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**Waste Tank Vapor Project:
Enhancements to the PNL
SUMMA™ Analytical Laboratory
Tank Organic Vapor Support Task**

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Waste Tank Vapor Project:

**Enhancements to the PNL SUMMA™
Analytical Laboratory Tank Organic Vapor
Support Task**

FY 1994 Final Report
Letter Report

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Scope

The following report provides the status, as of the end of FY 1994, on the individual components of the SUMMA™ Canister Analytical Laboratory that Pacific Northwest Laboratory (PNL)^(a) has assembled to support the Hanford Tank Safety Issues Program. This report is being sent to address the 9/30/94 milestone in the milestone description sheet (MDS) {work breakdown structure (WBS) designator 1.1.2.08} "Enhance PNL SUMMA™ Laboratory Capability." Although this milestone does not specify a written report, this is being provided to indicate our completion of this milestone. The laboratory is located in the 300 area in 326/23B.

General Status

The laboratory was moved to its current location in 326/23B in January 1994. Since that time, the following have been installed:

1. cabinet storage for 60 6-L SUMMA™ canisters
2. power (220 amps of 120 VAC) to the center bench
3. five instrument systems, described below
4. an oven-based loop injector
5. a SUMMA™ canister cleaning system
6. a hydrocarbon-free clean air generator
7. a dynamic dilution system.

In addition, a canister tracking system was designed and implemented. To bring the laboratory to an operational status, we have reported on the analysis of samples collected from 10 different Hanford waste tanks. A scale layout of the laboratory is given in Figure 1. The status of the individual components of the laboratory is as follows:

Status of Instrumentation

1. *Hewlett-Packard Gas Chromatograph/Mass Spectrometer System #1*

This system was procured and installed in the spring of 1993. It was interfaced with an EnTech 2000 cryoconcentrator during the summer of 1993. It was moved from the 329 building to the 326 building Lab 23B in January 1994. An oven-based loop injector was interfaced to this system in March 1994.

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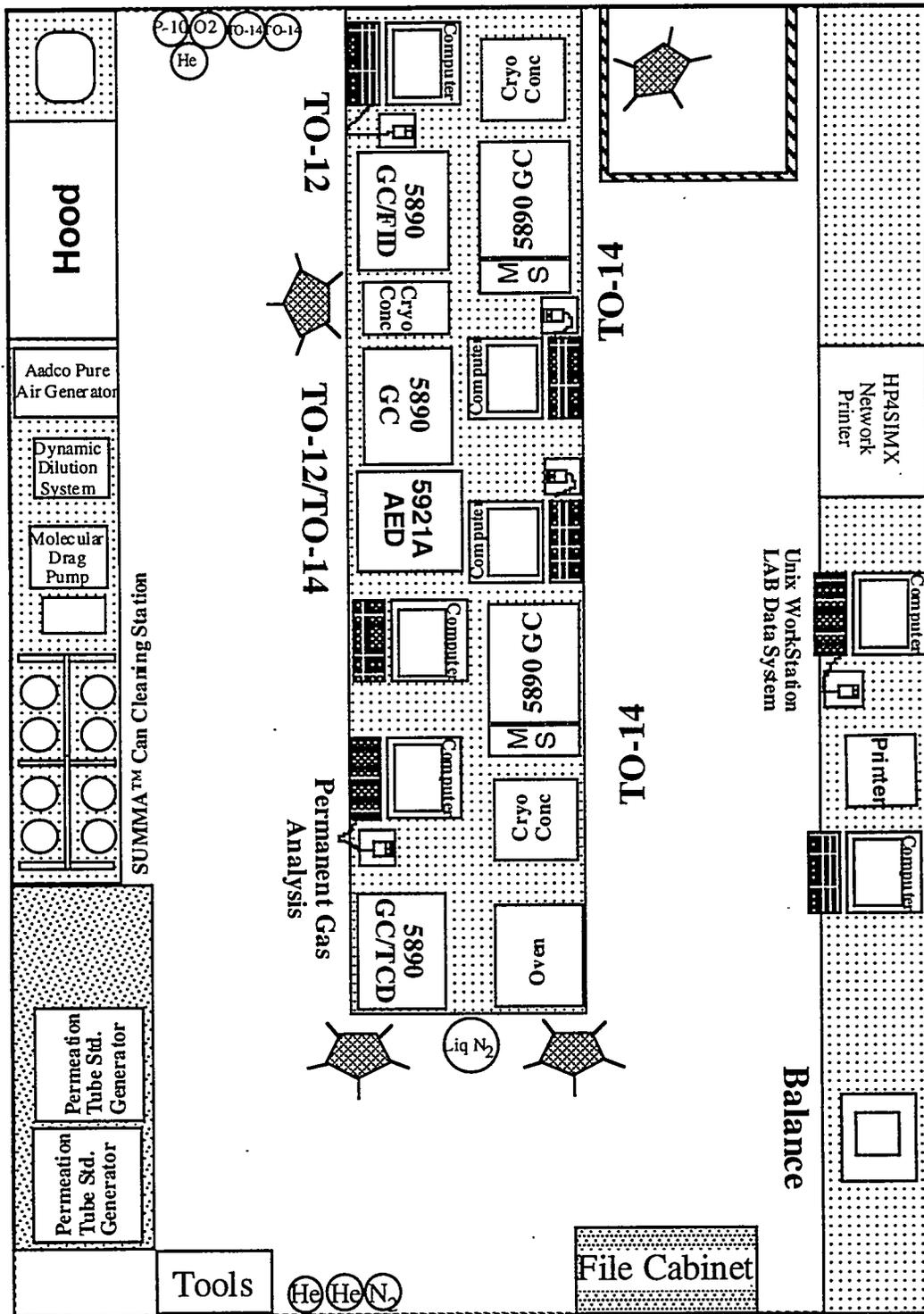


Figure 1. Scale Drawing of the SUMMA™ Air Analysis Laboratory Located in 326/23B

Tank-headspace samples taken from Hanford Tanks C-103, C-104, C-105, C-106, BY-104, BY-105, BY-106, BY-107, BY-108, and BY-111 have all been analyzed on this system. The performance of this system was greatly improved through the elimination of cold spots that were responsible for trapping out semivolatile organic compounds. The system has been calibrated for all 40 TO-14 compounds. The EnviroQuant software utility has been implemented to quantify TO-14 compounds in tank headspaces. This system will continue to be used to analyze tank headspaces.

2. Hewlett-Packard Gas Chromatograph/Mass Spectrometer System #2

The bidding was completed and the order placed in March 1994. The installation was completed in late May 1994. The EnTech 7000 cryoconcentrator was received in late September. EnTech installed a loaned model 2000 cryoconcentrator in late June that allowed us to operate until the model 7000 was shipped. System 2 is used primarily for SUMMA™ canister validation and ambient-air analysis.

3. Hewlett-Packard Gas Chromatograph/Flame Ionization Detector

The bidding was completed and the order placed in February 1994. The instrument was received and installed in mid-May 1994. An EnTech 7000 cryoconcentrator was received in September 1994 and coupled with the gas chromatograph/flame injection detector (GC/FID) to complete the TO-12 analysis system.

4. Hewlett-Packard Gas Chromatograph/Atomic Emission Detector

The bidding was completed and the order placed in March 1994. The instrument was received in late June 1994. Installation was completed in September 1994. This instrument shares the EnTech 7000 cryoconcentrator with the TO-12 system of No. 3 above.

5. Hewlett-Packard Gas Chromatograph/Thermal Conductivity Detector

The bidding was completed and the order placed in March 1994. The instrument was received and installed in late June 1994. The instrument has been set up for permanent gas analysis. Columns and certified gas standards have been received. A procedure, PNL-TVP-05, has been developed to analyze CO, N₂O, CH₄, and H₂ down to the 100-ppb level. Lower detection limits await the arrival of a mass selective detector, which is currently on order.

6. Addco Clean Air Generator

The order was placed in late March 1994. The equipment was received and installed in late June 1994. Samples have been analyzed through cryoconcentration via the EnTech instrumentation coupled to a gas chromatograph/mass spectrometer. The system performance appears acceptable.

7. Kin-Tek Permeation-Tube Standards Generator

The order was finalized and placed in February 1994. The delivery was completed in early June. The system currently has been installed, and a technical procedure, PNL-TVP-06, has been developed. Currently, standards can be generated for 10 non-TO-14 compounds. Additional permeation tubes are on order.

8. *EnTech 4560 Dynamic Gas-Dilution System*

The system was ordered and received in the fall of 1993. The system was moved to the 326-23B laboratory and installed and since then has been fully operational. It is used to prepare dilutions of TO-14 certified standards, internal standards, and surrogate mixtures. The mass-flow controllers were certified by the Westinghouse Hanford Standards Laboratory. A procedure, PNL-TVP-04, has been developed for this activity.

9. *EnTech SUMMA™ Canister-Cleaning System*

The order for a canister-cleaning system for four canisters was completed in 1993. The system was moved to the 326/23B laboratory in January 1994. An oilless molecular drag pump was ordered and installed on the canister-cleaning system in March 1994. A canister manifold that allows simultaneous cleaning of eight canisters was added in May 1994. The system is complete and is used routinely for cleaning SUMMA™ canisters. A procedure, PNL-TVP-02, has been developed and implemented for cleaning and validating SUMMA™ canisters. Over 100 SUMMA™ canisters were cleaned and validated during FY 1994.

10. *Hewlett-Packard UNIX Integrated Laboratory Data System*

The bidding and ordering were completed early June 1994. The system was received in mid-September 1994. Installation is expected in October. This system will provide automated backup of all laboratory computers each night and will allow data processing/data analysis to be accomplished at much greater speeds.

Status of Quality-Assurance Implementation

The Tank Organic Vapor Support Project is currently operating at PNL quality assurance (QA) Level II. A quality assurance project plan (QAPP) for the Tank Safety Program was developed by the PNL QA Department. The Tank Organic Vapor Support Project Team was briefed on this QAPP. In addition, the team was trained to PNL administrative procedures.

Seven methods have been developed and approved for operating the laboratory. Training in these methods has been supplied to appropriate staff members. The methods are listed below.

- **PNL Technical Procedure PNL-TVP-01**
Determination of TO-14 Volatile Organic Compounds in Ambient Air using SUMMA™ Passivated Canister Sampling and Gas Chromatographic-Mass Spectrometry Analysis
- **PNL Technical Procedure PNL-TVP-02**
Procedure for Cleaning SUMMA™ Canisters and Validation of the Cleaning Process
- **PNL Technical Procedure PNL-TVP-03**
Determination of TO-14 Volatile Organic Compounds in Hanford Tanks using SUMMA™ Passivated Canister Sampling and Gas Chromatographic-Mass Spectrometry Analysis

- **PNL Technical Procedure PNL-TVP-04**
Preparation of Calibration Gas Standards using Dynamic Dilution of High Pressure Certified Gas Standards
- **PNL Technical Procedure PNL-TVP-05**
A TCD^(a) Method for the Analysis of CH₄, CO₂, CO, H₂, and N₂O in Hanford Tank Headspace Samples
- **PNL Technical Procedure PNL-TVP-06**
Preparation of Calibration Gas Standards using Controlled Temperature Permeation Tube Standard Gas Generation
- **PNL-Technical Procedure PNL-TVP-07**
Shipping and Receiving Procedure for PNL Waste Tank Samples

(a) Thermal conductivity detector

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