

**Quality Assurance Project Plan for Hydrogen and Methane Monitoring
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CHANGE HISTORY SUMMARY

REVISION NUMBER	DATE ISSUED	DESCRIPTION OF CHANGES
1	11/30/10	<p>Added ANSI, ASME, NMED, and VOC to the acronym list</p> <p>Changed wording in the title for Step 2.2.1 from Director to Manager</p> <p>Changed container to canister throughout the document</p> <p>Changed Section 11.0 to 14.0 in Step 4.2</p> <p>Added ANSI to standards in Step 5.1</p> <p>Added wording passivated to stainless steel canisters throughout the document</p> <p>Added wording pressure to gauge throughout the document</p> <p>Added \geq to 95 percent throughout the document</p> <p>Added wording vacuum to pressure gauge throughout the document</p> <p>In Step 9.0 removed wording on statistical analysis and changed wording about planning session to Statement of Work</p> <p>Changed Section 11.0 to 10.0 in Steps 9.5.5 and 13.2</p> <p>Added wording on ultra purity nitrogen in Step 9.6.1 and removed wording on monitoring location</p> <p>Added \leq to 25 and 35 percent throughout the document</p> <p>Changed 500 to 1000 ppmv in Step 11.2</p> <p>Changed numerical to data in Section 12.0</p> <p>Added reference to Reference section</p>

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ACRONYMS AND ABBREVIATIONS

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	ASTM International
CLP	Contract Laboratory Program
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 Units
HWFP	Hazardous Waste Facility Permit
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
MDL	method detection limit
MRL	method reporting limit
NIST	National Institute of Standards and Technology
NMED	New Mexico Environment Department
ppmv	parts per million by volume
QA	quality assurance
QAPD	Quality Assurance Program Description
QAPjP	Quality Assurance Project Plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RPD	relative percent difference
SEC	Site Environmental Compliance
SOP	standard operating procedure
SOW	statement of work
TCD	thermal conductivity detector
TRU	transuranic

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VOC	volatile organic compound
WIPP	Waste Isolation Pilot Plant
WTS	Washington TRU Solutions LLC

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1.0 INTRODUCTION ¹

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 Washington TRU Solutions LLC (WTS), the WIPP management and operating contractor; and by Sandia National Laboratories, the scientific advisor for the project.

This Quality Assurance Project Plan for Hydrogen and Methane Monitoring, or "QAPjP (as defined by the U.S. Environmental Protection Agency [EPA] in Quality Assurance and Quality Control [EPA, 1990a]) has been prepared to document the measures that will be implemented by WTS for the DOE so that analytical data from monitoring of hydrogen and methane at WIPP will be of sufficient quality to confirm compliance with the action levels in the WIPP Hazardous Waste Facility Permit (HWFP) (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 WTS and its subcontractors during the course of equipment procurement, design, and installation, and air monitoring for hydrogen and methane 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 Hydrogen and Methane 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 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 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.

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1.2 Hydrogen and Methane Monitoring

Monitoring for hydrogen and methane became a HWFP requirement on March 25, 2008. This sampling program focuses on "filled" hazardous waste disposal units (HWDUs). Each filled HWDU will be sampled using 18 sampling lines. Thirteen of these sampling lines will be the lines previously used for volatile organic compound (VOC) sample collection. Five additional sample lines will be used to collect samples from each side of the two access-restricting bulkheads and from the inlet side of Room 1 in each "filled" panel.

Any loss of sample lines will be handled in accordance with WP 12-VC.03, Hydrogen and Methane Monitoring Plan. The action steps associated with loss of sample lines will be documented in program procedures.

This monitoring program will provide data for final panel closure system determination and will also allow for the detection of potential rising concentrations from a safety standpoint.

2.0 HYDROGEN AND METHANE MONITORING PROGRAM

The overall structure of the hydrogen and methane monitoring program and its interfaces with applicable departments are described in WP 13-1, Washington TRU Solutions LLC Quality Assurance Program Description (QAPD). Specific QC and operational responsibilities for the Hydrogen and Methane Monitoring Program are assigned to individual groups as described below.

2.1 Manager Quality Assurance Department

The WTS QA Department has the primary oversight responsibility for all aspects of the Hydrogen and Methane Monitoring Program. The manager of this department is responsible for establishing, maintaining, and monitoring the overall QA program. The manager is responsible for establishing and implementing appropriate and effective corrective actions for reported conditions that are adverse to quality and environmental compliance. Quality Assurance personnel receive technical direction from and are under the administrative control of the QA manager. The WTS QA manager has the primary responsibility for verifying that site personnel comply with and understand QA program objectives when conducting hydrogen and methane 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.

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- Verifying that a management assessment of quality-related functions is performed on a periodic basis.
- Interfacing with the hydrogen and methane monitoring program 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 variance requests, 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 below.

2.2.1 Manager, Washington Regulatory and Environmental Services

The Washington Regulatory and Environmental Services Director has the responsibility of ensuring that hydrogen and methane monitoring operations comply with applicable state and federal regulations. The Director 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 responsible for implementing hydrogen and methane monitoring activities, which includes the Hydrogen and Methane Monitoring Program, required to ensure compliance with applicable federal and state environmental regulations. The EM&H manager will serve as the Hydrogen and Methane Monitoring Program Manager. As the program manager, specific duties 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 while training and qualification requirements are met.

2.2.3 Program Scientists

Program scientists are responsible for performance of the administration of the program. These duties include:

- Complying with this QAPjP.
- Implementing program changes.
- Coordinating laboratory activities for the Hydrogen and Methane Monitoring Program.
- Communicating with the DOE, the New Mexico Environment Department (NMED), and the EPA with regard to this program.
- Preparing the Hydrogen and Methane Monitoring Program reports.
- Coordinating procurement of supplies and materials for this program.
- Preparing standard operating procedures.
- Coordinating corrective actions.
- Verifying adequacy of the training program.
- Defining and initiating the sampling schedule.
- Facilitating laboratory performance audits.
- Requisitioning materials/equipment.
- Managing records and preparing data reports.
- Developing training materials for WTS 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. The field sampling staff will also be responsible for routine maintenance. Other duties of the field technicians include but are not limited to:

- Initiating sampling and removal of completed samples.
- Troubleshooting of equipment malfunctions.
- Maintaining equipment.
- Maintaining on-site sample chain-of-custody.
- Completing field data forms.
- Collecting duplicate samples on a minimum frequency of 5 percent (every twentieth sample).
- Managing, handling, storing, and delivering (shipping) samples to the laboratory.
- Identifying training needs to line management.
- Inputting data from analytical deliverables into evaluation software.

2.2.5 Hydrogen and Methane Monitoring System Engineer

The hydrogen and methane monitoring system cognizant engineer has the ultimate responsibility for the physical systems of the hydrogen and methane monitoring program. This individual designs the hydrogen and methane 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 hydrogen and methane 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 environmental regulations. The SEC manager ensures submittal of reports to the DOE and the NMED as required by the HWFP.

2.2.7 Manager, Radiological Control

The Radiological Control manager is responsible for radiological surveys of the hydrogen and methane monitoring systems and equipment. When possible radioactive contamination of samples or sampling systems exists, radiological control technicians (RCTs) will perform radiological surveys on filters associated with the hydrogen and methane monitoring systems. 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 radiation.

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 EM&H 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 and enforce laboratory and analytical procedures, including QA/QC procedures, and provide oversight for reporting laboratory results.

2.2.9 Subcontract Vendor

The subcontractor has responsibility for hydrogen and methane monitoring system equipment maintenance and calibration. The subcontractor is responsible for the following activities:

- 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

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2.2.10 Manager, Technical Training

The Technical Training manager is responsible for identifying training needs associated with hydrogen and methane 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

The QA policy, manuals, and objectives for the Hydrogen and Methane Monitoring Program are described in this section.

3.1 WIPP Site Quality Assurance Program

The purpose of the WTS QA Program for WIPP is to establish policies to facilitate the implementation of regulatory requirements and to provide an internal means for control and review so that the work performed by WTS and its contractors meets or exceeds applicable requirements.

The WTS General Manager is responsible for the overall direction of the site 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, surveillances, and overviews.

3.2 WIPP Site Quality Assurance Documents

The WTS QAPD and implementing procedures direct the quality-related activities at WIPP and define acceptable practices to be employed by WIPP/WTS personnel in general.

3.3 Quality Assurance Objectives for the Hydrogen and Methane Monitoring Program

The Hydrogen and Methane Monitoring Program will be performed in conformance with WTS 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.

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- 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 for Environmental Data Operations, EPA QA/R-5
 - Report on Minimum Criteria to Assure Data Quality, EPA/530-SW-90-021. This document has now been revised and retitled, Quality Assurance and Quality Control, Chapter 1.0 of SW-846
 - WP 13-1, Washington TRU Solutions LLC Quality Assurance Program Description

Monitoring is to be performed using the concept of subatmospheric grab sample collection in stainless steel canisters described in the U.S. EPA Compendium Method TO-15, Determination of VOCs in Air Collected In Specially Prepared Canisters and Analyzed by Gas Chromatography Mass Spectrometry (GC/MS), and the specifications in the final RCRA Permit.

Laboratory analytical procedures have been developed based on the concepts contained in the following EPA documents:

- EPA, Compendium Method TO-15, SW 846 8260B
- EPA, Contract Laboratory Program Statement of Work (CLP-SOW), Volatile Organics Analysis of Ambient Air in Canisters

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 hydrogen and methane monitoring personnel for this program. The training program was developed and implemented by hydrogen and methane 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.

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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 following sections of the QAPD:

- Sample Control and Quality Assurance Requirements
- Procurement Planning Requirements

To verify subcontractor conformance to program QA/QC requirements, WTS QA or its contractor 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 15.2 of this QAPjP.

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

4.2 Control of Supplier Nonconformances

Supplier nonconformances will be controlled as described in Section 14.0 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 hydrogen and methane 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 WTS 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 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 Science 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

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- Required materials, including sample canisters
- 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

Measuring and test equipment used in the field and laboratory will be controlled by a formal calibration program in accordance with the requirements of the WTS QAPD and applicable procedures and standards. Equipment calibration requirements for subcontractor-provided equipment are established by this QAPjP and by subcontractor standard operating procedures (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 measuring and test equipment 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 canister samplers (mass flow controllers and gauges) will be performed by subcontract calibration laboratories. The calibration procedures for these types of equipment will be documented by the subcontractor in its SOPs and QAPjPs. Each mass flow controller and pressure/vacuum gauge will be calibrated annually when in service. The cognizant engineer is responsible for specifying calibration requirements for all system-related instruments.

Calibration and control of measurement and test equipment will be managed in accordance with the QAPD.

6.3 Preventive Maintenance

Periodic preventive maintenance for critical sampling and analytical equipment will be performed during each cleaning cycle. Maintenance of the canister samplers and associated monitoring equipment will include, but not be limited to, replacement of damaged or malfunctioning parts, leak testing, and cleaning of associated equipment. Backup system components will be maintained in inventory.

7.0 SAMPLING PROGRAM

Sampling activities, such as collection, packaging, handling, shipping, analysis, and sample storage, will be performed in accordance with procedures approved by the Permittees.

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The basic concepts of the method included in the sampling program are:

- Use of air sampling equipment to produce subatmospheric grab samples in passivated stainless steel canisters.
- Analysis of samples using gas chromatography/thermal conductivity detector (GC/TCD) or equivalent.

7.1 Subatmospheric Grab Sampling

The subatmospheric grab sampling technique is used to collect hydrogen/methane samples as well as disposal room VOC samples in filled panels. This method employs concepts found in EPA Compendium Method TO-15. The collection of air samples is obtained by a sampling assembly and an evacuated six-liter passive stainless steel sampling canister.

The sample assembly consists mainly of dual particulate filters, a vacuum/pressure gauge, a mass flow controller, and a metering valve. Prior to sample collection, the vacuum is verified using a vacuum/gauge. Air is initially purged from the sample line at a set flow rate. The sample is then collected from the continued flow of air. The ending pressure is just below atmospheric pressure.

Samples that are voided for any reason, and are not recollected, will count against the overall program completeness percentage described in Section 10.0 (≥ 95 percent).

7.2 Sample Collection Procedures

Sample collection is described in applicable procedures that define the location and frequency of sampling to ensure effective representation of site conditions. Sampling station locations are shown in Figure 7-1 at the end of this document.

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 Hydrogen and Methane Program procedures.

7.4 Sample Shipping and Storage

Samples for laboratory analysis will be collected and transferred to the subcontract laboratory following chain-of-custody procedures (see Section 8.0). Samples will be shipped or delivered to the subcontract laboratory to perform analysis in accordance with established sample holding times and program schedule. No samples will be accepted by the receiving laboratory personnel without demonstration of sample

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integrity by either custody seals or direct chain of custody verification. Vacuum/pressure readings will be taken as prescribed in laboratory SOPs.

All samples will be maintained and shipped at ambient temperature from the time of collection until receipt at the analytical laboratory. Completed samples will generally be received at the laboratory monthly for each filled panel. Canisters will not be pressurized during the sampling procedure, and additional pressurization at the laboratory will routinely be necessary for analyses. Canister vacuum/pressure, however, will be verified prior to analysis to confirm that no significant quantity of gas was introduced 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 completed chain-of-custody form that demonstrates process activities through ultimate sample disposal.

A Chain-of-Custody Form (Attachment 1) will be initiated by personnel when receiving and handling clean certified canisters and samplers. Chain-of-custody will also be utilized when collecting and shipping canister samples. Applicable WIPP procedures define the process.

9.0 HYDROGEN AND METHANE LABORATORY ANALYSIS

Laboratory activities to be performed as part of this program involve four primary tasks:

- Cleaning and certification of sample canisters
- Analysis of QC samples
- Analysis of canister samples
- Preparation of analytical reports

Each of these activities is discussed later in this section. A Request for Analysis Form (12-VC.02-2 [see Attachment 2 for an example]) will be completed to identify the sample canister number(s), sample type, and analysis required to obtain analytical results.

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 QA 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,

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duplicates, and check standards). In addition, field QC samples (duplicates) will be collected and analyzed. Test performance, QA analyses, and results will be documented using data forms/formats defined in applicable procedures. Field and laboratory reduction data will be formally documented and verified before any reports are issued.

A Statement of Work has been submitted to the laboratory listing specific requirements of the testing program, including:

- Analytical parameters and methods
- Sampling procedures
- Sample canister and sampler cleaning and certification
- Sample volumes and holding times
- QC sample analysis
- Laboratory reporting
- Other requirements contained in this plan

9.1 Initiation of Laboratory Analysis

Procedures established by WTS 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 derived from concepts contained in EPA Compendium Method TO-15 and the draft EPA CLP-SOW for the Volatile Organics Analysis of Ambient Air in Canisters. Portions of the analytical process are not covered by an EPA Method. These processes are reviewed by WTS for approval.

9.3 Canister Cleaning and Certification

Before each use, canisters will be cleaned and certified by the laboratory in batches. The batch of canisters will be certified clean if no target analytes are detected in the representative canister at concentrations greater than the minimum detection level (MDL). Clean canisters are then evacuated and are ready to be reused.

9.4 Sample Management

As part of the system design, the air sample must first pass through two particulate filters. These filters will be surveyed by RCTs for alpha and beta contamination prior to removing the sample canister from the underground. If the removable filter indicates less than detectable activity, the interior of the sample canister can be identified as "clean." If any filters are determined to be contaminated with radioactive particulate

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material, they will be considered derived waste and handled appropriately. The external surfaces of canisters and samplers can also be surveyed for alpha, beta, and gamma radiation, when possible contamination exists.

9.5 Analytical System Requirements

The analytical system will consist of three major components. These components are presented below.

9.5.1 Sample Introduction System for Canisters

The sample introduction system will include the following:

- Auto sampler system
- Transfer line
- Fixed-volume sample loop

9.5.2 Analyte Separation

Analyte separation will be achieved by gas chromatography (GC) using capillary columns.

9.5.3 Detection System

The detection system will include:

- A Thermal Conductivity Detector
- A data system capable of continuous acquisition and storage of raw data on machine readable media
- A computed algorithm for analyte quantitation

Raw and processed GC/TCD data must be stored on magnetic tape or disk and maintained for the duration of this program.

9.5.4 Standard Preparation

Certified primary standards will be obtained from approved suppliers for the target analytes. Secondary standards will be prepared from dilution of the primary standards. These standards will be checked against reference materials to verify the accuracy of their concentrations.

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Laboratory procedures specify detailed requirements for preparation of standards and reagents, including requirements for grades of materials, equipment, and record keeping.

9.5.5 Calibration Procedures

Calibration standards for hydrogen and methane in the canister 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 at or near a concentration corresponding to the required MRL. Average response factors will be generated for hydrogen and methane. 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.

9.5.6 Data Reporting

Analyte concentrations will be quantified using the initial calibration and will be reported in ppmv. A table listing the run sequence must be reported with the analytical results. Any nonconformances must be included with the data reports. Analytical laboratory data package contents and organization will be similar to requirements in the EPA Contract Laboratory Program.

9.6 Quality Control Testing

The specific project activities that will be performed for QC are presented below.

9.6.1 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 method. 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. Standard gas mixture certifications will be verified.

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B. Blank Analysis

Two different types of blanks will be used during the study.

Method Blank - A method blank will be analyzed to evaluate the cumulative potential sample contaminants and interferences due to laboratory conditions and activities. A method blank will be prepared and analyzed once for each batch of samples. The three main contaminant sources of the target analytes are reagents (such as zero air or ultra-high purity nitrogen); system contaminants arising from tubing, valves, and other system components; and residual contaminants from prior analysis.

Certification Blanks - Laboratory blanks will be analyzed routinely as part of the cleaning and certification processes applied to both canisters and samplers to verify the effectiveness of these processes.

Blank corrections are not performed for the canister analysis, so acceptable method blank results must be less than or equal to the MDLs.

A laboratory control sample (LCS) is an internal QC sample generated by the analytical laboratory by spiking a standard air matrix (zero air or ultra-high purity nitrogen) with a known amount of a certified reference gas. The reference gas will contain hydrogen and methane at known concentrations, and will be prepared independent of instrument calibration gas standards. Percent recovery for LCS analysis will be used to assess laboratory accuracy.

C. Duplicate Analysis

Laboratory duplicate analysis (e.g., duplicate injections) will be performed by the laboratory on single canisters. Laboratory duplicate analysis will be used to determine laboratory precision. Laboratory duplicates will be analyzed for each batch of samples.

Field duplicate canister samples (two canisters filled simultaneously by the same sampler) will be collected in the field at a frequency of 5 percent. The duplicate canister samples will be analyzed and the results will be used to assess field sampling precision.

10.0 QUALITY ASSURANCE OBJECTIVES

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 below. Specific objectives for data quality are presented in Table 1.

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Table 1 – Quality Assurance Objectives for Accuracy, Precision, Sensitivity, and Completeness for Hydrogen and Methane Analysis

Analyte	Accuracy (Percent Recovery)	Precision (RPD)*		Required MRL (ppmv**)	Completeness (Percent)
		Laboratory	Field		
Hydrogen	70 to 130	≤25	≤35	150	≥95
Methane	70 to 130	≤25	≤35	150	≥95

*RPD – relative percent difference

**ppmv - parts per million by volume

- Precision will be defined and evaluated by the RPD between field duplicate samples and between laboratory duplicate samples, as follows:

$$\text{RPD} = \text{ABS} (A - B) / [(A + B) / 2] \times 100$$

where

A = Original (primary) sample result

B = Duplicate sample result
ABS indicates Absolute

- Accuracy is 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 criteria for instrument calibrations and LCSs. These criteria will constitute the verification of accuracy for the target analyte quantification (i.e., quantitative accuracy).

- Quantitative accuracy is defined as:

$$\text{Percent recovery} = X / T \times 100$$

where

T = True or reference value of the analyte being measured

X = Experimentally determined value of the analyte recovered from the sample

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- 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. 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 or after major changes in instrument configuration.
- Completeness is defined as the percentage of the ratio of the number of sample results received that meet other data quality objectives (i.e., precision, accuracy) versus the total number of samples collected. Completeness may be affected, for example, by sample loss or destruction during shipping, laboratory sample handling errors, or by rejection of analytical data during data validation. Completeness will be assessed by the following equation:

$$\text{Percent complete} = \frac{D_r}{D_c} \times 100$$

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 canisters. Laboratory duplicate values will be evaluated through the use of control charts. The data quality objective for laboratory precision is ≤ 25 percent for each set of duplicate analysis.

B. Evaluation of Field Precision

Duplicate canister samples will be taken in the field at a frequency of 5 percent. A single analysis will be performed for each sample. The data quality objective for field precision is ≤ 35 percent 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 and analysis of LCSs/LCSDs (laboratory control sample duplicates). For the initial, five-point calibration, any single response factor for a particular target analyte, can differ by no more than 30 percent (i.e. ≤ 30) from the average of the five response factors. After the successful completion of the five-point calibration, it is sufficient to analyze a midpoint standard 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 hydrogen and methane before sample analysis may begin.

Percent recoveries for the target analytes will be calculated for each LCS/LCSD relative to the reference concentrations. Objectives for percent recovery, listed in Table 1, are based on accuracy criteria proposed by EPA for canister sampling programs. LCSs/LCSDs will be analyzed with each sample lot.

Qualitative Accuracy

Qualitative accuracy in the identification of target analytes will be evaluated as follows:

A. Evaluation of Sensitivity

The presence of aerosol salts in underground locations may affect the MDL of the samples taken in those areas. The sampling canisters will be sufficiently protected with in-line filters to minimize aerosol interference.

The MDL for each of the target analytes will be evaluated by the analytical laboratories before sampling begins. An MDL evaluation will be performed initially and at least on an annual basis. The initial and subsequent MDL evaluations are performed in accordance with 40 CFR Part 136.

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 annually.

C. Representativeness

The monitoring program has been designed to collect air samples that are representative of the media being sampled. Subatmospheric grab samples are collected from a steady stream of air being pulled from the desired sample location at a set flow rate.

11.0 LABORATORY ANALYSIS DOCUMENTATION AND REPORTING

QA requirements for laboratory analysis documentation and reporting are described below.

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 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 checkprints 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 16.0).

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 designee, as "final" information.

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The laboratory will notify the EM&H manager immediately if laboratory analyses indicate that concentrations of any target analytes are higher than expected. For Hydrogen/Methane monitoring, notification will be made if any compound exceeds 1000 ppmv.

Table 2 – 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

12.0 DATA ANALYSIS AND REPORTING

Analytical data for the sampling program will be evaluated to calculate concentrations of hydrogen and methane attributed to HWDUs. Results will be reported to the New Mexico Environment Department (and the DOE) in accordance with reporting requirements of the HWFP.

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 by the method, or input 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 WTS 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.

13.0 DATA VALIDATION AND CORRECTIVE ACTIONS

This section of the QAPjP presents a discussion of data validation and corrective actions.

13.1 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 1. 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 designee.

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 1 can be achieved when established methods of analyses are used as proposed in this plan.

13.2 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 reanalysis of samples, additional training of personnel, modification to field and laboratory procedures, and recalibration of test equipment.

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Laboratory corrective actions may be required to maintain data quality. The laboratory continuing calibration criteria, as described in Section 10.0, indicate the response factor for the midpoint standard must not be more than 30 percent different from the mean response factor for the initial calibration. Differences greater than 30 percent will require recalibration of the instrument before samples can be analyzed.

The laboratory results for samples, 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 by the contract laboratory.

14.0 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.

15.0 QUALITY ASSURANCE AUDITS

The requirements and responsibilities of the WTS QA Audit Program are described in QAPD, Section 3, Assessment Requirements. Internal program audits and external supplier (e.g., analytical laboratories, equipment manufacturers) evaluations, surveys, or audits will be conducted by WTS 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 WTS departments. The procedure establishing the methods and authority for conducting and tracking QA internal and external audits is given in the QAPD.

15.1 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.

15.2 Hydrogen and Methane Monitoring System Audits

Audits of site activities associated with the hydrogen and methane monitoring program will be performed by WTS QA at or shortly after program start-up and on an annual basis thereafter. This audit will be performed as part of the annual VOC monitoring audit. 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

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- 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 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 site program audits, audits may be performed, as needed, to evaluate the adequacy of the contractor's laboratory or other suppliers' QA programs and compliance with the requirements of this QAPjP.

15.3 Performance Audits

Performance audits, as defined by Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans (EPA, 1983), 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.

15.4 Quality Assurance Reports

The results of QA audits will be reported in accordance with the WTS 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 WTS QA through implementation and closure.

16.0 RECORDS ADMINISTRATION

The Hydrogen and Methane 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, WTS, and WIPP requirements.

The WTS 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 Quality Assurance 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. Hydrogen and methane 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. Documentation will be available for inspection by internal and external auditors.

16.1 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.

17.0 REFERENCES

40 CFR Part 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants"

40 CFR §264.602, "Monitoring, Analysis, Inspection, Response, Reporting, and Corrective Action"

40 CFR §270.23(a)2, "Specific Part B Information Requirements for Miscellaneous Units"

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Hazardous Waste Facility Final Permit, Waste Isolation Pilot Plant, NM 4890139088-TSDF issued by the New Mexico Environment Department,

U.S. Environmental Protection Agency, 1990a. EPA/530-SW-90-021, Report on Minimum Criteria to Assure Data Quality

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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, 1994. *Draft Contract Laboratory Program Statement of Work, Volatile Organics Analysis of Ambient Air in Canisters*, EPA540/R-94-085, December 94, 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*, 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. EPA QA/R-5, *EPA Requirements for Quality Assurance Project Plans* (2001), 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"

WP 12-VC.03, Hydrogen and Methane Monitoring Plan

WP 13-1, Washington TRU Solutions LLC Quality Assurance Program Description

WP 15-RM, WIPP Records Management Program

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Attachment 1 – Example Environmental Chain-of-Custody Record

Environmental VOC Chain-of-Custody Record

No 4277

SAMPLE NUMBER _____

Canister Serial No. _____

Date of Receipt: _____ / _____ / _____

Equipment Type: _____

Cleaning Cert. Date: _____

Storage Location: _____

Installation Location: _____

Date: _____ / _____ / _____

Date: _____ / _____ / _____

C/C Control _____

R/A Control No. _____

Shipping Document No. _____

Cal. Due Date: _____

Time: _____

Time: _____

1. Received By: _____
Signature Date Time

Relinquished By: _____
Signature Date Time

2. Received By: _____
Signature Date Time

Relinquished By: _____
Signature Date Time

3. Received By: _____
Signature Date Time

Relinquished By: _____
Signature Date Time

4. Received By: _____
Signature Date Time

Relinquished By: _____
Signature Date Time

5. Received By: _____
Signature Date Time

Relinquished By: _____
Signature Date Time

6. Received By: _____
Signature Date Time

Relinquished By: _____
Signature Date Time

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

NAME (print)

SIGNATURE

DATE

Remarks: _____

Completion of this step constitutes validation of this record and is found to be complete.

Name (print) Signature Date

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Attachment 2 – Example Request for Analysis Form

Waste Isolation Pilot Plant
Washington TRU Solutions LLC
P.O. Box 2078
Carlsbad, NM 88221-2078

VOC Monitoring Program _____

Purchase Order No. _____

R/A Control _____
 C/C Control No. _____
 Date Samples Shipped _____
 Lab Destination _____
 Laboratory Contact _____
 Send Lab Report To _____

 Date Report Required _____
 Project Contact _____
 Project Contact Phone No. _____

Serial No.	Sample No.	C-of-C No.	Sample Type	Sample Pressure	Preservatives	Contract-Specific Testing	Special Instructions

TURNAROUND TIME REQUIRED: (Rush must be approved by appropriate Manager) NORMAL _____ RUSH _____ (Subject to rush surcharge)
 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 _____

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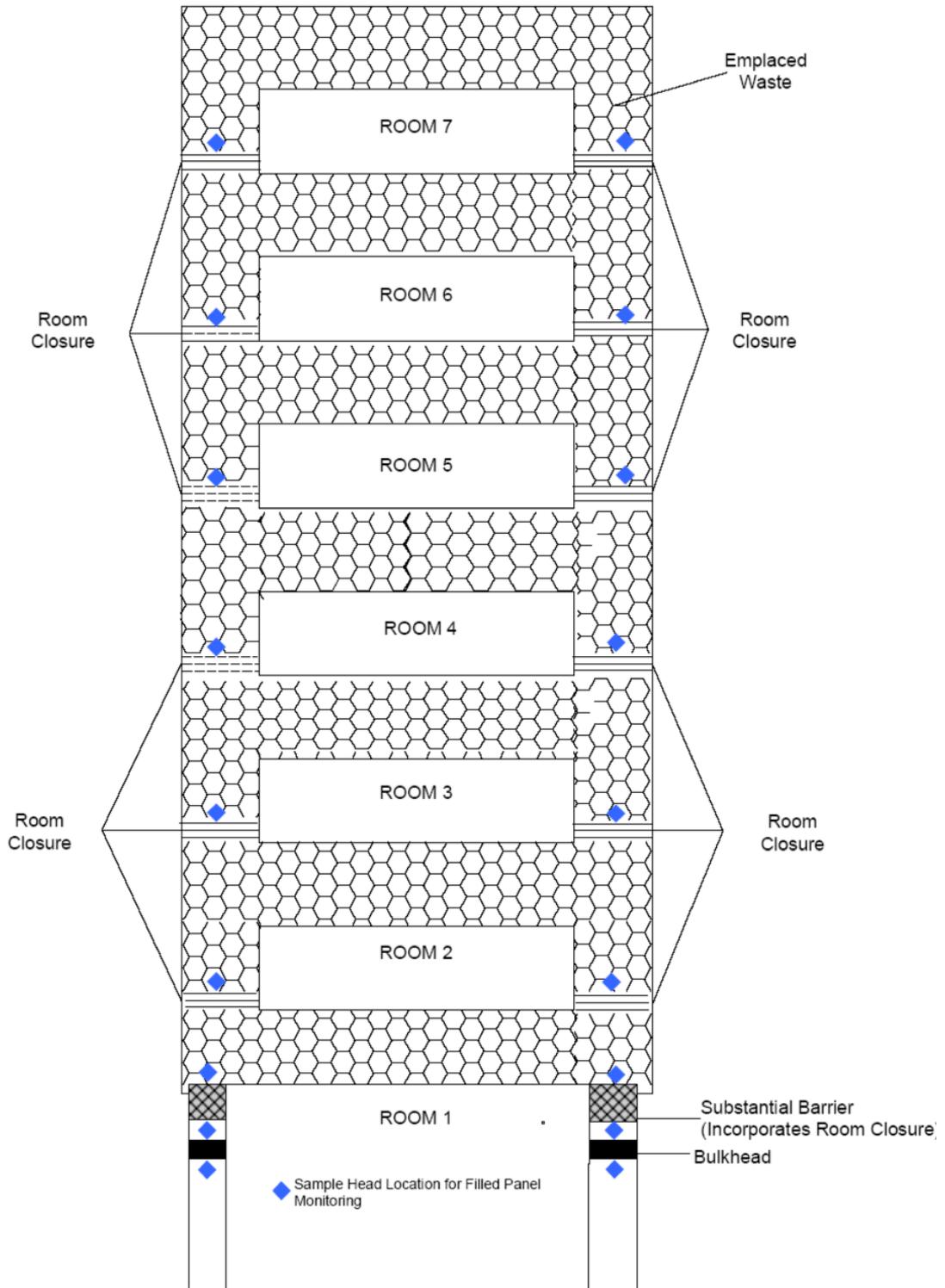


Figure 7 - 1 – Typical Hydrogen and Methane Monitoring Locations