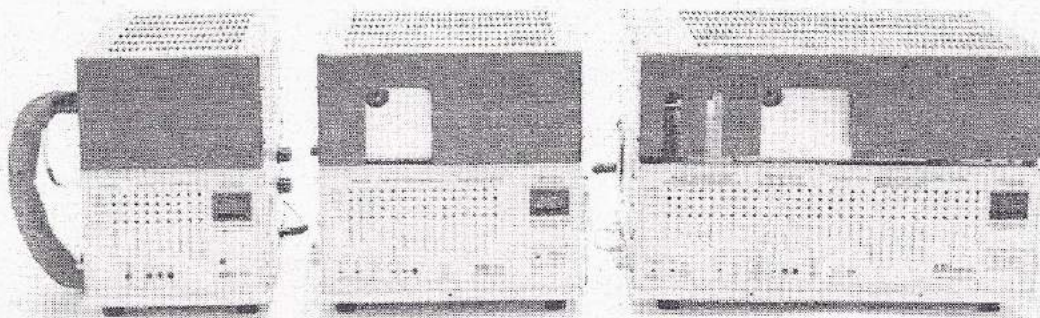


SRI Instruments

Operation Manual and Reference Guide



Model 110
Standalone
Detector
Chassis

Model 310 Ultra-
compact GC

Model 8610C Compact GC

SRI Instruments
20720 Earl St.
Torrance CA 90503

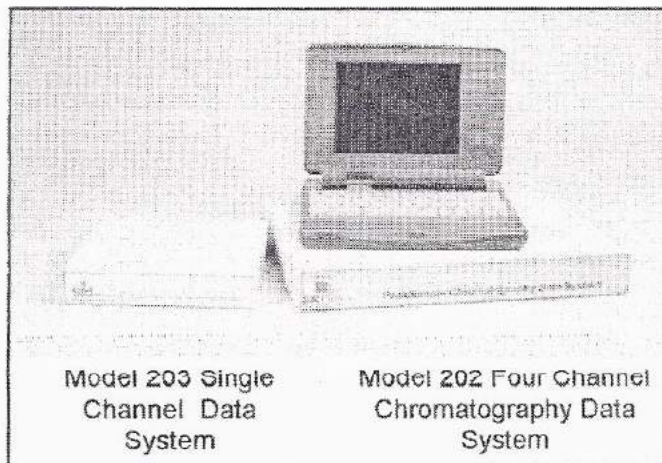
Phone: 310-214-5092
Fax: 5097

Web: <http://www.srigc.com>

E-mail: sales@srigc.com

January 2005

Model H2-50
Stand-alone
Hydrogen
Generator



Model 203 Single
Channel Data
System

Model 202 Four Channel
Chromatography Data
System

UNITS OF PRESSURE EQUIVALENCE (EQUAL TO 1 PSI)

- 1 psi = 2.036 in. Hg (inches of mercury)**
- = 27.68 in. w.c. (inches of water column)**
- = 51.715 mmHg or torr**
- = 0.068947 bar**
- = 0.06804 atm (atmospheres)**
- = 6.8947 kilopascals or KPa**
- = 0.0703 kg/cm²**
- = 2.307 ft. H₂O**

WARRANTY AND WARNINGS

WARRANTY:

SRI will repair or replace any defective parts within two years from the date of shipment.

Consummable items such as lamps, heaters, septa, NPD beads, ECD detector cell, DELCD heaters, FPD photomultiplier tubes, traps, filters, TCD filaments, columns, syringes, etc. are excluded. Replacement or repair shall be the purchaser's only remedy, and in no case shall SRI's liability exceed the original purchase price. The equipment is purchased without any other warranty expressed or implied, including, without limitation, any warranty of merchantability, any warranty arising from a course of dealing, performance of usage of trade and/or any warranty that the equipment is fit for any particular purpose or trade. The purchaser agrees to assume all risks of defects relating to the design, construction, purchase, operation, condition, maintenance, possession and use of the equipment, and to release SRI, to the maximum extent allowed by law, from any and all liabilities, claims or demands of any nature, including without limitation any claims based on incidental or consequential damages (foreseeable or not), lost earnings, negligence (active or passive), strict liability, breach of agreement or misconduct. The purchaser is aware of and waives the provisions of California Civil Code Section 1542, ("A general release does not extend to claims which the creditor does not know or suspect to exist in his favor at the time of executing the release, which if known by him must have materially affected his settlement with the debtor"), and/or all other laws, local, state, federal, or international, of similar intent, scope or purpose, relating to the release of unknown or unexpected claims. It is expressly agreed that the possibility of such unknown or undiscovered claims exist and has been explicitly taken into account in determining the equipment's purchase price and that consideration has been adjusted, having been bargained for in full knowledge of the possibility of such unknown claims. In the event the equipment is sold, loaned, or otherwise transferred, purchaser agrees to bind the third party to the terms of this agreement as a condition of transfer. Purchaser is aware of the dangers, and hazards inherent in operating chromatographs and data systems including but not limited to the warnings listed below. No agent, representative, distributor or employee of SRI has authority to amend this warranty in any way. In the event that any term or provision of this warranty is subject to valid claim of unenforceability, such term or provision shall be narrowly construed, the remaining provisions shall nevertheless survive, granting SRI the greatest possible protection then available under law.

WARNINGS AND HAZARDS:

Purchaser is aware of and accepts complete responsibility for

operation of the equipment knowing that:

- 1) Flammable gases such as hydrogen and argon/methane are required for operation of some detectors, and adequate precautions must be taken by the user to install safe and leak-free gas line tubing with flow snubbers, quick shutoff valves, etc. in accordance with all local fire department regulations. Flammable gases should not be used as carrier gas.
- 2) High temperatures may burn the operator. Safety gloves should be worn, and all surfaces touched only after making sure they are not hot.
- 3) High voltages on the PID lamp or FPD Photo-multiplier tube may shock the operator. Be sure the power is off before touching these parts.
- 4) Radioactive material is present inside the ECD detector. It is the user's responsibility to comply with all regulations and safety precautions, and to dispose of the detector in the manner prescribed by regulatory agencies. ECD detectors are transferred directly from Valco Inc., Houston Texas, to the purchaser, and all licenses, details of operation, warranty, disposal, etc. are solely the responsibility of Valco and the purchaser.
- 5) Toxic, hazardous, or poisonous solvents such as N-Propanol are required for operation of the ELCD detector. Other detectors may release or form toxic compounds, requiring operation under a fume hood or use of a respirator. Standards or samples required to calibrate the GC may be toxic, hazardous, or flammable.
- 6) Eye damaging ultra-violet light is emitted by the PID lamp. Eye protection should be worn at all times when operating the GC.
- 7) Both qualitative and quantitative results from GC/Data System are subject to many sources of error. The magnitude of the error is variable, and must be statistically evaluated and controlled by the operator. Responsibility for the accuracy of the results obtained is solely the operator's. SRI makes no claims regarding the accuracy, bias, or precision of the results.
- 8) All SRI equipment is intended for operation by trained laboratory personnel only. It is the purchaser's responsibility to limit access so that only qualified laboratory technicians may operate the equipment and to ensure that they are provided with all necessary safety apparatus, training, and procedures to minimize injury and/or damage in the event of an accident or malfunction (foreseeable or not)
- 9) Errors and/or "bugs" may exist in integration software.

**OPERATING THIS EQUIPMENT SHALL CONSTITUTE ACCEPTANCE
OF ALL TERMS AND PROVISIONS ABOVE.**

PLEASE READ!!!

ATTENTION !

AVOID THESE COMMON ERRORS

1. In general, SRI Instruments does not recommend using nitrogen as a carrier gas. If nitrogen carrier must be used with a TCD, the current must be set to LOW. High current TCD operation with nitrogen carrier will destroy the filaments. Using nitrogen as carrier gas in capillary columns will drastically reduce the separating ability of the column. Use of helium carrier is suggested wherever possible. **NEVER TURN ON THE TCD FILAMENT CURRENT BEFORE CARRIER AND REFERENCE GAS FLOWS EXIST THROUGH THE DETECTOR AND HAVE BEEN VERIFIED. THE TCD FILAMENTS WILL BE DESTROYED IF ENERGIZED WITHOUT THESE FLOWS!** The 8610C gas chromatograph, in programmable and educational models, is equipped with a filament protection cutout circuit. This circuit will de-energize the filaments if the column carrier gas head pressure falls below a preset value (factory set to 3psi). This will prevent the filaments from incandescing if the carrier gas is interrupted to the detector by a removed septum nut, disconnected column, or empty carrier gas cylinder. It will not prevent filaments from damage if nitrogen carrier gas is used in conjunction with high filament current, which is prohibited and will void the warranty of the TCD detector. **NEVER OPERATE THE TCD ON HIGH CURRENT WHEN USING NITROGEN CARRIER.**

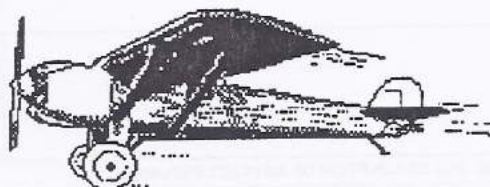
2. The SRI educational TCD-equipped gas chromatograph is equipped with a manual pressure regulator in lieu of a flow controller for carrier gas flow. The full-featured 8610C GC is equipped with programmable electronic pressure control (EPC) of carrier gas flow. Therefore, hydrogen carrier gas should not be used with either GC configuration. If a leak, column breakage, or other failure occurs, hydrogen gas could be released in dangerous concentrations, creating the potential for a fire or explosion to occur. Helium carrier offers an almost identical Van Deemter curve and performance to hydrogen carrier gas, and is the recommended substitute carrier gas.

3. When selecting a port address for the serial data acquisition interface built into your 8610C gas chromatograph, you must verify that you are not using a COM port on the data system host PC that is being shared with a mouse. Some PCs offer a DB-9 serial port labeled COM1, and have a DIN-plug type mouse with a separate, small, round plug and port. This may also be on the COM1 address. Consult your PC manual for information. If you are connecting to COM 2, and your PC is equipped with an internal modem, change the modem's COM port address from COM2 to COM3 or COM4 to avoid conflicts. Failure to do so will prevent the PC-based data system from communicating with the GC via the serial port. If you have any doubts regarding the configuration of your PC's COM ports, use the MS-DOS MSD.EXE utility to inspect your hardware settings.

4. If you have an NPD detector, do not use hydrogen as a carrier. The detector bead will overheat if the hydrogen flow is above 5 ml/min. Also, do not forget to install the NPD restrictor and resistor supplied, if your NPD also performs as a convertible FID detector. Do not turn the bead voltage above 4 volts or the detector bead will burn up. The voltage can be monitored with the digital display on the front of the unit. The display reads out in 1/100ths of a volt - 4 volts will be displayed as 400 units on the digital display.

Chapter: PREFACE

Topic: RETURNS OF EQUIPMENT FROM OUTSIDE U.S.A



In the event an item of SRI equipment needs to be returned to the factory from outside the U.S. A., please make a copy of the U. S. Customs form 3311 provided on the facing or reverse page, and include the filled out form with the shipping documents. This form will allow the equipment back into the U. S. without any customs duties, and will speed up customs clearance delay.

Before returning any goods, please obtain a RMA number (return material authorization) from SRI. At the time the RMA is issued, you will be advised on preferred methods of shipment and shipping companies. SRI will normally request pre-paid FEDX delivery.

To obtain an RMA contact:

SRI Instruments Technical Support
20720 Earl St.
Torrance CA 90503 U.S.A.
310-214-5092
fax 5097



DEPARTMENT OF THE TREASURY
UNITED STATES CUSTOMS SERVICE

Form Approved
OMB No. 1515-0043

**DECLARATION FOR FREE ENTRY OF
RETURNED AMERICAN PRODUCTS**

19 CFR 10.1, 10.5, 10.6, 10.66, 10.67, 12.41, 123.4, 143.23, 145.35

1. PORT & DISTRICT	2. DATE	3. ENTRY NO. & DATE
4. NAME OF MANUFACTURER		5. CITY AND STATE OF MANUFACTURE
6. REASON FOR RETURN		7. U.S. DRAWDRAW PREVIOUSLY <input type="checkbox"/> CLAIMED <input type="checkbox"/> UNCLAIMED
		8. PREVIOUSLY IMPORTED UNDER TSUSA 864.05? <input type="checkbox"/> YES <input type="checkbox"/> NO
9. MARKS, NUMBERS, AND DESCRIPTION OF ARTICLES RETURNED		10. VALUE *

* If the value of the article is \$10,000 or more and the articles are not clearly marked with the name and address of U.S. manufacturer, please attach copies of any documentation or other evidence that you have that will support or substantiate your claim for duty free status as American Goods Returned.

11. I declare that the information given above is true and correct to the best of my knowledge and belief; that the articles described above are the growth, production, and manufacture of the United States and are returned without having been advanced in value or improved in condition by any process of manufacture or other means; that no drawback bounty, or allowance has been paid or admitted thereon, or on any part thereof; and that if any notice(s) of exportation of articles with benefit of drawback ☐ was ☐ were filed upon exportation of the merchandise from the United States, such notice(s) ☐ has ☐ have been abandoned.

12. NAME OF DECLARANT	13. TITLE OF DECLARANT
14. NAME OF CORPORATION OR PARTNERSHIP (If any)	
15. SIGNATURE (See note)	
16. SIGNATURE OF AUTHORIZING CUSTOMS OFFICER	

NOTE: If the owner or ultimate consignee is a corporation, this form must be signed by the president, vice president, secretary, or treasurer of the corporation, or by any employee or agent of the corporation who holds a power of attorney and a certificate by the corporation that such employee or agent has or will have knowledge of the pertinent facts.

Notice required by Paperwork Reduction Act of 1980: This information is needed to ensure that importers/exporters are complying with U.S. customs laws, to allow us to compute and collect the right amount of money, to enforce other agency requirements, and to collect accurate statistical information on imports. Your response is mandatory.

Statement required by 5 CFR 1320.21: The estimated average burden associated with this collection of information is 6 minutes per respondent or recordkeeper depending on individual circumstances. Comments concerning the accuracy of this burden estimate and suggestions for reducing this burden should be directed to U.S. Customs Service, Paperwork Management Branch, Washington, DC 20229, and the Office of Management and Budget, Paperwork Reduction Project (1515-0043), Washington, DC 20503.

GC & GC Data Handling Application Support and Training Services

Application Support and Training Services

ChromLab provides a full range of support, training and method development services for chromatography and data handling instrumentation, including:

- Complete installation and setup services for GC instrumentation and sample introduction systems including Headspace and Thermal Desorption.
- On-site training in GC and GC Data Handling for laboratory personnel.
- Development of effective operator manuals and in-house training programs.
- Method development for GC, HS/GC, capillary GC and fast GC analysis.

Benefits Provided to GC Customers

ChromLab gives your company the benefits of on-site chromatography expertise. We provide application support and training services for your GC instrumentation tailored to meet the needs of your laboratory when you need them and on a cost-effective basis.

- Reduced setup and training costs with on-site training for your personnel.
- On-site GC and GC data handling method setup and calibration for quick implementation of cost saving QC/QA chromatography methods.
- Customized Headspace GC, Thermal Desorption methods to solve difficult sample analysis challenges.
- Setup and training in regulatory compliance methods - EPA, OSHA, ASTM

ChromLab provides its support services to the following industries:

- Petroleum, Chemical, Energy, Environmental
- Flexible Packaging, Converting, Paper and Flooring Products, Inks and Coatings
- Pharmaceutical, Food and Beverage

ChromLab

A Chromatography Technology and Development Company

Customized On-site GC Support and Training Services

ChromLab will train of your personnel in the efficient setup, operation and routine calibration of your GC equipment. We will assist in the transfer of new GC methods to your laboratory site. We will also optimize your GC data handling methods and develop standard operating procedures for your personnel to use after the training is complete. Training is available in the following areas:

- Basic GC
- Capillary Column GC
- Headspace GC
- Thermal Desorption GC
- GC Data Handling.

These support and training services will greatly reduce your GC downtime and overall operational costs to give your organization real long term saving. Your personnel will gain a solid understanding of their GC system and the confidence to perform routine calibration, maintenance and troubleshooting.

Providing Expert Technical Leadership

Burton S. Todd, is the Technical Director of **ChromLab** with over 30 years of hands-on expertise in providing application support and training in GC, HS/GC, GC/MS and GC data handling. He has worked with hundreds of companies, large and small assisting in the specification and setup of GC and data handling instrumentation. He has provided successful solutions to solve difficult analytical challenges and helped to build the confidence and skills of laboratory personnel through customized training tailored to meet their needs.

For More Information

For more information on these and other GC support and training services please contact **ChromLab** at 610-644-2260 or Fax your inquires and questions to Burton Todd. We will be glad to assist you in developing a support program to help meet your laboratory's goals.

THE ENVIRONMENTAL TECHNOLOGY VERIFICATION PROGRAM



U.S. Environmental Protection Agency



Environmental Security
Technology Certification
Program



Oak Ridge National Laboratory

Joint Verification Statement

TECHNOLOGY TYPE:	GAS CHROMATOGRAPHY	
APPLICATION:	MEASUREMENT OF EXPLOSIVES IN CONTAMINATED SOIL	
TECHNOLOGY NAME:	Model 8610C Gas Chromatograph/Thermionic Ionization Detection	
COMPANY:	SRI Instruments	
ADDRESS:	20720 Earl Street Torrance, CA 90503	PHONE: (310) 214-5092 FAX: (310) 214-5097
WEB SITE:	www.srigc.com	
EMAIL:	hagoldsmith@earthlink.net	

The U.S. Environmental Protection Agency (EPA) has created the Environmental Technology Verification Program (ETV) to facilitate the deployment of innovative or improved environmental technologies through performance verification and dissemination of information. The goal of the ETV Program is to further environmental protection by substantially accelerating the acceptance and use of improved and cost-effective technologies. ETV seeks to achieve this goal by providing high quality, peer-reviewed data on technology performance to those involved in the design, distribution, financing, permitting, purchase, and use of environmental technologies.

ETV works in partnership with recognized standards and testing organizations, stakeholder groups consisting of regulators, buyers, and vendor organizations, with the full participation of individual technology developers. The program evaluates the performance of innovative technologies by developing test plans that are responsive to the needs of stakeholders, conducting field or laboratory tests (as appropriate), collecting and analyzing data, and preparing peer-reviewed reports. All evaluations are conducted in accordance with rigorous quality assurance protocols to ensure that data of known and adequate quality are generated and that the results are defensible.

The Department of Defense (DoD) has a similar verification program known as the Environmental Security Technology Certification Program (ESTCP). The purpose of ESTCP is to demonstrate and validate the most promising innovative technologies that target DoD's most urgent environmental needs and are projected to pay back the investment within 5 years through cost savings and improved efficiencies. ESTCP demonstrations are typically conducted under operational field conditions at DoD facilities. The demonstrations are intended to generate supporting cost and performance data for acceptance or validation of the technology. The goal is to transition mature environmental science and technology projects through the demonstration/ validation phase, enabling promising technologies to receive regulatory and end user acceptance in order to be field tested and commercialized more rapidly.

The Oak Ridge National Laboratory (ORNL) is one of the verification organizations operating under the Site Characterization and Monitoring Technologies (SCMT) program. SCMT, which is administered by EPA's National Exposure Research Laboratory, is one of 12 technology areas under ETV. In this verification test, ORNL evaluated the performance of explosives detection technologies. This verification statement provides a summary of the test results for SRI Instruments' Model 8610C gas chromatograph with thermionic ionization detection (GC/TID). This verification was conducted jointly with DoD's ESTCP.

VERIFICATION TEST DESCRIPTION

This verification test was designed to evaluate technologies that detect and measure explosives in soil. The test was conducted at ORNL in Oak Ridge, Tennessee, from August 21 through 30, 2000. Spiked samples of known concentration were used to assess the accuracy of the technology. Environmentally contaminated soil samples, collected from DoD sites in California, Louisiana, Iowa, and Tennessee and ranging in concentration from 0 to approximately 90,000 mg/kg, were used to assess several performance characteristics. The primary constituents in the samples were 2,4,6-trinitrotoluene (TNT); isomeric dinitrotoluene (DNT), including both 2,4-dinitrotoluene and 2,6-dinitrotoluene; hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX); and octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX). The results of the soil analyses conducted under field conditions by the GC/TID were compared with results from reference laboratory analyses of homogenous replicate samples analyzed using EPA SW-846 Method 8330. Details of the verification, including a data summary and discussion of results, may be found in the report entitled *Environmental Technology Verification Report: Explosives Detection Technology—SRI Instruments, GC/TID*, EPA/600/R-01/065.

TECHNOLOGY DESCRIPTION

The SRI Model 8610C gas chromatograph (GC) is a transportable instrument that can provide on-site analysis of soils for explosives. Coupling this transportable gas chromatograph with a thermionic ionization detector (TID) allows for the determination of explosives in soil matrices following simple sample preparation procedures. Samples are extracted in acetone, diluted, and injected directly onto the GC column within a heated injection port. The high temperature of the injection port instantaneously vaporizes the solvent extract and explosives, allowing them to travel as a vapor through the GC column in the presence of the nitrogen carrier gas. The stationary phase of the GC column and the programmable oven temperature separate the components present in sample extracts based on their relative affinities and vapor pressures. Upon elution from the column's end, compounds containing nitro groups are ionized on the surface of the thermionic bead, and the increased conductivity of atmosphere within the heated detector is measured with a collector electrode. In this verification test, the instrument was verified for its ability to detect and quantify 2,4-dinitrotoluene (2,4-DNT), RDX, and TNT. Analytical run times were typically less than 7 min and reporting limits were typically 0.5 mg/kg.

VERIFICATION OF PERFORMANCE

The following performance characteristics of SRI's GC/TID were observed.

Precision: The mean relative standard deviations (RSDs) for 2,4-DNT, RDX, and TNT were 15%, 14% and 23%, respectively, indicating that the determinations of all analytes were precise.

Accuracy: Accuracy was assessed using the performance evaluation (PE) soil samples, which were spiked to nominal TNT and RDX concentrations of 0, 10, 50, 100, 250, and 500 mg/kg each by an independent laboratory. The mean percent recoveries for RDX and TNT were 91% and 97%, respectively, indicating that the analyses were unbiased.

False positive/false negative results: Of the 20 blank soils, SRI reported TNT in five samples (25% false positives). No false positives were reported for 2,4-DNT and RDX. False positive and false negative results were also estimated by comparing the GC/TID result to the reference laboratory result for the environmental and spiked samples (e.g., whether SRI reported a result as a nondetect that the reference laboratory reported as a detection, and vice versa). For these soils, 3% of the 2,4-DNT results and 7% of the TNT results were reported as false positives relative to the reference laboratory results, but none of the RDX results were reported as false positives. Similarly, a small percentage of the results were reported as nondetects by SRI (i.e., false negatives) when the laboratory reported a detection (2% for RDX, 4% for TNT, none for 2,4-DNT).

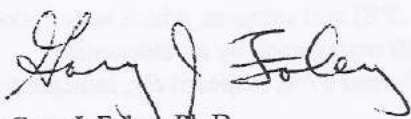
Completeness: The GC/TID generated results for all 108 soil samples for a completeness of 100%.

Comparability: A one-to-one sample comparison of the GC/TID results and the reference laboratory results was performed for all samples (spiked and environmental) that were reported as detects. The correlation coefficient (r) for the comparison of the entire soil data set for TNT (excluding one suspect measurement for the reference laboratory) was 0.95 (slope (m) = 1.32). When comparability was assessed for specific concentration ranges, the r value did not change dramatically for TNT, ranging from 0.89 to 0.93 depending on the concentrations selected. RDX correlation coefficient with the reference laboratory for all soil results was slightly lower than TNT ($r = 0.85$, $m = 0.91$). The GC/TID's results for RDX correlated better with the reference laboratory for concentrations <500 mg/kg ($r = 0.96$, $m = 0.83$) than for samples where concentrations were >500 mg/kg ($r = 0.49$, $m = 0.56$). For the limited number of data points where both the reference laboratory and SRI reported results for 2,4-DNT ($n = 14$), the correlation was 0.44 ($m = 0.33$).

Sample Throughput: Throughput was approximately three samples per hour. This rate was accomplished by two operators and included sample preparation and analysis.

Ease of Use: No particular level of educational training is required for the operator, but knowledge of chromatographic techniques and experience in field instrument deployments would be advantageous.

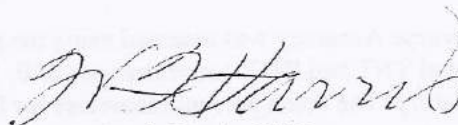
Overall Evaluation: The overall performance of the GC/TID for the analysis of 2,4-DNT, RDX, and TNT was characterized as precise and unbiased. As with any technology selection, the user must determine if this technology is appropriate for the application and the project's data quality objectives. For more information on this and other verified technologies, visit the ETV web site at <http://www.epa.gov/etv>.



Gary J. Foley, Ph.D.

Director

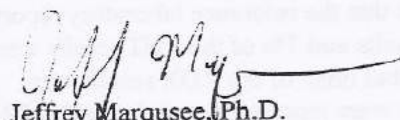
National Exposure Research Laboratory
Office of Research and Development



W. Frank Harris, Ph.D.

Associate Laboratory Director

Biological and Environmental Sciences
Oak Ridge National Laboratory



Jeffrey Marqusee, Ph.D.

Director

Environmental Security Technology Certification Program
Department of Defense

NOTICE: EPA and ESTCP verifications are based on evaluations of technology performance under specific, predetermined criteria and appropriate quality assurance procedures. EPA, ESTCP, and ORNL make no expressed or implied warranties as to the performance of the technology and do not certify that a technology will always operate as verified. The end user is solely responsible for complying with any and all applicable federal, state, and local requirements. Mention of commercial product names does not imply endorsement or recommendation.