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FEB 06 1995 ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 603276

2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
DISTRIBUTION	SAFETY EQUIPMENT DEVELOPMENT 71130	NA
5. Proj./Prog./Dept./Div.:	**6. Cog. Engr.:**	**7. Purchase Order No.:**
VAPOR CHARACTERIZATION	DK DEFORD	NA
8. Originator Remarks:		**9. Equip./Component No.:**
THIS ENGINEERING TASK PLAN IS BEING CIRCULATED FOR REVIEW AND APPROVAL.		NA
		10. System/Bldg./Facility: 200G
11. Receiver Remarks:		**12. Major Assm. Dwg. No.:** H-2-85278
		13. Permit/Permit Application No.: NA
		14. Required Response Date: 29 DEC 94

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16. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)	1. Approval 4. Review 2. Release 5. Post-Review 3. Information 6. Dist. (Receipt Acknow. Required)	1. Approved 4. Reviewed no/comment 2. Approved w/comment 5. Reviewed w/comment 3. Disapproved w/comment 6. Receipt acknowledged

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1	1	Cog.Eng. DK DEFORD	Dan DeFord	12/22/94	H5-09	~~RE BAUER~~			~~L8-37~~	~~3~~	
1	1	Cog. Mgr. TL MOORE	J L Moore	1/12/95	H5-09	RS POPIELARCZYK	[illegible]	1-18-95	B1-30	3	4
1	1	QA KK CUTSFORTH	T.G. Tyge	1/23/95	S1-57	CENTRAL FILES (2)			L8-04	3	
1	1	Safety MN ISLAM	L.E. Myers	1/29/95	R3-08	OSTI (2)			L8-07	3	
1	1	GD FOREHAND	G D Forehand	1/23/95	S7-31						
1	1	JW OSBORNE	[illegible]	1-13-95	S7-15						
1	1	RA MEZNARICH	R A Meznarich	1-18-95	S3-27						

18.	19.	20.	21. DOE APPROVAL (if required)
Dan DeFord 12/21/94 Signature of EDT Originator — Date	Authorized Representative for Receiving Organization — Date	J L Moore 1/12/95 Cognizant Manager — Date	Ctrl. No. [] Approved [] Approved w/comments [] Disapproved w/comments

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MASTER

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Document Title:	IN SITU SAMPLING CART DEVELOPMENT ENGINEERING TASK PLAN
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This document was reviewed following the procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Kara M. Broz — February 6, 1995

SUPPORTING DOCUMENT

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7. Abstract

THIS ETP IS THE MANAGEMENT PLAN FOR DEVELOPMENT OF AN IMPROVED SYSTEM FOR IN SITU SAMPLING. THE DESIGN CRITERIA ARE INCLUDED, WITH A DESCRIPTION OF THE DEVELOPMENT CONTROL PROCEDURES TO BE USED.

8. RELEASE STAMP

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IN SITU SAMPLING CART DEVELOPMENT

ENGINEERING TASK PLAN

Approval Designator SQ

DISCLAIMER

David K. DeFord
December 1994

FILENAME: ETP138.R0

ETN-94-0160

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1.0 INTRODUCTION

1.1 GENERAL

This Engineering Task Plan (ETP) supports the development for facility use of the "next generation" in situ sampling system for characterization of tank vapors. "In situ" sampling refers to placing sample collection devices (primarily sorbent tubes) directly into the tank headspace, then drawing tank gases through the collection devices to obtain samples. The current in situ sampling system is functional but was not designed to provide the accurate flow measurement required by today's data quality objectives (DQOs) for vapor characterization. The new system will incorporate modern instrumentation to achieve much tighter control. Development for facility use, as defined in WHC-CM-6-1, Standard Engineering Practices, EP 2.4, *Development Control Requirements*, includes design, fabrication, and formal documentation of the system. The next generation system will be referred to in this ETP as the New In Situ System (NISS) or New System.

1.2 DEFINITIONS

DQO	Data Quality Objectives
ECN	Engineering Change Notice
ETP	Engineering Task Plan
HEPA	High-Efficiency Particulate Air (filter)
HTS	Hanford Technical Services
IH&S	Industrial Health and Safety
in situ sampling	Vapor sampling accomplished by placing sample collection media (primarily sorbent tubes) into the tank headspace
NISS	New In Situ System
RCR	Review Comment Record
sorbent tube	A sample collection device consisting of a hollow tube which is packed with a sorbent medium selected to adsorb specific analytes of concern
SUMMA	SUMMA is a registered trademark of Molectrics, Inc., Cleveland, Ohio. It is used here in reference to sample collection canisters prepared using the SUMMA passivation process.

TWRS	Tank Waste Remediation System
USQ	Unreviewed Safety Question

2.0 SCOPE

2.1 OBJECTIVES

This ETP is intended to be the management plan governing the design, fabrication, and formal documentation of the NISS.

In order to fully characterize tank headspaces to the accuracy required by the applicable DQOs, the overall error for sampling and analysis combined must be less than 30 percent. As the laboratory analysis methods are by far the more expensive to modify, it is desired to improve the accuracy of mass flow measurement to provide an error as close to zero as is reasonably achievable. Plus or minus ten percent error is the bounding criteria provided by the program office.

New drawings or drawing revisions will be issued to document the NISS at the end of its development, at which time it is planned to build two more carts.

This plan identifies the engineering services and other resources to accomplish that purpose. The design basis for the development of the New System is presented in this ETP.

2.2 DELIVERABLES

Ultimately, the item to be delivered is the completed New In Situ System, with adequate documentation to allow its use in sampling, and production of subsequent carts. In order to produce the hardware and use it, the following documents are required.

2.2.1 This ETP.

2.2.2 A "Change Safety Review (Screening)" or safety analysis as determined to be necessary.

2.2.3 The prototype unit will be developed from engineering sketches and tested informally by HTS personnel. HTS will provide written criteria for the informal testing. If deemed acceptable in informal tests, the prototype will undergo official calibration and be used in field sampling tests before formal acceptance and documentation.

2.2.4 H-2 drawings (new or revised) issued for fabrication of the NISS production units.

2.2.5 A revision to HTS's internal procedure for use of the current system, reference 8.3, will be required for in-tank testing of the New System.

2.2.6 Prior to system turnover for routine sampling, a system description shall be issued that describes the system specifications, criteria, etc.

2.3 INTERFACES

The NISS has the following interfaces which must be considered in its design.

2.3.1 The system must connect with the sorbent trains currently in use for in situ sampling. The specific elements of each sorbent train are developed for the individual tank and are outside the scope of this task. The interface at each end of the sorbent train is a 1/4 inch outside diameter tube.

2.3.2 The current system obtains power through a standard 110 volt extension cord, which greatly enhances its field portability. This arrangement will be preserved if reasonably achievable.

2.3.3 The HEPA device currently in use is at the maximum practical size for easy insertion into risers. It will be retained as is.

3.0 DESCRIPTION

3.1 PHYSICAL DESCRIPTION/DESIGN BASIS

3.1.1 SAMPLING CONDITIONS AND REQUIREMENTS

In situ sampling is a method of obtaining samples for analysis of the vapor in the headspace of the chosen tank. Sorbent tubes are lowered into the tank headspace, then tank gases are drawn through them by means of a manifold which measures the amount of gas drawn. The sorbent tubes adsorb the specific vapors being sought for later analysis. There may be a great deal of water vapor present in the headspace of some tanks. If allowed to condense at the sample device entry, the water can prevent some constituents from passing into the sorbent tubes. If the sample device is at or above the tank headspace temperature, this condensation will be eliminated. The headspace may also contain particulates which may be radioactive. A HEPA filter on the inlet will remove any particulates while allowing tank gases and vapors into the sample device.

WHC-SD-WM-ISB-001, "Hanford Site Tank Farm Facilities Interim Safety Basis," requires that sample devices used in waste tanks be electrically grounded and that provisions be made to prevent dropping items into the tank.

3.1.2 EXISTING SYSTEM

The in situ sampling system, H-2-85278, currently consists of the cart, the tubing bundle, the sorbent sample trains, and the HEPA filter device. There are typically eight sorbent trains, consisting of several sorbent tubes connected in series by flexible tubing. The sorbent trains are connected to the cart via the tubing bundle, which is nominally 50 feet long. An additional tube is contained in the tubing bundle to facilitate SUMMA sample collection. The HEPA filter device terminates the sorbent trains and the SUMMA sampling tube, providing protection for the sorbent media from internal and external radioactive contamination.

The current version of the in situ sampling cart uses purely mechanical flow measurement, which is manually operated and timed to determine total flow through the sorbent tubes. It was developed for use in screening activities, in which samples were to be analyzed to detect the presence but not the concentrations of certain chemicals. It was not required to measure flow very accurately and has an error band of about 20 percent in field use. As a screening tool, it worked as intended, but for determining the chemicals' presence and concentrations (characterization), the error is too great.

Physically the cart consists of a vacuum pump capable of drawing tank gases (essentially air with traces of other chemicals) through the HEPA filter, the sorbent trains, and the tubing bundle. It has four stations with valves and mechanical flowmeters which can be used with a stopwatch to measure the volume of air drawn through the manifold. A separate connection is available for SUMMA sampling. The pressure and temperature of the air at the cart and in the tank must be recorded so a calculation can be done to determine the approximate mass of air drawn through the sorbent train.

The cart has several built-in safety devices: each station has a water trap to protect the system in the event that the tubing bundle is lowered into something other than tank air, and there is also a final HEPA filter in each line to protect the equipment.

3.1.3 NEW SYSTEM REQUIREMENTS

The New System is required to provide, as a minimum, the following elements.

- Provisions are required for five sample connections (four sorbent and one SUMMA) compatible with the tubing bundle currently in use for in situ sampling. The bundle is to provide for eight sorbent trains and one SUMMA sampling line.

- Each sample connection shall be independently operable at the selected flow rate, providing flow measurement accurate within 10 percent of the total flow.

- HEPA filtration at the inlet to prevent radioactive particulates from contaminating the samples, and some method of protecting the sorbent trains from external contamination shall be provided. The existing HEPA device will be retained for this purpose. The HEPA device requires preheating before being placed into the headspace to prevent condensation. A fabric heater has been identified for this purpose.

- Provisions are required for reading the temperature of the vapors in the tank headspace and in the distribution manifold of the cart.

- The system is required to be portable to the extent that a single technician can move it from the tank farm boundary to the sampling site. It shall be designed to allow setup and preparation to be performed outside of the tank farm, with a minimum number of steps to be performed inside the farm. It shall be operable outdoors in all weather conditions (-30°C to 46°C).

- The New System shall be an improvement or refinement of the existing sample equipment; it is not intended to produce any fundamentally new or different approach to in situ sampling. The existing sampling procedure should require no <u>significant</u> changes as a result of the new hardware.

- Before the NISS can be used in any tank, procedures require a flammability check which shows that concentrations of flammable materials are well below lower flammability limits. For this reason, the system cannot be used in a flammable atmosphere. It will therefore be designed to meet the requirements of National Fire Protection Agency 70 - 1993 (the National Electrical Code) for general industrial use.

- As further system design criteria are identified, they will be added to this task plan by ECN.

3.2 ENGINEERING TASKS

3.2.1 The overall responsibility for determining criteria, design, fabrication, and documentation of the NISS belongs to Safety Issues Engineering, Safety Equipment Development [DeFord].

3.2.2 Instrumentation design review and documentation will be carried out by Safety Issues Engineering, Special Projects [Gimera].

3.2.3 Quality Assurance review of this ETP and related documents will be by TWRS Programs Quality Assurance [Cutsforth].

3.2.4 IH&S input/reviews will be by TWRS IH&S/Waste Tank Safety Support review of this ETP and related documents. TWRS Safety signature will be by a reviewer within TWRS Nuclear Safety [Islam].

3.2.5 Preparation of required change safety review (USQ Screening) or safety analysis, as necessary, will be by TWRS Technical Safety Support [Farley].

3.2.6 Preparation of the prototype unit and any informal test apparatus, and conduct of informal testing are assigned to HTS at the direction of DeFord and/or Gimera.

3.2.7 Revision of the sampling procedure and the field sampling trial are assigned to HTS. Those who will use the equipment have the responsibility of familiarizing the facility person in charge with the equipment and procedures before such testing takes place [Pingel/Mahon].

3.2.8 When an acceptable prototype has been tried in field sampling conditions and accepted, the design will be formally documented and the follow-on units fabricated. Design services will be provided by Applications Design Services.

3.3 VERIFICATION

The initial design of any prototype to be used in field sampling testing will undergo design verification through the use of independent reviewers. These independent reviews will be documented on RCRs. At turnover, the RCRs will be attached as an appendix to this task plan by an ECN.

4.0 ORGANIZATION

This development effort is to be carried out in support of the Tank Waste Characterization Program. David Forehand is the program manager. Organizations concerned with the scope of this ETP are assigned specific tasks in the "Engineering Tasks" section.

5.0 SCHEDULE

The New System is intended to replace the Vapor Sampling System for most sampling on the Vapor Issues Resolution schedule for this fiscal year. For this reason, the delivery is required as soon as possible. Development is proceeding in parallel with the approval of this document; there is a small risk of wasted effort if changes are required later in the project.

Tentative plans are to issue this document in early January 1995, with the development and informal testing of the first cart to be completed by mid-February. Calibration of the system should be done by late February, making the cart immediately available for use in field testing. The first field testing event will be done in parallel with the Vapor Sampling System in order to generate two sets of data for the same tank at the same time. Once the data from the New System is validated against the Vapor Sampling System generated data and accepted, the formal documentation and follow-on units can be completed. (Laboratory analysis and reports generally take three to six weeks.) The required date for field deployment of two systems and the spare is June 29, 1995. A detailed schedule will be prepared separately when the major design elements are defined.

6.0 FUNDING

This development effort is funded under Task Package Control Number (TPCN) N4100. Other TPCNs will be assigned as needs are identified.

The hardware costs are not expected to be over $60,000.00.

7.0 QUALITY ASSURANCE

This document is assigned an approval designator of SQ. The formal documentation (drawings) of the New System will also be assigned an approval designator of SQ. The safety class of the equipment is 3.

As the prototype units are sketched, fabricated, and tested, the sketches will be maintained per EP 2.4 by the cognizant engineer, who will be responsible for obtaining appropriate independent reviews.

8.0 REFERENCES

8.1 WHC-CM-6-1, Standard Engineering Practices, EP 2.4, *Development Control Requirements*, Revision 3, May 27, 1994.

8.2 WHC-SD-WM-DQO-002, "Data Quality Objectives for Generic In-Tank Health and Safety Issue Resolution," Revision 0, March 7, 1994.

8.3 WHC-IP-1127, Sampling and Mobile Laboratories Procedure Manual, Procedure 4.6, *Vapor Sampling of Waste Tanks Using In Situ Sampling System*.