data items required by the VOC sampling procedures.

7.4 Sample Shipping and Storage

Samples for laboratory analysis will be collected and transferred to the subcontract laboratory accompanied by a chain-of-custody (CofC) record (example attachment 1) following CofC procedures as discussed in section 8.0. A Request for Analysis Form (example attachment 2) will be completed to identify the sample canister number(s), sample type, and analysis required to obtain analytical results. Samples will be delivered/shipped to the subcontract laboratory for analysis in accordance with established sample holding times and program schedule. No samples will be accepted by the receiving laboratory personnel unless they are properly labeled and custody maintained. Appropriate vacuum/pressure readings will be taken as prescribed in laboratory SOPs.

All samples will be maintained at ambient temperature from the time of collection until time of disposal at the analytical laboratory. Completed samples will generally be received at the laboratory weekly. Most canisters will be pressurized during the sampling process, and additional pressurization at the laboratory using dilution gases will not routinely be necessary for analyses of pressurized samples. Subatmospheric samples requiring VOC analysis will generally be received at the laboratory monthly for filled panels requiring ongoing monitoring. These samples will require some dilution. Some pressurized and subatmospheric samples will require serial dilutions when concentrations exceed the initial calibration range. Analysis involving dilutions will be reported with a dilution factor and nature of the dilution gas. Sample analysis results will be corrected for dilutions. Canister pressure or vacuum readings will be documented after sample receipt by the analytical lab to confirm that no significant changes in vacuum/pressure occurred during shipping and storage.

8.0 CHAIN-OF-CUSTODY

One of the significant considerations for laboratory analysis data is demonstration that collected samples were obtained from the locations stated and that they reached the laboratory without alteration. To satisfy this requirement, evidence of collection, shipment, laboratory receipt, and custody must be documented with a CofC record that demonstrates process activities through ultimate sample disposal.

A CofC record (example attachment 1) will be initiated by personnel after receiving clean certified canisters. Applicable WIPP procedures define the process.

9.0 VOC LABORATORY ANALYSIS

Laboratory activities will be performed in accordance with approved procedures and are based on the concepts described in EPA Compendium Method TO-15, EPA SW-846 8260B, and EPA CLP document.

Laboratory activities to be performed as part of this program involve five primary tasks:

- Cleaning and certification of sample canisters.
- Analysis of QC samples.
- Analysis of sample canisters.
- Analysis of VOC sampler cleaning and certification samples.
- Preparation of analytical reports.

Each of these activities is discussed later in this section. Target VOC analytes for the VOC Monitoring Program will include the compounds listed in table 2. Some non-targets may be included on the laboratory's target analyte list as additional requested analytes (ARA) to gain a better understanding of potential concentrations and associated risk. The analytical laboratory will be directed to calibrate for ARAs when requested, and classify and report other non-target VOCs as tentatively identified compounds (TICs), if tentative identification can be made as described in section 9.2.6.

Data quality objectives indicated in table 2 are derived from control criteria proposed by the EPA in the draft CLP document Volatile Organics Analysis of Ambient Air in Canisters.

Laboratory analysis will be performed under a formal QA program in accordance with documented and approved procedures by trained and qualified personnel in accordance with the defined QA program objectives for precision, accuracy, completeness, representativeness, comparability, traceability, and sensitivity. The QC activities implemented during this program will provide a basis for assessing the QA parameters.

Analytical testing will be controlled by a laboratory QA program (including, as appropriate, method certification, internal chain-of-custody, analysis of method blanks, laboratory duplicates, check standards, and internal standards). In addition, field QC samples (duplicates) will be collected and analyzed. Test performance, QC analyses, and results will be documented using data forms/formats defined in applicable procedures.

A Statement of Work has been submitted to the laboratory listing specific requirements of the analytical laboratory, including:

- Analytical parameters and methods.

- Sample canister cleaning and certification.

- Sampler cleaning and certification samples.
- Sample volumes and holding times.
- QC sample analysis.
- Laboratory reporting requirements.
- Providing applicable SOPs to NWP.
- Other requirements contained in this plan.

9.1 Initiation of Laboratory Analysis

Procedures established by NWP and the laboratory will be examined to determine that the appropriate chain-of-custody and sample management steps are in place and will adequately assure the integrity of samples and the program**.**

9.2 Laboratory Analytical Procedures

This subsection summarizes laboratory analytical procedures for analysis of VOCs collected in passivated canisters.

9.2.1 Sampler and Canister Cleaning and Certification

Both the VOC samplers used for pressurized VOC sampling and the sample canisters must undergo cleaning and certification procedures prior to initial use. The calibration functions of VOC samplers are certified as described in section 6.2. Sampling systems, including sample inlet lines, will be cleaned and leak checked and samplers will undergo a humid zero air certification to demonstrate that no target VOCs exist in the systems at concentrations ≥ 0.2 ppbv for each target VOC listed in table 2. Samplers not meeting this criterion but demonstrated to be free of contamination above the required MRL for repository VOC monitoring (see table 2) will be designated as a limited use sampler. Finally, the samplers will be tested with a humid calibration gas standard. Target compound recoveries between 90 and 110 percent are expected. For continued use, recertification will be required for each individual sampler one year after being placed in service. The responsibility of the laboratory is to process and analyze VOC sampler certification samples and provide the results to the Subcontract Vendor (section 2.2.9) and NWP. The Subcontract Vendor performs the cleaning and certification of the VOC samplers.

Before each use, canisters will be cleaned and certified by the laboratory (batch certification acceptable). A procedure describing this process will be provided by the subcontract analytical laboratory to NWP. This procedure can be based on cleaning concepts contained in EPA Compendium Method TO-15 and the Draft EPA CLP document Volatile Organics Analysis of Ambient Air in Canisters or developed using in-house proprietary SOPs. Regardless of the process used for cleaning, the canisters will be leak tested, certified clean, and evacuated to < 0.05 mmHg (i.e., < 50 mtorr) before they are used for sampling. A batch of canisters will be certified clean if no target VOCs are detected in the representative canister at concentrations ≥ 0.2 ppbv for each target VOC listed in table 2. A recall date is assigned to cleaned and certified canisters as one year from the cleaning certification date. If a canister is not used for sampling before the recall date expires, the canister must be recertified before use for sampling.

9.2.2 Sample Management

Samples will arrive at the laboratory under CofC. The laboratory will receive custody of the samples and maintain controlled custody of the samples throughout the analysis. Samples must be maintained at ambient temperature until time of disposal at the laboratory.

9.2.3 Analytical Systems Requirements

The analytical system will consist of three major components. These components are presented below.

a. Sample Introduction System for Canisters

The sample introduction system will include heated components equipped with thermostats to minimize adsorption of VOCs. It may include a solid phase drying tube to remove moisture from the gas stream. One or more cryogenic traps may be used to focus and desorb trapped material. Transfer lines within the introduction unit will be heated so that VOCs are not actively adsorbed and tubing will be of a low dead-volume type. The introduction system will have an in-line mass flow controller or fixed volume loop for higher concentration samples. The introduction unit will be capable of introducing internal standards directly into the sample flow path.

b. Analyte Separation

Analyte separation will be achieved by Gas Chromatography (GC).

c. Detection System

Analyte detection will be performed by a mass spectrometer in the SCAN mode. The mass spectrometer and software capabilities must meet the following:

- Capable of scanning from 35 to 300 atomic mass units every one second or less in the SCAN mode.
- Utilize 70 volts (nominal) electron energy in the electron impact ionization mode.

- Produce a mass spectrum which meets all the instrument performance acceptance criteria when 50 nanograms (ng) or less of bromofluorobenzene (BFB), Chemical Abstracts Service registry number (CAS#) 460-00-4, is introduced to the analytical system

- Include a data system capable of continuous acquisition and storage of raw data on machine readable media.

- Have a computer algorithm for analyte quantitation and forward library searches.

9.2.4 Calibration Standards

Certified primary standards will be obtained from approved suppliers for the target VOCs as well as the internal standards and BFB. Secondary standards may be prepared from dilution of the primary standards. Alternatively, analytes that are gases at STP may be prepared in a static gas dilution bottle. For analytes that are liquids or solids at STP, a mixture may be made and loaded directly into a standard preparation cylinder. These standards will be checked against EPA audit cylinders or other reference materials to verify the accuracy of their concentrations. An audit accuracy of ≤30 %, as described in EPA Compendium Method TO-15, is required.

Laboratory procedures specify detailed requirements for preparation of standards and reagents, including requirements for grades of materials, equipment, and record keeping.

9.2.5 Calibration Procedures

Prior to the analysis of a sample, the GC/MS system must undergo tuning and a mass calibration check. Tuning acceptance is checked by introducing ≤ 50 ng of BFB into the analytical system.

The requirements for relative ion abundances (see table 1) must be met before analyses may proceed. BFB requirements must be met before initiation of an analytical run sequence and for each 24 hours of analytical system operation.

Table 1 – BFB Key Ions and Abundance Criteria

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

Calibration standards for the target VOCs in passivated canisters will be prepared and analyzed at a minimum of five concentrations. These concentrations should be within the linear range of the instrument; however, if some nonlinearity exists, concentrations may be determined through curve fitting or physical plotting of data. One standard concentration should be less than or equal to the required method reporting limit (MRL). Average Relative Response Factors (RRF) will be generated for each target compound. These response factors must meet the requirements listed in section 10.0. The method used for quantitation of the data must be reported with the analytical results. In addition, a single-point calibration check will be performed for each 24 hours of analytical system operation.

9.2.6 Library Searches

In every sample analyzed, a search of a library of mass spectra to attempt to tentatively identify non-target compounds with chromatographic peaks with area responses that are at least 10 percent of the area response of the relevant internal standard must be performed. Guidelines for making tentative identifications can be found in EPA Method SW-846 8260B. Tentatively Identified Compounds (TICs) will be reported as described in section 9.2.7. If identification cannot be made based on recommended guidelines, the non-target will be identified as “unknown.”

9.2.7 Data Reporting

Target analyte concentrations will be quantified using the responses from the initial calibration. The average RRFs of the calibration standard used for quantitation will be reported with the analytical results. Non-target sample constituents identified by library searches will be reported as TICs, and concentration calculations will be based on a response factor of one. The average response factors of the calibration standard used for quantitation will be submitted with the results. Copies of spectra, with library search results (purity and fit), will be submitted with the data reports. A table listing the analytical run sequence with the corresponding internal standard area counts must be reported. Any nonconformances must be included with the reporting of the data.

Analytical laboratory data package contents and organization will be similar to requirements in the EPA CLP document. Raw and processed GC/MS data must be stored on magnetic tape or disk and maintained for the duration of this program.

9.3 Quality Control Testing

The specific project activities that will be performed for QC are presented in section 9.3.1.

9.3.1 Types and Frequencies of Quality Control Analysis

To ensure data quality, QC protocols and check sample analysis will be performed by the analytical laboratory. The QC checks performed by the laboratory are described in the following subsections.

a. Method Certification

An initial phase in the Analytical Laboratory Testing Program includes certification of the selected analytical methods. The certification procedure involves: (1) establishing an analytical procedure for method performance; (2) training analysts in proper equipment operation and method performance; (3) generating initial method performance data (e.g., calibration curves, method detection limit [MDL] studies); and (4) eliminating or minimizing determinate errors that may be due to analyst error or to the use of inadequate equipment, reagents, or gases. Neat compounds will be a standard grade of purity (>98.0 percent) or the purity will be reported prior to analysis. Standard gas mixture certifications will be verified.

b. Blank Analysis

Two different types of blanks will be used during the study.

Method Blank -- Method blanks will be analyzed to evaluate the cumulative potential of sample contaminants and interferences due to laboratory conditions and activities. A method blank will be prepared and analyzed for each 24 hours of analytical system operation. The main contaminant sources of the target analytes are dilution gases; carrier gases; system contaminants arising from tubing, valves, and other system components; residual contaminants from prior analysis (i.e., carryover); and solvent vapors in the laboratory.

Blank corrections are not performed for the sample analysis; therefore method blank results must be less than 0.5 ppbv for each target VOC listed in table 2 when EPA Compendium Method TO-15 analysis is performed. When analysis is performed based on concepts of EPA Method SW-846 8260B, method blank technical acceptance criteria will be as described in Chapter 1 of SW-846.

Certification Blanks -- Laboratory blanks will be analyzed routinely as part of the cleaning and certification processes applied to canisters and samplers to verify the effectiveness of these processes. Acceptance criteria are described in section 9.2.1.

c. Laboratory Control Sample Analysis

A laboratory control sample (LCS) or blank spike (BS) is an internal QC sample derived from a certified reference gas. The reference gas will contain the target VOCs at known concentrations and will be independent of instrument calibration gas standards (i.e., different vendor or same vendor, different lot #). Percent recovery for LCS analysis will be used to assess laboratory accuracy. LCSs will be analyzed for each sample batch at a frequency of 10 percent, or one per analytical lot, whichever is more frequent.

d. Duplicate Analysis

Laboratory duplicate analysis (i.e., duplicate injections) will be performed by the laboratory on single sample canisters. Laboratory duplicate analysis will be used to determine laboratory precision. Laboratory duplicates will be analyzed for each sample batch at a frequency of 10 percent, or one per analytical lot, whichever is more frequent.

Field duplicate samples (two canisters filled simultaneously) will be collected in the field at a frequency of at least 5 percent. The duplicate samples will be analyzed and the results will be used to assess field sampling precision.

Additional precision determination is made by performance of duplicate analysis for all LCSs in each analytical batch.

10.0 QUALITY ASSURANCE OBJECTIVES

The QA activities for the VOC monitoring programs will be conducted in accordance with the following EPA documents: Guidance for Quality Assurance Project Plans, EPA QA/G-5 (EPA, 2002), and the EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5 (EPA, 2001). This section addresses the methods to be used to evaluate the effectiveness of the components of the measurement systems and how this evaluation will be used to define data quality. Definitions for the key objectives are presented in this section. Specific objectives for data quality are presented in table 2.

Table 2 – Quality Assurance Objectives for Accuracy, Precision, Sensitivity, and Completeness

Compound	Accuracy (Percent Recovery)	Precision (RPD)*		Required MRL (ppbv)* Repository	Required MRL (ppbv)* Disposal Room	Completeness (Percent)
		Laboratory	Field			
Carbon tetrachloride	60 to 140	≤25	≤35	2	500	≥95
Chlorobenzene	60 to 140	≤25	≤35	2	500	≥95
Chloroform	60 to 140	≤25	≤35	2	500	≥95
1,1-Dichloroethylene	60 to 140	≤25	≤35	5	500	≥95
1,2-Dichloroethane	60 to 140	≤25	≤35	2	500	≥95
Methylene Chloride	60 to 140	≤25	≤35	5	500	≥95
1,1,2,2-Tetrachloroethane	60 to 140	≤25	≤35	2	500	≥95
Toluene	60 to 140	≤25	≤35	5	500	≥95
1,1,1-Trichloroethane	60 to 140	≤25	≤35	5	500	≥95

* RPD - relative percent difference
ppbv - parts per billion by volume

- Precision will be defined and evaluated by the RPD between duplicate samples, including field duplicates, between laboratory duplicate samples, and between LCS and Laboratory Control Sample Duplicate (LCSD) recoveries, as follows:

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

Where: A = Original sample result
B = Duplicate sample result
Note: vertical lines in the formula above indicate absolute value of A-B.

- Accuracy is measured and evaluated through the use of analytical standards, by analysis of method blanks, and by the recoveries of blank spikes (LCS/LCSD or BS/BSD). Because recovery standards cannot reliably be added to the sampling stream, overall system accuracy must be based on analytical instrument performance evaluation criteria. These criteria will include performance verification criteria for instrument calibrations, LCSs, LCSDs, and internal standard area responses. These criteria will constitute the verification of accuracy for the target analyte quantification (i.e., quantitative accuracy). Evaluation of standard ion abundance criteria for BFB will be used to evaluate the accuracy of the analytical system in the identification of target analytes, as well as the evaluation of unknown constituents (qualitative accuracy).

Quantitative accuracy is defined as:

Percent recovery = X / T x 100

Where,

T = True or reference value of the analyte being measured

X = Experimentally determined value of the analyte recovered from the standard

- Sensitivity is defined by the MRLs for the program. Attainment of MRLs will be verified by the performance of statistical MDL studies in accordance with 40 CFR Part 136 Appendix B. The MDL represents the minimum concentration that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. An MDL study will be performed at least annually by the program analytical laboratory and after major changes in instrument configuration.

- Completeness is defined as the percentage of the ratio of the number of valid sample results received that meet data quality objectives (i.e., precision, accuracy) versus the total number of samples required to be collected. Completeness may be affected, for example, by sample loss or destruction during shipping, laboratory sample handling errors, inability to collect the required samples, or by rejection of analytical data during data validation. Completeness will be assessed by the following equation:

Percent complete = $\frac{D_r}{D_c} x100$

Where,

D_r = Number of samples for which valid results are reported
D_c = Number of collected samples

a. Evaluation of Laboratory Precision

Laboratory duplicates will be used for the evaluation of laboratory precision. Duplicate analysis will be performed on single sample canisters. Laboratory duplicate values will be evaluated through the use of control charts. The data quality objective for laboratory precision is ≤ 25 RPD for each set of duplicate analysis.

b. Evaluation of Field Precision

Duplicate canister samples will be taken in the field at a frequency of at least 5 percent and analyzed individually. The data quality objective for field precision is ≤ 35 RPD for each set of duplicate samples.

c. Evaluation of Laboratory Accuracy

Both quantitative and qualitative accuracy evaluations will be performed in the laboratory.

Quantitative Accuracy

Quantitative analytical accuracy will be evaluated through performance criteria based on average relative response factors (RRFs) generated during instrument calibration, analysis of LCSs/LCSDs. For the initial calibration, any single response factor for a particular target analyte, can differ by no more than 30 percent from the average of the initial calibration response factors. After the successful completion of the calibration, it is sufficient to analyze only a midpoint standard for every 24 hours of analytical system operation (i.e., continuing calibration). The RRFs of the midpoint standard must pass the ≤ 30 percent difference acceptance criterion for each target analyte before sample analysis may begin.

Percent recoveries for the target analytes will be calculated for each LCS and LCSD relative to the known reference concentrations. Objectives for percent recovery, listed in table 2, are based on accuracy criteria proposed by EPA for canister sampling programs. LCSs/LCSDs will be analyzed with each sample lot.

Internal standard areas will be monitored as a verification of stable instrument performance. In the absence of any unusual interferences, areas should not change by more than 40 percent over a 24-hour period. Deviations larger than 40 percent are an indication of a potential instrument malfunction. If an internal standard area in a given sample changes by more than 40 percent, the sample must be reanalyzed. If the 40 percent criterion is not achieved during the reanalysis, the instrument must undergo a performance check and the midpoint standard must be reanalyzed to verify proper operation.

Qualitative Accuracy

Qualitative accuracy in the identification of target analytes will be evaluated as follows:

a. Evaluation of Sensitivity

The MDL for each of the target analytes will be evaluated by the analytical laboratory before sampling begins. An MDL evaluation will be performed initially and at least annually thereafter. MDL evaluations will be performed in accordance with 40 CFR Part 136 Appendix B.

The presence of aerosol salts in underground locations may affect the MDL of the samples taken in those areas. The sample canisters will be sufficiently protected with in-line filters to minimize aerosol particulate interference.

b. Completeness

The expected completeness objective (i.e., percentage of valid data obtained from the total planned) for this program is greater than or equal to 95 percent. Data completeness will be tracked and evaluated monthly.

c. Representativeness

The monitoring program has been designed to collect air samples that are representative of the media being sampled. Repository and disposal room VOC monitoring samples are programmed to collect for a six-hour duration. The sampling locations, as prescribed in the Permit, were selected to provide representative samples. For ongoing disposal room VOC monitoring, subatmospheric samples are collected from a steady stream of air being pulled from Room 1 of a filled panel at a set flow rate.

11.0 LABORATORY ANALYSIS DOCUMENTATION AND REPORTING

QA requirements for laboratory analysis documentation and reporting are described in sections 11.1-11.2.

11.1 Documentation

Laboratory analytical programs will systematically and uniformly document administrative and technical information. Necessary forms will be reviewed and approved by EM&H prior to initiating the analytical programs. Data forms will be completed during the analysis processes. Requested information will be addressed or designated as not applicable. This information will include, as appropriate:

- Program identification.
- Identification of reporting personnel.
- Analysis date.
- Identification number of calibrated equipment used.
- Identification and description of sample(s) analyzed.
- Analytical results.
- QC check results.
- Unusual conditions encountered.

Data evaluation will include the analysis results of method blanks, LCSs/LCSDs, duplicate samples, and instrument calibration. These data will be summarized appropriately and the results transmitted to the program files. Laboratory administrative forms, analytical raw data, QC raw data, computer printouts, internal logs, and check prints will be organized and maintained in accordance with the American Society of Mechanical Engineers (ASME), NQA-1-1989, or transmitted to the program files as required (section 15.0).

11.2 Laboratory Data Reporting

Designated laboratory personnel will review analytical results prior to external distribution. The reviewer will, as appropriate:

- Compare analyses performed to the requested analytical program.
- Review results for reasonableness.
- Review QC data results.
- Verify that required checking was properly performed.
- Review holding time requirements.

If the review indicates that data meet program quality requirements, the data will be released to the EM&H manager or other Cognizant Individuals as "final" information. At this point, proper disposal of applicable samples by the subcontract laboratory may commence.

12.0 DATA ANALYSIS AND REPORTING

Analytical data for the sampling program will be evaluated to calculate concentrations of target compounds attributed to Underground HWDUs. Results will be reported to the New Mexico Environment Department (and the DOE) in accordance with reporting requirements of the WIPP RCRA Permit.

Data analyses and reporting activities will be performed in a planned and controlled manner. Any changes to final analyses will be subject to the same level of control used for the originals. Performance responsibility rests with the EM&H manager.

12.1 Calculations

Documentation will be sufficient to permit a technically qualified individual to review and understand the calculations and to verify the results. Each calculation sheet will be signed and dated by the originator and the person who checked the calculation.

Calculations should, as appropriate, include a statement of calculation intent, description of methodology used, assumptions and their justifications, input data analyses (including computer types, program name and revision, inputs and outputs, status of program verification, and the basis for application of the program), numerical calculations (including units), and results.

Verification of calculations will be performed by a technically qualified individual(s) other than the person(s) who performed the original work, or specified the method, or established the parameters to be used. Verification will be performed prior to release of the results of calculations in final reports, or the unverified information will be clearly identified and controlled. Evidence of verification will be documented.

12.2 Computer Software

The use of computer software for data management and validation will be controlled in accordance with the NWP QAPD.

12.3 Qualification of Data Management Personnel

Personnel performing test activities will have experience and receive the training necessary to provide a complete understanding of the program to be tested. Indoctrination to the technical objectives and requirements of the QA Program elements will be required.

12.4 Data Presentation

The results of analyses may be presented in figures and/or tables within the individual data packages.

12.5 Data Validation and Corrective Actions

This section of the QAPjP presents a discussion of data validation and corrective actions.

Data Validation

Data and records generated by field sampling personnel and laboratory reports will be reviewed for completeness and correctness. The criteria that will be used to validate data integrity are shown in table 2. Data points that do not meet program data quality criteria will be flagged and evaluated for corrective action.

The possibility exists that some data points may appear to be inconsistent with the normal range of data collected. Statistical tests will be used to identify outlying data points. Data so identified will be flagged for final disposition by the EM&H manager or other Cognizant Individuals. In addition, control charts will be maintained and evaluated to identify outlying precision and accuracy measurements based on historical performance.

Acceptable data for this monitoring program will meet stated precision and accuracy criteria. The QA objectives for precision, accuracy, and completeness as shown in table 2 can be achieved when established methods of analyses are used as proposed in this plan. The program data will be evaluated and QA objectives modified as necessary based on the results of the QC testing program.

Corrective Action

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

Laboratory corrective actions may be required to maintain data quality. The laboratory continuing calibration criteria, as described in section 10.0, indicate that the response factor for the midpoint standard must be ≤ 30 percent difference from the mean response factor of the initial calibration. Differences greater than 30 percent will require recalibration of the instrument before samples can be analyzed.

If the internal standard areas in a sample change by more than 40 percent, the samples must be reanalyzed. If the 40 percent criterion is not achieved during the reanalysis, the instrument must undergo a performance check and the midpoint standard reanalyzed to verify proper operation. Deviations larger than 40 percent are an indication of a potential instrument malfunction.

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

13.0 CONTROL OF NONCONFORMANCE ITEMS/CORRECTIVE ACTION

Control of nonconformance items is provided as specified in the QAPD. The responsibilities and specific requirements for initiating corrective actions after encountering conditions inconsistent with quality are defined in the QAPD.

14.0 QAULITY ASSURANCE AUDITS

The requirements and responsibilities of the NWP QA Audit Program are described in QAPD, section 3, Assessment Requirements. Internal VOC monitoring program audits and external supplier (e.g., analytical laboratories, equipment manufacturers) evaluations, surveys, or audits will be conducted by NWP as required to verify compliance with the established QA Program and to determine the effectiveness of program implementation. The QAPD also describes the required qualifications of lead auditors and the individual audit responsibilities of NWP departments. The procedure establishing the methods and authority for conducting and tracking QA internal and external audits is given in the QAPD.

14.1 Auditor Training and Qualification

The training and qualification requirements for personnel participating in or conducting QA audits at WIPP are defined in QA procedures. Auditing personnel will be trained in accordance with these procedures.

14.2 Quality Assurance Surveillance

General QA surveillance of the monitoring program such as observation, evaluation, monitoring, and witnessing to verify conformance of items or activities will be conducted in accordance with the QAPD.

14.3 VOC Monitoring System Audits

Audits of WIPP site activities associated with the VOC Monitoring Program will be performed by NWP QA at or shortly after program startup and at least on an annual basis thereafter. These audits consist of, but are not limited to, on-site evaluation of the following:

- Sampling equipment condition and certification.
- Staff qualifications and training.
- Availability and implementation of procedures.
- Sample collection and handling protocols.
- Equipment calibration.
- Field data documentation completeness.
- Data reduction verification.
- Representativeness of samples and validity of data.
- Comparability and consistency of data.
- Identification of anomalous data.
- Adequacy of data validation procedures.
- Nonconformance control and corrective action.

Laboratory data will be reviewed as part of the annual WIPP site program audits. This review may include as appropriate:

- Assessment of completeness of laboratory analytical data and associated records.

- Evaluation of analytical data with respect to required sensitivity, accuracy, precision, and freedom from contamination.

- Indication of adequate equipment calibration.
- Identification and evaluation of nonconforming data.
- Consistency of reported data.

In addition to WIPP site program audits, audits may be performed, as needed, to evaluate the adequacy of the subcontractor's laboratory or other suppliers' QA programs and compliance with the requirements of this QAPjP.

14.4 Performance Audits

Performance audits or evaluations, as defined by EPA Requirements for Quality Assurance Project Plans (EPA, 2001), will be accomplished through the introduction of audit samples (laboratory blinds) into the analytical sampling stream. Blind audit canisters will be submitted to the program laboratory at least once during the sampling program. An audit accuracy of ≤ 30 %, as described in EPA Compendium Method TO-15, is required.

14.5 Quality Assurance Reports

The results of QA audits will be reported in accordance with the NWP QAPD. Audit reports will include identification of findings and/or observations, as well as an assessment of the effectiveness of the QA program elements reviewed. Corrective actions are the responsibility of the nonconforming organization and will be tracked by NWP QA through implementation and closure.

15.0 RECORDS ADMINISTRATION

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

The NWP QAPD describes the requirements and responsibilities regarding identification, preparation, collection, storage, maintenance, disposition, and permanent storage of QA records. The WIPP Records Management Program and the QA Records management policy are applicable to all WIPP projects and project participants for the purpose of providing a WIPP project-wide records management system that coordinates the collection, maintenance, identification, and preservation of official WIPP records. Requirements specific to the management of QA records are defined in WP 15-RM, WIPP Records Management Program. Several of the monitoring program records are maintained as part of the RCRA operating record. VOC monitoring records are maintained and dispositioned in accordance with the EM&H Records Inventory and Disposition Schedule.

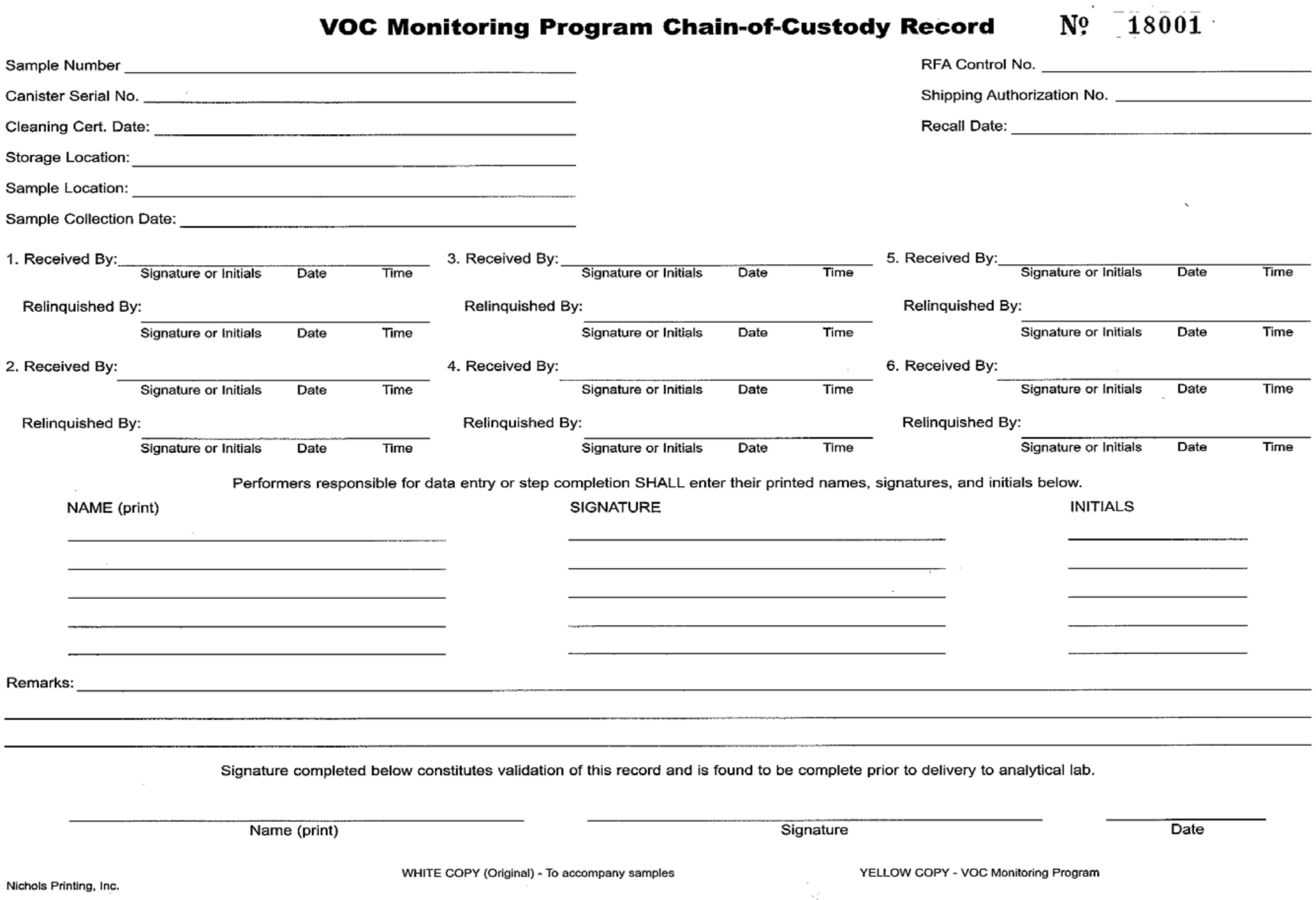
Revisions to completed records (i.e., as a result of audits or data validation procedures) may be made only with the approval of the responsible program manager and in accordance with applicable QA procedures. Original and duplicate or backup records of project activities will be maintained at the WIPP site. Electronic records that cannot be altered by the user and capable of producing a paper copy shall be deemed to be a written record. Documentation will be available for inspection by internal and external auditors.

15.1 Records Validation

The EM&H manager shall be responsible for validation of these records prior to transmittal to Project Records Services. The activity of validation may be delegated.

REFERENCES	
DOCUMENT NUMBER AND TITLE	KEY STEP
40 CFR Part 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants"	
Hazardous Waste Facility Permit, Waste Isolation Pilot Plant, NM 4890139088-TSDF issued by the New Mexico Environment Department	**1**
U.S. Environmental Protection Agency, 1996. SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.* Third Edition. Office of Solid Waste and Emergency Response, Washington, D.C.	
U.S. Environmental Protection Agency, 1999. Compendium Method TO-15: *Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)* EPA-625/R-96/010b. Center for Environmental Research Information, Office of Research and Development, Cincinnati, OH, January 1999.	
U.S. Environmental Protection Agency, 1991. *Contract Laboratory Program Statement of Work, Volatile Organics Analysis of Ambient Air in Canisters(Draft),* EPA540/R-94-085, December 1991, Washington, D.C.	
U.S. Environmental Protection Agency. 2001. EPA QA/R-5, *EPA Requirements for Quality Assurance Project Plans,* March 2001, Washington, D.C.	
U.S. Environmental Protection Agency. 2002. EPA QA/G-5, *Guidance for Quality Assurance Project Plans*, December 2002, Washington, D.C.	
20.4.1.500 New Mexico Administrative Code (incorporating Title 40 *Code of Federal Regulations* §264.602 and §270.23[a][2]), "Adoption of 40 CFR Part 264"	
Washington Regulatory and Environmental Services, 2003, *Technical Evaluation Report for WIPP Room-Based VOC Monitoring*, December 2003	
WP 10-AD.01, *Metrology Program*	
WP 12-VC.01 *Volatile Organic Compound Monitoring Plan*	
WP 13-1, *Nuclear Waste Partnership LLC Quality Assurance Program Description*	**2**
WP 15-RM, *WIPP Records Management Program*	

Attachment 1 – Example of VOC Monitoring Program Chain-of-Custody Record



VOC Monitoring Program Chain-of-Custody Record

№ 18001

Sample Number ____________________

Canister Serial No. ____________________

Cleaning Cert. Date: ____________________

Storage Location: ____________________

Sample Location: ____________________

Sample Collection Date: ____________________

RFA Control No. ____________________

Shipping Authorization No. ____________________

Recall Date: ____________________

1. Received By: ____ Signature or Initials / Date / Time	3. Received By: ____ Signature or Initials / Date / Time	5. Received By: ____ Signature or Initials / Date / Time
Relinquished By: ____ Signature or Initials / Date / Time	Relinquished By: ____ Signature or Initials / Date / Time	Relinquished By: ____ Signature or Initials / Date / Time
2. Received By: ____ Signature or Initials / Date / Time	4. Received By: ____ Signature or Initials / Date / Time	6. Received By: ____ Signature or Initials / Date / Time
Relinquished By: ____ Signature or Initials / Date / Time	Relinquished By: ____ Signature or Initials / Date / Time	Relinquished By: ____ Signature or Initials / Date / Time

Performers responsible for data entry or step completion SHALL enter their printed names, signatures, and initials below.

NAME (print)	SIGNATURE	INITIALS

Remarks: ____________________

Signature completed below constitutes validation of this record and is found to be complete prior to delivery to analytical lab.

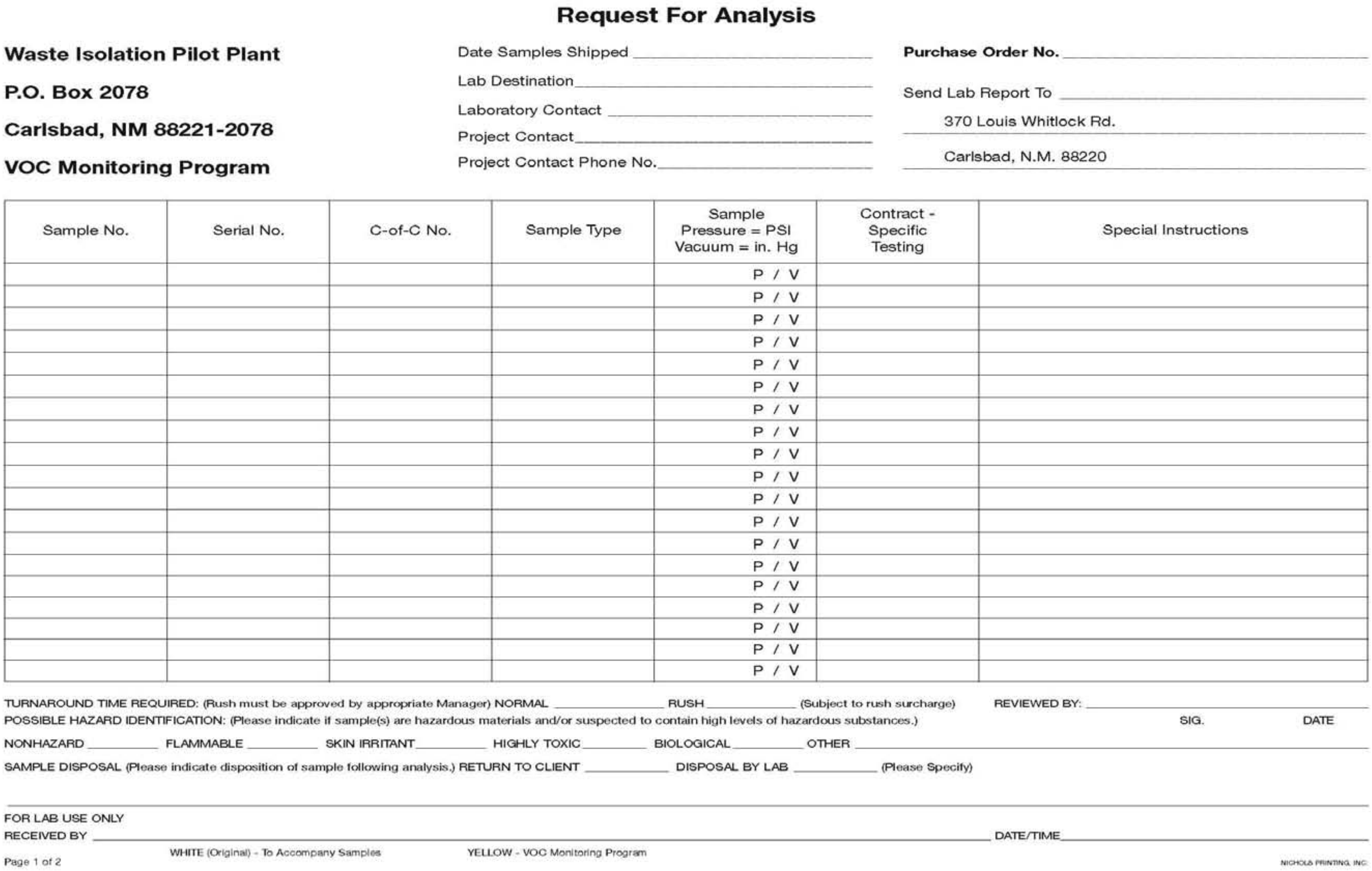
Name (print) ____________________ Signature ____________________ Date ____________________

Nichols Printing, Inc.

WHITE COPY (Original) - To accompany samples

YELLOW COPY - VOC Monitoring Program

Attachment 2 – Example of Request for Analysis



Request For Analysis

Waste Isolation Pilot Plant

P.O. Box 2078

Carlsbad, NM 88221-2078

VOC Monitoring Program

Date Samples Shipped ____________________
Lab Destination ____________________
Laboratory Contact ____________________
Project Contact ____________________
Project Contact Phone No. ____________________

Purchase Order No. ____________________
Send Lab Report To ____________________
370 Louis Whitlock Rd.
Carlsbad, N.M. 88220

Sample No.	Serial No.	C-of-C No.	Sample Type	Sample Pressure = PSI Vacuum = in. Hg	Contract - Specific Testing	Special Instructions
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		
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				P / V		
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		
				P / V		

TURNAROUND TIME REQUIRED: (Rush must be approved by appropriate Manager) NORMAL ____________ RUSH ____________ (Subject to rush surcharge)

REVIEWED BY: ____________________
SIG. DATE

POSSIBLE HAZARD IDENTIFICATION: (Please indicate if sample(s) are hazardous materials and/or suspected to contain high levels of hazardous substances.)

NONHAZARD ________ FLAMMABLE ________ SKIN IRRITANT ________ HIGHLY TOXIC ________ BIOLOGICAL ________ OTHER ____________________

SAMPLE DISPOSAL (Please indicate disposition of sample following analysis.) RETURN TO CLIENT ________ DISPOSAL BY LAB ________ (Please Specify)

FOR LAB USE ONLY
RECEIVED BY ______________________________ DATE/TIME ____________________

WHITE (Original) - To Accompany Samples YELLOW - VOC Monitoring Program

Page 1 of 2

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APPENDIX 3-E
AERMOD FILES (The files are provided in electronic format.)