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ENGINEERING DATA TRANSMITTAL

Page 1 of 1

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2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
Distribution	Characterization Monitoring Development	600150
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95C-EWW-451 / Tank Char. / 75240 / N2144 / ETN-95-0033	Katie White (AW) & Bill Meeuwsen (AN)	N/A

8. Originator Remarks:
This document defines the responsibilities and requirements associated with the operation, maintenance, and calibration of the Gas Characterization Systems in both AW and AN tank farms.

9. Equip./Component No.: Gas Characteriztn Sys.

10. System/Bldg./Facility: 200 East Tank Farms

11. Receiver Remarks:

12. Major Assm. Dwg. No.: H-14-100434

13. Permit/Permit Application No.: N/A

14. Required Response Date: 2/26/96

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(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	WHC-SD-WM-PLN-117		0	Gas Characterization System Operation, Maintenance and Calibration Plan	S,Q	1	1	

16. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
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17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)

(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.
1	1	AN Cog.Eng. WE Meeuwsen		2/26/96	S5-05	AW Cog.Eng. K White		2/26/96	S5-13	1	1
1	1	AN Cog. Mgr. GN Hanson		2/26/96	S5-05	AW Cog. Mgr. RJ Nickles		2/26/96	R1-43	1	1
1	1	QA CA Sams		2-26-96	S5-13	Design Eng. TC Schneider		2/26/96	S5-57	1	1
1	1	Safety SU Zaman		2/26/96	R3-08	Prog.Mgr. JW Lentsch			S7-15	1	1
4	4	CV Vo		2/22/96	L6-37					1	1
								2/22/96		1	1

18.	19.	20.	21. DOE APPROVAL (if required) Ctrl. No.
D. Tate Signature of EDT Originator — Date 2/22/96	K. White Authorized Representative for Receiving Organization — Date 2/26/96	R. Bauer Originating Manager — Date 2/23/96	[ ] Approved [ ] Approved w/comments [ ] Disapproved w/comments

BD-7400-172-2 (04/94) GEF097

Gas Characterization System Operation, Maintenance, and Calibration Plan

Daron Tate
Westinghouse Hanford Company, Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-87RL10930

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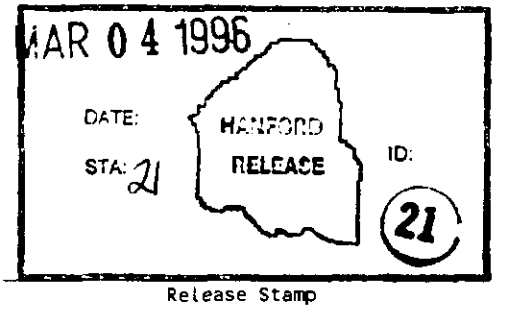
Key Words: Operation, Maintenance, Calibration, Gas Characterization System, FTIR, Gas Chromatograph, Hydrogen, Ammonia, Nitrous Oxide, Methane, MOU

Abstract: This document details the responsibilities and requirements for operation, maintenance, and calibration of the GCS analytical instrumentaiton. It further, defines the division of responsibility between the Characterization Monitoring Development organization and Tank Farms Operations.



Release Approval Date

Release Stamp

Approved for Public Release

GAS CHARACTERIZATION SYSTEM OPERATION, MAINTENANCE AND CALIBRATION PLAN

A Project for
The Flammable Tank Safety Program

(WHC-SD-WM-PLN-117 rev.0)

Approval Designator S, Q

Prepared by

E. K. Straalsund
&
D. D. Tate

February 21, 1996

Westinghouse Hanford Company
P.O. Box 1970
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CONTENTS

FLAMMABLE TANK SAFETY PROGRAM
GAS CHARACTERIZATION SYSTEM
OPERATION,MAINTENANCE AND CALIBRATION PLAN

1.0 INTRODUCTION

The flammable gas watch-list (FGWL) tanks, which have the greatest potential of releasing hydrogen levels exceeding 0.625% by volume, require characterization in addition to that provided by SHMS to determine the actual lower flammability limit. Currently, two tanks, AW-101 and AN-105 have had gas releases exceeding 0.625% hydrogen and thus require additional monitoring. In order to accomplish this monitoring, Gas Characterization Systems (GCS) have been fabricated which will measure tank vapor space gas concentrations to determine the actual lower flammability limit of these tanks, accurately measure the low baseline gas concentrations, and determine potential hazards associated with larger gas release events (GREs).

The vapor monitoring instruments to be installed in the gas monitoring system will allow accurate analysis of the tank vapor. It will be possible to accurately measure a wide range of hydrogen from parts per million to percent by volume, as well as other gas species suspected to be generated in FGWL tanks. Dependable operation and analytical accuracy of these instruments requires the instrument operator to have a thorough understanding of gas chromatography and infrared chemistry as well as specialized training in the operation and maintenance of these instruments. Currently this support is provided by WHC Characterization Monitoring Development (CMD).

This document details methodologies and requirements for performing routine operations and calibrations of GCS analytical gas monitoring instrumentation in support of the Flammable Tank Safety Program.

2.0 SCOPE

This plan details responsibilities and requirements for the operation, maintenance, and calibration of GCS analytical instrumentation. Additionally, this document defines the division of responsibility recommended in the memorandum of understanding attached as appendix "D".

3.0 DESCRIPTION

3.1 Physical Description

The Gas Characterization System (GCS) contains analytical instrumentation and data logging and analysis computers required to accurately characterize and monitor tank vapors. The system also consists of non-data (information only) flow and temperature instrumentation. See drawing tree H-14-100434 for the system drawing list. The Certified Vendor Information (CVI) file for the GCS system is CVI-22665.

4.0 OPERATION AND MAINTENANCE

The analytical chromatographs and spectrometers located in the GCS facility are sufficiently complex and specialized in nature to require a dedicated team of engineers and technicians working in conjunction with WHC Operation and Crafts to ensure instrument reliability and the analytical quality of data generated.

4.1 Routine Operations

Routine operations consist of system checks, by CMD, to verify proper flow and temperature properties, calibration gas pressure, carrier gas pressure, process air pressure, and instrument functionality. Archive of system data files and synchronization of system clocks shall also be performed during system checks. Routine system checks shall be performed at least once a week.

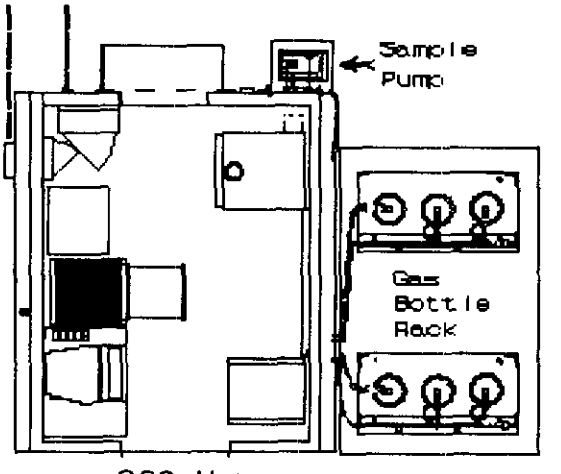
4.2 On-Call Operations

A member of the GCS support team will be available on a on-call basis 24-hours a day, seven days per week to ensure GCS system operation. The approved GCS support team call list shall be transmitted to and maintained current with the appropriate Tank Farm Shift Managers.

4.3 Responsibility Boundaries

Responsibility and technical oversight for the GCS instrumentation system and it's operation, calibration, and maintenance activities, will remain with the Characterization Monitoring Development organization. The physical boundary of this obligation is limited to the GCS hut. The equipment inside and attached to the outside of the GCS hut will remain a CMD responsibility (see figure 1 for location).

200 East
AW & AN Tanks Farms



GCS Hut

Figure #1

Physical items of equipment included in this set are:

- GCS Hut
- Exterior gas bottle rack
- Bottles and regulators
- Sample pump
- MTI Gas Chromatograph (2 ea)
- Fourier Transform Infrared Spectrometer (FTIR)
- FTIR computer
- GC1 computer
- GC2 computer
- GCSHOST computer
- GCS System Software
- Sample & Calibration Gas Control Assembly

Documentation maintenance of the GCS system will also be supported by Characterization Monitoring Development. Specific documents to be maintained by CMD are:

- Design Layout for Gas Characterization System Computer Systems, WHC-SD-WM-CSWD-077
- Flammable Tank Safety Program Gas Characterization System (GCS) Operation, Maintenance and Calibration Plan, WHC-SD-WM-PLN-117 (this document).

Use of the term "responsibility" in this context is not intended to mean that the work will always be performed by the responsible party, but rather that the system will be managed and action initiated by CMD.

"Technical Oversight" means that procedures or plans involving GCS and all ECNs and controlled documents relating to GCS will be routed to CMD for approval. ECNs and work packages dealing directly with the GCS will be initiated by CMD.

In addition to the physical boundary, a logical system boundary may also be defined. This logical margin includes the gas analysis group (FTIR, GC, Data Acquisition), computers that support the gas analysis group. (see figure 2).

4.4 Funding Boundaries

Funding for maintenance, modification, or operational activities beyond the CMD support team will be an Operations budgeting responsibility. The cost of CMD operation, maintenance, calibration, and oversight will be funded by the "Safety Equipment Hardware & Fabrication" Program, for FY96 and FY97. Parts related to the normal operation, maintenance and calibration of equipment in the GCS will also be funded by Safety Equipment Hardware & Fabrication.

4.5 Maintenance Operations

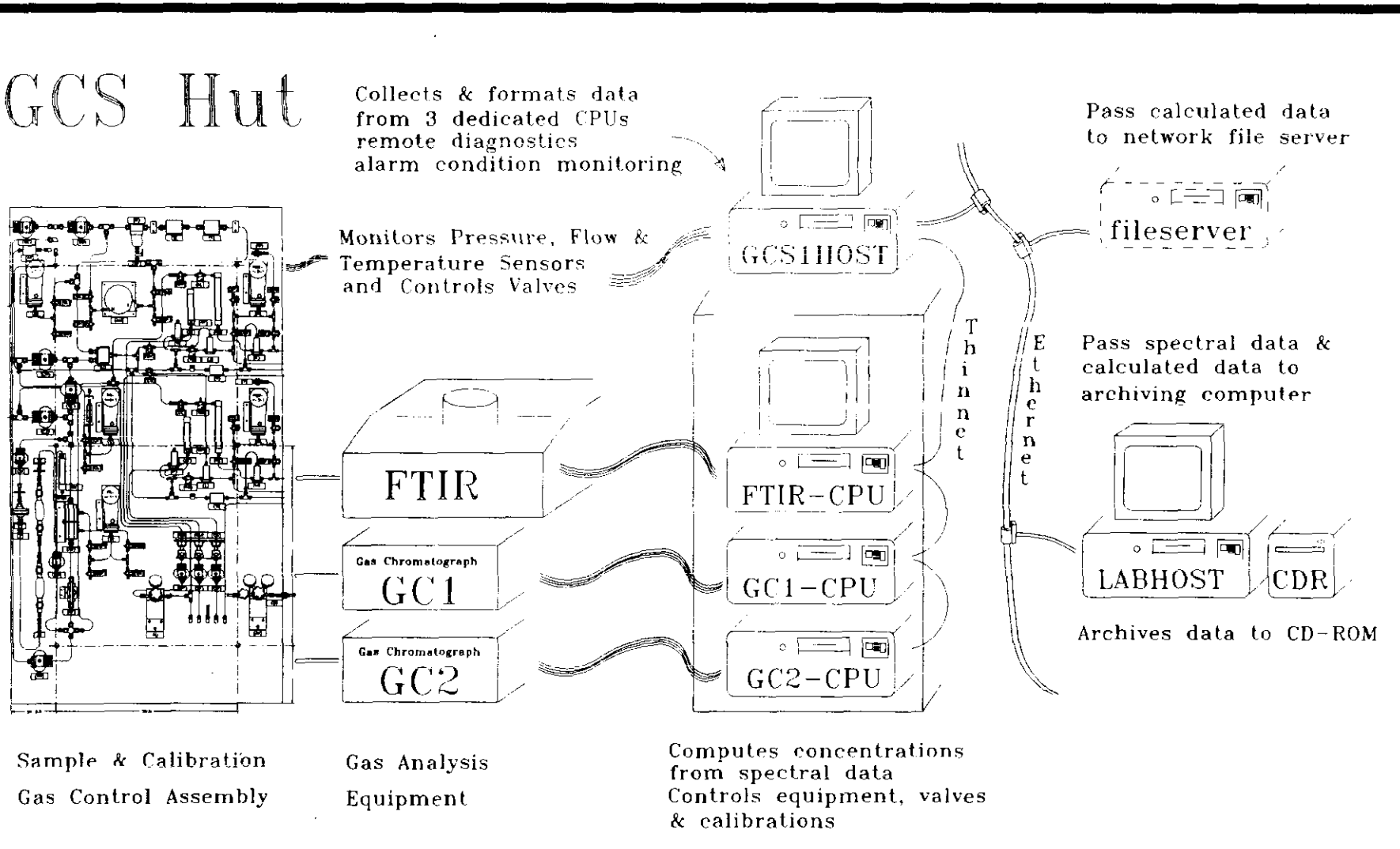
Maintenance activities will be conducted by WHC Crafts using works packages and the Job Control System. Work package resolutions will be drafted by the GCS cognizant system engineer and conducted by WHC Crafts in conjunction with CMD and Operations as appropriate. The appropriate Tank Farm Cognizant Engineer maintains final signature approval for all JCS work packages. Prior to field maintenance on the GCS system, training of Maintenance and Operations personnel shall be conducted as required on the off-line GCS mock-up system located in the 306E building. The cognizant GCS engineer may elect to witness any field maintenance.

4.6 Tank Isolation (Safety Issue)

The tank vapor space gasses will be isolated from the maintenance activity prior to opening the line for maintenance.

4.7 Notifications & Approvals

Communication of changes, outages, and reduced capability are an important factor in optimum system performance. Operations will, therefore, notify CMD of outages or activities which may impact the GCS system (ie. power outage, sample line valved out, exhauster outage, or access change). Likewise Characterization Monitoring Development will notify the appropriate Area Shift Manager in advance of any planned outage of the GCS system.



Equipment within the Operations, Maintenance and Calibration responsibility of Characterization Monitoring Development

Figure #2	Responsibility Boundary
D. Tate	
1/4/96	OMCP - page 6 of 16

Characterization Monitoring Development will ensure Tank Farm Transition Projects is notified, in writing, by the cognizant GCS manager should a reorganization occur which may impact this plan or the attached MOU agreement.

Change authorization for the GCS, including its hardware or software, will include Characterization Monitoring Development and Tank Farm Transition Projects / Plant Engineering. Tank Farm Transition Projects / Plant Engineering will supply the Cognizant Engineer and the Cognizant Engineer Manager for GCS. Changes of equipment or systems affecting the GCS shall be routed to Tank Farm Transition Projects / Plant Engineering, Operations, and Characterization Monitoring Development for review and approval.

5.0 CALIBRATION

Calibration of the GCS gas chromatographs and infrared spectrometer will be conducted by Characterization Monitoring Development. The following section describes calibration terms, methodologies, frequencies, and documentation requirements. Table 1 summarizes the information presented in section 5.1 through 5.7.

Description	Frequency	Documentation
Gas Chromatograph Verification	Bi-Weekly	Verification log to file
Gas Chromatograph Calibration	Quarterly	Calibration report to file
FTIR Verification	Quarterly	Verification log to file
FTIR Calibration	As-Required	Calibration report to file

TABLE 1: Calibration Description and Frequency

5.1 Terminology

Chromatogram	Raw data acquired by a gas chromatograph. Consists of binary or ASCII representation of detector signal versus acquisition time. Injection of sample or calibration standard results in peaks in the chromatogram. Areas under the peaks are set proportional to concentration.
Interferrogram	Raw data acquired by an infrared spectrometer. Consists of binary or ASCII representation of detector signal versus wavelength. Injection of sample or calibration standards results in peaks in the interferrogram. Areas under the peaks are set proportional to concentration.
Response Factor	Linear proportionality constant relating area under a chromatogram's peak to gas concentration. Response factor or RF is defined as Area/Concentration.
Training Spectra	A series of interferrograms collected by an FTIR under known conditions (gas concentration, pressure, flow, path length, etc...). Used to generate linear or non-linear calibrations for FTIR. Training spectra may be generated in the laboratory or consist of electronic data base libraries such as the HITRAN data base.
Background	Interferrogram containing data from atmospheric air. Subtracted from sample interferrogram to yield components in tank vapor space.
Centerburst	Diagnostic interferrogram used to evaluate signal strength of FTIR
Verification	Verification refers to process of injecting standard calibration gases into analytical systems and comparing the instrument's response to these standards. Verification also refers to the process of comparing FTIR spectra with archived electronic training spectra.
Calibration	Process of updating the response factor or linearization curve used to convert peak areas to concentration.

5.2 Gas Chromatograph Verification

5.2.1 Methodology

The gas chromatograph instruments shall be verified a minimum of once every two weeks. This verification shall consist of injecting a hydrogen standard of known concentration into the GC. The calculated concentration is compared to the certified concentration of the standard. If the deviation between these two values is greater than +/- 10% instrument calibration is required.

5.2.2 Documentation

Results of quarterly gas chromatograph verifications shall be recorded on a gas chromatograph verification log sheet. A copy of the log sheet shall be maintained in the GCS calibration file maintained by CMD. A blank gas chromatograph verification log sheet is included as Appendix "A".

5.3 Gas Chromatograph Calibration

5.3.1 Methodology

The gas chromatograph instruments shall be calibrated a minimum of once per quarter or more frequently as required by weekly instrument checks. Calibration shall consist of injection of at least two different concentrations of standard calibration gases. The Response Factor of the instrument shall be calculated and updated.

5.3.3 Documentation

Results of quarterly gas chromatograph calibrations shall be recorded on a gas chromatograph calibration report. A copy of the calibration report shall be maintained in the GCS calibration file maintained by CMD.

5.4 FTIR Verification

Operating principles of the infrared spectrometer result in inherently stable and consistent peaks. The location and magnitude of peaks in the interferrogram maintain constant however resolution may decrease as signal to noise for the spectrometer degrades. Instrument verification consists of field check to monitor instrument signal to noise ratio and comparison of field generated interferrograms with laboratory generated and library interferrograms.

5.4.1 Methodology

The FTIR shall be verified a minimum of once per quarter. This verification shall consist of performing a background scan and a centerburst scan using the field spectrometer. The peak-to-peak voltage of the current centerburst scan shall be compared with the previous peak-to-peak voltage for deviation. Additionally, five analyzed interferrograms shall be collected and compared with HITRAN library spectra and/or spectra generated in the laboratory. If results of field spectra differ from library and/or laboratory spectra by more than +/- 10%, the instrument will require calibration.

5.4.2 Documentation

Results of quarterly FTIR verifications shall be recorded on a FTIR verification log sheet. A copy of the log sheet shall be maintained in the GCS calibration file maintained by CMD. A FTIR verification log sheet is included as Appendix "B".

5.5 FTIR Calibration

5.5.1 Methodology

The FTIR shall be calibrated when results of quarterly verifications do not meet required tolerances. Prior to instrument calibration, a complete service of the FTIR may be required including beam alignment and replacement of optics. Alignment of the instrument is performed by Bio-Rad trained personnel. Calibration will consist of detailed comparison of field generated interferrograms with HITRAN library and laboratory interferrograms. Based upon the results of these comparisons, new training spectra will be generated and new calibration curves will be calculated and implemented.

5.5.2 Documentation

Results of required FTIR calibrations shall be documented by a report issued to the CMD instrument calibration file. Copies of the report shall be transmitted to Operations and Data Users.

5.6 System Loop Verifications

All GCS analytical instrumentation data communication is digital via ethernet or RS-232 communications. No analog conditioning or loop losses are introduced into the system.

5.6.1 Methodology

At least once a quarter a random check shall be performed comparing at least 15 data points from each instrument's host computer file and associated master data file.

5.6.2 Documentation

Results of quarterly loop verifications shall be recorded on a GCS System Loop Verification Log Sheet and maintained on file in the CMD instrument calibration file.

5.7 Process Instrumentation

GCS also houses process instrumentation for trending system pressures, flow, and temperatures. These instruments are non-data and used for information purposes only. The process instrumentation was initially calibrated by WHC Standards Lab but no recall or regularly scheduled verifications are required.

6.0 QUALITY ASSURANCE

All work is conducted in accordance with the relevant quality requirements of WHC-CM-6-1 "Standard Engineering Practices", and WHC-CM-4-2, "Quality Assurance Manual", QR-12. Additionally, equipment that is deployed in Hanford's waste tank applications, must be in compliance with NEPA (National Environmental Protection Act) requirements, with associated documentation.

7.0 SAFETY

This system is classified Safety Significant in accordance with the requirements of WHC-CM-4-46, "Nonreactor Facility Safety Analysis Manual," and WHC-CM-3-5 "Approval of Environmental, Safety, and Quality Affecting Documents".

9.0 REFERENCES

A) WHC-CM-3-5, "Approval of Environmental, Safety, and Quality Affecting Documents", Westinghouse Hanford Company, Richland, Washington.

B) WHC-CM-4-46, "Nonreactor Facility Safety Analysis Manual", Westinghouse Hanford Company, Richland, Washington.

C) WHC-CM-4-2, "Quality Assurance Manual", QR-12, Westinghouse Hanford Company, Richland, Washington.

D) WHC-CM-6-1, "Standard Engineering Practices", Westinghouse Hanford Company, Richland, Washington.

E) WHC-SD-WM-CSWD-077, "Design Layout for Gas Characterization System (GCS) Computer Systems", Westinghouse Hanford Company, Richland, Washington

F) Letter from Daron Tate to Katie White & Bill Meeuwsen, of the subject; "Gas Characterization System (GCS) Memorandum of Understanding (MOU): To identify boundaries, responsibilities, and points of contact, for the operation, maintenance, and calibration of the GCS units", dated February 16, 1996.

GC Verification Log for GCS

Date	Sample ID	Standard H_2 Concentration	Reported H_2 Concentration	Deviation from Standard H_2	Comments

Appendix "A"

FTIR Verification Log for GCS

Date	Sample ID	FTIR Cell Pressure	Reported N_2O Concentration	Reported NH_3 Concentration	Deviation from Hitran N_2O	Deviation from Hitran NH_3	Comments

Appendix "B"

Gas Chromatograph Calibration Report for GCS

Operator: Date:

Instrument: Time:

Old Resp. Factor:

Calibration Gas Standard	Area Counts (3 sample average)	Response Factor (RF) (Area Counts/Conc)	Calc. Concentration (Area * Avg RF)	% Deviation from standard
Calibration Std. #1 ID: _____ Conc: _____				
Calibration Std. #2 ID: _____ Conc: _____				
Calibration Std. #3 ID: _____ Conc: _____				
		New Avg. RF: _____		
Comments:				

Appendix "C"

Westinghouse Hanford Company — **Internal Memo**

From: Characterization Monitoring Development
Phone: 373-7551 L6-37
Date: February 16, 1996
Subject: **Gas Characterization System (GCS) Memorandum Of Understanding (MOU): To identify boundaries, responsibilities, and points of contact, for the operation, maintenance and calibration of the GCS units.**

To: K.A. White S5-13
W.E. Meeuwsen S5-05

cc: J.W. Lentsch S7-15
GCS/ Proj. file

Based upon our discussions, a review of the draft "Operation, Maintenance, and Calibration Plan" (OMCP), and the input by John Truax, the following memorandum of understanding (MOU) has been developed. Significant mutual understandings related to the operation, maintenance, modification, calibration, or removal of equipment, which are not defined in the OMCP or other formal document should be contained in this agreement. It is intended that changes in this agreement be reflected by amending it.

Background

As part of the TWRS Multi-Year Program Plan, and RL milestone commitments, two Gas Characterization Systems will be installed on tank AW-101 and AN-105, in early 1996. These units will sample from and return tank vapor space gasses to the exhauster system. The GCS output measurements and calculations will be delivered to the users and archive via the Hanford Local Area Network (HLAN).

The GCS units require maintenance and calibration that is unique and complex. The systems of concern include the Fourier Transform Infra-Red Spectrometer (FTIR), and the two Gas Chromatographs (GC) in each GCS. This support will therefore be retained by the Characterization Monitoring Development (CMD) organization.

Discussion

Characterization Monitoring Development will provide for the continued maintenance, operation, and control of the AN-105 and AW-101 GCS units, as outlined in the "Operation, Maintenance, and Calibration Plan" (OMCP) document number "WHC-SD-WM-PLN-117". CMD will also provide technical oversight and assistance on activities requiring craft or operations involvement.

Characterization Monitoring Development will provide documentation and references for certified vendor information (CVI) files to Configuration Documentation North, shall establish maintenance/calibration files, engineering bases, drawings, safety documentation, operational data gathering, and other design media.

Tank Farms Operations shall provide for the operation, maintenance, and control of the other related systems and equipment, as well as maintenance activities requiring the crafts. Maintenance activities involving WHC crafts will use work packages and the Job Control System.

Tank Farms Operations and Characterization Monitoring Development agree to exchange notification of any planned outages or activities which may impact the GCS. Additionally, both organizations agree to provide updated lists of key people, and organizational changes which may impact communication.

Duration

These GCS units are to be considered temporary equipment. The function of GCS is to collect sufficient statistically correct data to characterize the flammable gas production and release traits of the AW-101 and AN-105 tanks. The equipment will be removed after this data is collected. Waste Tanks Process Engineering manager Blaine Barton, defined sufficient statistically correct data from the GCS as being 6 gas release (burp) cycles. For AW-101, with a release cycle taking approximately two months, the characterization data should be collected in one year. Including a 4 month baseline data collection period, the GCS unit is expected to be removed by the end of fiscal year 1998 (FY98). Tank AN-105 exhibits a burp cycle of approximately 15 months, which indicates the GCS being installed on AN-105 should be removed by the end of fiscal year 2004 (FY04).

D Tate

Daron Tate,
Characterization Monitoring Development
Gas Characterization System project

CONCURRENCE: C L Wilk 2-26-96 (242A Operations) R W Klem 2/27/96

Kathie White 2/26/96

"AW" farm Cog. Engineer — Date

William [illegible] 2/20/96

"AN" farm Cog. Engineer — Date

DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	Characterization Monitoring Development	Date 2/22/96
Project Title/Work Order		**EDT No.** 613253
Gas Characterization System (GCS), ETN-95-0033		**ECN No.** N/A

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
JW Lentsch	S7-15	X			
KA White	S5-13	X			
WE Meeuwsen	S5-05	X			
GN Hanson	S5-05	X			
RJ Nicklas	R1-43	X			
TW Bohan	S5-04	X			
MF Erhart	R1-51	X			
WE Ross	S5-07				X
JE Geary	S5-07	X			
CM Winkler	S5-14	X			
CA Sams	S5-13	X			
SU Zaman	R3-08	X			
RE Bauer	L6-37				X
TC Schneider	L6-37	X			
DD Tate	L6-37	3			
CV Vo	L6-37	X			
Central Files	A3-88	X			