

**PROJECT OPERATIONS PLAN
MALTA ROCKET FUEL AREA
SUPERFUND SITE
TOWNS OF MALTA AND STILLWATER
SARATOGA COUNTY, NEW YORK**

VOLUME II

March 1991

Prepared by

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CONTENTS - VOLUME I

	<u>Page</u>
1.0 INTRODUCTION	1-1
1.1 Project Operations Plan Summary	1-2
1.1.1 Field Sampling and Analysis Plan Summary	1-2
1.1.2 Quality Assurance Project Plan Summary	1-3
1.1.3 Health and Safety Plan Summary	1-3
1.1.4 Site Management Plan Summary	1-4
1.2 Site Location and Description	1-4
1.3 Site History and Existing Data	1-5
1.3.1 Site History Summary	1-5
1.3.2 Existing Data Summary	1-6
1.3.3 Potential Chemicals of Concern	1-9
1.3.4 Potential Mechanisms of Chemical Release	1-9
2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES	2-1
2.1 RI Project Officer/Facility Coordinator	2-1
2.2 RI Project Manager	2-2
2.3 RI Field Manager	2-3
2.4 RI Project Hydrogeologist	2-4
2.5 RI Field Technicians	2-5
2.6 RI Site Safety Coordinator	2-5
2.7 RI Quality Assurance Officer	2-6
3.0 SAMPLING PROGRAM OBJECTIVES	3-1
3.1 Project Objectives	3-1
3.2 Data Quality Objectives	3-2
3.2.1 Quality of Existing Data	3-4
4.0 LITERATURE SEARCH	4-1

CONTENTS (Continued)

	<u>Page</u>
5.0 FIELD SAMPLING AND ANALYSIS PLAN	5-1
5.1 Field Investigation Statement of Work	5-1
5.2 Field Investigation Overview	5-2
5.3 General Field Sampling and Analysis Procedures	5-3
5.3.1 Mobilization	5-4
5.3.2 Field Documentation	5-5
5.3.3 Sample Designation	5-5
5.3.4 Chain-of-Custody Procedures	5-8
5.3.5 Laboratory Documentation	5-9
5.3.6 Demobilization	5-9
5.4 Ambient Air Investigation	5-9
5.4.1 Assessment of Meteorological Conditions	5-9
5.4.2 Background Air Quality	5-10
5.4.2.1 Compound Specific Field and Analysis Procedure	5-11
5.4.2.2 Field Sampling Network Operation	5-12
5.4.2.3 Quality Assurance/Quality Control	5-13
5.4.3 Ambient Air Quality During RI Activities	5-14
5.5 Soil-Gas Surveys	5-15
5.5.1 Survey Grid Definition	5-16
5.5.2 Soil-Gas Sampling Procedure	5-17
5.5.3 Pumping Time Study	5-17
5.5.4 Gas Chromatograph Calibration	5-17
5.5.5 Compound Identification and Quantification	5-18
5.5.6 Blanks	5-18
5.5.7 Quality Control	5-19
5.5.8 Detection Limits	5-19

CONTENTS (Continued)

	<u>Page</u>
5.6 Geophysical Surveys	5-20
5.6.1 Measuring Point Selection	5-21
5.6.2 Electromagnetic Methods	5-21
5.7 Radiation Survey	5-22
5.8 Surface Soil Sampling	5-22
5.8.1 Site-Wide Surface-Soil Survey	5-22
5.8.2 Background-Soil Survey	5-23
5.8.3 Surface-Soil Sampling Near Storage Tanks	5-24
5.8.4 Surface-Soil Sampling Procedure	5-24
5.8.5 Equipment Decontamination	5-25
5.9 Subsurface-Soil Sampling	5-26
5.9.1 Hollow-Stem Auger Drilling	5-28
5.9.2 Borehole Logging	5-28
5.9.3 Formation Sampling	5-30
5.9.4 Field Screening for Total Volatile Organic Compounds	5-33
5.9.5 Equipment Decontamination	5-33
5.9.6 Disposal of Drill Cuttings and Fluids	5-35
5.9.7 Borehole Completion	5-35
5.10 Test-Pit Excavation and Sampling	5-35
5.10.1 Excavation	5-35
5.10.2 Test-Pit Soil Sampling	5-36
5.10.3 Buried Drum and/or Tank Handling and Sampling	5-38
5.10.3.1 Disposal	5-39

CONTENTS (Continued)

	<u>Page</u>
5.11 Ground-Water Monitoring Well Installation and Development	5-39
5.11.1 Borehole Drilling	5-41
5.11.2 Formation Sampling	5-41
5.11.3 Shelby Tube Sampling	5-41
5.11.4 Monitoring Well Construction	5-42
5.11.4.1 Gravel Pack and Borehole Annulus Seal	5-43
5.11.4.2 Well Construction Diagram	5-43
5.11.5 Well Development	5-44
5.11.6 Equipment Decontamination	5-46
5.11.7 Disposal of Drill Cuttings and Fluids	5-46
5.11.8 Elevation Survey	5-47
5.12 Borehole Geophysical Logging	5-47
5.12.1 Borehole Logging Procedure	5-48
5.12.2 Equipment Decontamination	5-49
5.13 Water-Level Measurement	5-49
5.14 Ground-Water Sampling	5-51
5.14.1 Preparation for Sampling	5-52
5.14.2 Sampling Equipment	5-53
5.14.3 Well Evacuation	5-54
5.14.4 Ground-Water Sample Collection	5-55
5.14.4.1 Filling Sample Containers	5-56
5.14.5 Sample Containers and Preservation	5-58
5.14.5.1 Sample Containers	5-58
5.14.5.2 Preservation	5-58
5.14.6 Field Analyses	5-59
5.14.6.1 Temperature	5-59
5.14.6.2 pH	5-59
5.14.6.3 Specific Conductance	5-60

CONTENTS (Continued)

	<u>Page</u>
5.14.7 Quality Control Sample Collection	5-60
5.14.7.1 Replicate Analyses	5-60
5.14.7.2 Blanks	5-61
5.14.8 Field Documentation	5-61
5.14.8.1 Daily Log	5-61
5.14.8.2 Water-Sampling Log	5-62
5.14.8.3 Sample Labels and Chain-of-Custody Form	5-63
5.14.9 Equipment Decontamination	5-63
5.15 Aquifer Testing	5-64
5.15.1 Installation of Discharge Measurement and Control Devices	5-66
5.15.2 Barometer Installation	5-66
5.15.3 Rain Gauge Installation	5-67
5.15.4 Conducting the Aquifer Test	5-67
5.15.4.1 Slug Test Procedure	5-67
5.15.4.2 Preliminary Aquifer Test (Step Test)	5-68
5.15.4.3 Constant-Rate Test	5-69
5.15.4.4 Frequency of Measurement	5-69
5.15.4.5 Recovery Test	5-70
5.15.5 Data Plots	5-71
5.15.5.1 Data Plot Corrections	5-71
5.15.6 Aquifer Test Memorandum	5-72
5.15.7 Aquifer Test Data Analyses	5-72
5.15.7.1 Boulton Delayed-Yield Method	5-73
5.15.7.2 Hantush Partial-Penetration Method	5-74
5.15.7.3 Cooper-Jacob Method	5-75
5.15.7.4 AQTESOLV™ Method	5-75
5.15.7.5 FEEST™ Method	5-76
5.15.7.6 Alternative Data Analysis Methods	5-77
5.15.7.7 Slug Test Data Analysis	5-77

CONTENTS (Continued)

	<u>Page</u>
5.16 Sediment Sampling	5-78
5.16.1 Sediment Sampling Procedure	5-78
5.16.1.1 Field Screening for Total Volatile Organic Compounds	5-79
5.16.1.2 Sample Containers	5-80
5.16.2 Equipment Decontamination	5-80
5.17 Surface-Water/Sludge Sampling	5-80
5.17.1 Surface-Water Sampling Procedure	5-82
5.18 Wipe Sampling	5-83
5.18.1 Wipe Sampling for Radioactive Material	5-83
5.18.2 Wipe Sampling for PCBs	5-84
5.19 Step I Habitat-Based Assessment	5-85
6.0 QUALITY ASSURANCE PROJECT PLAN	6-1
6.1 Introduction	6-1
6.2 Data Collection	6-1
6.2.1 Monitoring Parameters, Sample Matrices, and Frequency of Collection	6-1
6.2.2 Laboratory Calibration Procedures	6-2

CONTENTS (Continued)

	<u>Page</u>
6.3 Quality Assurance Objectives	6-2
6.3.1 Accuracy	6-2
6.3.2 Precision	6-3
6.3.3 Completeness	6-3
6.3.4 Representativeness	6-4
6.3.5 Comparability	6-4
6.3.6 Quantitation Limits	6-4
6.3.7 Field Blanks	6-5
6.3.8 Container Blanks	6-5
6.3.9 Trip Blanks	6-5
6.3.10 Replicate Samples	6-5
6.3.11 Matrix Spike/Matrix Spike Duplicate	6-6
6.3.12 Laboratory Blanks	6-6
6.4 Sample Custody	6-6
6.4.1 Field Custody	6-7
6.4.2 Transfer of Custody and Shipment	6-7
6.4.3 Sample Preservation and Shipment Procedures	6-8
6.4.4 Field Documentation Responsibilities	6-9
6.5 Field Measurement and Calibration Procedures	6-9
6.6 Data Reduction, Validation, and Reporting	6-9
6.6.1 Data Reduction	6-10
6.6.2 Data Validation	6-10
6.6.3 Data Reporting	6-11
6.7 Internal Quality Control Checks	6-11
6.8 Performance and System Audits	6-12
6.9 Preventive Maintenance	6-13
6.10 Data Assessment Procedures	6-14
6.11 Corrective Action	6-15
6.12 Quality Assurance/Quality Control Evaluation	6-15

CONTENTS (Continued)

	<u>Page</u>
7.0 HEALTH AND SAFETY PLAN	7-1
7.1 Introduction	7-1
7.2 Purpose/Objective	7-1
7.2.1 Assignment of Responsibilities	7-2
7.2.2 RI Site Safety Coordinator	7-3
7.2.3 RI Site Safety Officer/RI Project Hydrogeologist	7-3
7.2.4 RI Project Manager	7-3
7.2.5 USEPA Project Manager	7-3
7.3 Hazard Evaluation	7-4
7.3.1 Volatile Organic Compounds (VOCs)	7-4
7.3.2 Flammable/Explosive Gases and Vapors	7-5
7.3.3 Ionizing Radiation	7-6
7.3.4 Dioxins and Furans	7-6
7.3.5 PCBs	7-7
7.3.6 Trenching/Excavation	7-7
7.3.7 Explosion Hazard	7-7
7.4 Air Monitoring	7-7
7.5 Personal Protective Equipment	7-8
7.5.1 Levels of Protection	7-9
7.5.1.1 Level D Protection	7-9
7.5.1.2 Level C Protection	7-10
7.6 Health and Safety Procedures	7-11
7.6.1 Regulated Areas	7-11
7.6.2 Decontamination	7-11
7.6.2.1 Personal Decontamination Procedures and Guidelines	7-12
7.6.2.2 Health and Safety Monitoring Equipment Decontamination	7-13

CONTENTS (Continued)

	<u>Page</u>
7.6.3 Access	7-13
7.6.4 Posting/Barricades	7-13
7.6.5 General Work Practices	7-13
7.6.6 Drilling Activities	7-15
7.6.7 Heavy Equipment Operation	7-16
7.6.8 Heat Stress	7-17
7.6.9 Cold Stress	7-18
7.7 Training	7-20
7.7.1 Contractors	7-20
7.8 Health Monitoring	7-21
7.9 Emergency Procedures	7-23
7.9.1 Personal Injury in the Exclusion Zone	7-23
7.9.2 Personal Injury in the Support Zone	7-23
7.9.3 Fire/Explosion	7-24
7.9.4 Personal Protective Equipment Failure	7-24
7.10 Emergency Phone Numbers	7-24
7.10.1 Directions to Hospital	7-24
7.11 Safety Equipment	7-25
8.0 SITE MANAGEMENT PLAN	8-1
8.1 Site Access	8-1
8.2 Site Security	8-1
8.3 Field Office	8-2
8.4 Site Operations	8-2
8.5 Field Operations Schedule	8-2
8.6 Contingency Plan	8-2
8.6.1 Alternative Geophysical Methods	8-3
8.6.1.1 Magnetic Methods	8-3
8.6.1.2 Ground Penetrating Radar	8-4
9.0 REFERENCES	9-1

TABLES

1. Summary of Data Quality Objectives and Data Gathering Requirements During Remedial Investigation, Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.
2. Summary of Analytical Levels Appropriate to Various Data Uses, Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.
3. Ground-Water Quantitation Limits and ARARs for the Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.
4. Soil Quantitation Limits and ARARs for the Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.
5. Air ARARs (Including OSHA Requirements) for the Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.
6. Waste and Sludge ARARs for the Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.
7. Sampling Plan Summary, Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.
8. Air Sample Locations/Parameters, Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.
9. Field Instrument Calibration Summary, Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.
10. Sample Matrices, Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.
11. Sample Containers and Preservation, Target Compound List (TCL) Parameters, Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.
12. Current Occupational Airborne Contaminant Standards and Guidelines.
13. Contingency Plans for Potential Problems, Malta Rocket Fuel Area Site, Towns of Malta and Stillwater, Saratoga County, New York.

FIGURES

1. Location of Malta Rocket Fuel Area Superfund Site, Malta/Stillwater, New York.
2. Source Control Investigation Areas, Malta Rocket Fuel Area Superfund Site, Malta/Stillwater, New York.
- 3a. Potentiometric Level Contour Map for Shallow Wells, August 5, 1986.
- 3b. Potentiometric Level Contour Map for Deep Wells, August 5, 1986.
4. Proposed Sampling Locations, Malta Rocket Fuel Area Superfund Site, Malta/Stillwater, New York.
5. Previous Sampling Locations, Proposed Monitoring Wells, Stream Sampling Locations, Soil Sampling Locations, and the Early Warning System.
6. Proposed Schedule of Remedial Investigation Activities, Malta Rocket Fuel Area, Malta/Stillwater, New York.
7. Malta Rocket Fuel Area Project Organization.
8. Site Work Zones and Decontamination Procedure.
9. Windrose Diagram for 1989 at Station No. 14735, Albany, New York.
10. Emergency Response Plan for the Malta Rocket Fuel Area Superfund Site, Towns of Malta and Stillwater, Saratoga County, New York.

APPENDICES - VOLUME II

- A. Curriculum Vitae of Project Personnel.
- B. Field Documentation Forms.
- C. Soil-Gas Survey Grids.
- D. Geophysical Survey Grids.
- E. Laboratory Quality Assurance Project Plans.
- F. QA/QC Short Form.
- G. Health and Safety Plan Enclosures.

APPENDIX A
**CURRICULUM VITAE
OF PROJECT PERSONNEL**



DENNIS COLTON

Senior Project Advisor
and Senior Associate

CREDENTIALS/REGISTRATION

M.A. Geology, Adelphi University, 1978

B.A. Geology, University of Maryland, 1972

Certified Professional Geologist: American Institute of Professional Geologists (No. 6677)

PROFESSIONAL AFFILIATIONS

Association of Ground Water Scientists and Engineers (NWWA)

FIELDS OF SPECIALIZATION

- Organization and supervision of projects relating to the investigation and evaluation of ground-water contamination incidents at industrial plants and waste disposal sites
- Development and management of ground-water resources for municipal and industrial clients
- Design and supervision of drilling programs utilizing a variety of drilling methods
- Development and evaluation of hydrogeological data
- Hazardous waste site remediation
- Field sampling and analysis

EXPERIENCE SUMMARY

Mr. Colton was employed as a geologist by the Maryland Geological Survey in 1972 to revise outdated geological maps of the state of Maryland. Since joining Geraghty & Miller, Inc. he has participated in numerous pumping tests and contributed to the evaluation of hydrologic and chemical field data. He was the principal author of the status of ground-water investigations for organic chemicals in the Nassau-Suffolk area of New York for the USEPA sponsored Nassau-Suffolk 208 Program. Mr. Colton has prepared and evaluated technical documents for litigation and compliance purposes. As a project manager, he has designed subsurface investigations in diverse geologic environments utilizing various well drilling methods and ground-water monitoring techniques. He has been responsible for conducting investigations at numerous waste disposal sites, analyzing geologic and ground-water quality data, preparing reports assessing the impact of these sites on ground-water resources, and evaluating remedial alternatives.

KEY PROJECTS

- Supervised well drilling and construction, core sampling and geophysical logging in Suffolk County, New York, for the EPA- sponsored Suffolk County Flow Augmentation Needs Study.
- Evaluated the extent of ground-water contamination at many municipal and industrial landfill sites. Conducted the field investigation, including soil and water sampling.
- Supervised the installation of monitoring wells to meet RCRA requirements prior to construction of several industrial landfills in the Midwest.
- Evaluated the extent of ground-water contamination at an oil refinery in compliance with NJDEP ECRA requirements.
- Investigated the extent of ground-water contamination at several industrial plant sites from waste disposal of both inorganic and organic chemicals in improperly constructed lagoons.



DENNIS COLTON/2

- Investigated contamination of industrial plant water supplies by organic chemicals from unrecorded past spills or leaks; selected locations for additional water supply wells in areas not affected by contamination.
- Defined hydrologic setting of a private landfill and determined the reliability of the leachate collection system and the potential impact of ground-water contamination for a municipal client interested in purchasing the landfill.
- Directed the field investigation and participated in the design and installation of slurry wall containment systems at several industrial landfill sites in Illinois and New Jersey.
- Defined ground-water contamination in a bedrock aquifer at an industrial site, adjacent to a municipal water supply well field.
- Participated in numerous pumping tests and evaluated the potential water-bearing characteristics of the aquifers tested.
- Project manager for several sites requiring the design of oil recovery systems to collect free product with densities greater than and less than water in Illinois, Pennsylvania, and Massachusetts.
- Project manager for hydrogeologic investigations at CERCLA sites in Indiana and New York.
- Project manager for assessments of PCB contamination in soil and ground water at several chemical plants in the northeast.
- Project manager for a RCRA Facility Investigation (RFI) at a waste disposal facility in New Jersey.
- Conducted environmental site assessments at industrial sites in Massachusetts, Michigan, New Jersey, and New York prior to transfer of site ownership.

6/89



TOM C. ENG

Senior Engineer/Industrial Hygiene
Northeast Regional Health & Safety

CREDENTIALS/REGISTRATION

B.S. Chemical Engineering, City College, 1984
Industrial Hygienist in Training (IHIT), American Board of Industrial Hygiene, 1989

PROFESSIONAL AFFILIATIONS

American Industrial Hygiene Association, National and Local Chapter Member
American Board of Industrial Hygiene, Member

FIELD OF SPECIALIZATION

- Occupational Health & Safety
- Identification, Evaluation and Control of Occupational Disease Exposures
- Development of Comprehensive Control Strategy
- Field sampling and data analysis

EXPERIENCE SUMMARY

Prior to joining Geraghty & Miller Environmental Services, Inc., Mr. Eng was the New York Division Industrial Hygienist/Pollution Control Coordinator for Liberty Mutual Insurance Group, Inc. His responsibilities included consulting with clients on industrial hygiene and pollution liability issues, designing, implementing and teaching in training seminars for both clients and internal personnel, field surveys to identify potential health hazards, and sampling and data analysis.

Associated with Liberty Mutual for 5 plus years, Mr. Eng has extensive industrial hygiene experience in a major cross section of industries and has appreciable knowledge of current occupational health and safety standards and guidelines. He has accompanied and represented clients in regulatory meetings as a technical expert in the negotiation process to determine adequate control measures.

Joining the firm in 1990, his responsibilities include managing portions of the company's Health and Safety Program, preparing and reviewing Site Safety Programs, providing technical expertise in the field of industrial hygiene, and participating in training programs design for clients.

KEY PROJECTS

- Formaldehyde and ethylene oxide surveys for New York area health facilities.
- Indoor air quality surveys for commercial and industry facilities.
- Laser hazard surveys for medical and high tech equipment manufacturers.
- Noise surveys for a variety of industries, from food to industrial clients, punch press operations, bakeries, print rooms..., etc.
- Lead surveys in various industries, foundries, indoor firing ranges, electronics ... etc.



TOM C. ENG/2

KEY PROJECTS (Continued)

- Organic solvent surveys, degreasing operations, spray painting, printing press, electronics..., etc.
- Ionizing radiation survey for a watch manufacturing client.
- Hazard communication program development and implementation for various industries.
- Assisting clients in implementing monitoring programs to address occupational disease exposures.

5/90



FRANK A. JONES, Ph.D.

Associate and Principal Scientist

CREDENTIALS/REGISTRATION

Ph.D. Environmental Toxicology, University of Wisconsin, Madison, 1986

B.S. Biology, Loyola University, Chicago, 1981

PROFESSIONAL AFFILIATIONS

Society of Environmental Toxicology and Chemistry

Society for Risk Analysis

American Water Resources Association

Sigma Xi

FIELDS OF SPECIALIZATION

- Risk Assessments
 - Public Health Evaluations
 - Environmental Assessments
 - Exposure Assessments
 - Toxicity Profiles
- Determination of risk-based remediation concentrations
- Investigation and evaluation of ground-water contamination
- Hydrologic and solute transport modeling
- Investigation and research on fate and transport of pesticides

EXPERIENCE SUMMARY

As technical director of site-specific risk assessments for the Geraghty & Miller Risk Evaluation Group (GMREG), Dr. Jones has prepared and/or managed the preparation of over 75 Endangerment Assessments or Risk Assessments associated with the threat and/or actual release of hazardous substances (CERCLA) or hazardous wastes (RCRA). Areas of expertise include evaluations of constituent mobility, persistence, and toxicological properties, identification of exposure pathways, exposed populations, food-chain interactions, and wildlife habitat impacts, and the integration of all available data into an overall assessment of potential risks. These factors were evaluated in assessing the public health and environment risks associated with spills or disposal of fuel-related hydrocarbons, solvents, pesticides, and metals. Dr. Jones has assessed the risks associated with polychlorinated biphenyls (PCBs) in both indoor (former manufacturing facilities) and outdoor (soils and sediment) environments. Dr. Jones has evaluated surface-water discharges and calculated target concentrations or site remediation levels for aqueous, soil, and air exposure routes.

Dr. Jones has provided expert testimony in regulatory and judicial hearings. He has provided testimony as an expert in the areas of toxicology, contaminant mobility and persistence, exposure assessments, and the process and results of hazardous waste risk assessments. Dr. Jones also lectures regularly on the use of risk assessments for CERCLA or RCRA investigations and also on the toxic properties of compounds and associated adverse effects for an OSHA-approved Health and Safety Training Course.



FRANK A. JONES, Ph.D./2

Prior to joining Geraghty & Miller, Inc., Dr. Jones was Toxicologist and Ground Water Specialist for the Wisconsin Department of Agriculture Trade and Consumer Protection. Dr. Jones managed the investigation of ground-water contamination incidents at pesticide storage and handling facilities and conducted research to evaluate the extent of pesticide leaching occurring throughout the state. Dr. Jones was in charge of the review of pesticide toxicity research data and drafted Environmental Impact Statements related to the regulation of leaching pesticides and Material Safety Data Sheets for Toxic Response Team Investigations.

KEY PROJECTS

- Managed and drafted Endangerment Assessments and Risk Assessments for storage, disposal, and spill sites.
- Developed site-specific remediation levels for aqueous, soil, and air media.
- Assessed potential public health risks from PCB exposure at a former manufacturing facility being converted to a public museum.
- Expert witness in a judiciary hearing establishing the validity of natural attenuation as a remedial alternative.
- Developed a method of linking unsaturated and saturated contaminant transport models.
- Expert testimony regarding human health and ecology impacts of proposed landfill siting.
- Developed regulatory strategies for several pesticide use regulations.
- Drafted Environmental Impact Statements associated with pesticide use regulations.
- Investigation coordinator for several cases involving ground-water contamination at pesticide storage and handling facilities.
- Developed and evaluated data for a survey of Wisconsin pesticide usage.
- Project Manager of a monitoring project that evaluated the occurrence of pesticides in Wisconsin ground water.

SELECTED PUBLICATIONS

- Harkin, J.M., F.A. Jones, R. Fathulla, E.K. Dzantor, E.J. O'Neill, D.G. Kroll, G. Chesters, 1984. Pesticides in Ground Water Beneath the Central Sand Plain of Wisconsin. Water Resources Center Tech. Rept. WIS-WRC, 84-01, 46 pp.
- Harkin, J.M., G. Chesters, F.A. Jones, 1985. Health Implications of Aldicarb Residues in Wisconsin Ground Water. Wisconsin Academy Review, Vol. 32, No. 1: 37-40.



FRANK A. JONES, Ph.D./3

PUBLICATIONS (Continued)

Harkin, J.M., F.A. Jones, R.N. Fathulla, E.K. Dzantor, D.G. Kroll, 1986. Fate of Aldicarb in Wisconsin Ground Water. In ACS Symposium Series 315, Evaluation of Pesticides in Ground Water (Garner, W.Y., R.C. Honeycutt, and H.N. Nigg, Editors), American Chemical Society, Washington, D.C.

Harkin, J.M., G. Chesters, F.A. Jones, R.N. Fathulla, E.K. Dzantor, D.G. Kroll, 1986. Fate of Aldicarb in Wisconsin Ground Water. Water Resources Center Tech. Rept. WIS-WRC, 84-01, 49 pp.

Jones, F.A., and J.K. Postle, 1986. Ground-Water Monitoring Project for Pesticides. Progress Report - Wisconsin Department of Agriculture Trade and Consumer Protection, 11 pp.

Environmental Impact Statement for Proposed Rules Relating to Special Restrictions on the Use of Pesticides Containing Aldicarb, 1987. Wisconsin Department of Agriculture Trade and Consumer Protection, 129 pp.

Jones, F.A., 1987. Computer Simulation of Aldicarb Migration and Degradation in the Sand Plain of Central Wisconsin. Ph.D. Thesis, University of Wisconsin, Madison, WI.

Jones, F.A., 1987. Pesticide Use Survey. Proceedings of the 1987 Fertilizer, Aglime and Pest Management Conference, Vol. 26: 294-296.

Jones, F.A., G. Chesters, and J.M. Harkin, 1987. A Site Specific Predictive Method for Regulating Leachable Pesticides. Proceedings of the Eastern Regional Ground Water Issues: A Conference. National Water Well Association, July 14-16.



THEODORE N. LOUKIDES

Staff Scientist

CREDENTIALS/REGISTRATION

B.S., L.A. Geology, State University College at Oneonta, NY, 1981

PROFESSIONAL AFFILIATIONS

Association of Ground Water Scientists and Engineers (NWWA)
American Water Resources Association
Geological Society of America

FIELDS OF SPECIALIZATION

- Investigation and evaluation of ground-water contamination at industrial plants and waste disposal sites
- Geophysical well log interpretation
- Water well construction and drilling methodology
- Field sampling

EXPERIENCE SUMMARY

Since joining Geraghty & Miller in 1988, Mr. Loukides has participated in numerous ground-water investigations at industrial and waste disposal sites. He has supervised the drilling and installation of monitoring wells and soil borings in Missouri, Illinois, New Jersey, Connecticut, and New York and has performed soil and water sample collection in accordance with USEPA-approved protocols. In addition, he has compiled many types of field- and laboratory-generated data in preparation of text for reports. Mr. Loukides has conducted field investigations utilizing a wide range of instrumentation (e.g., data logger, geophysical logger, gas chromatograph, and pH/conductivity meter).

Prior to joining Geraghty & Miller, Mr. Loukides was employed variously as a water-well driller with a Long Island-based environmental organization, a legal assistant with a New York City law firm specializing in pollution liability claims, and a graduate teaching assistant in the Department of Earth Sciences at Montana State University.

KEY PROJECTS

- Carried out sampling of soils and water at a failed industrial leaching field in Maine.
- Supervised the drilling and installation of monitoring wells and soil borings at large industrial and waste disposal sites in Missouri and Illinois.
- Directed field activities at an EPA Superfund site in southern New Jersey, encompassing the installation of 10 monitoring wells and 10 soil borings as well as compilation of large volumes of regional hydrogeologic and geochemical literature.
- Operates geophysical well logger, traveling to various sites to perform the logging operation, then evaluating resultant data to determine optimal well screen and casing depths.



JUDITH A. MILLER

Coordinator - Environmental
and Business Communications

CREDENTIALS/REGISTRATION

M.A. Spanish, Middlebury College, 1983
B.A. Political Science, Colby College, 1982

FIELDS OF SPECIALIZATION

- Community relations
- Public affairs
- Business communications

EXPERIENCE SUMMARY

Ms. Miller is Coordinator of Environmental and Business Communications at Geraghty & Miller's Plainview, New York office. Prior to joining Geraghty & Miller, Ms. Miller was employed by The Tribeca Corporation of New York, where she acted as coordinator of the firm's public relations activities. While with Tribeca, she initiated and developed special events and fundraisers and was responsible for the company's media relations.

While with Geraghty & Miller, Ms. Miller co-founded the firm's Environmental Communications Service. As Coordinator of the group, she is charged with policy development, communications planning and implementation, and project administration. Ms. Miller is also responsible for newsletter writing, press release writing and media relations, as well as investor relations, and other in-house communications activities.

Ms. Miller has written in-house guidance documents for community relations planning and other public relations activities.

KEY PROJECTS

- Developed questionnaire, conducted interviews, and drafted community relation plan for a midwest Department of Energy RCRA facility investigation. As part of the comprehensive communications program, also developed and wrote fact sheets and assisted in the preparation and coordination of public meetings.
- Assisted southeast Department of Defense facility in research and development of a community relations plan as required by the site Installation Restoration Program. Besides conducting interviews from which an overall communications strategy and plan was developed, a slide show with accompanying script and IR program brochure were developed.
- Coordinated and developed a booklet designed for public distribution about the Seymour site in Seymour, Indiana. Community relations activities also included a slide show and accompanying script, traveling educational exhibit, and community newsletters.



JUDITH A. MILLER/2

KEY PROJECTS (Continued)

- Researched and wrote citizens participation plans for inactive hazardous waste sites which were submitted to the New York State Department of Environmental Protection.
- Edited fact sheets about residential ground-water sampling for distribution to the public as part of an overall community relations strategy.
- Wrote and edited press releases.
- Editor and contributing writer to in-house employee newsletter.
- Developed and wrote marketing brochures for company service groups.

9/90



JAMES O. RUMBAUGH, III

Principal Scientist
and Associate

CREDENTIALS/REGISTRATION

M.S. Geology, The Pennsylvania State University, 1983

B.A. Geology, Susquehanna University, 1980, Honors

Registered Professional Geologist: South Carolina No. 438

PROFESSIONAL AFFILIATION

Association of Ground Water Scientists and Engineers (NWWA)

FIELDS OF SPECIALIZATION

- Numerical simulation of ground-water flow and solute transport
- Modeling of multiphase and variably-saturated flow
- Aquifer test analyses
- Surface geophysical methods

EXPERIENCE SUMMARY

Prior to joining Geraghty & Miller, Inc., Mr. Rumbaugh was employed by GeoTrans, Inc., as a senior hydrogeologist. While at GeoTrans he was principal investigator and project manager for a diversity of projects ranging from three-dimensional ground water flow and transport modeling to surface geophysical investigations. His responsibilities included project administration, direction of site-specific model investigations, and software development.

Mr. Rumbaugh joined the firm in 1987, when the Geraghty & Miller Modeling Group was established. He has worked to develop techniques to increase modeling efficiency and accuracy. He has extensive experience in the practical application of quantitative techniques to the solution of ground-water problems. His responsibilities include project management, quantitative analysis, and preparation of technical reports.

KEY PROJECTS

- Project Manager for a three-dimensional ground-water flow and solute transport model of a coastal plain aquifer in California. The project goal was to assess remedial alternatives at the site of a gasoline spill.
- Unsaturated flow modeling at a gasoline spill site in California. The model was used to assess remedial alternatives in a perched aquifer.
- Project Manager for a flow and transport model in the Great Miami River Valley, Ohio. The model was used to assess contaminant fate and transport in the glacial aquifer system.
- Project Manager for an unsaturated flow and transport modeling project at the Savannah River Plant. The SATURN model was used to assess the appropriateness of using simpler models at the site.



JAMES O. RUMBAUGH, III/2

- Designed and implemented a geophysical monitoring system at a landfill in Montgomery County, Maryland. Electromagnetic and resistivity measurements are made at two-month intervals around the landfill perimeter. The geophysical data supplement the existing ground-water monitoring program.
- Project Manager of a field investigation to assess the degree of ground-water contamination at a site in Pennsylvania. The project involved the use of geophysical methods to delineate fracture zones in the bedrock aquifer and the design and installation of a electronic transducer network for detailed water-level measurement. The goal was to determine whether site ground-water contamination posed a threat to a nearby public water-supply well.

MODEL DEVELOPMENT

GREMLIN. Performs nonlinear least square inverse analysis of resistivity and electromagnetic soundings. Developed with G. M. Duffield. Derives parameters in a layered-earth model from sounding data.

SEFTRAN. Codeveloper of SEFTRAN model (two-dimensional finite-element ground-water flow and solute transport) with P. S. Huyakorn, B. H. Lester, D. S. Ward, and others.

SWANFLOW. Codeveloper of the SWANFLOW model (three-dimensional water, air, and nonaqueous phase flow) with C. R. Faust.

FEEST. Inverse two-dimensional model which can be used in areal, cross-sectional, or radial configurations to automatically calibrate a steady-state or transient flow model. Codeveloper with G. Duffield.

SELECTED PUBLICATIONS

Rumbaugh, J. O., J. R. Pepper, P. C. Lowe, and J. F. Villaume, 1984. Evaluation of ground-water monitoring wells and sampling techniques, Proceedings of the NWWA Technology Division Eastern Regional Conference, NWWA, Boston, MA.

Rumbaugh, J. O., and R. R. Parizek, 1983. Effect of fracture permeability on radon-22 concentration in ground water of the Reading Prong, PA, Abstracts with Programs, G.S.A. National Meeting, Indianapolis, IN.

Rumbaugh, J. O., J. A. Caldwell and S. T. Shaw, 1987. A geophysical monitoring program for a sanitary landfill, implementation and preliminary analysis, Proceedings of the First National Outdoor Action Conference on Aquifer Restoration, Ground Water Monitoring and Geophysical Methods, paper accepted for May 21, 1987.



JAMES O. RUMBAUGH, III/3

PUBLICATIONS (Continued)

Cohen, R. M., R. R. Rabold, Faust, J. O. Rumbaugh, and J. Bridge, 1987. Investigation and hydraulic containment of chemical migration at four landfills in Niagara Falls, New York, Civil Engineering Practice, the Journal of the BSCE (in press).



GREGORY K. SHKUDA, Ph.D.

Senior Project Advisor
and Associate

CREDENTIALS/REGISTRATION

Ph.D. Organic Chemistry, New York University, 1976
M.S. Organic Chemistry, New York University, 1973
B.A. Chemistry, New York University, 1968

PROFESSIONAL AFFILIATIONS

American Chemical Society
Association of Ground Water Scientists and Engineers (NWWA)

FIELDS OF SPECIALIZATION

- In-depth knowledge of federal and state environmental regulations
- Evaluation of complex ground-water quality problems
- Knowledge of biodegradation of complex organics in ground water
- Provides expert testimony and reports on hazardous waste compliance issues
- Review of QA/QC plans and development of analytical protocols for litigation purposes

EXPERIENCE SUMMARY

Dr. Shkuda, a Senior Project Advisor for Geraghty & Miller's New York office, evaluates complex problems relating to the chemical contamination of ground water and soil. Dr. Shkuda participates in every aspect of the firm's work relating to ground-water contamination and provides expert testimony on behalf of the firm's clients.

Prior to joining the firm in 1986, Dr. Shkuda was an environmental scientist at the New York State Department of Law, Environmental Protection Bureau where he participated in major environmental litigation as a member of a unique staff of attorneys and scientists. From 1980 to 1982, Dr. Shkuda was employed by a consulting engineering firm where he developed sampling strategies to characterize hazardous waste sites located in two EPA regions as part of a national contract. As part of this work, Dr. Shkuda supervised the chemical assessments needed to characterize hazardous waste sites and was responsible for collecting enforcement data. During the period 1976-1980, Dr. Shkuda was a Research Associate in the Department of Microbiology and Immunology, Albert Einstein College of Medicine.

KEY PROJECTS

- Directed the Remedial Investigation/Feasibility Studies at two municipal landfills on Long Island. Dr. Shkuda was responsible for negotiating the scope of the work plans for these programs with the New York State Department of Environmental Conservation. Implementing the studies, coordination with the client, state and local community.
- Directed the hydrogeologic investigation at a Superfund site located in Eastern Tennessee for a Fortune 500 client. This site received large quantities of liquid chemical wastes. Dr. Shkuda was responsible for the evaluation of previously collected data, proposal of additional scopes-of-work and negotiations with the State of Tennessee. He participated in the delineation of the extent of



GREGORY K. SHKUDA, Ph.D./2

contamination and proposed solutions to the problem of the collection of the non-aqueous phase liquids encountered at the site.

- Directed the environmental investigation at a closed aircraft manufacturing facility on Long Island. Dr. Shkuda's role included negotiations with the State as to the scope of the investigation, evaluation of the monitoring data, supervision of RCRA closure activities and coordination of proposals for cleanup activities.
- Directed hydrogeologic investigations for a major defense contractor at seven sites located in three states. Dr. Shkuda played a key role in the collection and review of historical data, preparation of work plans, supervision of field investigations, report preparation negotiations with Federal and state regulatory agencies, and the implementation of remedial activities at several of the facilities.

SELECTED PUBLICATIONS

Geller, S., Wei, S.C., Shkuda, G.K., Marcus, D.M., Brewer, C.F.: Carbon-13--Enriched Tetra-L-Alanine Hapten to Fab' Fragments of Antipoly(L-Alanine) Antibodies. *Biochemistry* 1980, 3614-3623.

Shkuda, G.K., Wei, S.C., Geller, S., Brewer, C.F., Marcus, D.M.: A ^{13}C NMR Study. New York University, New York 1976.

Shkuda, G.K.: The Decomposition of Bicyclic Diazo Compounds: A Mechanistic Study. New York University, New York 1976.

Rodgers, J.A., Shkuda, G.K.: Training and Safety Considerations in Using Self-Contained Breathing Apparatus (SCBA) and Tethered Cascade Breathing Apparatus (TCBA) in Hazardous Atmospheres at Uncontrolled Hazardous Waste Sites. American Chemical Society 184th Annual Meeting, Kansas City, Mo., September 184th Annual Meeting, Kansas City, Mo., September 1982.



GISELLA M. SPREIZER

Senior Scientist - Geochemist/Statistician

CREDENTIALS/REGISTRATION

M.A. Applied Mathematics, Hofstra University, Hempstead, NY, 1987

B.S. Chemistry, Hofstra University, Hempstead, NY, 1984

PROFESSIONAL AFFILIATIONS

American Society for Testing and Materials (ASTM). Member of ASTM subcommittee on Analysis of Data for the Interpretation of Hydrogeologic Systems

Member of joint ASTM/USEPA/USGS/US Navy task group for the development of standards for the analysis of hydrogeologic data

Association of Ground Water Scientists and Engineers (NWWA)

American Chemical Society

Mathematical Association of America

New York Academy of Sciences

American Statistical Society

FIELDS OF SPECIALIZATION

- Development of statistically-based sampling programs for RCRA and CERCLA programs.
- Evaluation of water-quality and geochemical data.
- Selection and implementation of appropriate statistical methods for the evaluation of monitoring data.
- Evaluation of water quality data from RCRA monitoring programs.
- Development of statistical methodology to terminate ground-water pumping remedial measures.
- Organization and supervision of projects relating to the investigation and evaluation of ground-water and soil contamination.
- Development of ground-water and soil monitoring programs.

EXPERIENCE SUMMARY

Ms. Spreizer joined Geraghty & Miller, Inc. in 1984 as a member of a team providing technical support in connection with ground-water and soil contamination investigations at Rocky Mountain Arsenal in Colorado. This work involved researching historical and technical records, and interpreting chemical information. She has validated CLP laboratory monitoring data, and has developed and used computer programs for the statistical analysis of the data as required by Federal and State hazardous waste programs. Ms. Spreizer is familiar with RCRA, CERCLA and TSCA regulations, as well as with local and state hazardous and solid waste regulations.



GISELLA M. SPREIZER/2

Ms. Spreizer has also evaluated and developed alternative statistical models for use in RCRA compliance monitoring to identify if downgradient water quality has been adversely impacted. She has also developed a statistical model to predict when ground-water remedial measures can be terminated when it is infeasible for the ground-water system to reach the specified clean-up action levels. Ms. Spreizer has collected and evaluated chemical information from the literature and computer databases related to industrial processes in support of ground-water investigations. The data collected include information on the reactivity and mobility of contaminants in the environment, and the reliability of laboratory analyses performed during investigations. Ms. Spreizer is familiar with various geostatistical techniques used to evaluate water-level, and soil and water-quality data. She is proficient with several statistical software packages that are used to support both geostatistical and environmental statistical evaluations.

KEY PROJECTS

- Preparation of technical reports as part of a litigation support effort for a major environmental lawsuit.
- Co-author of a guidance manual to aid RCRA permit writers with the selection of effective monitoring parameters.
- Evaluation and presentation of water quality and geochemical data.
- Validation and evaluation of monitoring data collected from sites in the Northeast.
- Development of statistically-based soil and ground-water monitoring programs.
- Developed soil sampling programs to characterize overall soil quality and to identify if hotspots of contamination are present in the study.
- Developed action levels for ground-water and soil cleanup programs using statistical techniques.
- Project manager for a RCRA ground-water monitoring program focused on the statistical evaluation of water quality data.
- Project manager for a town-wide ground-water investigation in Massachusetts as well as for a detailed assessment at the town's Landfill.
- Technical review of geostatistical (including kriging interpretations) reports and other statistical evaluations being used in litigation.
- Preparation and presentation of numerous statistics seminars for industrial clients, governmental groups and Geraghty & Miller.



SELECTED PUBLICATIONS AND PRESENTATIONS

- Saar, R.A., and G.M. Spreizer, Guidance Manual for the Selection of Chemical Parameters at Hazardous Waste Facilities, Draft, Prepared for the Land Disposal Branch, Office of Solid Waste, U.S. Environmental Protection Agency, Washington, D.C., 1985.
- Spreizer, G.M., Assessing the Probability Distribution of Ground-Water Monitoring Data. Presented at ASTM Standards Development for Ground Water Monitoring, Tampa, FL, January 20, 1987.
- Braids, O.C., Ph.D., Shkuda, G.K., Ph.D., and G.M. Spreizer, Technical Issues of Ground Water Data. Presented at ASCE Symposium on the Detection, Control and Renovation of Contaminant Groundwater, Atlantic City, NJ, (in publication) April 1987.
- Frangos, N., and G.M. Spreizer, Ground-Water Monitoring and Regression Analysis (Testing for Normality), Presented at Statistical Society of Canada, 1987 Annual Meeting, Quebec, Canada, June 1987.
- Spreizer, G.M., RCRA Statistics: A Consultant's View, Presented at ASTM Workshop on Standards Developed for Ground-Water and Vadose Zone Monitoring Investigations, Minneapolis, MN, September 1987.
- Spreizer, G.M., Maxim, D., Valkenburg, N., and M. Hauptmann, "How Flat is Flat? Termination of Remedial Ground-Water Pumping", Ground Water and Vadose Zone Monitoring, ASTM STP 1053, D.M. Nielsen and A.I. Johnson, Eds., American Society for Testing and Materials, Philadelphia, PA, 1990, pp. 247-255.



IRENE VERA

Staff Scientist

CREDENTIALS/REGISTRATION

A.A.S. Medical Technology, Nassau Community College, Garden City, New York, 1983

A.A. Pre-Pharmacy, Valencia Community College, Orlando, Florida, 1981

Electronic Technology Diploma, Grumman Data Systems Institute, Bohemia, New York, 1986

PROFESSIONAL AFFILIATIONS

Association of Ground-Water Scientists and Engineers (NWWA)

New York State Registry of Medical Technology

FIELDS OF SPECIALIZATION

- Soil-gas surveys
- Onsite chemical analysis
- Ground-water field investigations
- Field instrumentation
- Health and Safety

EXPERIENCE SUMMARY

Prior to joining Geraghty & Miller in 1988, Ms. Vera was employed by Photovac, Inc., Huntington, New York. Her responsibilities included in-house service of air monitoring instruments and technical support for clients, ranging from troubleshooting to chemical applications. Ms. Vera has also worked in Private Medical Laboratory as supervisor in the chemistry and Radioimmuno Assay (RIA) departments.

As a Staff Scientist with Geraghty & Miller, Ms. Vera's responsibilities include operating the field Gas Chromatograph for ground-water investigations to characterize the magnitude, extent, and transport of chemical contaminants. Other activities include maintenance of field instruments, miscellaneous electronic repairs, and performance of wet chemical analyses.

KEY PROJECTS

- Conducted a ground-water survey which was used to successfully locate a previously unknown source of volatile organic contamination in an industrial site in Massachusetts.
- Provided on-site analysis of soil samples from numerous concurrent investigations at a U.S. Department of Energy (DOE) site in Ohio.
- Provided on-site analysis of ground-water samples for an investigation involving the installation of permanent and temporary well points to delineate the lateral and vertical extent of a VOC plume for an industrial site in New Jersey.
- Conducted a soil-gas survey as part of an overall site assessment for a former sand and gravel mine/asphalt plant prior to sale.



IRENE VERA/2

KEY PROJECTS (Continued)

- Conducted a soil-gas survey at a former gasoline station on Long Island to delineate subsurface contamination.
- Provided on-site analysis for a contamination investigation of a spill at medium-sized petroleum transfer terminal.
- Supervised ground-water sampling program at Superfund sites in New York.
- Responsible for QA/QC ground-water sampling at Superfund sites in New York.

3/89



LAINE VIGNONA

Senior Scientist

CREDENTIALS/REGISTRATION

M.S. Environmental Science and Engineering, Rice University, Houston, Texas, 1984. Emphasis on hydrogeology and geochemistry.

B.S. Geology, Brooklyn College, New York, 1981

PROFESSIONAL AFFILIATIONS

Association of Ground Water Scientists and Engineers (NWWA)

FIELDS OF SPECIALIZATION

- Remedial investigations and feasibility studies of inactive hazardous waste sites
- Federal and state environmental regulations
- Sampling and analytical methods for the evaluation of environmental quality
- Technical review

EXPERIENCE SUMMARY

Since joining Geraghty & Miller in 1988, Ms. Vignona has managed ground-water and soil contamination projects, primarily at inactive hazardous waste sites and municipal landfills. She is responsible for technical negotiations with regulatory agencies, work plan development, management of field activities, report preparation and design of ground-water remediation systems. She has also reviewed numerous reports to assess technical quality.

Prior to joining Geraghty & Miller, Ms. Vignona was a technical advisor at the New York State Department of Law, Environmental Protection Bureau, participating in major environmental litigation. She was responsible for technical evaluation and negotiation in the development of consent orders, primarily for Superfund and petroleum-contaminated sites. The projects required the selection of numerous well locations and analytical techniques, as well as the remedial design and preparation of long-term plans to monitor the selected remedial alternatives. Other responsibilities included preparation of witnesses for depositions and court appearances.

Prior to joining the Department of Law, Ms. Vignona performed laboratory research at Rice University, analyzing ground-water samples and researching geochemical reactions.

KEY PROJECTS

- Remedial Investigation/Feasibility Study of a multi-landfill facility in upstate New York currently under active remediation.
- Ground water, vadose zone and residential air quality assessment program at a Long Island gasoline spill site.
- Remedial Investigation/Feasibility Studies of ground water and vadose zone contamination for a large municipal landfill classified as an inactive hazardous waste site.



LAINE VIGNONA/2

KEY PROJECTS (Continued)

- Remedial Investigation/Feasibility Study of floating product, ground water and soils at two firemen's training centers and a petrochemical storage facility.
- Soil remediation program in a Staten Island residential area contaminated by airborne lead from a nearby smelter.
- Remedial Investigation/Feasibility Study of dense non-aqueous phase liquids and ground-water contamination at an inactive hazardous waste landfill in Niagara Falls.
- Ground water and soil quality investigations at multiple sites owned by a major defense contractor.
- Remedial Investigation/Feasibility Study of solvent and metals contamination at a Long Island facility situated in a deep flow recharge area.

PUBLICATIONS

Tomson, M.B., and Vignona, L.C. "Precipitation of Phosphate Minerals in Waste Water Treatment Systems" In: Nriagu and Moore (eds.), "Phosphate Minerals," Springer-Verlag. (1984).

1/90

APPENDIX B
FIELD DOCUMENTATION FORMS

[illegible]

WATER SAMPLING LOG

Project/No. _____ Page _____ of _____

Site Location _____

Site/Well No. _____ Coded/
Replicate No. _____ Date _____

Weather _____ Time Sampling
Began _____ Time Sampling
Completed _____

EVACUATION DATA

Description of Measuring Point (MP) _____

Height of MP Above/Below Land Surface _____ MP Elevation _____

Total Sounded Depth of Well Below MP _____ Water-Level Elevation _____

Held _____ Depth to Water Below MP _____ Diameter of Casing _____

Wet _____ Water Column in Well _____ Gallons Pumped/Bailed
Prior to Sampling _____

Gallons per Foot _____

Gallons in Well _____ Sampling Pump Intake Setting
(feet below land surface) _____

Evacuation Method _____

SAMPLING DATA/FIELD PARAMETERS

Color _____ Odor _____ Appearance _____ Temperature _____ °F/°C

Other (specific ion; OVA; HNU; etc.) _____

Specific Conductance,
umhos/cm _____ pH _____

Sampling Method and Material _____

Constituents Sampled	Container Description From Lab _____ or G&M _____	Preservative
_____	_____	_____
_____	_____	_____
_____	_____	_____

Remarks _____

Sampling Personnel _____

GAL./FT.	WELL CASING VOLUMES			
1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	
1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	

DRILLING & INSTALLATION OF MONITORING WELLS DAILY CHECKLIST

PROJECT: _____

WELLS/BORINGS: _____

LOCATION: _____

DATE: _____

G&M PERSONNEL ON SITE: _____

TIME: _____

CHECKED BY: _____

ITEMS	OK/NA	COMMENTS
PRIOR TO DRILLING:		
Contractor has checked for underground utilities.		
Well locations staked.		
Well drilling permits secured.		
G&M QA Manual/QA plan available.		
Health & Safety plan (HASP) available.		
Safety equipment on site.		
Contractor equipment adequate.		
Drilling equipment steam cleaned.		
Drilling water source approved/sampled.		
Drilling equipment water sample taken.		
Drilling mud & additives approved.		
Sand or gravel pack sample approved.		
Grout composition approved.		
DURING INSTALLATION:		
Formation samples properly taken and bottled or bagged.		
Rock color chart used.		
OVA monitoring during drilling and sampling.		
Cores properly marked and stored.		
Hard hat worn.		
Proper safety procedures followed.		
Hazardous soil, mud or water properly handled.*		
Daily Log kept.		
Sample/Core Log form filled out.		
Well Construction Log prepared.		
Materials/Cost Log prepared.		
Location Sketch made.		
Tremie pipe used in grouting.		
Abandoned well/boring grouted & staked.		
Protective casing/well cap/lock installed.		
Well identification number attached.		
Well development adequate.		
Well elevation and location surveyed in.		

*See QA Manual, Drilling and Installation of Monitoring Wells, Sect. 2.16.2.

Instructions: Original to Field Project File; copy to Project Manager and to QA Representative.

UTILITIES AND STRUCTURES CHECKLIST

Project: _____ **Prepared by:** _____

Location: _____ **Date:** _____

Instructions. This checklist has to be completed by a G&M staff member as a safety measure to insure that all underground utility lines, other underground structures as well as above-ground power lines are clearly marked out in the area selected for boring or excavation. **DRILLING OR EXCAVATION WORK MAY NOT PROCEED UNTIL LINES ARE MARKED AND THIS CHECKLIST HAS BEEN COMPLETED.** Arrangements for underground utility markouts are best made at the time of the preliminary site visit to allow client and/or utility company sufficient time. Keep completed checklist and maps onsite; send copy to Project Manager.

Assignment of Responsibility. Client is responsible for having underground utilities and structures located and marked. Preferably, the utilities themselves should mark out the lines.

Drilling or Excavation Sites. Attach a map of the property showing the proposed drilling or excavation site (or if sites are widely separated, several maps) clearly indicating the area(s) checked for underground utilities or underground structures and the location of above-ground power lines.

Utilities and Structures

Type	Not Present	Present	How Marked? ¹⁾
Petroleum products line			
Natural gas line			
Steam line			
Water line			
Sewer line			
Storm drain			
Telephone cable			
Electric power line			
Product tank			
Septic tank/drain field			
Overhead power line			

1) Flags, paint on pavement, wooden stakes, etc.

Name and affiliation of person who marked out underground lines or structures.

NAME ORGANIZATION PHONE

Emergency Procedures

Persons at site or facility to contact in case of emergency

1. _____ Phone _____

2. _____ Phone _____

Fire Dept.: Phone _____ Ambulance: Phone _____

Utility: Phone _____ Utility: Phone _____

Utility: Phone _____ Utility: Phone _____

Directions to nearest hospital (describe or attach map).

LOCATION SKETCH

Well(s) _____ Project/No. _____ Page _____ of _____

Site Location _____

Observer _____

(Locate all wells, borings, etc. with reference to three permanent reference points; tape all distances; clearly label all wells, roads, and permanent features)



0 ft. _____ ft.

PROJECT _____		WELL _____	SITE _____
SCREEN _____	MEASURING POINT _____	HEIGHT ABOVE _____	
SETTING _____	DESCRIPTION _____	GROUND SURFACE _____	
STATIC _____	MEASURED WITH _____	DATE/TIME _____	
WATER LEVEL _____			
DRAWDOWN ☐	START OF TEST _____	PUMPING _____	
RECOVERY ☐	END OF TEST _____	WELL _____	
DISTANCE FROM WELL _____	DISCHARGE _____	ORIFICE _____	
MEASURED TO PUMPING _____	RATE _____		
WELL (r) _____			

[illegible]

1) Dewatering Correction 2) Equivalent Artesian Drawdown 3) pH, Spec. Cond., Temp., Weather, Sand, Turbidity, etc.



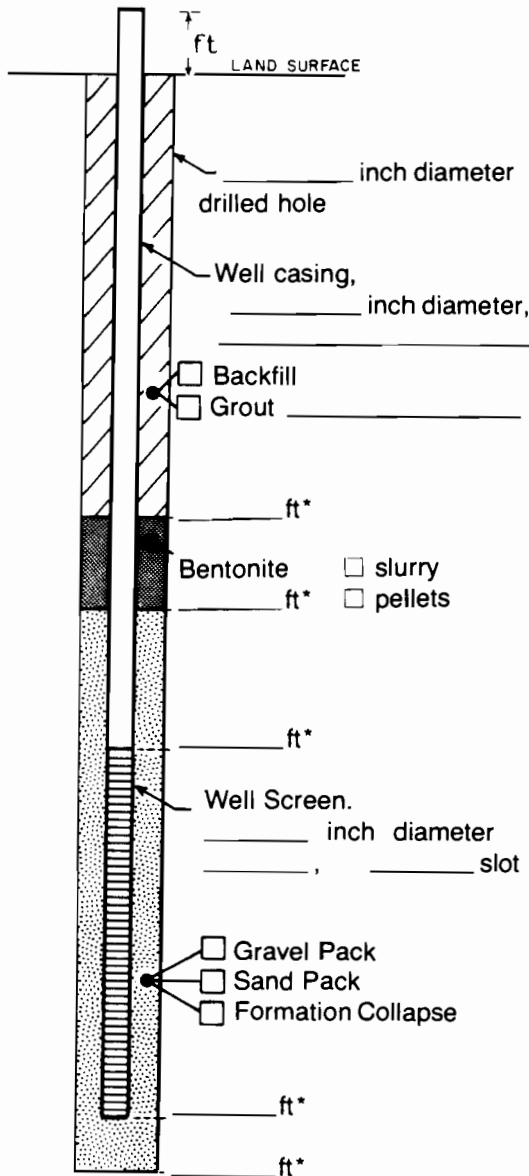
Page _____ of _____

Wells: _____
 Site Location: _____
 Project/No.: _____
 Calculated By: _____
 Checked By: _____

[illegible]

WELL CONSTRUCTION LOG

(UNCONSOLIDATED)



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

*Depth Below Land Surface

Project _____ Well _____

Town/City _____

County _____ State _____

Permit No. _____

Land-Surface Elevation

and Datum _____ feet ☐ Surveyed

☐ Estimated

Installation Date(s) _____

Drilling Method _____

Drilling Contractor _____

Drilling Fluid _____

Development Technique(s) and Date(s)

Fluid Loss During Drilling _____ gallons

Water Removed During Development _____ gallons

Static Depth to Water _____ feet below M.P.

Pumping Depth to Water _____ feet below M.P.

Pumping Duration _____ hours

Yield _____ gpm Date _____

Specific Capacity _____ gpm/ft

Well Purpose _____

Remarks _____

Prepared by _____

SAMPLING OF MONITORING WELLS DAILY CHECKLIST

PROJECT: _____

WELL(S): _____

LOCATION: _____

DATE: _____

G&M PERSONNEL ON SITE: _____

TIME: _____

CHECKED BY: _____

ITEMS	OK/NA	COMMENTS
PRIOR TO DRILLING:		
Health & safety precautions (HASP) received; equipment ready.		
Sample containers, coolers, received from laboratory; ice or ice packs ready.		
Sampling equipment and supplies inventoried, clean and operational.		
Check in with client at site.		
Integrity of well noted.		
Well area prepared for sampling; plastic placed around well; gasoline-powered pumps placed downwind.		
Well and water-level measurements made and recorded along with other pertinent field information on water sampling log.		
Field instruments calibrated.		
Sample containers labelled; preservatives added, if necessary.		
DURING AND AFTER SAMPLING:		
Well purged three to five times its volume.		
Sample collected using a bailer or pump as per sampling plan.		
Measurement of field parameters recorded on sampling log.		
Sample containers filled according to collection protocol of analyses.		
Field and trip blanks collected; replicates or split samples collected as per sampling plan.		
Samples stored at 4°C in coolers for transport to lab.		
Water sampling log and chain-of-custody form completed.		
Reusable equipment decontaminated; non-reusable equipment disposed of in appropriate manner.		
Well secured and locked.		
Laboratory contacted to confirm receipt and condition of samples.		

Additional Comments:

Instructions: Original to Field Project File; copy to Project Manager and to QA Representative.

TELEPHONE CONVERSATION RECORD

DATE: _____ TIME: _____ PROJECT: _____

FROM: _____ TO: _____

COMPANY: _____ COMPANY: _____

TELE NO: _____ TELE NO: _____

RE: _____

CHAIN-OF-CUSTODY SEAL



GERAGHTY & MILLER, INC.

CHAIN-OF-CUSTODY SEAL

APPENDIX C
SOIL-GAS SURVEY GRIDS



DRAFTER: W.H. QROO

APPROVED: D. COLTON

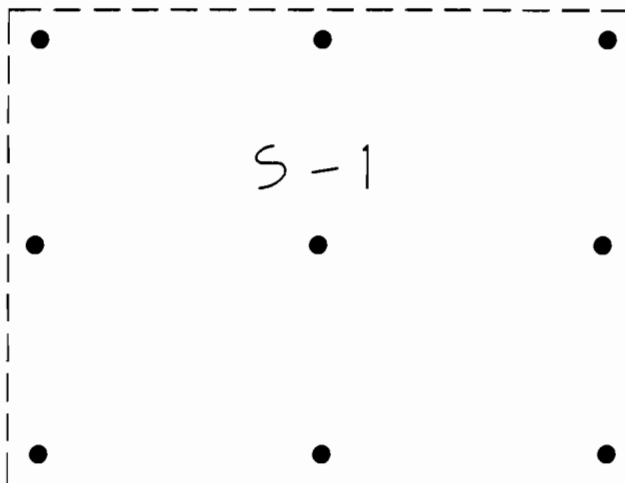
CHECKED: D.V.S.

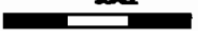
CAD FILE: S0-S1

FILE NO.: 990

PRJCT. NO.: NY04605

DWG. DATE: 27NOV90



0  30 FT



SOIL-GAS GRID: AREA S-1

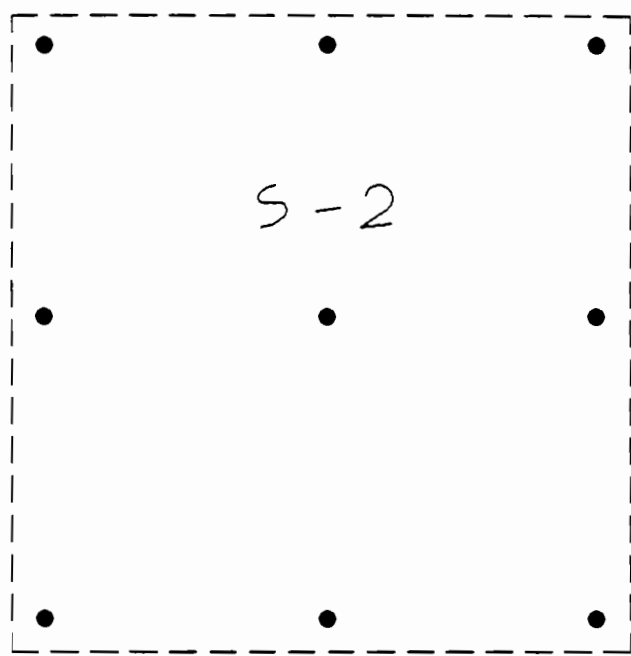
MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

C-1



DATE: 27NOV90 | PROJECT NO.: NY04805 | FILE NO.: 990 | CAD FILE: SG-S2 | CHECKED: D.V.S. | APPROVED: D. COLTON | DRAFTER: W.H. CICIO



FIRE LANE



GERAGHTY
& MILLER, INC.
Environmental Services

0  30 FT

SOIL-GAS GRID: AREA S-2

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

C-2



ROAD "H"

S-3

11D

11C

11B

11A

ROAD "B"

0  40 FT



**GERAGHTY
& MILLER, INC.**
Environmental Services

SOIL-GAS GRID: AREA S-3

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

C-3

DRAWN: W.H. CICIO

APPROVED: D. COLTON

CHECKED: D.V.S.

CAD FILE: SG-S3

FILE NO.: 990

PROJECT NO.: NY04605

DWG. DATE: 02DEC90



DRAFTER: W.H. CICIO

APPROVED: D. COLTON

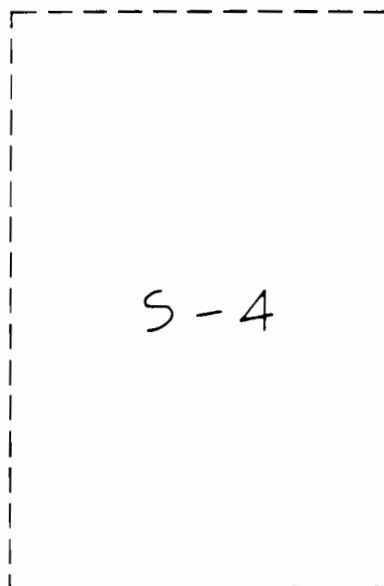
CHECKED: D.V.S.

CAD FILE: SO-S4

FILE NO.: 990

PRJCT. NO.: NY04805

DWG. DATE: 27NOV90



SCALE
0 10 FT



**GERAGHTY
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SOIL-GAS GRID: AREA S-4

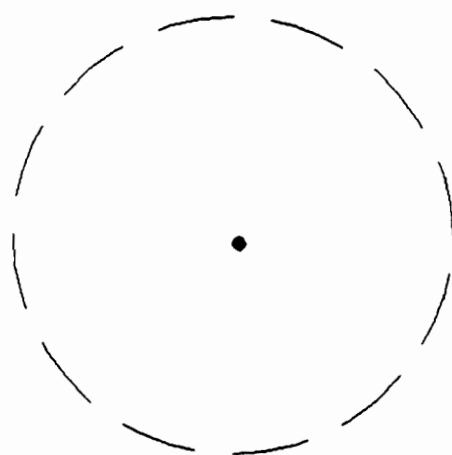
MALTA ROCKET FUEL SITE
SUPERFUND SITE

FIGURE

C-4



DWG. DATE: 27NOV90 | PRJCT. NO.: NY04605 | FILE NO.: 980 | CAD FILE: SG-01 | CHECKED: D.V.S. | APPROVED: D. COLTON | DRAFTER: W.H. CICIO



D-1

SCALE
0 10 FT



SOIL-GAS GRID: AREA D-1

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE
C-5



DRAFTER: W.H. CICIO

APPROVED: D. COLTON

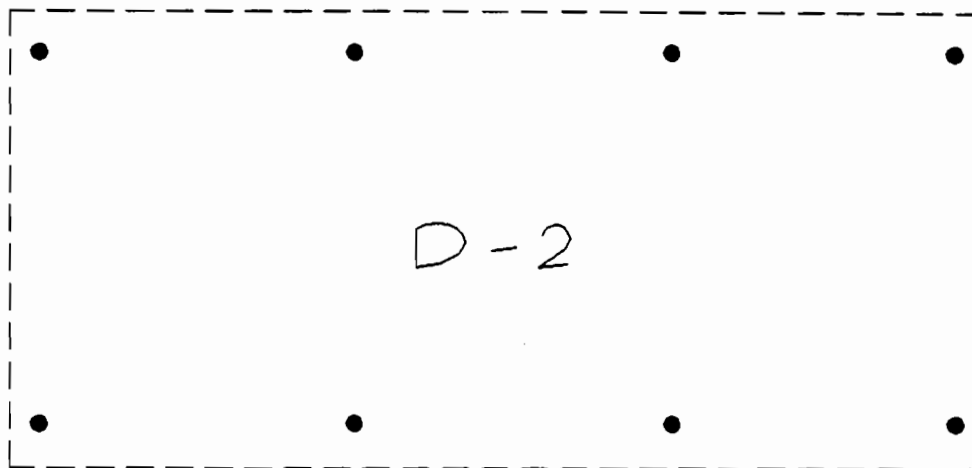
CHECKED: D.V.S.

CAD FILE: SC-D2

FILE NO.: 990

PRJCT. NO.: NY04605

DWG. DATE: 27NOV90



0  30 FT



**GERAGHTY
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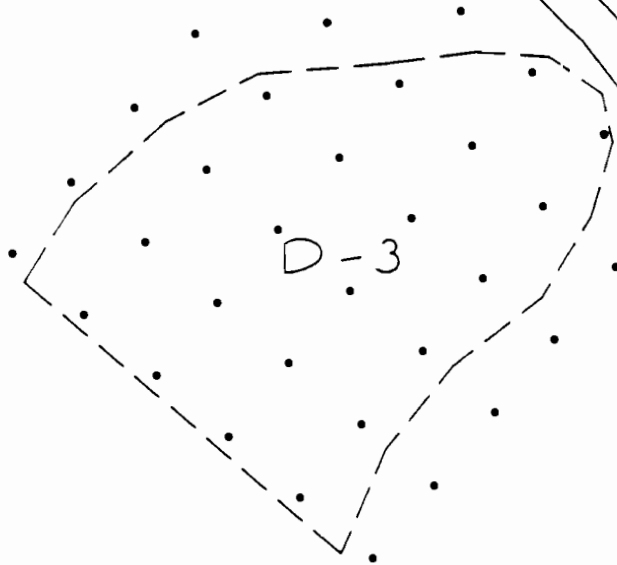
SOIL-GAS GRID: AREA D-2

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

C-6

OWC DATE: 02DEC90 | PROJCT. NO.: NY04605 | FILE NO.: 990 | CAD FILE: SG-D3 | CHECKED: D.V.S. | APPROVED: D. COLTON | W.H. CIGIO



MALTA TEST STATION BOUNDARY

SCALE
0 200 FT



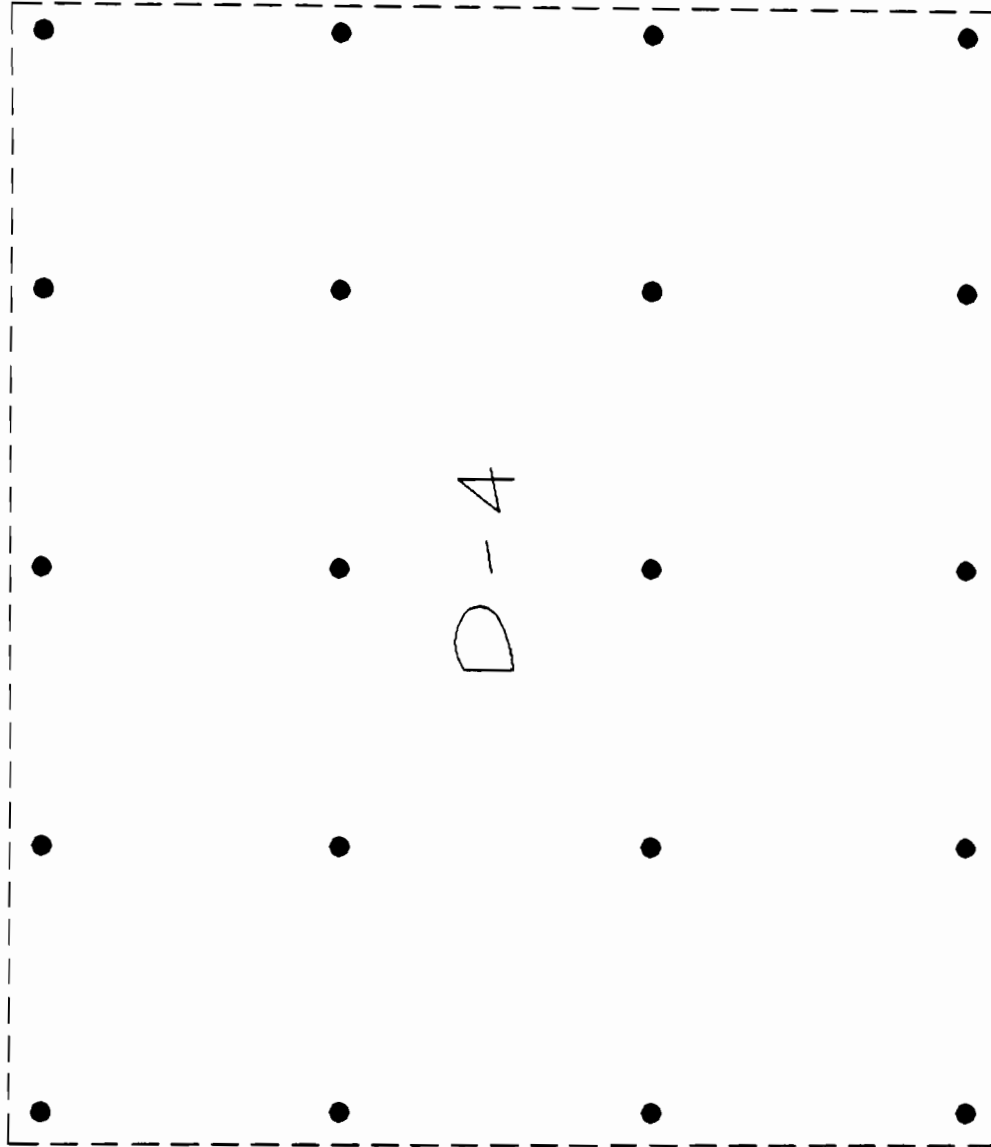
SOIL-GAS GRID: AREA D-3

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

C-7

DWG. DATE: 27NOV90 | PRJCT. NO.: NY04605 | FILE NO.: 990 | CAD FILE: SG-D4 | CHECKED: D.V.S. | APPROVED: D. COLTON | DRAFTER: W.H. CICIO



SCALE
0 40 FT


**GERAGHTY
& MILLER, INC.**
Environmental Services

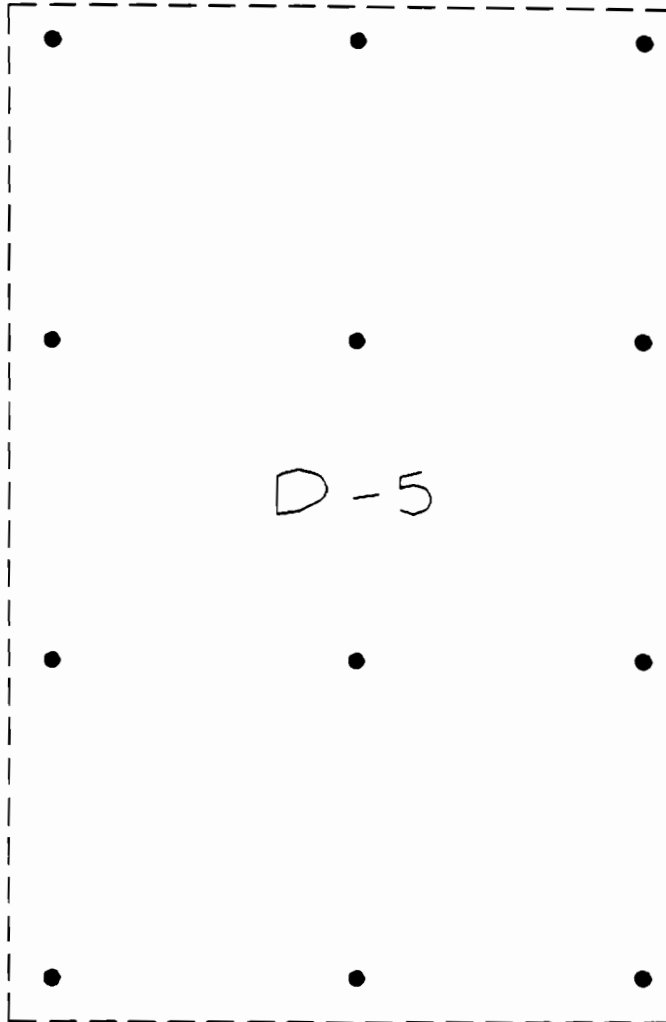
SOIL-GAS GRID: AREA D-4

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

C-8

IDWG. DATE: 27NOV80 | PRJCT. NO.: NY04605 | FILE NO.: 990 | CAD FILE: SG-D5 | CHECKED: D.V.S. | APPROVED: D. COLTON | DRAFTER: W.H. CICIO



0  30 FT



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SOIL-GAS GRID: AREA D-5

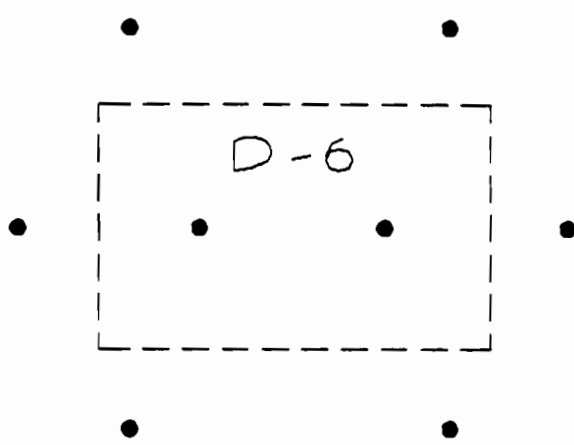
MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

C-9



DWG. DATE: 27NOV80 | PRJCT. NO.: NY04605 | FILE NO.: 990 | CAD FILE: SG-D6 | CHECKED: D.V.S. | APPROVED: D. COLTON | DRAFTER: W.H. CICIO



0  30 FT



SOIL-GAS GRID: AREA D-6

MALTA ROCKET FUEL SITE
SUPERFUND SITE

FIGURE
C-10

DRAFTER: W.H. CICIO

APPROVED: D. COLTON

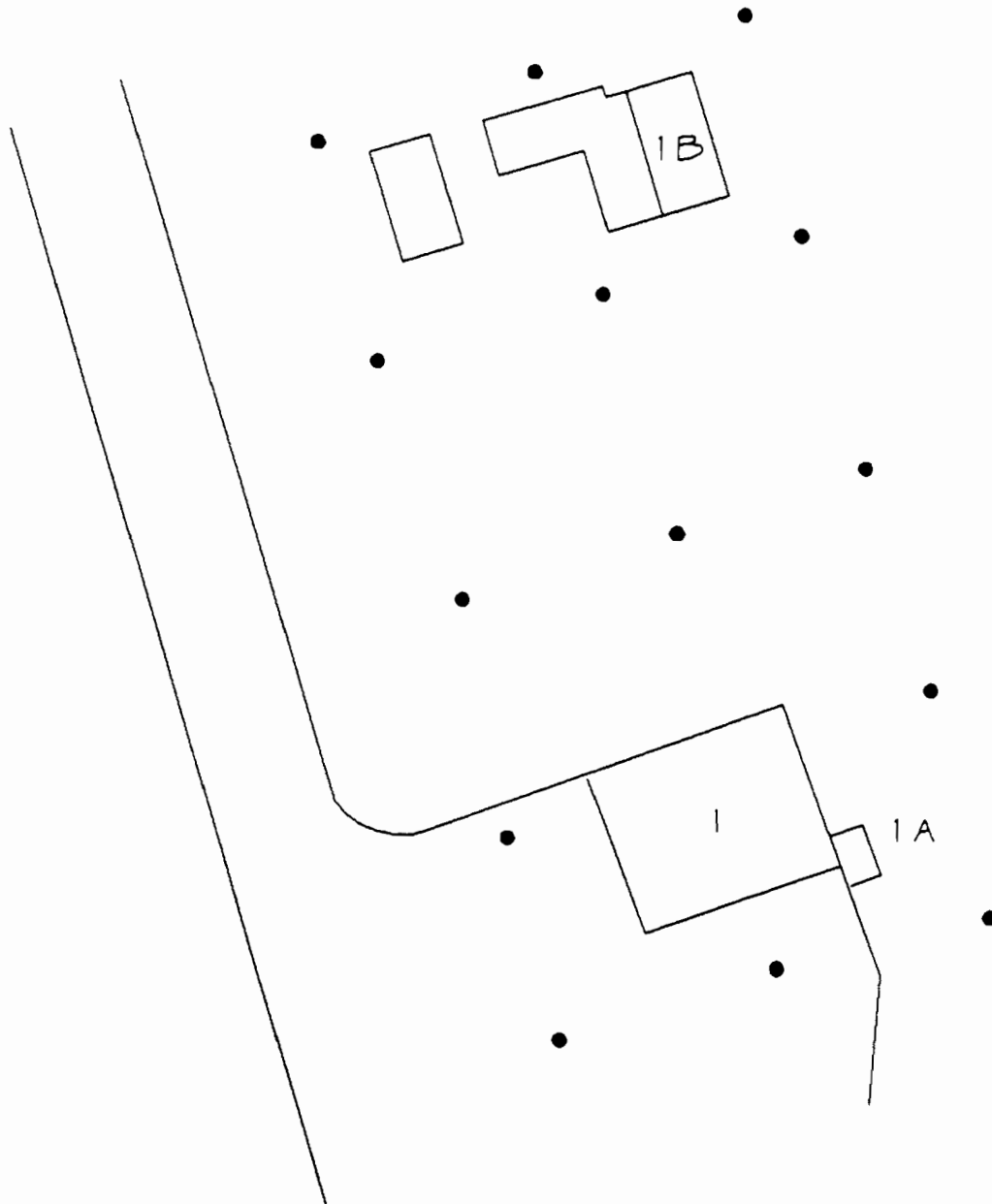
CHECKED: D.V.S.

CAD FILE: SC-TSI

FILE NO.: 990

PRCT. NO.: NY04605

DWG. DATE: 02DEC90



SCALE
0 40 FT



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SOIL-GAS GRID: TEST STRUCTURE 1

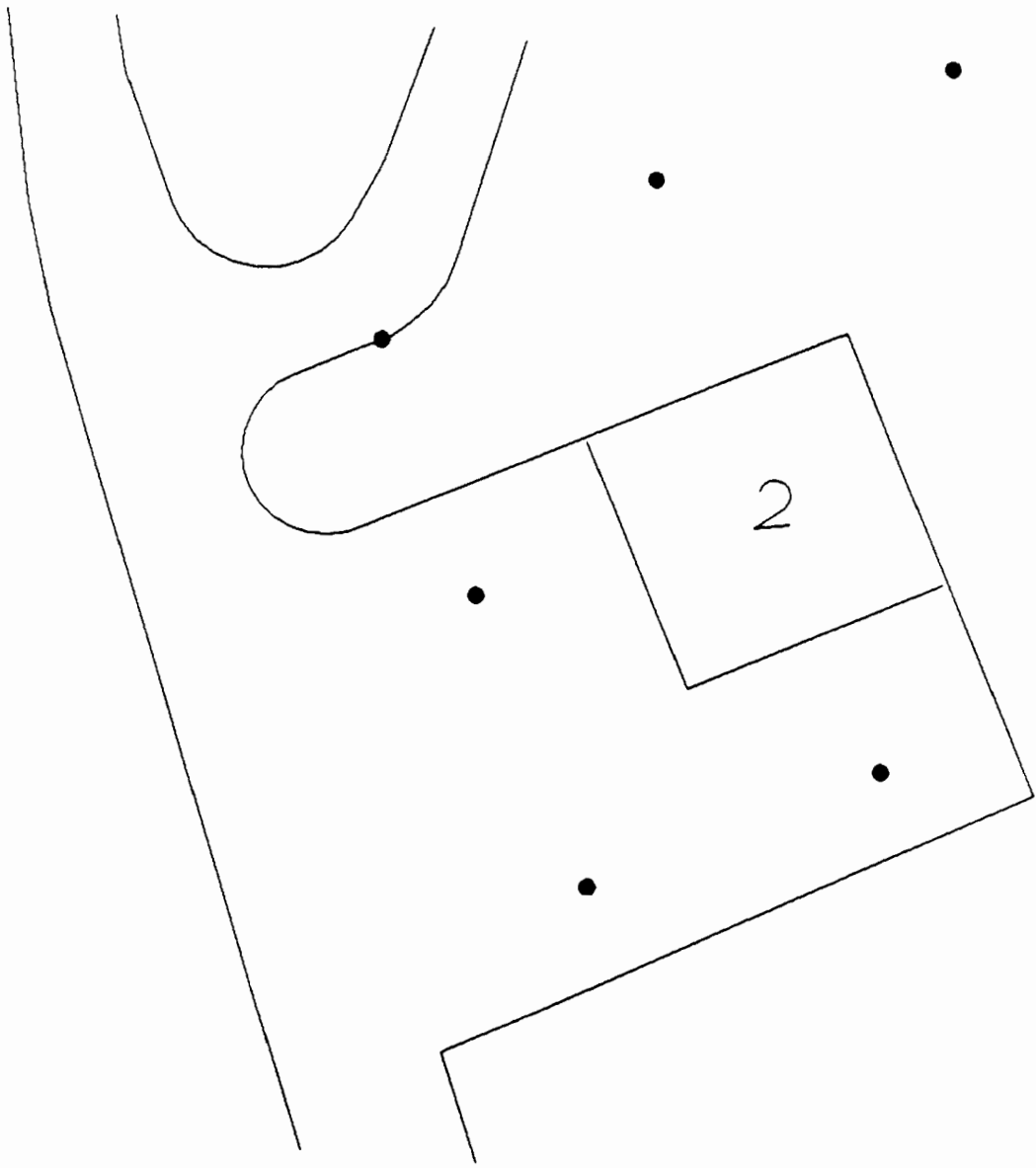
MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

C-11



DWG. DATE: 27NOV90 | PRJCT. NO.: NYO4605 | FILE NO.: 980 | CAD FILE: SG-2 | CHECKED: D.V.S. | APPROVED: D. COLTON | DRAFTER: W.H. CICIO



0 SCALE 30 FT

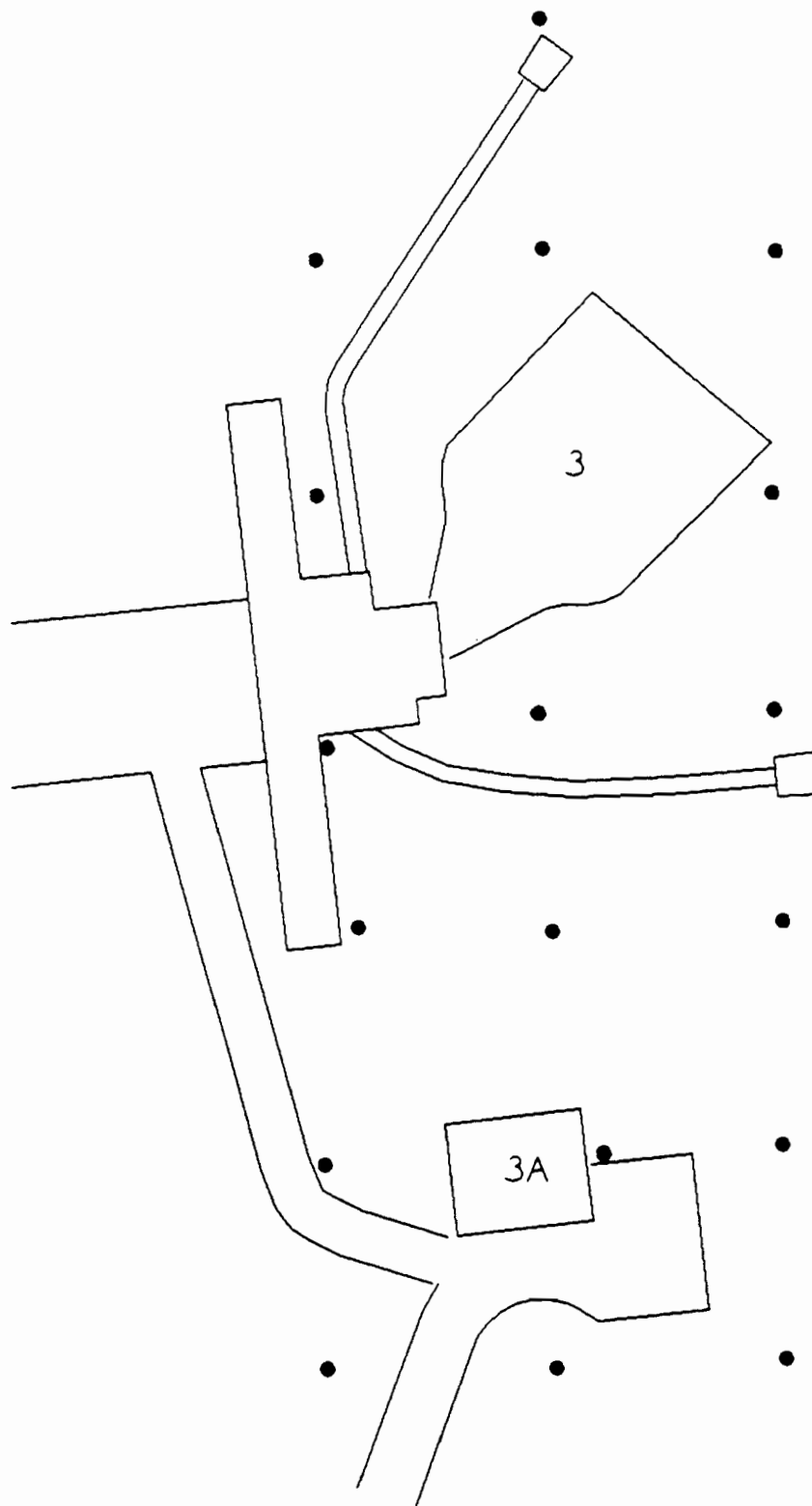


SOIL-GAS GRID: TEST STRUCTURE 2

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE
C-12

DWG. DATE: 02DEC90 | PRJCT. NO.: NY04605 | FILE NO.: 990 | CAD FILE: SG-TS3 | CHECKED: D.V.S. | APPROVED: D. COLTON | DRAFTER: W.H. CIGO



0  40 FT



SOIL-GAS GRID: TEST STRUCTURE 3

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

C-13

DWG. DATE: 02DEC90

PRJCT. NO.: NY04605

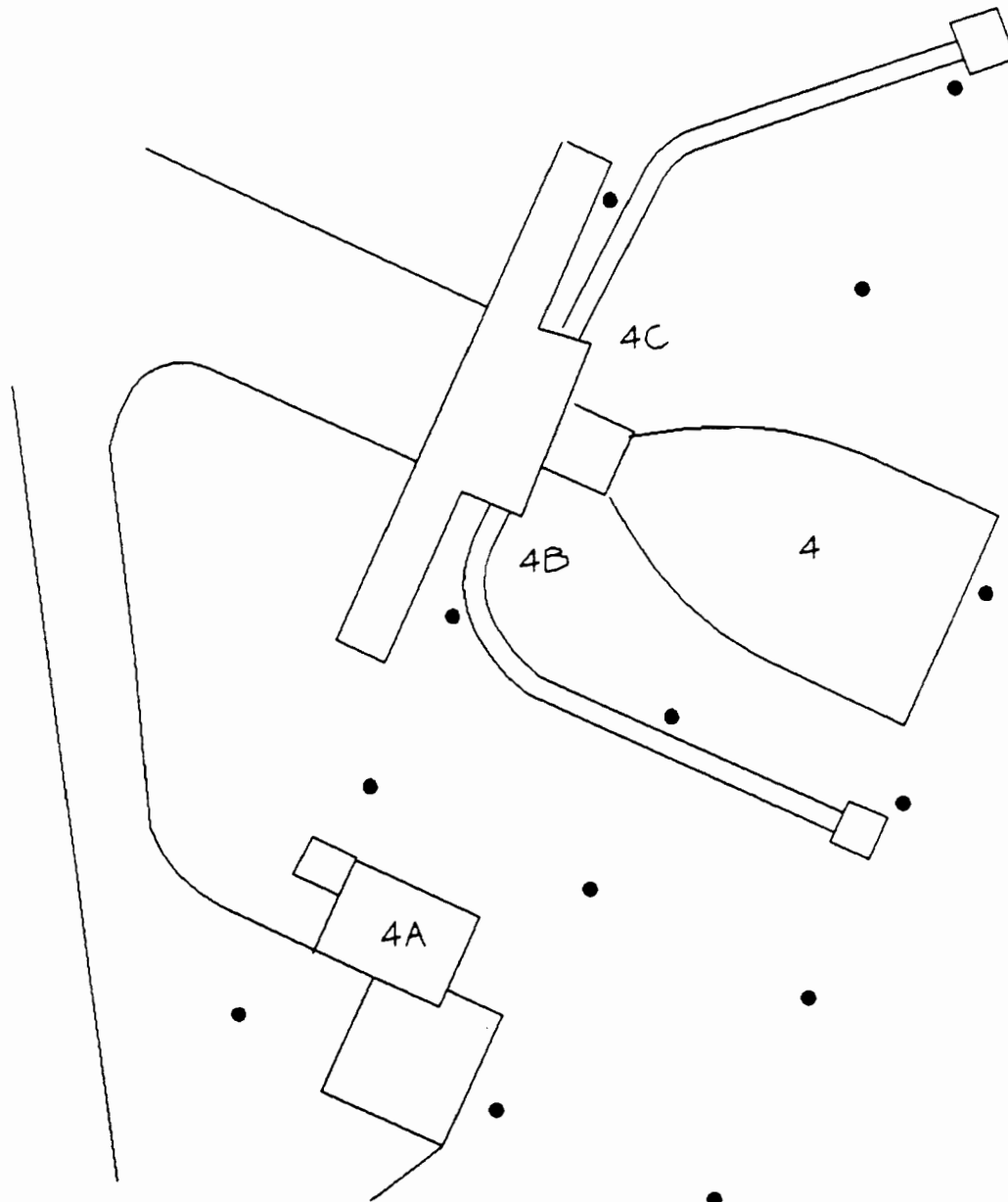
FILE NO.: 990

CAD FILE: SG-TS4

CHECKED: D.V.S.

APPROVED: D. COLTON

DRAFTER: W.H. CICIO



0 40 FT



GERAGHTY
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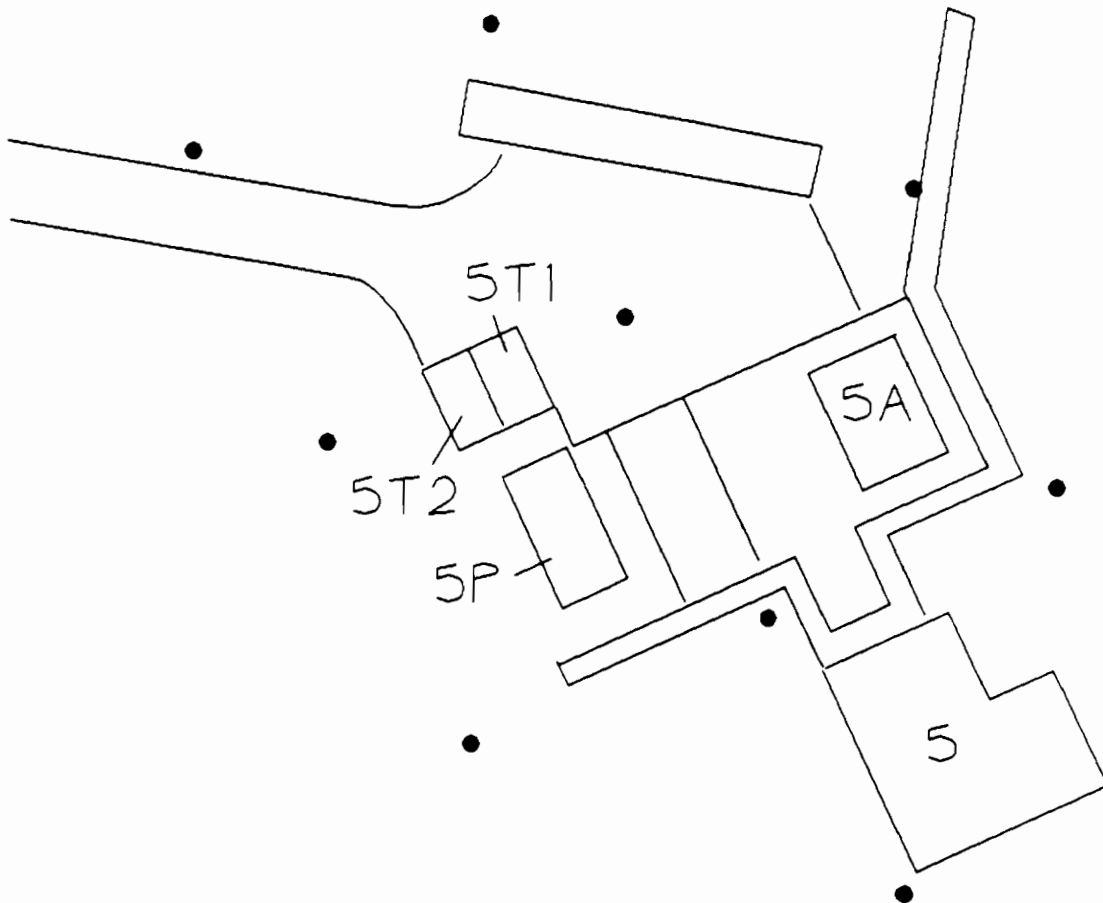
SOIL-GAS GRID: TEST STRUCTURE 4

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

C-14

DWG. DATE: 27NOV90 | PRJCT. NO.: NY04605 | FILE NO.: 980 | CAD FILE: SG-5 | CHECKED: D.V.S. | APPROVED: D. COLTON | DRAFTER: W.H. CICIO



0  30 FT



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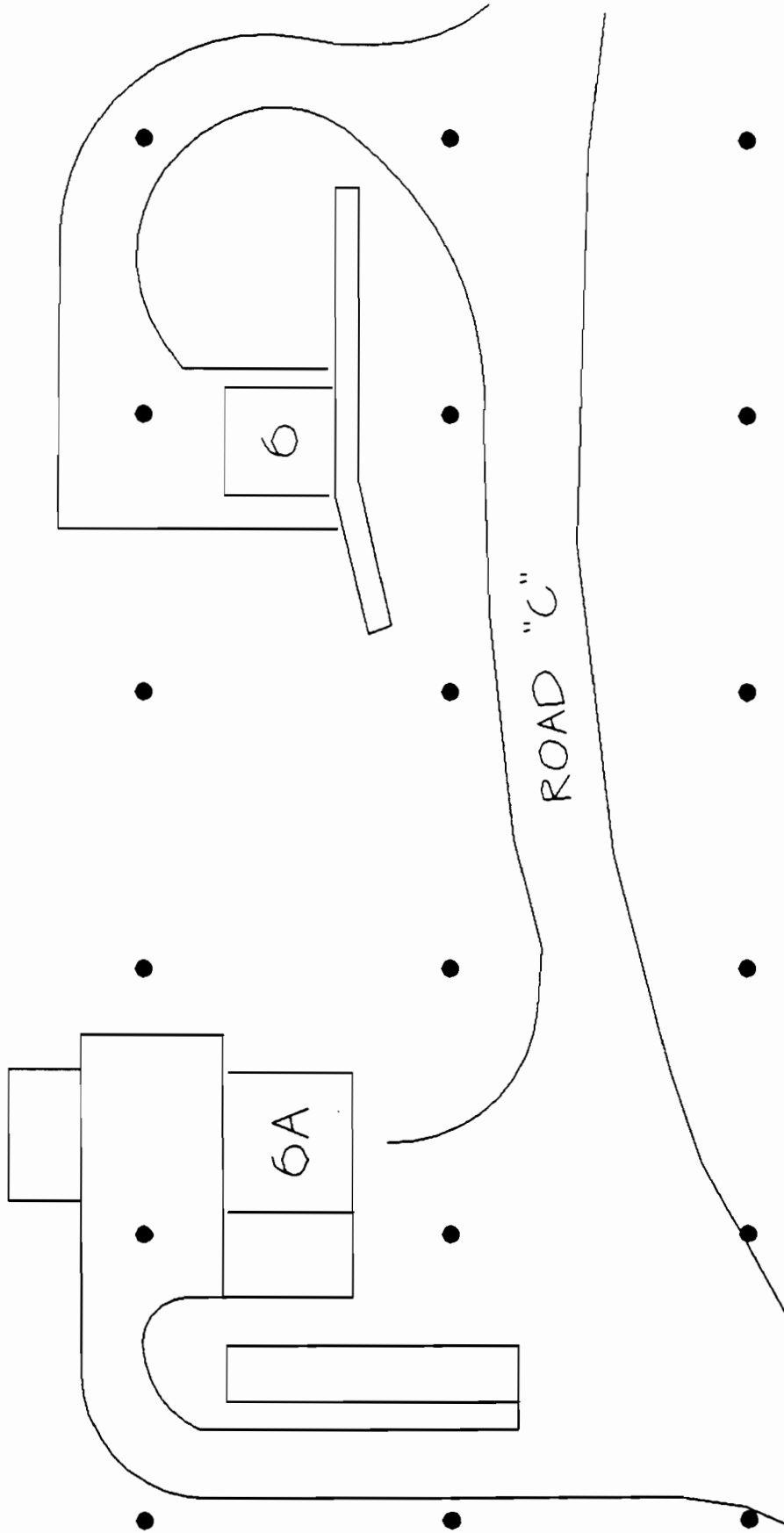
SOIL-GAS GRID: BUILDING 5

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

C-15

FIRE LANE



SCALE
 0 40 FT


**GERAGHTY
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SOIL-GAS GRID: BUILDING 6

MALTA ROCKET FUEL AREA
 SUPERFUND SITE

FIGURE

C-16



DRAFTER: W.H. CICIO

APPROVED: D. COLTON

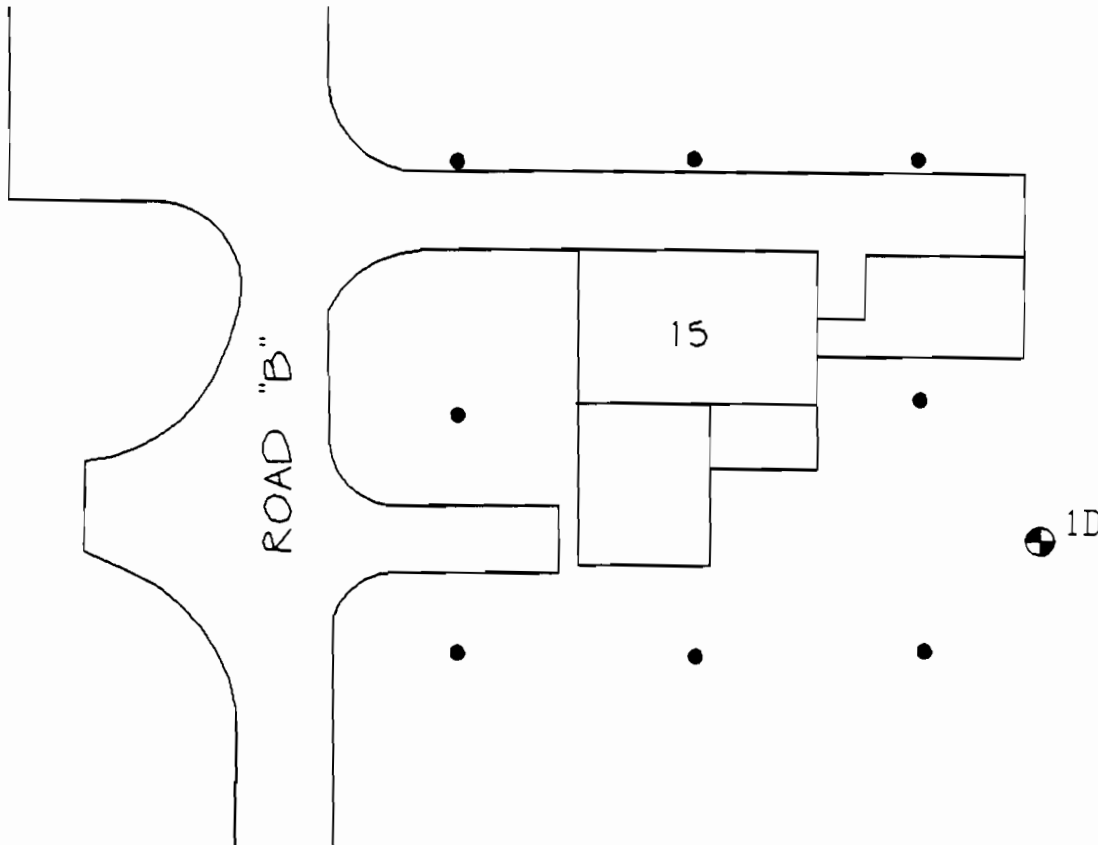
CHECKED: D.V.S.

CAD FILE: SG-15

FILE NO.: 990

PRJCT. NO.: NY04605

DWG. DATE: 02DEC90



0  40 FT



**GERAGHTY
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SOIL-GAS GRID: BUILDING 15

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

C-17



DRAFTER: W.H. CICIO

APPROVED: D. COLTON

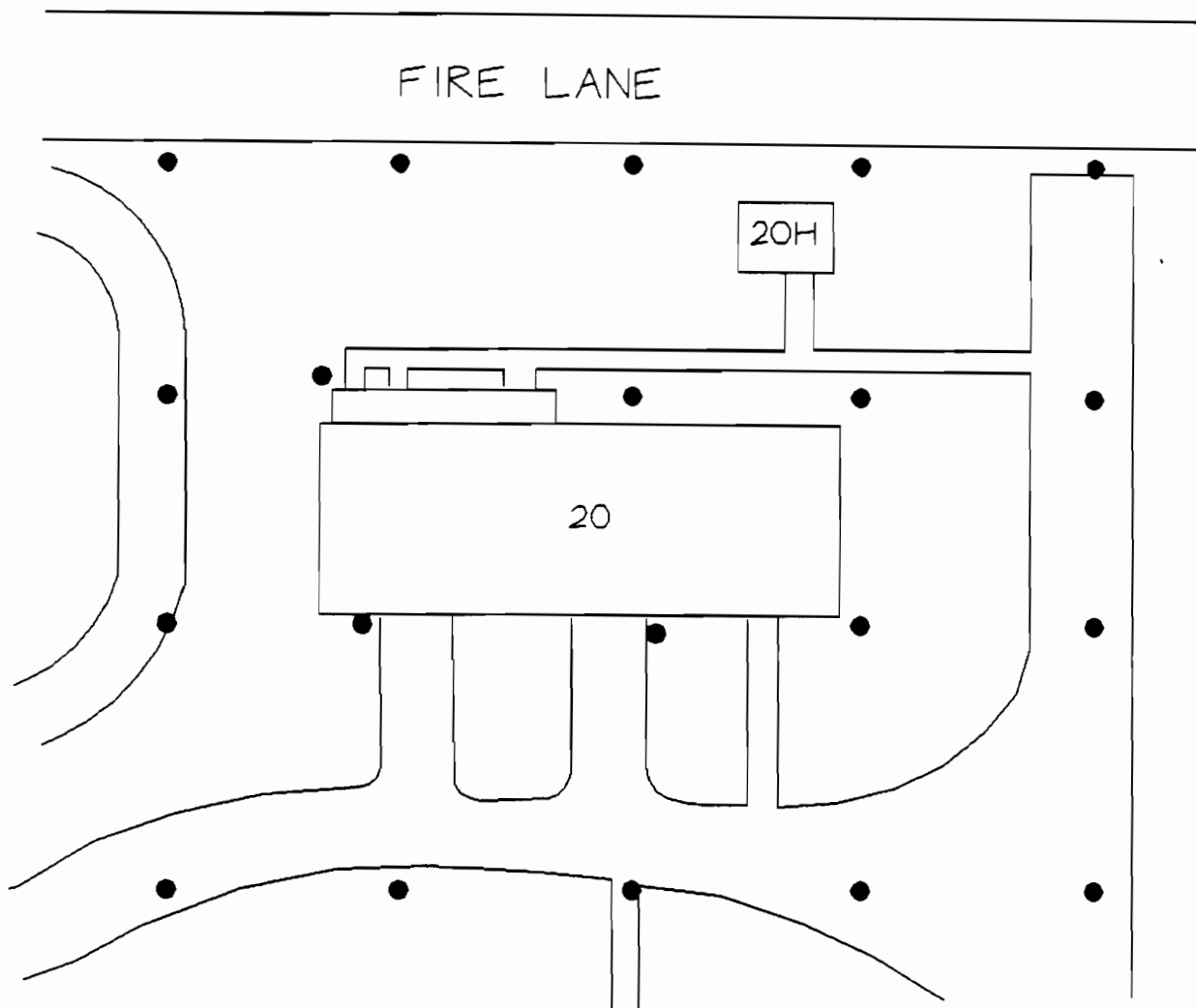
CHECKED: D.V.S.

CAD FILE: SG-20

FILE NO.: 990

PRJCT. NO.: NY04605

DWG. DATE: 27NOV90



0 SCALE 40 FT



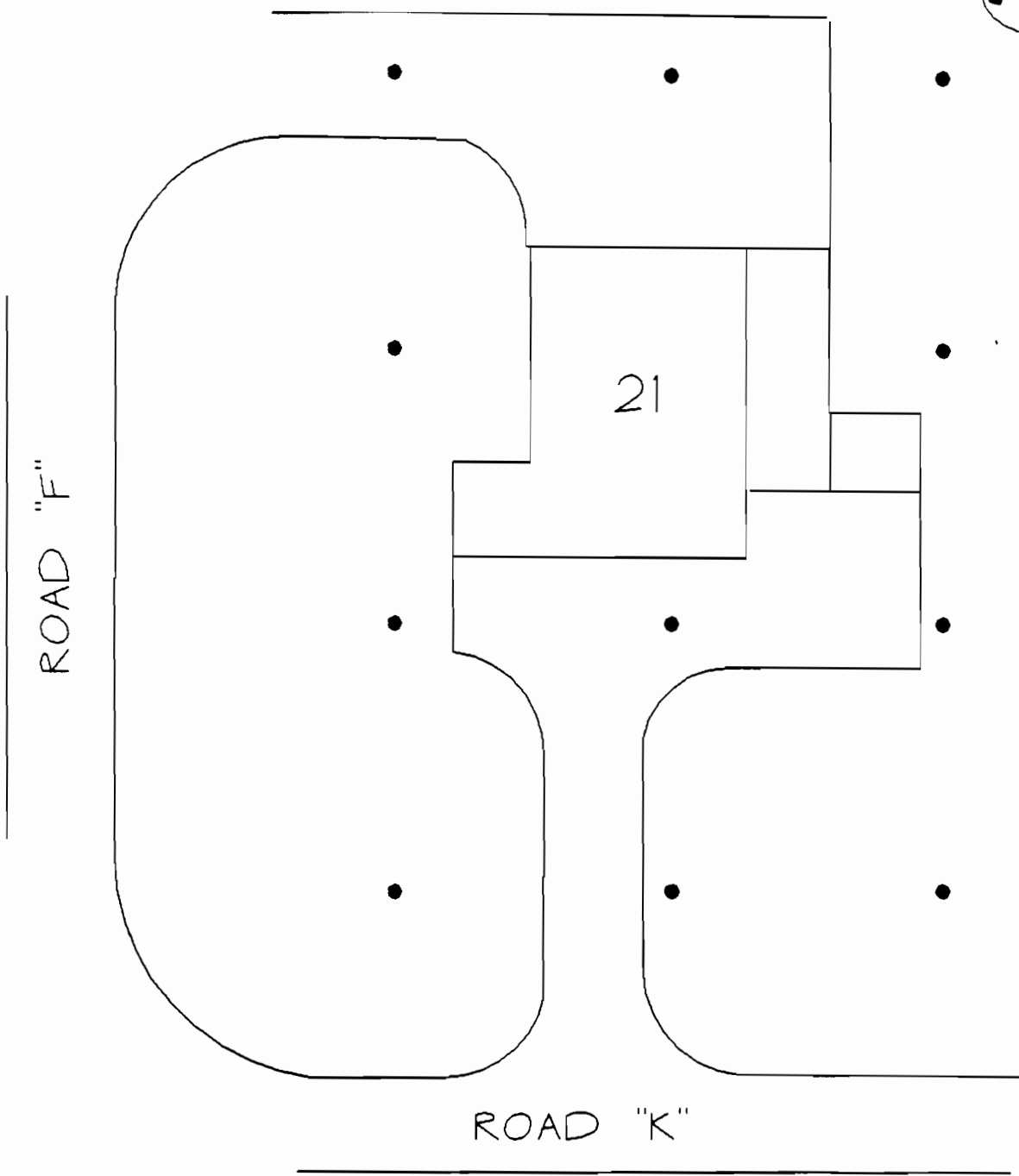
GERAGHTY
& MILLER, INC.
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SOIL-GAS GRID: BUILDING 20

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

C-18



DWG. DATE: 27NOV90 | PRJCT. NO.: NY04605 | FILE NO.: 990 | CAD FILE: SG-21 | CHECKED: D.V.S. | APPROVED: D. COLTON | DRAFTER: W.H. CICIO

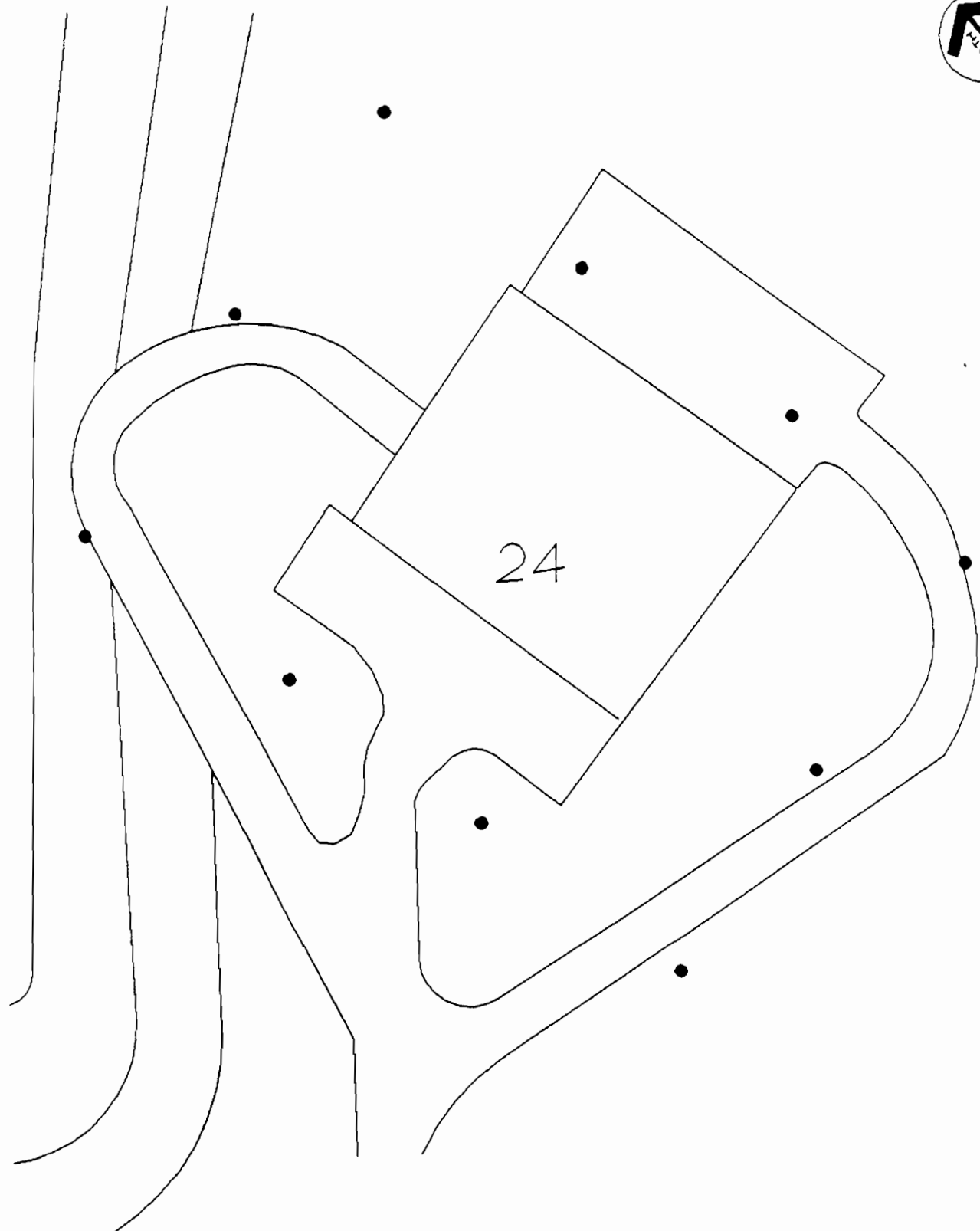
0  30 FT



SOIL-GAS GRID: BUILDING 21

MALTA ROCKET FUEL AREA
SUPERFUND SITE

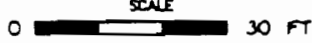
FIGURE
C-19



DATE: 27NOV90 | PROJECT NO.: NY04605 | FILE NO.: 990 | CAD FILE: SG-24 | CHECKED: D.V.S. | APPROVED: D. COLTON | DRAFTER: W.H. CICIO



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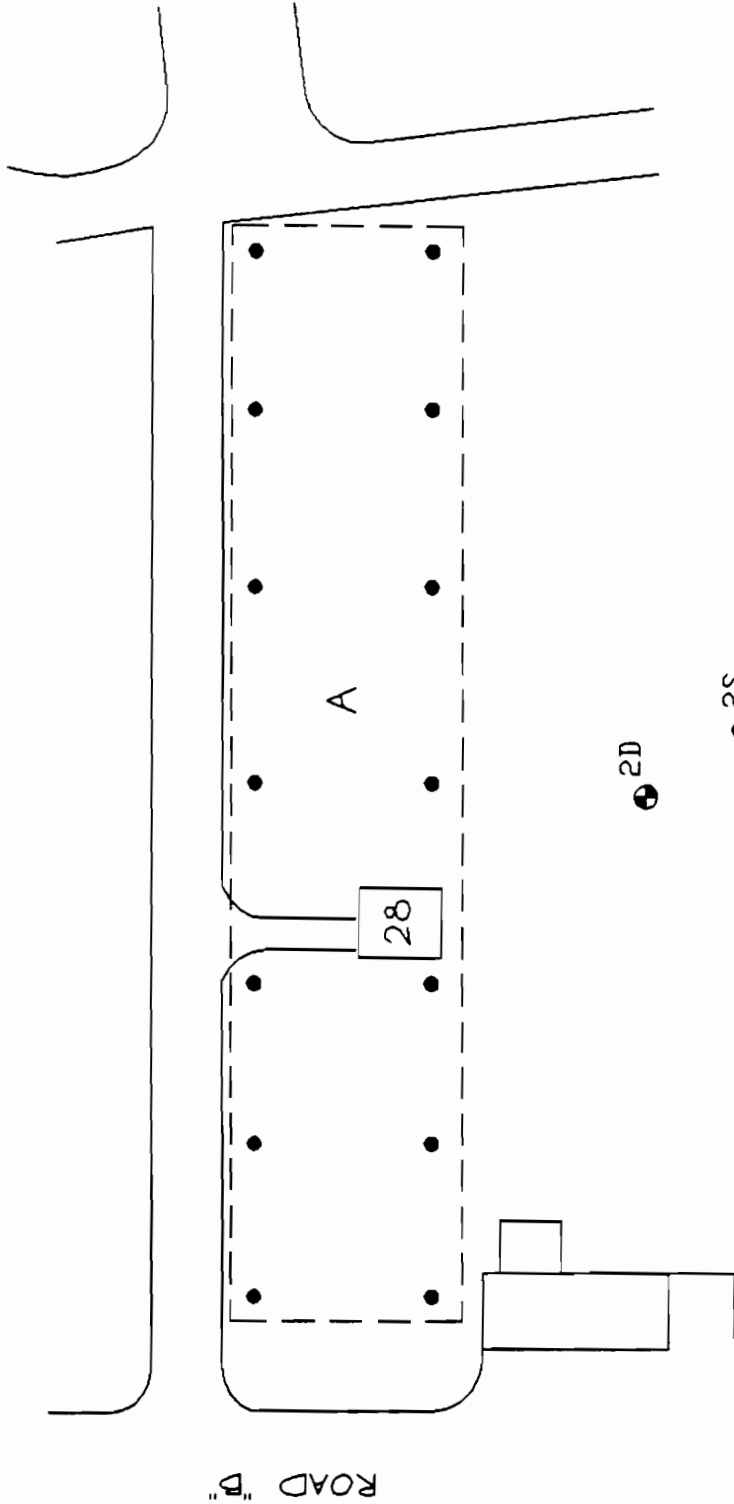
0  30 FT

SOIL-GAS GRID: BUILDING 24

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE
C-20

DWG. DATE: 27NOV90 | PRJCT. NO.: NY04805 | FILE NO.: 990 | CAD FILE: SG-A | CHECKED: D.V.S. | APPROVED: D. COLTON | DRAFTER: W.H. CICIO



SCALE
0 50 FT


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SOIL-GAS GRID: AREA A

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

C-22

DRAFTER: W.H. CICIO

APPROVED: D. COLTON

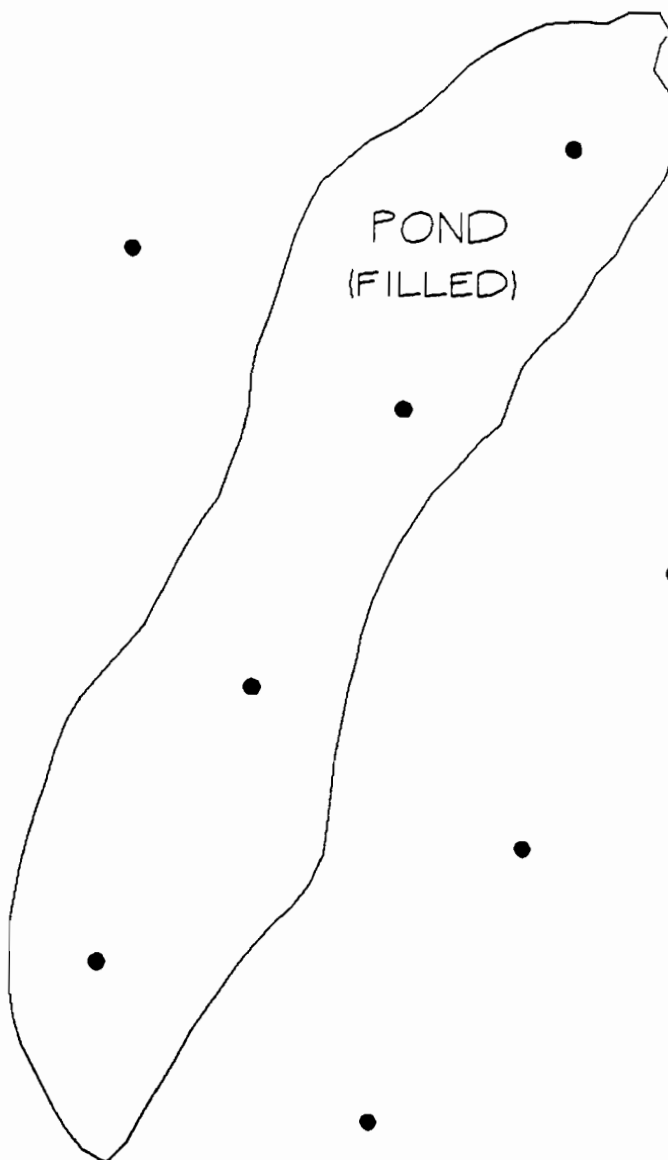
CHECKED: D.V.S.

CAD FILE: SC-8

FILE NO.: 990

PRJCT. NO.: NY04605

DWG. DATE: 27NOV90



0 SCALE 30 FT



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SOIL-GAS GRID:
FILLED-IN POND NEAR BUILDING 6

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

C-23



DRAFTER: W.H. CICIO

APPROVED: D. COLTON

CHECKED: D.V.S.

CAD FILE: SG-7

FILE NO.: 990

PRJCT. NO.: NY04605

DWG. DATE: 27NOV90



0 SCALE 30 FT



GERAGHTY
& MILLER, INC.
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SOIL-GAS GRID:
FILLED-IN POND NEAR BUILDING 7

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

C-24

DWG. DATE: 27NOV90 | PRJCT. NO.: NY04805 | FILE NO.: 990 | CAD FILE: GEO-PT12 | CHECKED: D.V.S. | APPROVED: D. COLTON | DRAFTER: W.H. GGO



FENCE



POND
FILLED

25H

SCALE
0 40 FT



SOIL-GAS GRID: FILLED-IN POND AT PTI

MALTA ROCKET FUEL SITE
SUPERFUND SITE

FIGURE

C-25

DRAFTER: W.H. GICIO

APPROVED: D. COLTON

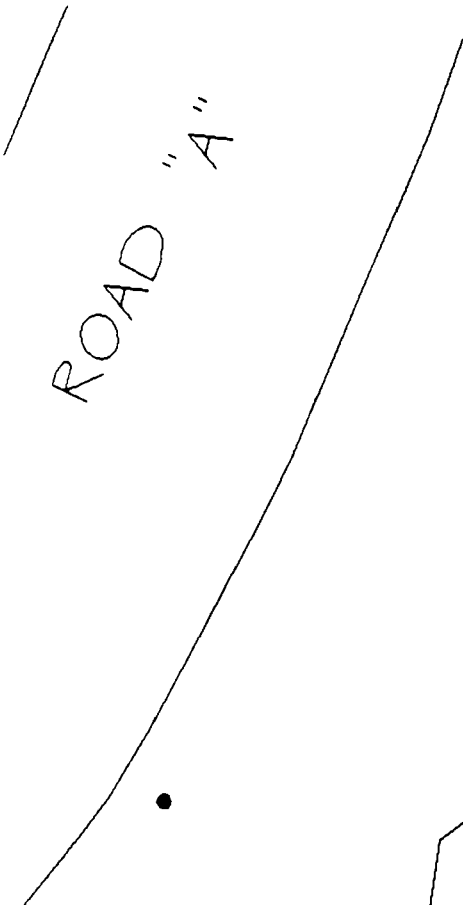
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CAD FILE: SG-MAG

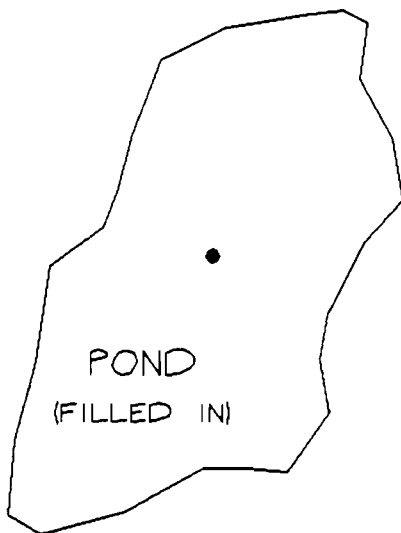
FILE NO.: 980

PRJCT. NO.: NY04605

DWG. DATE: 27NOV90



ROAD "A"



POND
(FILLED IN)

FENCE



0 SCALE 10 FT



GERAGHTY
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SOIL-GAS GRID: FILLED-IN POND
NEAR MAGAZINE AREA

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

C-26



DRAFTER: W.H. CICIO

APPROVED: D. COLTON

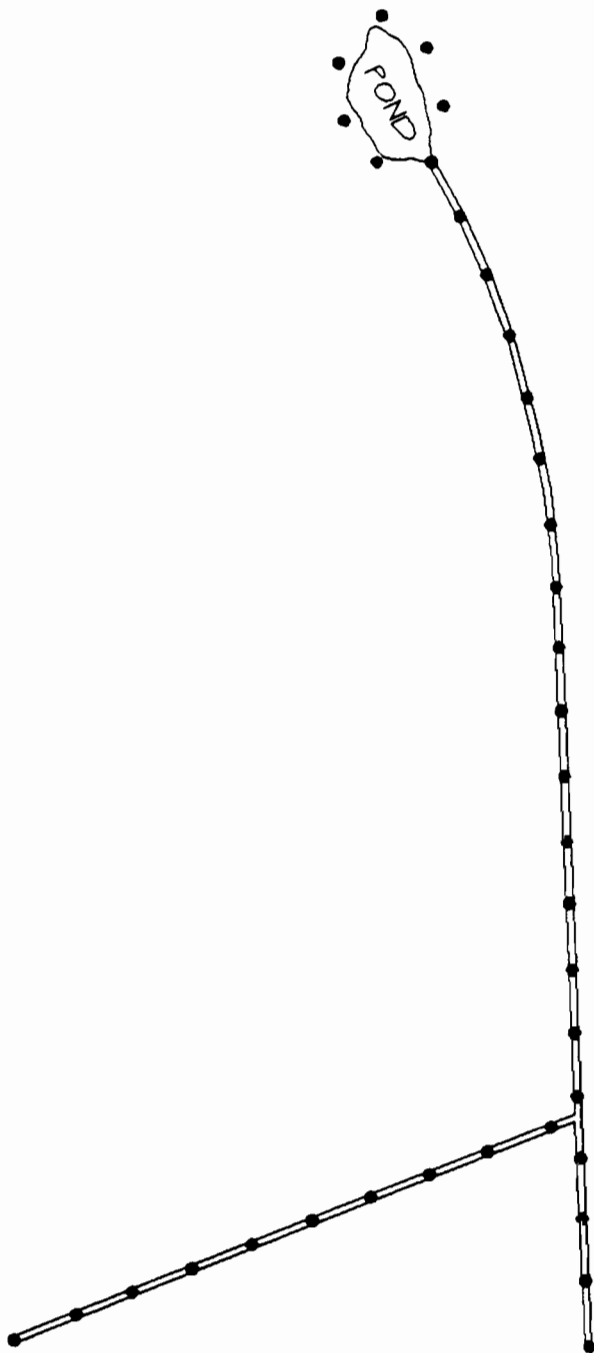
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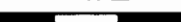
CAD FILE: SG-DITCH

FILE NO.: 990

PRJCT. NO.: NY04605

DWG. DATE: 02DEC90



0  150 FT



SOIL-GAS GRID: EXISTING POND AND DRAINAGE DITCH

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

C-27



DRAFTER: W.H. CIO

APPROVED: D. COLTON

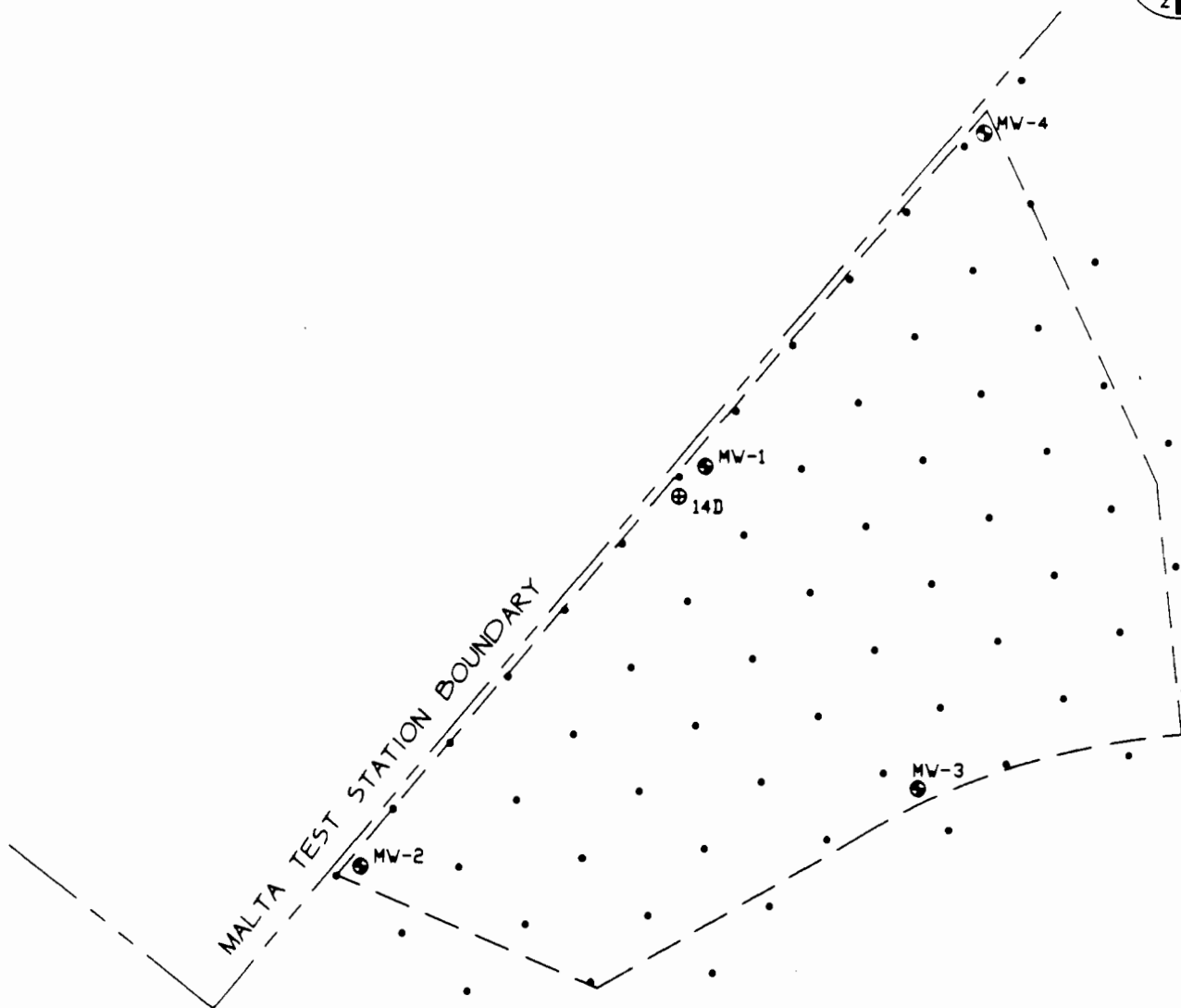
CHECKED: D.V.S.

CAD FILE: SG-TRI

FILE NO.: 1208

PRJCT. NO.: NY04605

DWG. DATE: 02DEC90



SCALE
0 200 FT



GERAGHTY
& MILLER, INC.
Environmental Services

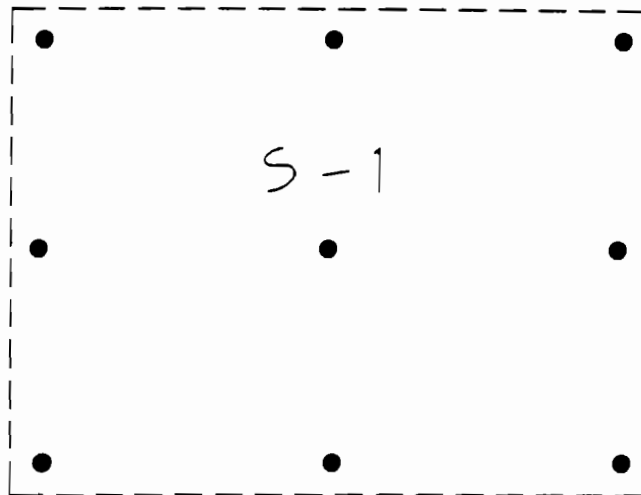
SOIL-GAS GRID: TRIANGULAR PARCEL
SOUTHWEST CORNER OF TEST STATION

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

C-28

APPENDIX D
GEOPHYSICAL SURVEY GRIDS



DRAFTER: W.H. CICIO

APPROVED: D. COLTON

CHECKED: D.V.S.

CAD FILE: GEO-S1

FILE NO.: 990

PRJCT. NO.: NY04605

DWG. DATE: 27NOV90

0  30 FT



GEOPHYSICAL SURVEY GRID: AREA S-1

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

D-1



DRAFTER: W.H. CICIO

APPROVED: D. COLTON

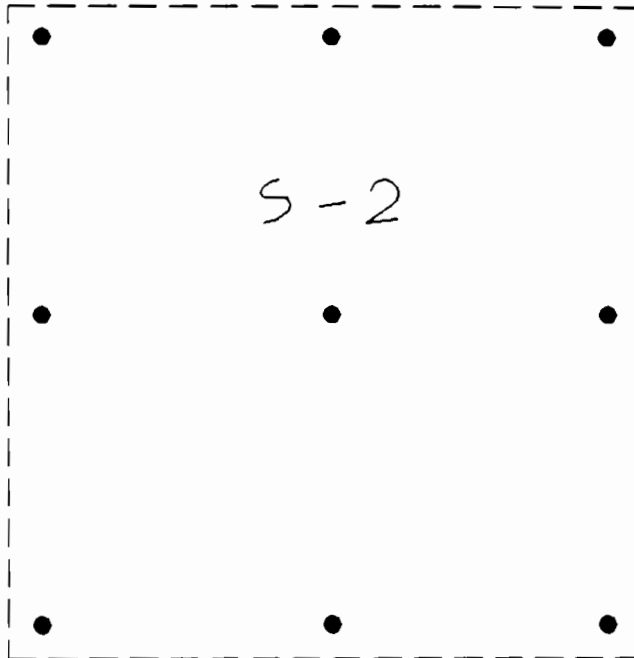
CHECKED: D.V.S.

CAD FILE: GEO-S2

FILE NO.: 990

PRJCT. NO.: NY04605

DWG. DATE: 27NOV90



FIRE LANE

0  30 FT



**GERAGHTY
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GEOPHYSICAL SURVEY GRID: AREA S-2

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

D-2

DRAFTER: W.H. CICIO

APPROVED: D. COLTON

CHECKED: D.V.S.

CAD FILE: GEO-S3

FILE NO.: 980

PRCT. NO.: NYD4605

DWG. DATE: 02DEC90



ROAD "H"

S-3

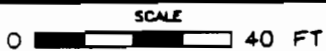
11D

11C

11B

11A

ROAD "B"

0  40 FT



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GEOPHYSICAL SURVEY GRID: AREA S-3

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

D-3



DRAFTER: W.H. CICIO

APPROVED: D. COLTON

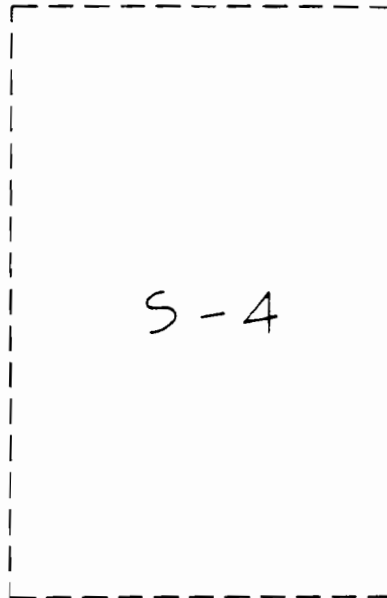
CHECKED: D.V.S.

CAD FILE: GEO-S4

FILE NO.: 990

PRJCT. NO.: NY04605

DWG. DATE: 27NOV90



S-4

SCALE
0 10 FT



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GEOPHYSICAL SURVEY GRID: AREA S-4

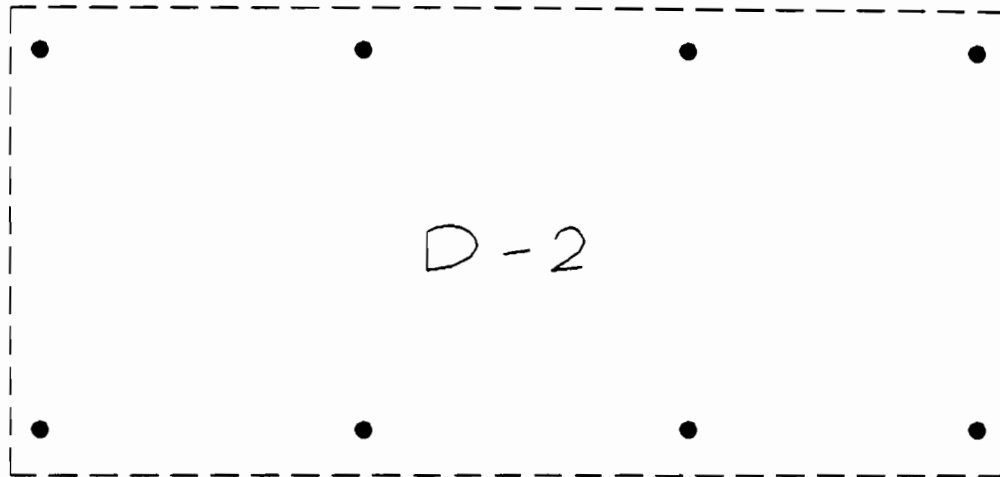
MALTA ROCKET FUEL SITE
SUPERFUND SITE

FIGURE

D-4



DWG. DATE: 27NOV90 | PRJCT. NO.: NY04605 | FILE NO.: 990 | CAD FILE: GEO-D2 | CHECKED: D.V.S. | APPROVED: D. COLTON | DRAFTER: W.H. CICIO



0  30 FT



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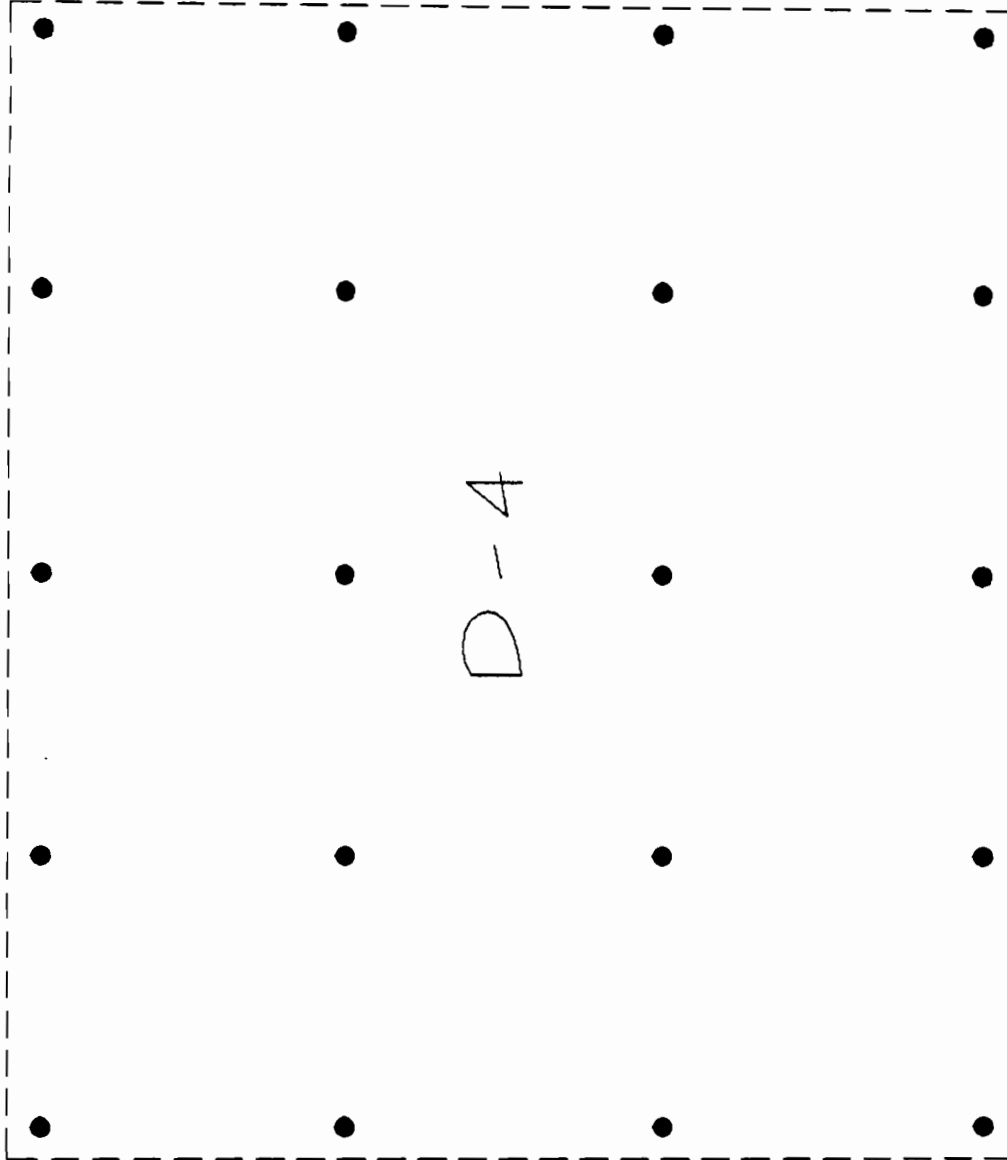
GEOPHYSICAL SURVEY GRID: AREA D-2

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

D-5

DWG. DATE: 27NOV90 | PRJCT. NO.: NY04805 | FILE NO.: 990 | CAD FILE: GEO-D4 | CHECKED: D.V.S. | APPROVED: D. COLTON | DRAFTER: W.H. CICIO



SCALE
0 40 FT


**GERAGHTY
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GEOPHYSICAL SURVEY GRID: AREA D-4

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

D-6



DRAFTER: W.H. CICIO

APPROVED: D. COLTON

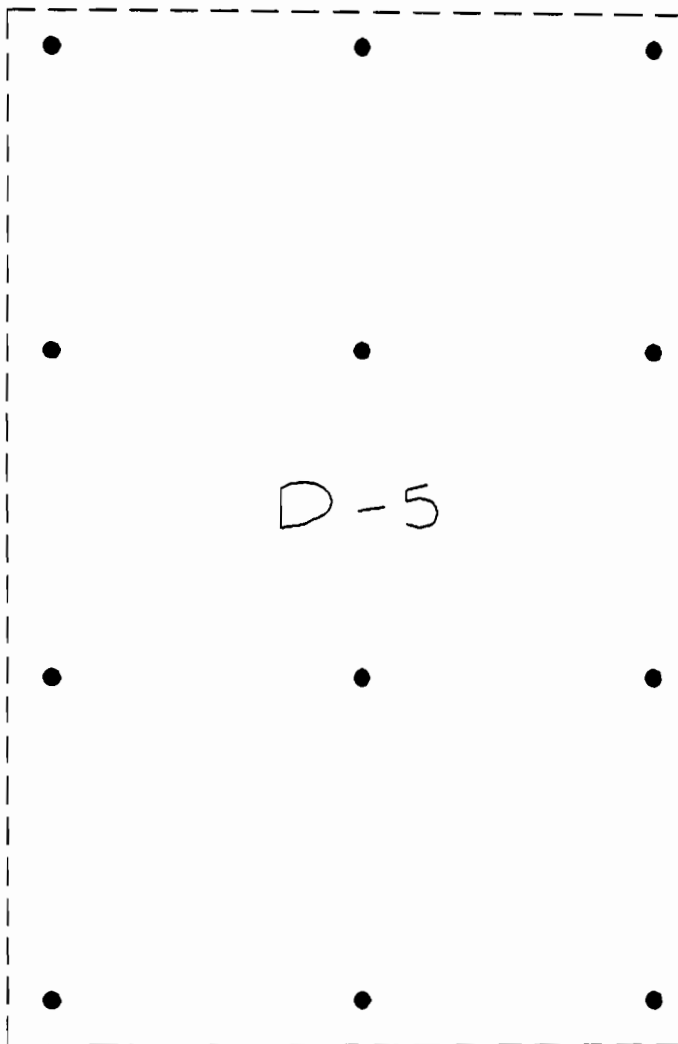
CHECKED: D.V.S.

CAD FILE: GEO-D5

FILE NO.: 900

PRJCT. NO.: NY04605

DWG. DATE: 27NOV90



FIRE LANE

0  30 FT



GEOPHYSICAL SURVEY GRID: AREA D-5

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

D-7



DRAFTER: W.H. CICIO

APPROVED: D. COLTON

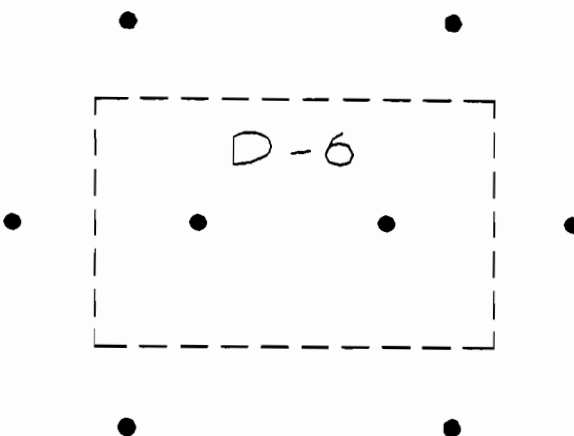
CHECKED: D.V.S.

CAD FILE: GEO-D6

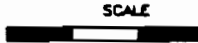
FILE NO.: 990

PRJCT. NO.: NY04605

DWG. DATE: 27NOV90



FIRE LANE

0  30 FT



GERAGHTY
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Environmental Services

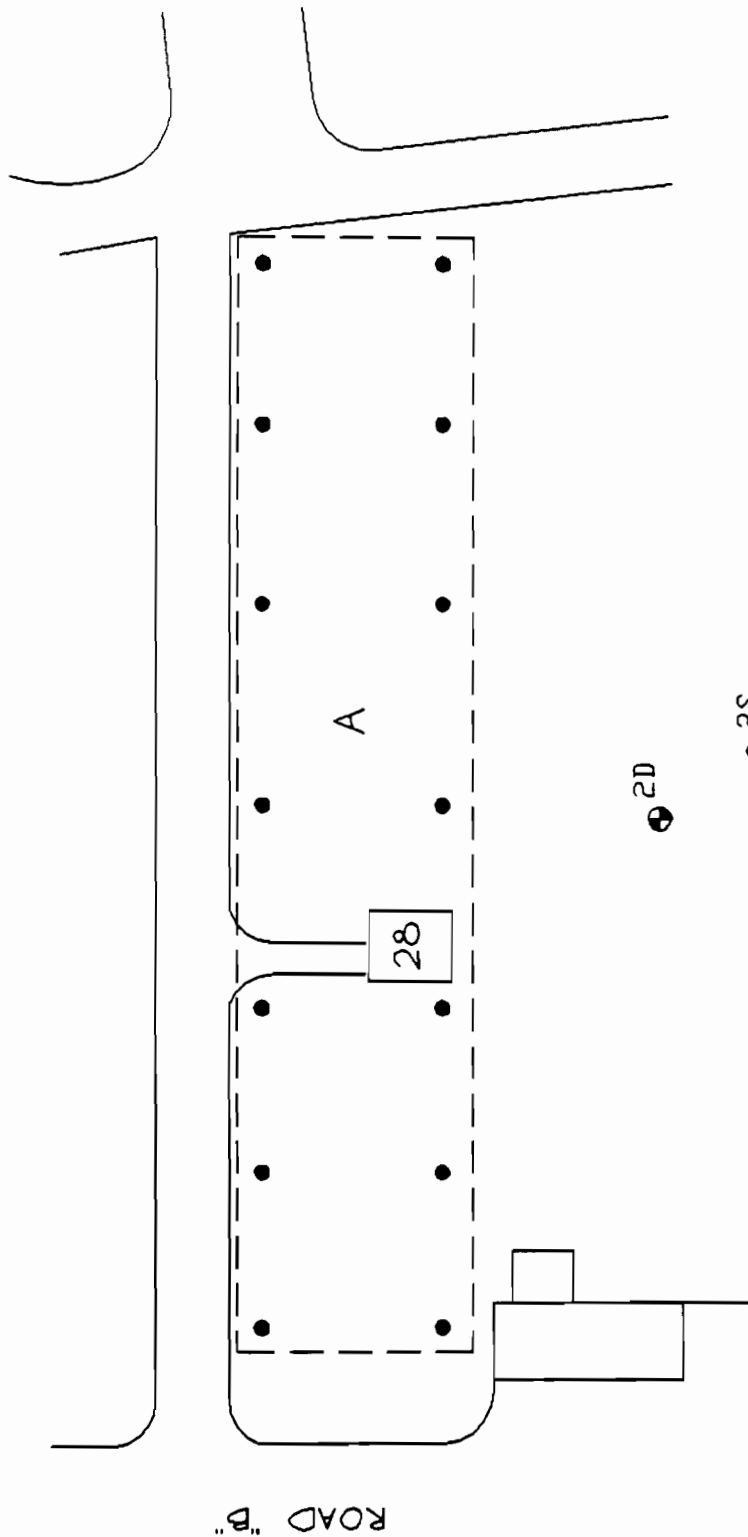
GEOPHYSICAL SURVEY GRID: AREA D-6

MALTA ROCKET FUEL SITE
SUPERFUND SITE

FIGURE

D-8

DWG. DATE: 27NOV90 | PRJCT. NO.: NY04605 | FILE NO.: 990 | CAD FILE: GEO-A | CHECKED: D.V.S. | APPROVED: D. COLTON | DRAFTER: W.H. CICIO



SCALE 0 50 FT



GEOPHYSICAL SURVEY GRID: AREA A

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

D-9

DRAFTER: W.H. CIGIO

APPROVED: D. COLTON

CHECKED: D.V.S.

CAD FILE: GEO-6

FILE NO.: 990

PRJCT. NO.: NY04805

DWG. DATE: 27NOV90



POND
(FILLED)

0  30 FT



GERAGHTY
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GEOPHYSICAL SURVEY GRID:
FILLED-IN POND NEAR BUILDING 6

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

D-10



DRAFTER: W.H. CICIO

APPROVED: D. COLTON

CHECKED: D.V.S.

CAD FILE: QEO-7

FILE NO.: 000

PRJCT. NO.: NY04805

DWG. DATE: 27NOV90



0  30 FT



**GERAGHTY
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**GEOPHYSICAL SURVEY GRID:
FILLED-IN POND NEAR BUILDING 7**

MALTA ROCKET FUEL AREA
SUPERFUND SITE

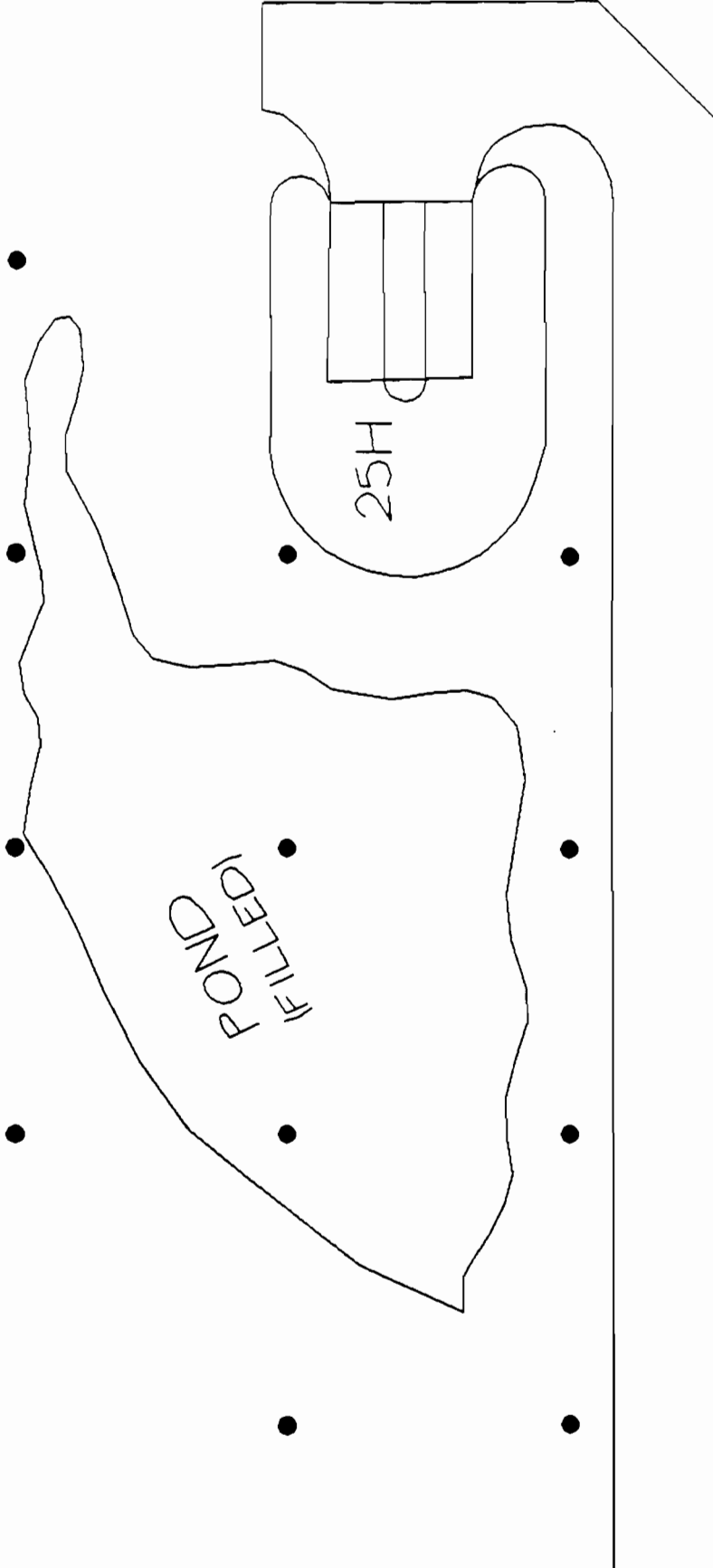
FIGURE

D-11

DWG. DATE: 27NOV90 | PRJCT. NO.: NY04805 | FILE NO.: 990 | CAD FILE: GEO-PTI | CHECKED: D.V.S. | APPROVED: D. COLTON | DRAFTER: W.H. CICIO



FENCE



**GERAGHTY
& MILLER, INC.**
Environmental Services

GEOPHYSICAL SURVEY GRID: FILLED-IN POND AT PTI

FIGURE

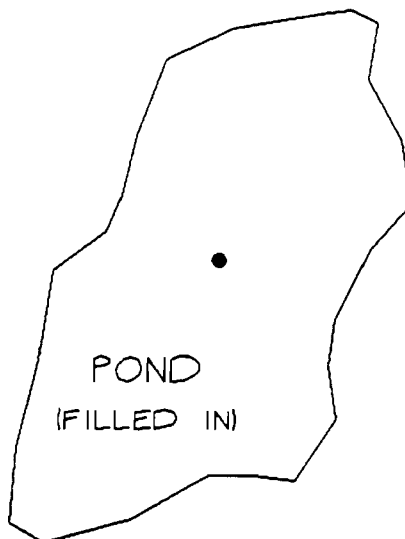
D-12

GENERAL ELECTRIC COMPANY
MALTA, NEW YORK



FENCE

ROAD "A"



SCALE

0 10 FT



GERAGHTY
& MILLER, INC.
Environmental Services

GEOPHYSICAL SURVEY GRID: FILLED-IN
POND NEAR MAGAZINE AREA

MALTA ROCKET FUEL AREA
SUPERFUND SITE

FIGURE

D-13

DRAFTER: W.H. CICIO

APPROVED: D. COLTON

CHECKED: D.V.S.

CAD FILE: GEO-MAG

FILE NO.: 980

PRJCT. NO.: NY04605

DWG. DATE: 27NOV90

APPENDIX E
AQUATECH, INC.
QUALITY ASSURANCE PROJECT PLAN

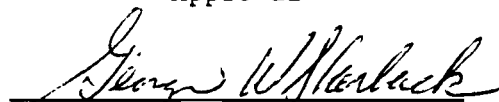
AQUATEC
QUALITY ASSURANCE
PROGRAM PLAN

Prepared by

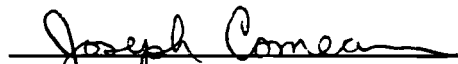
Aquatec, Inc.
75 Green Mountain Drive
South Burlington, Vermont

Revision 5

Approval



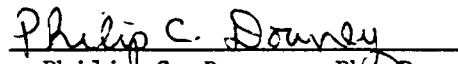
George W. Starbuck
President



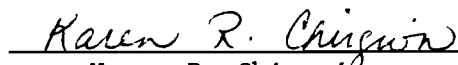
Joseph K. Comeau, Ph. D.
Vice President, Chemistry



Neal E. Van Wyck
Chemistry Laboratory Director

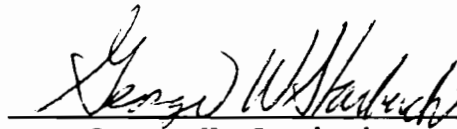


Philip C. Downey, Ph. D.
Biology Laboratory Director



Karen R. Chirgwin
Quality Assurance Officer

I hereby authorize and approve the following Quality Assurance Program Plan for use in Aquatec's Analytical Laboratory.



George W. Starbuck
President

1/11/91
Date

PREFACE

Aquatec believes that the commitment of all within its organization to a comprehensive Quality Assurance Program Plan is a necessity to meet the objectives of this analytical laboratory and of the Contract Laboratory Programs. The following Laboratory Quality Management Plan is an embodiment of the current practices of quality assurance/quality control at Aquatec. The in-house quality assurance program is aimed at the production of data of known quality and integrity, while sustaining a minimum loss of data due to out-of-control conditions.

Each laboratory section is responsible for keeping an updated version of Standard Operating Procedures (SOP) applicable to that section. To ensure continuity of analysis throughout the laboratory, specifics in the areas such as sample handling, instrument calibration, quality control measures, injection technique, data acquisition, data processing, and autosampler procedures are thoroughly explained in each SOP. Following the guidelines stated in SOPs, contractual obligations and method specifications can be met.

The constituents that make up Aquatec's quality assurance/quality control program have been greatly influenced by the contractual obligations. Currently, Aquatec is a participant in the United States Environmental Protection Agency's Contract Laboratory Program, REM Contract Laboratory Program, and the New York State Contract Laboratory Program. As a result, many of the routine quality assurance/quality control measures and restrictions utilized by the laboratory are designed to meet the obligations as set forth in these contracts. When "contractual obligation" is mentioned in the following text, it is in reference to these contracts.

The practices of quality assurance/quality control presented in the following text are set forth as minimums, and any additional measures that the client requires can be incorporated into the quality assurance/quality control project plan. The minimums set forth should be considered, as such, a minimum. Any tailoring or customizing the client may require, based on individual needs, can usually be implemented within the laboratory structure.

Table of Contents

A. Physical Facilities	A-1
B. Personnel	B-1
B.1 Roles and Responsibilities	B-1
B.2 Training	B-4
C. Analytical Instrumentation.	C-1
C.1 Summary of Major Analytical Instrumentation.	C-1
C.2 Instrument Calibration	C-4
C.3 Preventative Maintenance	C-4
D. Sample Handling and Storage Procedures	D-1
D.1 Chain-of-Custody Procedures.	D-1
D.2 Sample Receipt	D-2
D.3 Laboratory Documentation	D-4
D.4 Storage of Records	D-5
E. Analytical Methodologies.	E-1
E.1 Subcontracted Analyses	E-1
F. Quality Control	F-1
F.1 Method Blanks.	F-1
F.2 Reference Standards.	F-2
F.3 Analytical Spikes.	F-4
F.4 Replicate Analysis	F-5
F.5 Calibration Check Standards.	F-5
F.6 Internal Standards	F-6
F.7 Biological Standards	F-6
F.8 Software Quality Control	F-8
F.9 Audits	F-8
F.10 Corrective Action.	F-9
F.11 Interlaboratory Testing.	F-11
F.12 Inventory Procedures	F-11
G. Data Validation and Reporting	G-1
H. Safety Considerations	H-1

Appendix A: Qualifications of Personnel
Appendix B: Analytical Methodologies
Appendix C: Certifications

A. PHYSICAL FACILITIES

The physical facilities available for analytical work at Aquatec are housed in one building with a total of 22,300 square feet of floor space. This comprises the corporate headquarters with an additional off-site bioassay laboratory and storage facility. The floor plan in Figure A.1 shows the location, size, and utilities available on an individual laboratory basis. Over 12,000 square feet are utilized by the chemistry division; approximately 3,500 square feet are devoted to analytical activities. The laboratories occupy 3,000 square feet; sample management, 260 square feet; and incubators, the analytical balance, and desks for computations and transcription are located in an 190 square foot room. Linear bench space in the laboratories are made of synthetic stone and occupy a total of 317 feet. The entire facility is air conditioned, has overhead fluorescent lighting, and the flooring is comprised of epoxy, tile, or raised computer flooring depending on the needs of the work space. The gas chromatography/mass spectrometry laboratory has a positive pressure air system with make-up air drawn through activated carbon filters. All other laboratories utilize a negative pressure air system. The laboratory also has many facilities to support the analytical effort in the form of a reverse osmosis system, deionization system, and computer networking.

Because of the nature of our work at Aquatec, adequate security of the facilities, methodologies, and project files is necessary. Access to the main building is controlled through a system of combination-locked doors and, during business hours, reception log-in procedures for visitors. In addition, anti-intrusion devices and key-control are employed to secure access to the facilities and its contents. Visitors register upon entering the building and are accompanied by an employee while visiting the facility. Aquatec

Figure A.1.1 Facilities

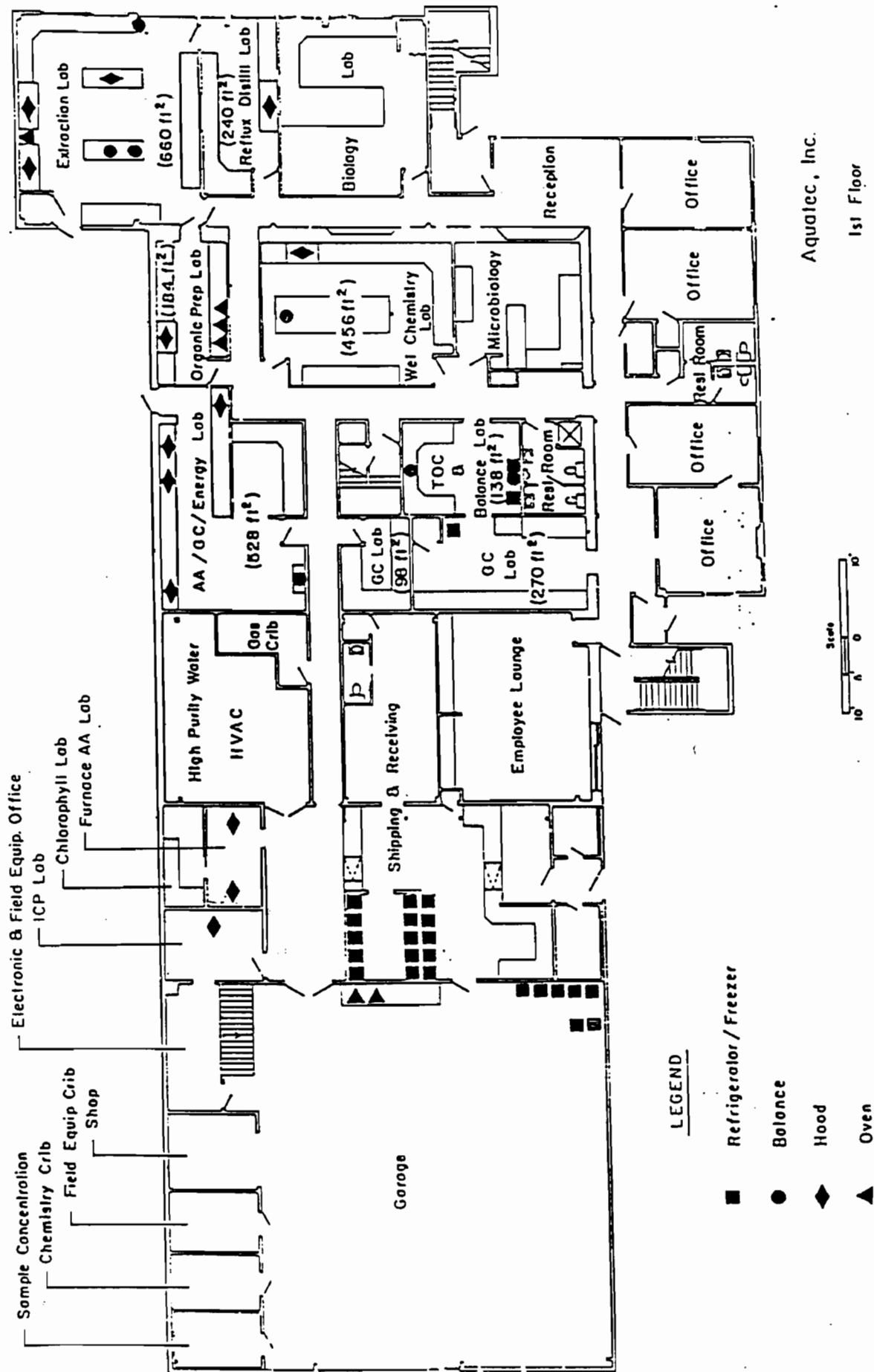
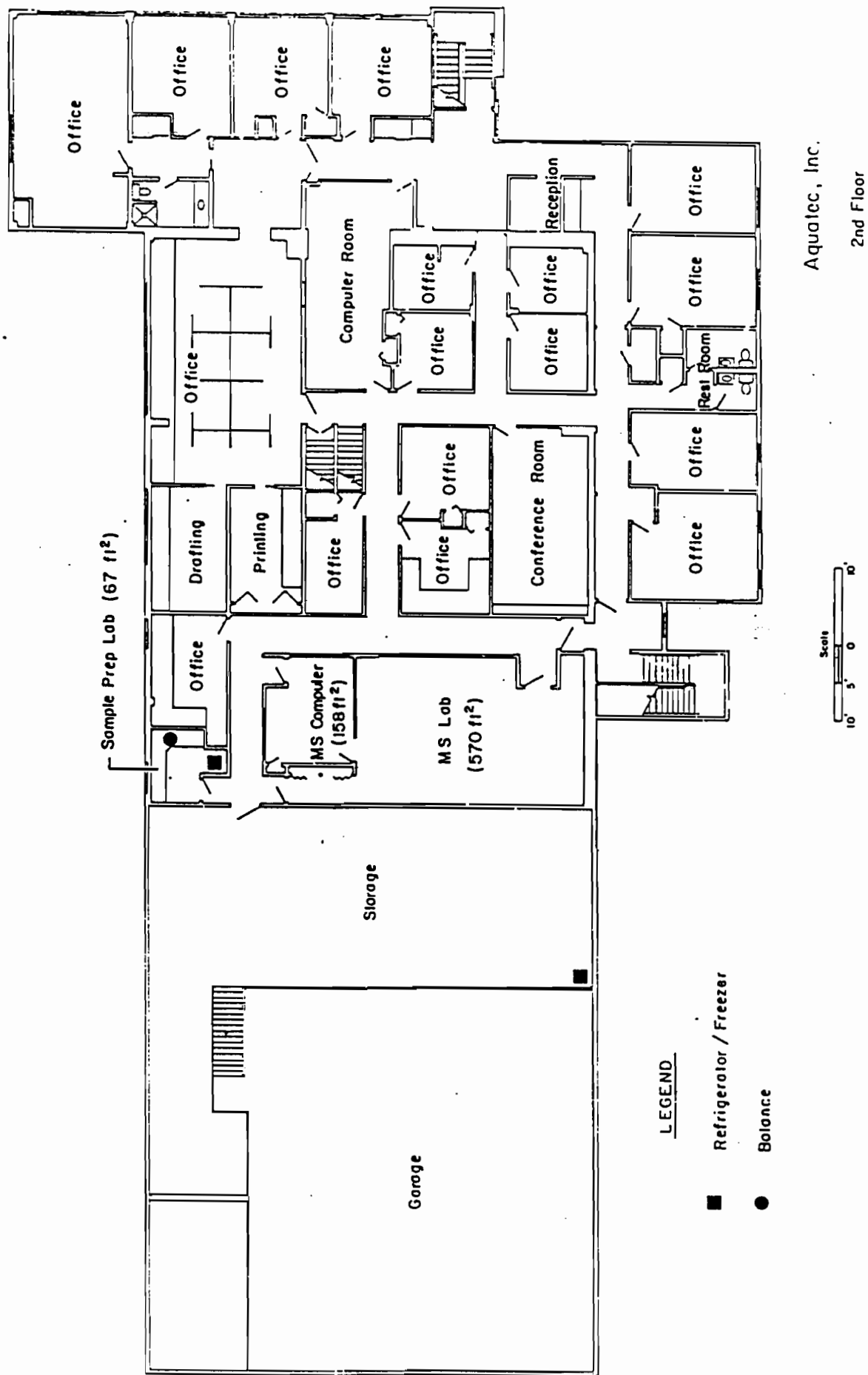


Figure A.1.2 Facilities



Page A-2
Revision 5
Date 01/11/91

employees are expected to be familiar with and adhere to standards of confidentiality mandated by individual contracts and common sense business practices. Laboratory Section Heads will insure that their personnel are familiar with Aquatec's security policies.

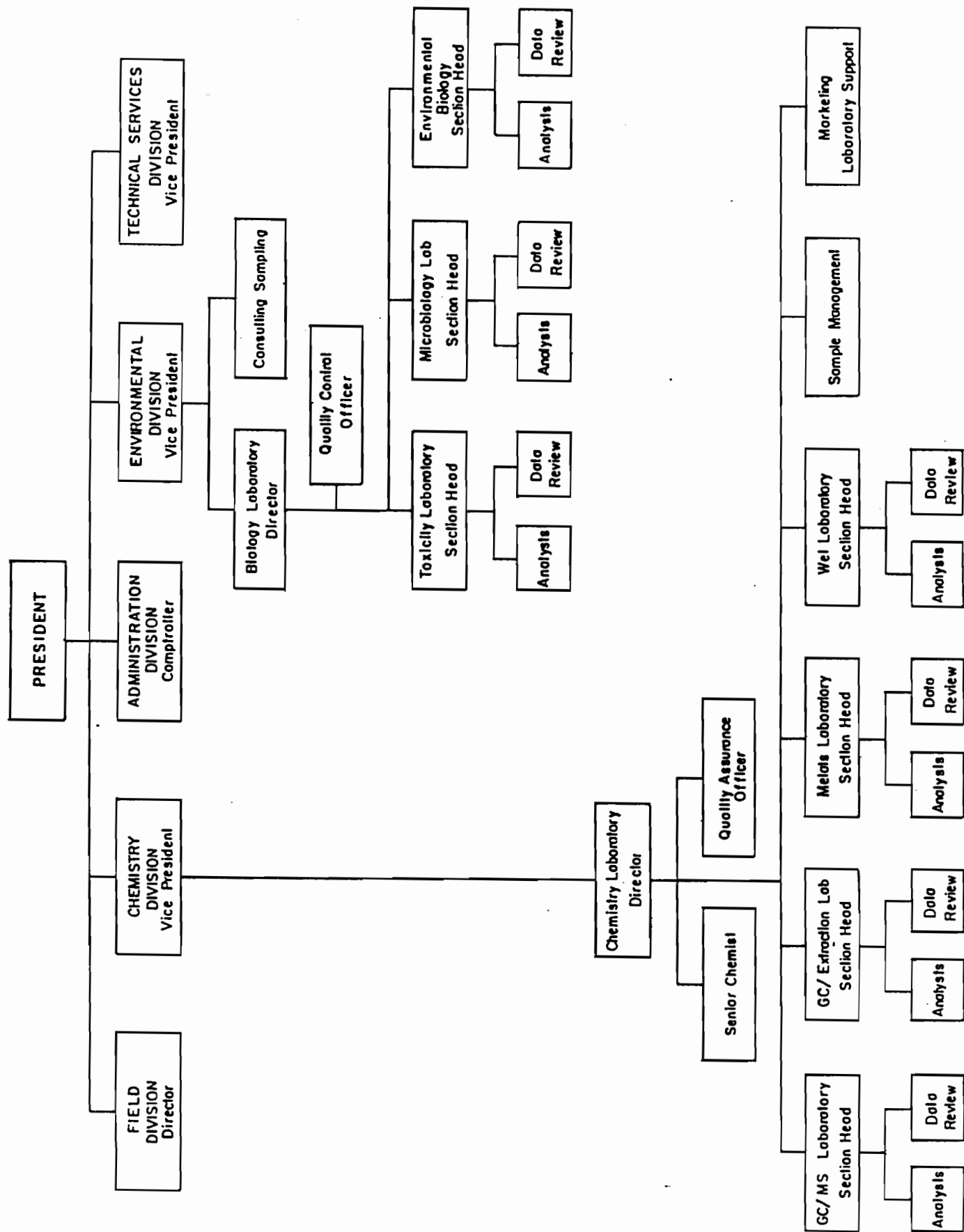
B. PERSONNEL

The organization of laboratory personnel within the Aquatec Analytical Laboratories is presented in Figure B.1. The laboratory structure provides a means for communication from the bench level up to the Laboratory Director. This organization facilitates the generation of data, several levels of data review, and the monitoring of the overall quality of the data produced in the laboratory before it is reported to the client. The Quality Assurance Program within the laboratory is operated independently of the laboratory sections generating data and reports directly to upper management levels. If discrepancies are found in the performance of any section of the laboratory, it is reported to the Laboratory Director who is responsible for initiating the proper corrective action within the section. In this way, objectivity in the evaluation of laboratory operations can be obtained.

B.1 Roles and Responsibilities

Each section within the laboratory has specific roles and responsibilities in terms of producing a product of known quality. All laboratory personnel are expected to have a working knowledge of the Aquatec Quality Assurance Program Plan (QAPP). It is expected that employees at every level will ensure that data is generated in compliance with the Aquatec QAPP.

At the bench level, analysts are responsible for the generation of data by analyzing samples according to written SOP's. They are also responsible for ensuring that all documentation related to the sample is complete and accurate. The analyst should provide management with immediate notification of quality problems within the laboratory. The analysts have the authority to accept or reject data based on compliance with well-defined QC acceptance criteria. The



acceptance of data, which falls outside of QC criteria or is questionable in nature, must be approved by the Laboratory Section Head.

The data review groups are responsible for providing a secondary review of the raw data presented by the analysts. All calculations, calibrations, and QC criteria are evaluated against the objectives of the contract to ensure nothing has been overlooked in the generation of the data. Any discrepancies found in the data should be reported to the appropriate Laboratory Section Head for corrective action. The data review group is also responsible for publishing the final product submitted to the project directors for final review. In the data presentation, the proper forms and formats must be observed.

Laboratory Section Heads are responsible for the overall flow of work and data in and out of the laboratory. They are responsible for the maintenance of accurate SOPs and the enforcement of the QAPP and SOPs in their laboratory. The data produced by the analysts must be of known quality and legally defensible. Any discrepancies in QC criteria will be brought to their attention, and a decision reached as to whether or not the data is acceptable. If, in their judgment, there are technical reasons which warrant the acceptance of what appears to be out-of-control data, these reasons should be well documented and discussed with the Laboratory Director before the sample and corresponding data are considered acceptable.

Project Directors are responsible for dealing directly with the clients. They are technically oriented and well versed in analytical methodologies enabling them to effectively communicate the clients' needs to the laboratory. Project Directors are selected for specific projects based upon their past experiences and qualifications in relation to the proposed scope of work. Roles of the Project

Directors include shipping the proper sampling containers to the job site, inspection of samples and shipping containers upon arrival at the laboratory, overseeing the log-in procedures, monitoring the progress of the analytical work, and review the final data packages before submittal to the client. Project Directors are instrumental in interfacing and assisting both the laboratory and the client in resolving any difficulties that may arise during the course of a project.

The Quality Assurance Officer is responsible for the implementation of the QAPP and monitoring the activities of the laboratory for compliance. The Quality Assurance Officer will periodically conduct internal audits to identify potential problems within the laboratory. The results of these audits are reported to the Laboratory Director for corrective action. The Quality Assurance Officer is also responsible for establishing databases which record performance attributes of the laboratory. The Quality Assurance Officer will also assist the chemists in the writing of the SOP's and distribution of revisions in a timely fashion. In an effort to evaluate the laboratory's performance against other laboratories, the Quality Assurance Officer will maintain records of Performance Evaluation results, audit comments, and training status of personnel.

The Laboratory Director is ultimately responsible for the data that is produced and reported by the laboratory. Any discrepancies in methodology, procedures, QC criteria, or reporting will be channeled through the Laboratory Director. When the Quality Assurance division detects discrepancies or problems, they are reported to the Laboratory Director who is responsible for initiating corrective action within the laboratory. A follow-up audit is performed to assure that the problem has been corrected.

B.2 Training

The level of training necessary to perform analytical tasks is derived from academic background and past experience, technical courses, and informal on-the-job training with specific methods or instrumentation. The responsibilities for formal academic training lies foremost with the individual. The responsibility for the additional specialized skills obtained through in-house training or external workshops is a shared obligation of the individual, their supervisor, and the Company. An individual's academic and professional experience are kept on file including an initial statement of qualifications or resume and any additional documentation concerning subsequent training. Copies of certificates of completion, transcripts, diplomas, or other documentation will be included in the files as appropriate.

Trainees are under the supervision of experienced analysts who are responsible for their work during the training period. This ensures the quality of data reported to clients. The training records consist of an Aquatec form F-0341 (Figure B.2) and is included in the individual's file. Training record summaries are available for inspection from the Document Control Officer.

Included in Appendix A are the resumes of key personnel and a summary of laboratory personnel experience.

TRAINING PROJECT NO. CODE

THE ABOVE NAMED PERFORMED
TRAINING OR INSTRUCTION ON THE DATES AND FOR THE HOURS INDICATED

Employee's Signature

SEP 86

C. ANALYTICAL INSTRUMENTATION

C.1 Summary of Major Analytical Instrumentation

The following is a listing of all major analytical instrumentation and date of purchase available for analysis at Aquatec. Analytical instruments are maintained by a qualified in-house technician.

Gas Chromatography/Mass Spectrometry

Two Finnigan 5100 Series GC/MS systems with subambient temperature control, chemical ionization, negative ion and high resolution capillary column chromatography capabilities. Data system includes Nova 4X computer, 70 Mb Winchester disk drive and Micro VAX file server networking. [(3/85),(3/85)]

Two Finnigan OWA 1050 Series GC/MS systems, each configured with Tekmar LSC-2 purge and trap and Tekmar automatic sampler units. Data system includes Nova 4X Computer, 70 Mb Winchester disk drive and Micro VAX file server networking. [(7/80),(10/82)]

Finnigan OWA 1050 Series GC/MS interfaced with a Tekmar LSC-2000 purge and trap, Dynatherm analytical thermal desorber and a Tekmar cryofocusing trap. [(7/88)]

Three Finnigan mass spectral data processors supporting Super Incos software and VAX networking. [(9/86),(7/88),(11/89)]

Varian 3400 GC equipped with Finnigan 700 ion trap detector. Subambient temperature controller, and Tekmar LSC-2000 purge and trap add versatility. (6/87)

Dedicated screening Hewlett Packard 5840 GC with Flame Ionization and Electron Capture Detectors and Hewlett Packard 3393A integrator. (6/78)

Gas/Liquid Chromatography

Eight Hewlett Packard 5890 gas chromatographs with autosamplers and subambient temperature controllers.

Detectors include FID, ECD, PID, HWD and NPD. An Envirochem 850 thermal desorber and Tekmar LSC-2 provide specialized sample introduction. Data is handled by four Maxima 820 computer data stations and Hewlett Packard 3392A integrators. [(5/84), (5/84), (3/85), (3/85), (4/85), (6/87), (7/88), (7/88)]

Hewlett Packard 5840 GC with autosampler and ECD and FID detectors. (6/78)

Two Tracor 540 GCs with Hall and photoionization detectors. Two Tekmar purge and trap sample concentrators and two Maxima 820 computer data stations. [(3/85), (12/87)]

Waters 600 multi-solvent delivery system liquid chromatograph. Lambda-Max LC UV-VIS spectrometer and Kratos 980 programmable fluorescence detection system. 742 WISP autosampler. (1/88)

Organic Sample Preparation

Analytical bio-chemistry 1002A autoprep gel permeation chromatograph with UV detector. (12/84)

Analytical bio-chemistry 1002B autoprep gel permeation chromatograph with UV detector. (8/90)

Ten Millipore Zero Headspace Extractors (ZHE) for TCLP VOA Extraction. [(1/87), (2/88), (2/88), (2/88), (2/88), (2/88), (8/90), (8/90), (8/90), (8/90)]

Atomic Spectroscopy/Metals Analysis

Two Perkin Elmer Plasma II inductively coupled plasma emission spectrometer with series 7500 computer and AS-51 autosampler. System has UV capabilities and versatile sequential scanning monochromator. [(12/85), (2/90)]

Two Jarrell-Ash SHZ1 atomic absorption spectrometers with Smith-Hieftje correction. System includes dedicated graphite furnace, atomizer, data station, and autosampler. [(8/90), (8/90)]

Perkin-Elmer 5000 atomic absorption spectrometer with Model 500 graphite furnace and AS-51 autosampler. (10/83)

Perkin-Elmer Z3030 graphite furnace atomic absorption spectrometer with Zeeman background corrector. System includes AS60 autosampler and video data station.(10/83)

Perkin-Elmer 3030B flame atomic absorption spectrometer. Capabilities include operation in both absorption and emission.(6/86)

Perkin-Elmer 306 atomic absorption spectrometer dedicated for cold vapor mercury analysis.(8/72)

CEM Corporation MDF 80 microwave digestion system includes Teflon vessels and constant torque lapping station.(4/87)

Wet Chemistry/Inorganic Analysis

Dionex 2000i/SP ion chromatograph.(10/85)

Bausch and Lomb 2000 scanning UV-visible spectrometer used for colorimetric analysis.(4/81)

LECO CHN-600 direct reading carbon hydrogen nitrogen determinator.(6/84)

LECO AC-300 automatic calorimeter.(6/84)

LECO direct reading moisture, ash, fixed carbon and volatile carbon determinator.(6/84)

LECO SC132 sulfur determinator.(2/88)

Oceanography International Model 700 total organic carbon analyzer.(12/78)

Dohrman DX-20 total organic halogen analyzer.(6/81)

Perkin-Elmer 1330 infrared spectrometer with data station.(8/81)

Biological Analysis

Turner Designs Model 10 Fluorometer.

Eberbach Model 2700 microprojection instrument. Adapted for computer digitizing.(3/73)

Zeiss DRC Dissecting Microscope (11/87)

Two Zeiss Lab 16 Compound Microscopes with high pressure mercury lamp for epifluorescent capabilities. [(11/85), (12/86)]

Olympus I MT-100 Trinocular Inverted Tissue Culture Microscope(1/82)

Four American Optical Binocular Microscopes [(4/70), (4/70), (6/73), (4/81)]

C.2 Instrument Calibration

The calibration and standardization procedures for analytical instrumentation is defined in the respective sectional SOP's. The procedures can be modified and revised as required by contractual obligations and special projects. Analytical balances and thermometers are calibrated against NBS, or NBS traceable, materials.

The sectional SOPS discuss in detail how each instrument is calibrated, including frequency for calibration and re-calibration, and the source or grade of the calibration materials. The range of analyses performed and instrumentation utilized by Aquatec is very large and the calibration procedures are instrument specific and vary from analysis to analysis. The calibration procedures usually include an initial system performance check and some type of initial calibration with each analytical series. On-going and closing calibration checks are also included in most analytical series. For each type of calibration standard or performance check there are specific criteria to meet before sample analyses begin. These criteria are established in the methodologies as they are written in the referenced texts or by contract specifications.

C.3 Preventative Maintenance

Analytical instrumentation are maintained and serviced according to the manufacturers specifications. Each analytical instrument has a specific maintenance logbook. All routine maintenance and repair work

is recorded with the date and the initials of the individual performing the maintenance task. Reports from outside service work are incorporated into the instrument logbooks. For GC/MS instrumentation, all performance checks (decafluorotriphenylphosphine and p-bromofluorobenzene) associated with instrument tune for a particular instrument are to be maintained in a separate loose-leaf notebook for that instrument.

On a daily basis, the operation of balances, incubators, refrigerators, the high purity water system, furnaces, ovens, air conditioning, and building facilities are documented on Aquatec Monitoring Worksheets. Any discrepancies are immediately reported to the appropriate laboratory or technical services personnel for resolution. All analytical balances are checked with Class "S" weights and a thermometer is resident in each refrigerator/freezer.

A computer based system to continuously monitor the temperatures inside the refrigerator/freezer units is used in addition to the manual daily thermometer reading. Each refrigeration unit contains a temperature probe packed in sand and is connected to the microVAX system to record the temperature of the unit. Acceptable temperature excursion limits have been established and set within the VAX program. Each temperature reading is immediately compared to the limits, and for values falling outside of the established limits, a buzzer will sound and corrective action will be initiated immediately. Provisions have been made to contact technical services personnel at home during off hours to insure that the refrigeration systems are not out of control for more than 20 minutes.

C.3.1 Maintenance Control Charts

In addition to routine and preventative maintenance, control charts are maintained for several instruments as an indicator of when maintenance may be necessary. In the GC/MS laboratory, instrument

sensitivity is monitored using internal standards. The internal standard solution is injected into every standard, blank, and sample acquired on the GC/MS. The area of the internal standard compounds in an acquisition are plotted on control charts that can serve as an indicator of the overall condition of the instrument. Instrumentation problems can be diagnosed and remedied by tracking the response patterns on the control charts. The control charts are updated following each analysis.

D. SAMPLE HANDLING AND STORAGE PROCEDURES

The procedures used to receive, track, and maintain the integrity and quality of both samples and data are presented below. Routine samples are processed with a variable degree of chain-of-custody documentation depending on client requirements. Samples requiring strict chain-of-custody have associated forms and procedures which establish written proof of possession. Sample receipt and subsequent handling are included as text and flow charts in the Sample Management SOP. Figure D.1 is an example of the flow of Contract Laboratory Program samples and documentation through the laboratory.

D.1 Chain-of-Custody Procedures

The critical nature of chain-of-custody procedures cannot be overemphasized. These procedures record the history of the samples' custody from acquisition to final disposal.

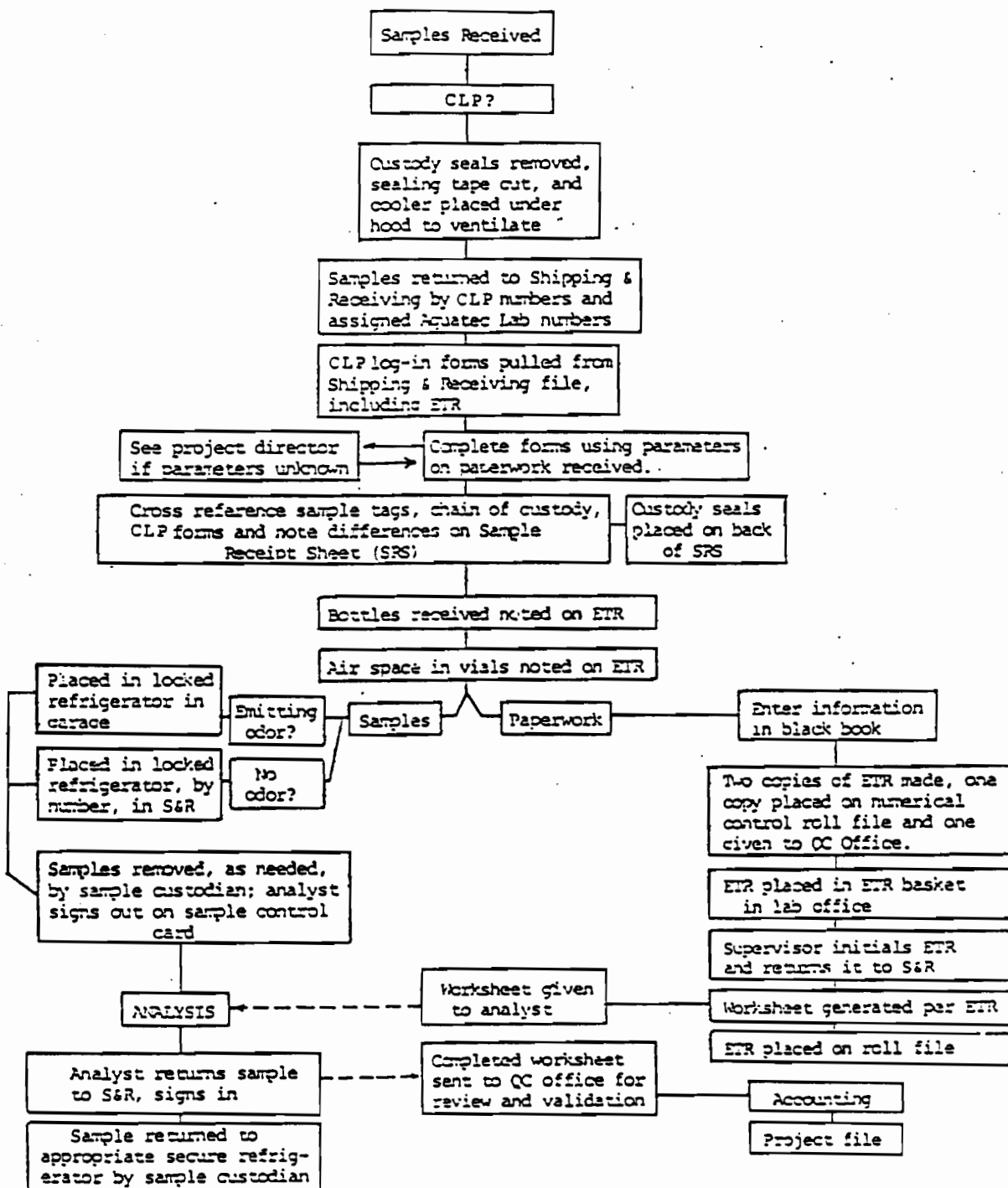
Samples are physical evidence and should be handled according to certain procedural safeguards. For some legal proceedings, proof that the laboratory is a secure repository for the sample is sufficient to insure that the analytical data will be admitted as evidence. However, in some cases a court may require a showing of the hand-to-hand custody of samples while at the laboratory. In such instances, the laboratory must be able to produce documentation that traces the in-house custody record of the samples from the time of sample receipt to the completion of sample analysis.

The National Enforcement Investigations Center (NEIC) of EPA defines custody of evidence in the following ways:

1. It is in your actual possession, or
2. It is in your view, after being in your physical possession, or
3. It was in your possession and then you locked or sealed it up to prevent tampering, or
4. It is in a secure area.

Figure D.1.

In-Lab Sample Handling



The chain-of-custody procedures employed at Aquatec are implemented through the Sample Management Office. An example chain-of-custody form is presented in Figure D.2. The following procedures have been established to satisfy contractual obligations.

1. To guarantee that samples are in a secure area, access to the laboratory is through a monitored reception area with all other access doors locked. Visitors sign-in with the receptionist and are escorted by an Aquatec employee during their stay in the laboratory. Refrigerators, freezers, and other sample storage areas are kept locked, and only sample custodians and supervisory personnel have keys to the sample storage area(s).
2. Samples will remain in locked sample storage until removal for sample preparation or analysis.
3. All transfers of samples into and out of the storage area(s) are documented on an internal chain-of-custody record (form F-0169) shown in Figure D.3.
4. After a sample has been removed from storage by the analyst, the analyst is responsible for returning the sample to the storage area before the end of their working day.

D.2 Sample Receipt

The receipt of samples should be scheduled with the Sample Custodian or designee before samples are shipped. This is important because unstable parameters require prompt analysis and the sample custodians must coordinate the arrival of the samples with Laboratory Section Heads to insure that staff and facilities are available to perform the required analysis. The quality of analytical data is reflected directly by the quality of sample handling.

Samples are received in an area specifically established for sample receipt and storage. Upon receipt, a sample is assigned a laboratory identification number. This number, along with basic

CHAIN OF CUSTODY RECORD

Aquatec, Inc. **75 Green Mountain Drive**

South Burlington, VT 05403

(802) 658-1074 / FAX: (802) 658-3189

[illegible]

(September '90)

Figure D.3

ETR Number:

AQUATEC, INC.

Results Transmitted:

Project No.:

Disposal Date:

Case Number:

Document Control No.: [REDACTED]

[illegible]

information (including date received and general sample description), is recorded in the laboratory's master log and the computer based Laboratory Management System (LMS). Aquatec uses the LMS to track samples from quote through login, analysis, reporting, and finally invoicing. The laboratory's master log is maintained as a parallel paper system backup.

An Environmental Test Request (ETR) is generated in the Laboratory Management System for each sample or series of samples. The ETR contains all of the specific information relative to a particular sample (all field information associated with sample collection, the sample identification number, the parameters to be analyzed for, the results of any field work). The ETR number is recorded in the laboratory's master log as a reference to the laboratory identification numbers. The ETR's are then maintained in a file of work in progress.

The individual samples are checked to insure that they are in proper containers and have been properly preserved for the requested analysis. The laboratory identification number is then physically affixed to the sample container(s), the proper Chain-of-Custody forms are generated, and the sample is properly stored in either refrigerators or freezers, depending on the requested analysis.

When the laboratory is ready to analyze the sample, an analyst requests the sample from the Sample Custodian and signs the proper Chain-of-Custody forms before removing it from the sample storage area. When analysis is complete, the analyst returns the sample to the custodian and signs the proper Chain-of-Custody form relinquishing custody of the sample. Once the samples have been completely analyzed, they are stored until their disposal date or a date specified by contractual obligations.

D.3 Laboratory Documentation

Workbooks, bench sheets, instrument logbooks, and instrument printouts, are used to trace the history of samples through the analytical process and to document and relate important aspects of the work, including the associated quality controls. All logbooks, bench sheets, instrument logs, and instrument printouts are part of the permanent record of the laboratory. Completed workbooks and instrument logbooks are submitted to the Data Review Groups for review and storage.

Each page or, as required, each entry is to be dated and initialed by the analyst at the time the record is made. Entries in the GC/MS standards logbooks and runlogs are made in duplicate using carbon sheets. Errors in entry are to be crossed out in indelible ink with a single stroke and corrected without the use of white-out or by obliterating or writing directly over the erroneous entry. All corrections are to be initialed and dated by the individual making the correction. Pages inserted into logbooks are to be stapled to a clean, bound page. The analyst's initials are to be recorded in such a manner that the initials overlap the inserted page and the bound page. A piece of non-removable transparent tape is then to be placed over the initials as a seal. Pages of logbooks that are not completed as part of normal record keeping should be completed by lining out unused portions. Specific information on the types of logbooks, format of entry, and other pertinent information are contained in the appropriate sectional SOPs.

Laboratory notebooks are periodically reviewed by the Laboratory Section Heads for accuracy, completeness, and compliance to this QAPP. All entries and calculations are verified by the Laboratory Section Head. If all entries on the pages are correct, then the

Laboratory Section Head initials and dates the pages. Corrective action is taken for incorrect entries before the Laboratory Section Head signs.

D.4 Storage of Records

D.4.1 Commercial Clients

Worksheets containing the supportive documentation are stored by method number in the file cabinets for one year. After this time period, the worksheets are placed in cardboard boxes. These boxes are labeled and stored for a minimum of seven (7) years.

D.4.2 Level IV Data

The completed data package including supportive documentation is placed in a box and retained at Aquatec for a minimum of seven (7) years.

D.4.3 Storage of Tapes

Magnetic computer tapes are stored in the computer room, and corresponding tape streamer logbooks are maintained for a minimum of seven (7) years.

E. ANALYTICAL METHODOLOGIES

Detailed descriptions of accepted procedures for the analysis of organic, inorganic, and biological parameters are maintained in the individual laboratory sectional SOPs. Appendix B of this QAPP presents a summary of the methods employed by Aquatec's chemistry and biology laboratories.

Detection limits for the individual parameters are dependent upon the methodologies employed. Aquatec achieves detection limits established by the methods which can also be modified to accommodate difficult sample matrices or client specifications.

It is important to the validity of the analytical results that samples be collected and stored in properly prepared containers to eliminate sources of contamination arising from sample containers. All aqueous samples are preserved, chemically or by refrigeration, as specified in EPA methodologies. Soil and sediment samples are unable to be uniformly chemically preserved, therefore the preservation for these samples will be limited to storage at 4°C.

E.1 Subcontracted Analyses

Aquatec does not routinely subcontract analytical services with the exception of dioxin, asbestos, and radiologicals analyses. Prospective subcontracting firms are thoroughly reviewed with an emphasis on their overall quality control practices and the quality of their data. Aquatec will ensure that the subcontracting firm has all the information necessary to perform the analyses to satisfy the objectives of the client. Samples are shipped to subcontracting firms from Aquatec's sample management department and the results of the analyses are transmitted back to Aquatec for review. These results will be synthesized into Aquatec's reporting format and presented to the client.

F. QUALITY CONTROL

Controls analyzed in conjunction with samples are essential in the evaluation of the quality of the generated data. The following quality control procedures are employed by the laboratory. Although, in many cases, this satisfies only the minimum requirements, the laboratory is continually working within quality control programs initiated by its clients. These programs may include any of the following quality controls in addition to other contractual obligations.

The quality control program implemented in the laboratory includes the analysis of method blanks, reference standards, analytical spikes, and surrogate spikes. Every analytical series includes some of these controls, depending upon the analysis. The combination of controls used in an analysis must be completely representative of the analytical task. This includes all aspects of sample preparation and sample analysis.

F.1 Method Blanks

Sources of contamination in the analytical process, whether a contribution of specific analytes or a source of interferences need to be identified, isolated, and corrected. The intent of the method blank is to identify possible sources of contamination within the analytical process. For this reason, it is necessary that the method blank is initiated at the beginning of the analytical process and encompasses all aspects of the analytical work. This will include glassware, reagents, instrumentation, or other sources of contamination that could affect sample analysis. Laboratory section SOP's as well as contractual obligations define the frequency of method blank analysis. In the absence of a specified frequency, a method blank is analyzed with each analytical series at a frequency of one method blank associated with no more than twenty samples.

This same concept applies to sample containers either used or supplied by Aquatec for the collection of samples. A method, or bottle blank, should be analyzed for each type of sample container as it would be used for sample collection. The frequency of analysis would preferably extend to each lot of processed sample containers. At a minimum the analysis of a container blank should be performed whenever the preparation process, preservation reagent, or type of container changes.

The use of holding blanks associated with volatile organics analyses, whether by GC or GC/MS, is also to be considered in the concept of a method blank. Cross contamination of samples held in closed storage is a distinct possibility. A holding blank specific to each group of samples received for analysis will be generated and analyzed with the samples. Holding blanks indicate contaminants which may have affected the sample during storage at the laboratory.

The analysis of field blanks, trip blanks and equipment blanks, add more insight into interpreting the results of sample analysis. Equipment blanks are generated as part of the sampling process in the field. Field and trip blanks indicate what contaminants may have affected the samples during sampling or in transit to the laboratory. Analysis of these type of blanks are not routine, but they can be performed at a client's request or as specified in a contract.

F.2 Reference Standards

Reference standards are standards of known concentration and independent in origin from the calibration standards. These reference standards are generally available through the U.S. Environmental Protection Agency, the National Bureau of Standards, or are specified by analytical methodologies. Reference standards are included in the

analytical process, although in some aspects of sample handling and preparation, they may not reflect the analytical process. The intent of reference standard analysis is to provide insight into the analytical proficiency within an analytical series. This includes the preparation of calibration standards, the validity of calibration, sample preparation, instrument set-up, and the premises inherent in quantitation. Reference standards are utilized in every analytical series with the exception of GC/MS and certain GC analyses for which reference standards do not exist. The results of a reference standard analysis exceeding specified tolerances have major implications with respect to the associated sample result, thus requiring the reanalysis of samples. It is important to consider how representative the standard analysis is with respect to the sample analysis in evaluating the results.

F.2.1 Control Limits

Control Charts are maintained for the inorganic analysis of water and wastewater using EPA's 200 series methods. The warning and control limits on these charts are calculated based on 20 determinations and are set by contractual obligations. In the absence of set limits, the warning limits are set at ± 2 standard deviations from the mean value; the control limits are set at ± 3 standard deviations from the mean value. If the 95% confidence interval published by EPA for the true value is within these determined limits, the EPA limits are used for that analyte. When a reference standard value exceeds the established warning limits, careful scrutiny is given to the operating system, standards preparation, and procedures that were used in obtaining the result. If the value of the reference standard exceeds the established control limits, then sample analysis is stopped and corrective action is taken. All samples analyzed since the last passing reference standard will be reanalyzed following recalibration of the instrument. The control limits are updated by

the Quality Assurance Officer annually or semi-annually based on the previous 20 determinations. Permanent records of all reference standard determinations are kept in a database. An example of a control chart is given in Figure F.1.

F.3 Analytical Spikes

F.3.1 Analyte Spikes

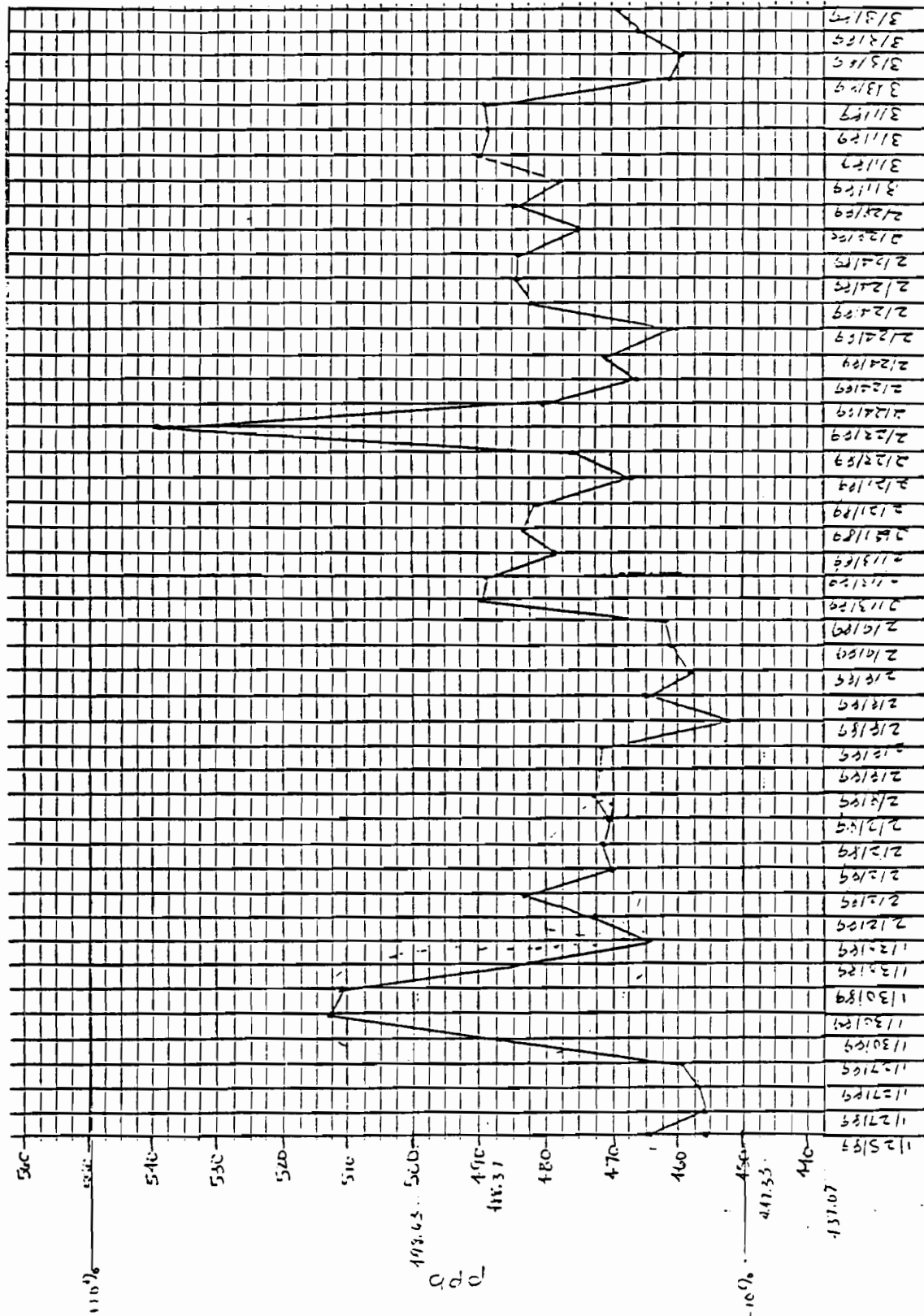
The intent of the analytical spike is to provide insight into the efficiency and proficiency of an analytical series. This includes quantitation standards, sample preparation, instrument set-up, and the premises inherent in quantitation. This control reflects the efficacy of sample analysis within an analytical series while it is less sensitive in reflecting the conditions which are within the control of the analyst. When analytes are spiked directly into the original sample, they are called matrix spikes. Within an analytical series, a representative sample portion is designated as a separate sample and spiked with known concentration(s) of the analyte(s) under consideration. The advantages to this approach lies in the fact that the spiked sample portion is handled and prepared in exactly the same manner as the samples. Sample related interferences affecting an analysis will be reflected in the results from the spiked sample portion. Results of analytical spikes exceeding the specified tolerances need to be evaluated thoroughly in conjunction with other measures of control. In the absence of other control measures, the integrity of the analytical work cannot be verified. Reanalysis with additional controls or different analytical methodologies is necessary.

F.3.2 Surrogate Spikes

Another type of analyte spike is a surrogate spike. Surrogates are compounds unlikely to be found in nature that have properties similar to the analytes of interest. This type of control is

Figure F.1 Example of Reference Standard Control Chart

.....Cadmium.....REFERENCE STANDARD IVQCS



n = 20
 $\bar{x}$ = 467.85
s.d. = 10.26
T.V. = 500 ppb
(estimated from
IVQCS(r))

DATE

primarily used in the GC/MS and GC laboratories. The intent of a surrogate spike is to provide broader insight into the proficiency and efficiency of an analytical method on a sample specific basis. This control reflects analytical conditions which may not be attributable to sample matrix. If results of surrogate spike analysis exceed specified tolerances, then the analytical results need to be evaluated thoroughly in conjunction with other control measures. In the absence of other control measures, the integrity of the data cannot be verified. Reanalysis of the sample with additional controls or different analytical methodologies is necessary.

F.4 Replicate Analysis

Replicate analysis is a measure of analytical precision and can be limited in its scope. If used in conjunction with reference standards or analytical spikes, it can give a measure of the reliability of the analytical systems. Replicate analyses can be significant in the interpretation of analytical results for samples which have complex matrices. The results of a replicate analysis may influence final reports.

F.5 Calibration Check Standards

Calibration check standards analyzed within a particular analytical series will give insight into the instruments' stability. A calibration check standard should be analyzed at the beginning and end of an analytical series or periodically throughout a series containing a large number of samples. Frequency of analysis is defined in the methodologies and contractual obligations. In the absence of a specified frequency, calibration check standards should be analyzed after every ten samples. In analyses where internal standards are used, a calibration check standard need only be run in the beginning of an analytical series. If results of the calibration check standard exceed specified tolerances, then all samples analyzed since the last acceptable calibration check standard are reanalyzed.

F.6 Internal Standards

Internal standard areas are monitored in the GC/MS laboratory. The internal standard is present in all acquisitions with the exception of performance standards (decafluorotriphenylphosphine and p-bromofluorobenzene). The response of each compound within the internal standard is plotted on a control chart (Figure F.2). The tolerance ranges of these charts are contractually set. In the absence of any other criteria, the following working rule applies: the area of any compound cannot fall below 50% of its value in the preceding check standard nor can it rise above 100% of its value. If internal standard areas in one or more samples exceeds the specified tolerances, then the instrument will be recalibrated and all affected samples reanalyzed.

F.7 Biological Standards

F.7.1 Microbiological Standards

All equipment and supplies used in the microbiological analyses are routinely checked for sterility. Laboratory dionized water is monitored monthly for bacterial densities and required water quality characteristics. If any of the parameters are out of the specified tolerances, the personnel responsible for the dionized water system are notified and corrective action is taken. The laboratory water is tested annually for suitability for culturing bacteria. Glassware is tested annually using the inhibitory test to insure that the glassware cleaning procedures do not inhibit bacterial growth. Bacteria sample containers are prepared in lots and each lot is checked for sterility. If the tested container is not sterile, then all the associated containers will be re-sterilized and re-tested.

A positive and negative control sample is run with each daily set of bacteriological samples. The negative control is conducted using the dilution water appropriate for the test. This dilution water is

IS	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT
1															
10															
28															
44															
60															
68															

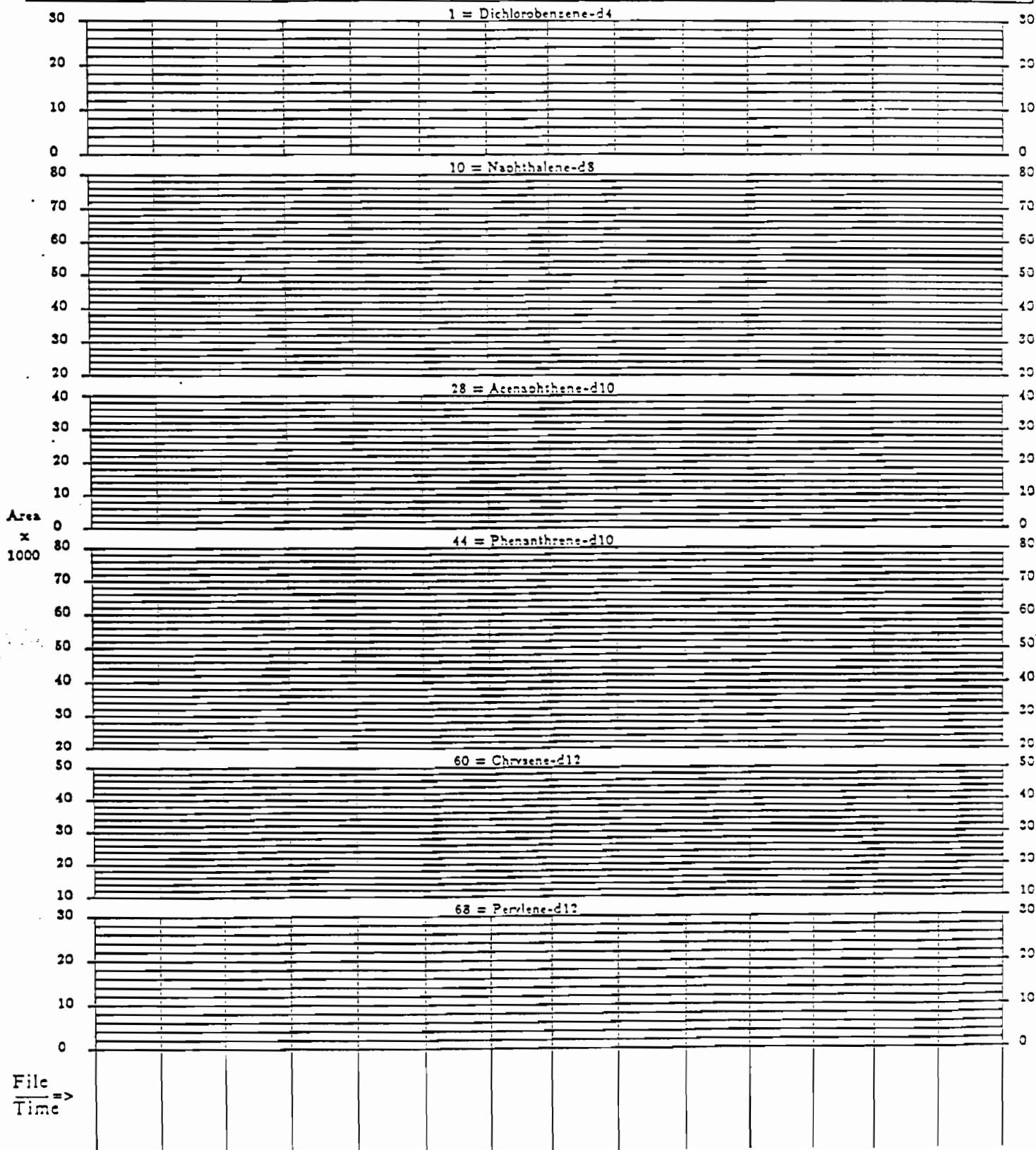


Figure F.2

ETR or Case No: _____

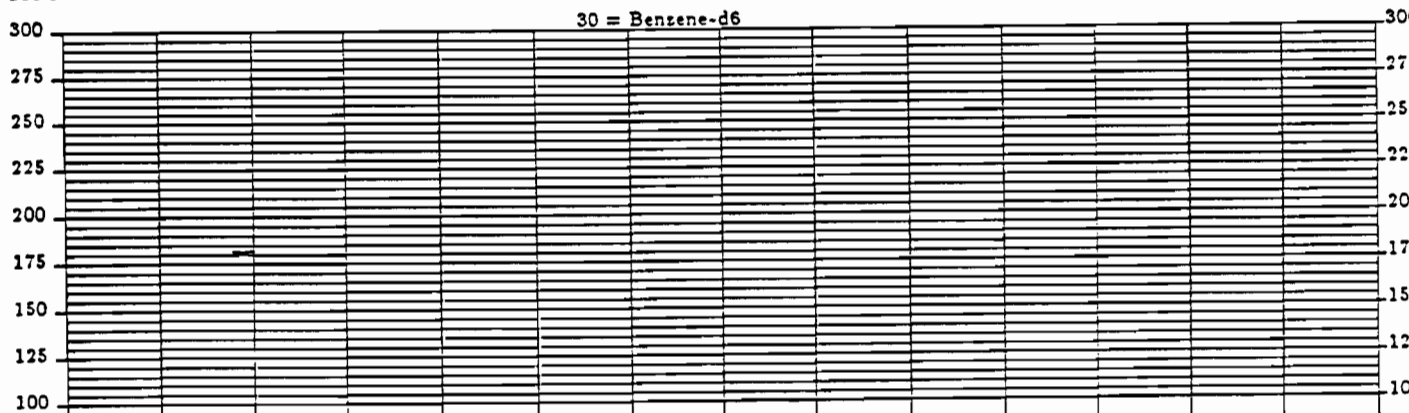
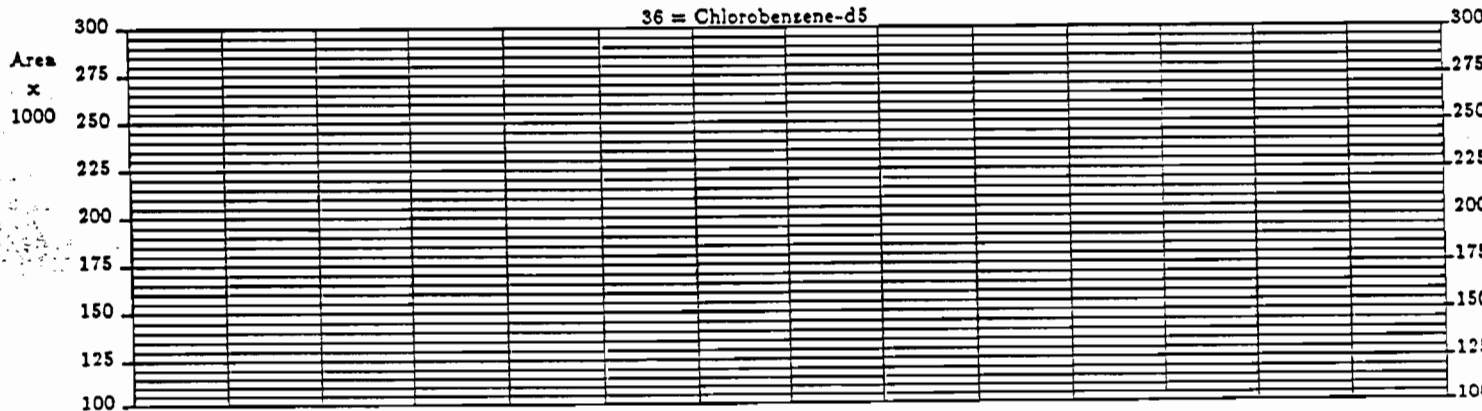
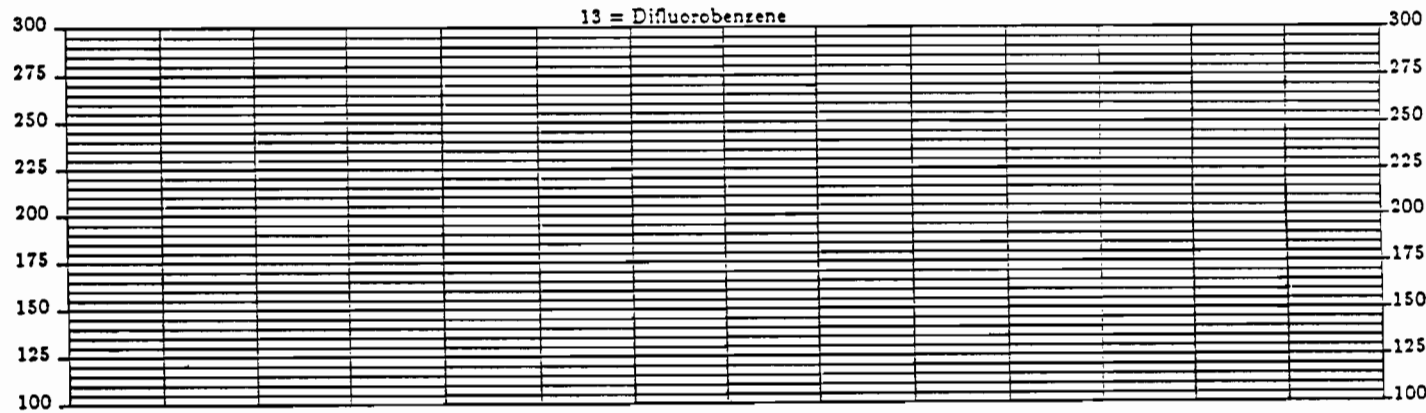
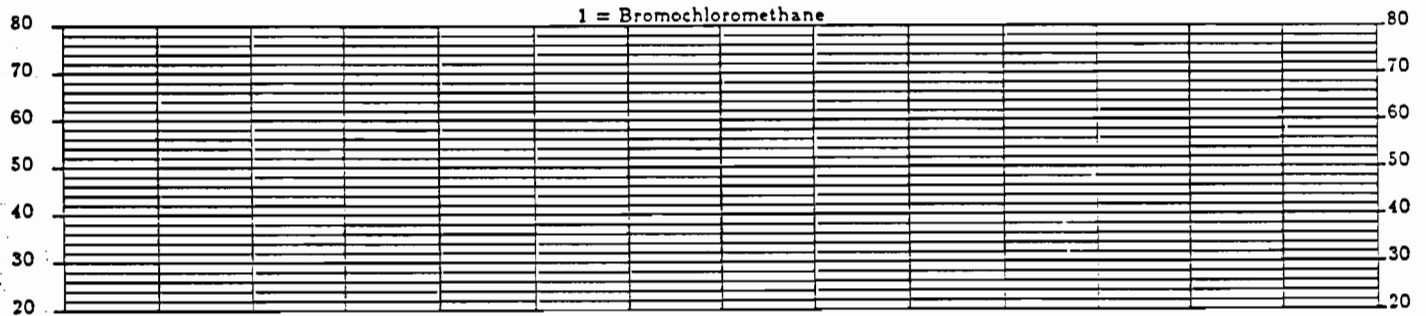
VO Internal Standard Area Plot

Instrument ID: _____

Client: _____

Acquisition Date(s): _____

IS	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT	RT
1															
13															
36															
30															



File
Time =>

Figure F.2 (continued)

typically sterile phosphate rinse buffer. The positive control consists of the use of a target bacteria for the specified test, such as Esterichia coli, Salmonella spp., or Enterobacter sp., which are routinely maintained in the laboratory. Positive contols are diluted to an appropriate concentration and are carried through the entire analysis to insure that cultural conditions are maintained. If the results of the negative or positive control samples indicate contamination or cultural problems, then all affected samples will be resampled and reanalyzed.

F.7.2 Bioassay Standards

The sensitivity of the lineages of all test organisms used in the bioassay studies are routinely evaluated using reference toxicants obtained from USEPA Quality Assurance Program and/or internal toxicant standards. Test organism sensitivites are compared to specified tolerances. Control limits are calculated as outlined in Section F.2.1 of this QAPP. Fresh and saltwater test organisms cultured in our laboratory are maintained under the recommended environmental conditions and monitored daily by laboratory personnel.

In accordance with bioassay method protocols, each test concentration and control samples are analyzed in replicate. A control sample consisting of the dilution water used in the bioassay are analyzed with every test series. If the response of the control test organisms are outside control limits, the test conditions are scrutinized for out-of-control situations. The response of the control test organisms and the test conditions are reported with each bioassay. The interpretation of the response and test conditions may influence the final report. If the test is judged by the Biological Laboratory Director as unacceptable due to organism response and/or laboratory conditions, the test results will be rejected and a new sample analyzed.

F.8 Software Quality Control

Aquatec's Technical Support Division develops software for data reduction and reporting for the Analytical Laboratory Division. These programs are requested and specified by the laboratory in terms of valid assumptions, calculations, and presentation of data. All software requests are presented to the Laboratory Director who will evaluate the request in terms of applicability and pass it on to Technical Support personnel. After the programs are developed but before they are put into general use by the laboratory, they are checked and approved by a laboratory representative. Once the programs have been approved, they are introduced to the laboratory personnel and the appropriate SOPs are updated to reflect changes in procedures for an analytical method. Record of all software requests, developments, improvements, and approvals are filed in the project files.

F.9 Audits

F.9.1 Audits from Regulatory Agencies

As a participant in state and federal certification programs, the laboratory sections at Aquatec are audited by representatives of the regulatory agency issuing certification. Audits are usually conducted on an annual basis and focus on laboratory conformance to the specific program protocols for which the lab is seeking certification. The auditor reviews sample handling and tracking documentation, analytical methodologies, analytical supportive documentation, and final reports. The audit findings are formally documented and submitted to the laboratory for corrective action.

F.9.2 Internal Audits

All laboratory sections of the Chemistry Division at Aquatec are required to participate in semi-annual internal audits which are administered by the Quality Assurance Officer. The findings of these audits are formally documented and submitted to the Laboratory Director and to corporate management. The Laboratory Director will

have the responsibility for resolving points at issue or for effecting necessary changes to the laboratory's practices.

The audit program will focus on the following areas:

1. Maintenance of acceptable and complete SOP's in company format.
2. Maintenance of training records.
3. Maintenance of notebooks.
4. Maintenance of instrument records.
5. Evaluation of standards control records.
6. Evaluation of sample handling procedures.
7. Evaluation of data handling and storage procedures.

F.10 Corrective Action

When deficiencies or out-of-control situations exist, the Quality Assurance Program provides a means of detecting and correcting these situations. Samples analyzed during out-of-control situations are reanalyzed prior to reporting of results. There are several levels of out-of-control situations that may occur in the laboratory during analysis.

F.10.1 Bench Level

Corrective action procedures are often handled at the bench level. If an analyst finds a nonlinear response during calibration of an instrument, then the instrument is recalibrated before sample analysis commences. The problem is often corrected by a careful examination of the preparation or extraction procedure, spike and calibration mixes, or instrument sensitivity. If the problem persists, it is brought to the management level.

F.10.2 Management Level

If resolution at the bench level was not achieved or a deficiency is detected after the data has left the bench level, then corrective action becomes the responsibility of the Laboratory Section Head or Laboratory Director. Unacceptable matrix or surrogate spike recoveries detected by data review are reported to the Laboratory

Section Head. A decision to reanalyze the sample or report the results is made depending on the circumstances. Documentation procedures for sample reanalysis are initiated at this point if necessary.

F.10.3 Receiving Level

If discrepancies exist in either the documentation of a sample or its container, a decision must be made after consulting with the appropriate management personnel. All decisions will be fully documented. Some examples of container discrepancies are broken samples, inappropriate containers, or improper preservation. In these cases, corrective action involves the Project Director contacting the client to resolve the problems.

F.10.4 Statistical Events

This type of corrective action can only be monitored if control charts are kept for an analyte. An out-of-control situation is defined as data exceeding control limits, unacceptable trends detected in the charts, or unusual changes in the instrument detection limits. When these situations arise, it is brought to the attention of the Laboratory Director who will initiate corrective action.

F.10.5 Audit Response

The laboratory is required to respond with corrective action to the audit findings and recommendations of the regulatory agencies before certification for a particular program can be granted. If a recommendation is related to document format (for example, laboratory name is absent from a preprinted benchsheet), then the laboratory personnel will revise the document format and a copy of the revised document format will be submitted to the appropriate representatives of the regulatory agency. If a recommendation is related to an actual procedure (for example, error correction), then the recommendation will be communicated to the laboratory personnel informing them of the correct procedure and a record of this communication will be submitted to the appropriate representatives of the regulatory agency. If a recommendation is related to the written procedures (for example,

written SOPs), then the laboratory personnel will revise the written SOPs and a copy of the new SOPs will be submitted to the appropriate representatives of the regulatory agency. The Laboratory Quality Assurance Officer will conduct a follow-up audit to verify that corrective action has been implemented within one to two weeks of the audit report. Observations made during this follow-up audit will be submitted to the appropriate representatives of the regulatory agency.

F.11 Interlaboratory Testing

The analytical laboratory participates in the EPA inter-laboratory performance evaluation program for water (WS) and wastewater (WP) in addition to evaluations conducted by the states of Vermont and New York. The analytical laboratory also participates in the inorganic and organic quarterly performance evaluations conducted by the EPA. Employee performances are annually evaluated. In some cases, extenuating circumstances will require more frequent evaluations.

F.12 Inventory Procedures

Purchasing guidelines for all equipment and reagents effecting data quality are well defined and documented in the sectional SOPs. Similarly, performance specifications are documented for all items of equipment having an effect on data quality. Any item critical to the analysis, an in situ instrument or reagent, received and accepted by the organization is documented. This includes type, age, and acceptance status of the item. Reagents are dated upon receipt to establish their order of use and to minimize the possibility of exceeding their shelf life.

Requests for equipment affecting the quality of analytical data will be submitted in writing to the Laboratory Director for technical approval. After approval, the requisition will be submitted to the company president for purchase approval.

G. DATA VALIDATION AND REPORTING

Each laboratory section provides extensive data validation prior to reporting results to the client. In general, there are three levels of review as outlined below. For a complete description of validation steps and processes, refer to the sectional SOPs or to the Analytical Laboratories SOP.

The analyst is responsible for primary review of data generated from sample analysis. If recoveries of all quality control samples are within specified tolerances, then the data are presented to data review groups for secondary review. If recoveries of any quality control samples exceed specified tolerances, then affected samples are reanalyzed.

Secondary review is conducted by data review groups to determine if analytical results are acceptable. If recoveries of all quality control samples are within specified tolerances, then the data are presented to Project Directors for final review. If recoveries of any quality control samples exceed specified tolerances, then affected samples are submitted for reanalysis.

Project Directors determine if all analytical results of a sample(s) are consistent. If so, then the data are presented in a final report to the client. If discrepancies or deficiencies exist in the analytical results, then corrective action is taken. Audits of final reports by the Quality Assurance Officer will be conducted to determine the precision, accuracy, completeness, and representativeness of sample analyses.

After all analytical data has been reviewed, the final report can be assembled for submission to the client. Aquatec offers five levels for reporting analytical results based on Data Quality Objectives (D.Q.O.). Level I data consists of measurements taken during field analysis.

Level II data requires a specified degree of confidence in the compound identification and quantitation. Compound identification specificity can range from group identification to single compound identification. Level II reporting consists of an analytical report with internal quality control results retained at Aquatec.

Level III data requires a high degree of confidence in the compound identification and quantification, but not necessarily to the standards of level IV. This degree of confidence is achieved by examination of the raw laboratory data and the use of applicable laboratory QA/QC requirements. The frequency of QA/QC checks and standardizations are less than for level IV analysis. Level III reporting consists of an analytical report with some internal quality control results reported; these include reference standards and method blanks.

Level IV data requires the highest degree of confidence in the compound identification and quantitation. Level IV is defined by the QA/QC supporting material which is provided by a CLP Regular Analytical Services Request. The high degree of confidence in the data are achieved by a thorough examination of the raw laboratory data and strict laboratory QA/QC controls. These controls include frequent standardization, spikes, duplicates, blanks, and strict compound identification criteria.

Level V data has unique requirements in either compound identification, quantitation, detection limits, cleanup or QA/QC requirements. Level V analytical procedures are defined through the use of Special Analytical Services (SAS) requests for CLP. The procedures and QA/QC are specified through these requests. The QA/QC for Level V data usually requires frequent standardization, spikes, duplicates, blanks, and strict compound identification criteria.

There are five (5) general sections to any CLP data package. Sections may be added or deleted depending on the scope of work.

Section 1 - Narrative

The information contained in the narrative consists of (a) client name and address; (b) cross reference to Aquatec's ETR #; (c) date of receipt of samples; (d) cross reference of Aquatec's lab number to clients sample ID; (e) a discussion of the analytical work.

Section 2 - Analytical Results

The results of all analyses will be contained in this section including any external quality control as specified by contractual obligations.

Section 3 - Supportive Documentation

This section contains any printouts, chromatograms, and raw data generated from the analyses.

Section 4 - Sample Preparation

Extraction sheets, digestion sheets, % solids, logbook pages, and runlog pages are found in this section.

Section 5 - Sample Handling

All documentation accompanying samples such as sample receipt sheets, internal Chain-of-Custody forms, correspondence, and telephone logs.

Once the document is assembled, the sections are distinguished with blue paper with their respective titles. The pages are paginated in numerical order and photocopied. Copy(s) of the documentation are sent to the client, and the original document is retained at Aquatec in storage for a minimum of seven (7) years.

H. SAFETY CONSIDERATIONS

Aquatec has a fundamental responsibility to provide facilities, equipment, maintenance, and an organized program to make necessary improvements to ensure a safe working environment. Unless employees fulfill their responsibilities for laboratory safety, the safety-related features of the facility and established safety programs will be ineffective.

The Aquatec building is equipped with many structural safety features. These include:

- * Fire Alarm System
- * Sprinkler System
- * Exit Signs
- * Emergency Lighting System
- * Fire Extinguishers
- * Laboratory Showers
- * Fire Doors
- * Fire Blankets
- * Fume Hoods

Each employee will be familiar with the location, use, and capabilities of general and specialized safety features associated with their workplace. To protect employees from potential workplace hazards, Aquatec provides and requires the use of certain items of protective equipment. These include safety goggles, protective clothing, gloves, respirators, etc. If employee owned safety equipment is used, these items will be inspected to assure adequacy and conformity to applicable regulations. For a complete description of the types of personal safety equipment available, refer to the Laboratory SOP Section H.6.

Precautions to be taken in the transportation, storage, and use of chemical substances are outlined on Material Safety Data Sheets provided by chemical supply companies. Employees using chemical substances are to become familiar with the Material Safety Data Sheets, especially those pertaining to routinely handled chemicals. These are maintained in a file, available to all employees.

APPENDIX A

Resumes of Key Personnel
Qualifications of Personnel

Resume

JANINE L. BANKS

Sample Management

EDUCATION

Rensselaer Polytechnic Institute, Troy, NY, 1980-1982
Studied Computer Science and Management

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, VT, 1984-Present

PROJECT RELATED EXPERIENCE

1984-Present

Responsible for the logging in of samples, ensuring contractual requirements (for government or private industry contracts) are met through scrutiny of both samples and corresponding documentation.

Responsible for following chain-of-custody procedures and enforcing the in-house custody system.

Responsible for managing a team of sample custodians.

Other responsibilities include the examination of samples for proper preservation and bottles as they arrive for log-in, preserving the integrity of samples while in the laboratory, keeping bottle stocks for the field department, shipping of bottles to clients, proper disposal of remaining samples, and career development of sample custodians.

Resume

JOSEPH K. COMEAU, Ph.D.

Vice President, Chemistry

EDUCATION

B.S., Manhattan College, NY, 1968
(Chemistry)

Ph.D., State University of New York, Buffalo, NY, 1975
(Analytical Chemistry)

PROFESSIONAL ASSOCIATIONS

American Chemical Society

SPECIALIZED TRAINING

Incos Applications Programming, Finnigan Institute, 1985
Infrared Spectroscopy, Perkin Elmer Corporation, 1981
Capillary Chromatography for GC/MS, Finnigan Institute, 1980
Analysis of Priority Pollutants, Finnigan Institute, 1980
Infrared Data Station Operation, Perkin Elmer Corporation, 1981
Miniranger Operation and Electronic Maintenance, Motorola
Government Electronics Division, 1975

Other

General Radiotelephone Operator License, 1987

EMPLOYMENT HISTORY

Aquatec, Inc., South Burlington
Vice President 1985 - Present
Laboratory Director 1976 - 1990
Chemist 1973 - 1976

Vermont Water Resources Laboratory, Montpelier, VT
Chemist 1972 (summer)

Ayerst Laboratories, Rouses Point, NY
Chemist 1965 - 1971 (summers)

RECENT RESPONSIBILITIES AT AQUATEC, INC.

Managerial - Responsible for overall work flow and project direction for a group of fifty scientists and technicians. Duties include goal setting, resource planning, staffing and client contact.

Technical - active in method design and implementation. Responsible for all technical aspects leading to Aquatec's entry into the EPA organic Contract Laboratory Program (CLP) in 1983. Currently involved in consultation on industrial waste treatment, high purity water production, process control and technical insurance matters.

REPRESENTATIVE PUBLICATIONS AND REPORTS

A Study of Organic Levels and General Water Quality in Champlain Water District Water. Prepared for IBM Corporation, 1978.

A Study of the Anodic Behavior of Propane Using Techniques of Electrochemical Mass Spectrometry, Ph.D. Thesis, SUNY at Buffalo, 1975.

Binkerd, R., H.G. Johnston, and J.K. Comeau. Physical Impact Evaluation of the Discharge of Heated Water from the C.P. Crane Generating Station. Prepared for State of Maryland Department of Natural Resources, 1978.

Bruckenstein, S., and J. Comeau. "Electrochemical Mass Spectrometry," Intermediates in Electrochemical Reactions, The chemical Society, Faraday Division 56, 1973.

Chemical Characterization and Treatability Study of Industrial Waste Effluent. Prepared for RCA Corporation, Mountaintop, PA, 1975.

Identification and Quantification of PCB's As Isomer Groups by Gas Chromatography/Electron Capture Detection on Low Level Extracts. Prepared for EPA Region 1, 1986.

James A. Fitzpatrick Nuclear Power Plant Cooling Water System Flow Study. Prepared for the Power Authority of the State of New York, 1975.

Krol, G., G. Boyden, R. Moody, B. Kho, and J. Comeau. "Thin Layer Separation and Detection of Free Estrogens," J. Chromatogr. 61, 1971.

Physical Impact Evaluation of Chalk Point Generating Station's Cooling Water System of the Patuxent River. Prepared for the State of Maryland Department of Natural Resources, 1979.

Proposed Methods for Treatment of Plating Waste Discharge. Prepared for Fairbanks-Morse Weighing Systems, Division of the Colt Industries Operating Corporation, 1974.

The Analysis of Fish for Trace Organic Contaminants Using Liquid Chromatography and Capillary GC/MS. Prepared for the State of Vermont Department of Health, 1981.

The Analysis of Polynuclear Aromatic Hydrocarbons in the Burlington Barge Canal Using Liquid Chromatography and Capillary GC/MS. Prepared for the State of Vermont Department of Health, 1981.

Resume

KAREN R. CHIRGWIN

Quality Assurance Officer

EDUCATION

- M.S. University of Vermont, Burlington, VT, 1988
(Biostatistics)
- B.A. University of Vermont, Burlington, VT, 1985
(Biology)
- B.A. University of Vermont, Burlington, VT, 1985
(Mathematics)

PROFESSIONAL HISTORY

- Aquatec, Inc., South Burlington, VT, 1987-Present
- University of Vermont Department of Mathematics and Statistics,
Burlington, VT, 1986-1988
- Environmental Science, Inc., Middletown, CT, 1986

REPRESENTATIVE EXPERIENCE

1989-Present, Aquatec, Inc.

As Quality Assurance Officer, Ms. Chirgwin is responsible for the continued development and implementation of a Quality Assurance Program for inorganic and organic analyses of environmental samples. Her responsibilities include the preparation and maintenance of the Laboratory Quality Assurance Program Plan (QAPP), conducting audits, participating in and responding to audits from government and regulatory agencies, and monitoring the use of quality controls within the laboratory sections. In addition, Ms. Chirgwin oversees the development, revision, and implementation of standard operating procedures within the laboratory sections. She is also involved with the preparation and review of Quality Assurance Project Plans (QAPjP) and work plans for large environmental projects.

1987-1989, Aquatec, Inc.

As an analytical chemist, Ms. Chirgwin was responsible for the analysis of volatile and semivolatile organic contaminants in environmental samples by GC/MS. Analyses required the use of GC/MS methodologies including EPA 500, 600, SW846, and EPA and New York State Contract Laboratory Protocols (CLP).

1986-1988, University of Vermont

Ms. Chirgwin was a Graduate Teaching Fellow responsible for lecturing, preparing exams, and grading students in introductory level statistics courses.

KAREN R. CHIRGWIN Resume

REPRESENTATIVE EXPERIENCE (continued)

1986, Environmental Science Corp.

Ms. Chirgwin was an analytical chemist responsible for the preparation and analysis of environmental samples for inorganic contaminants using atomic spectroscopy and conventional wet chemistry methods. She developed and implemented a program for total halogen analysis in contaminated oil samples, using the Parr Bomb, for 45-50 samples daily.

Supported the organic chemists by preparing BNA extracts for analysis by GC/MS and setting up autosampler runs for the analysis of PCBs and VOAs in contaminated oil samples by GC.

Resume

PHILIP C. DOWNEY, Ph.D.

Biology Laboratory Director

EDUCATION

B.S. Marietta College, 1975
(Biology)
B.S. University of Michigan, 1975
(Natural Resources; Field of Specialization - Fisheries)
M.S. Louisiana State University, 1978
(Fisheries)
Ph.D. University of Idaho, 1982
(Forestry Wildlife and Range Sciences; Field of
Specialization - Fisheries Resources)

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, VT, 1981-Present
Lecturer, Unity College, Unity, ME, August 1982
Instructor, Washington State University/University of Idaho Summer
Institute, June 1981
Consultant, Sterling H. Nelson and Sons, Inc., 1979

PROFESSIONAL ASSOCIATIONS AND CERTIFICATIONS

Certified Fisheries Scientist (Certification No. 1970)
Phi Sigma Biology Honor Society
American Fisheries Society (AFS)
Bioengineering Section of AFS
Fish Culture Section of AFS
Fish Health Section of AFS
American Society of Limnology and Oceanography
Vermont Subcommittee on Endangered Fishes

SPECIALIZED TRAINING

Hydroacoustic Assessment Techniques, Biosonics, Inc., 1986
Habitat Evaluation Procedures (HEP), Certified, 1984
Hazardous Materials Incident Response Operations (165.5)
SCUBA, NAUI Certified, 1976

REPRESENTATIVE EXPERIENCE

1985-Present

As the director of the biological division, Dr. Downey supervises the environmental, microbiology and toxicity laboratories. Recent fisheries projects have included environmental studies on lake Champlain and investigations of the habitat preferences of the American shad. Dr. Downey was the project director for a fish enhancement study conducted at a number of hydroelectric facilities. Behavioral studies conducted have included Atlantic salmon smolt outmigration with radiotelemetry. Dr. Downey was a fisheries consultant on the State of Vermont's project for locating a new State fish hatchery. His responsibilities

Resume

CONSTANCE C. DUMAS

Microbiologist

EDUCATION

B.S. University of Vermont, 1967

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, VT, 1984-Present

Medical Center Hospital of Vermont, Burlington, VT, 1964-1974

PROFESSIONAL CERTIFICATION

MT (ASCP) #60505

Medical Technologist (American Society of Clinical Pathology), 1967

SPECIALIZED TRAINING

DNA Probe Hybridization-Assay, 1987

REPRESENTATIVE EXPERIENCE

1984-Present

Mrs. Dumas' responsibilities include microbiological analyses of food products, especially in the dairy industry, according to the Bacteriological Analytical Manual (BAM) and drinking water analysis in our State Certified laboratory. Other microbiological analyses include monitoring sewage treatment discharges for permit requirements, developing techniques for identifying autotrophic bacteria and investigation of biodegradation of petroleum products by bacteria. Mrs. Dumas also assisted in developing techniques for the use of epifluorescent microscopy for monitoring ultra-pure water systems. Since 1987, she has been responsible for the maintenance, development and quality control within microbiology.

1970-1974

During this time as a staff technologist in hematology and bacteriology, Mrs. Dumas was involved with daily analytical work, quality control, special coagulation studies and laboratory instruction of new medical technology students.

1967-1969

As a rotating staff technologist, responsibilities included analysis in bacteriology, hematology, chemistry, blood bank, serology and urinalysis in the clinical laboratory of a teaching hospital.

Resume

David H. Hardwick

Chemist

EDUCATION

B.S. University of Vermont, 1977
(Biochemistry)

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, Vermont, 1987 to Present
University of Vermont, Department of Pathology and Psychiatry,
Burlington, Vermont, 1984 to 1987
St. Francis Hospital, Colorado Springs, Colorado, 1981 to 1984
University of Vermont, Department of Pathology and Biochemistry,
Burlington, Vermont 1977 to 1981

PROFESSIONAL ASSOCIATIONS

Member, Alpha Zeta Honorary Society

REPRESENTATIVE EXPERIENCE

1987-Present

Primarily concerned with aqueous, soil, and sludge samples. Responsible for ion chromatography, organic/inorganic carbon analysis, organic halide analysis and a wide variety of spectrophotometric and titrimetric procedures. Safety Officer for section. Acting Manager in absence of Supervisor.

1984-1987

Department of Pathology - Upper Level Technician studying asbestos toxicity. Extensive experience with tissue/organ culture, radioimmunoassays, and enzymatic measurement. Routine use of carcinogens and radioisotopes. Graphics and photographics production.

Department of Psychiatry - Laboratory Administrator and Technologist in lab studying blood platelet activation and differentiation of neuroblastoma hybrid cells. Research responsibilities included tissue culture, drawing human blood donors, monoclonal antibody production, column chromatography and radioimmune procedures. Administration duties related to 4-6 lab personnel and their associated projects, equipment, set-up and maintenance; equipment and supply ordering. Laboratory Photographer.

1981-1984

Processing of all routine and STAT blood chemistry tests, and the drawing of venous and arterial blood specimens. During employment, assumed increased responsibilities for quality control and instrument maintenance. The nature of the work stressed individual precision, accuracy, and organization, while demanding the ability to function as part of a team.

REPRESENTATIVE PUBLICATIONS AND REPORTS (continued)

Diffuser Performance Investigation at Indian Point Nuclear Generating Station. Prepared for Consolidated Edison Company of New York, 1978.

Hydrographic Study of Hawk Inlet using Fluorescence Tracer Techniques. Prepared for Martin Marietta Corporation, 1980.

Operational and Biological Studies. Prepared for Vermont Yankee Nuclear Power Corporation, 1983.

Physical Impact Evaluation of Chalk Point Generating Station's Cooling Water System of the Patuxent River. Prepared for the State of Maryland Department of Natural Resources, 1979.

Turbine Discharge Determination, Sawmill Station. Prepared for James River Corporation, 1981.

Turbine Discharge Determination, Shawmut Station. Prepared for Central Maine Power Company, 1982.

Resume

PAULINE T. MALIK

Chemist

EDUCATION

B.A. State University of New York at Buffalo, Buffalo, NY, 1982
(Chemistry)
Ph.D. University of Vermont, Burlington, VT, expected 1991
(Inorganic Chemistry)

PROFESSIONAL ASSOCIATIONS

American Chemical Society
Women in Science

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, VT, 1988-Present
University of Vermont, Burlington, VT, 1982-1987
State University of New York at Buffalo, Buffalo, NY, 1981-1982

PROJECT RELATED EXPERIENCE

1989-Present, Aquatec, Inc.

Ms. Malik is a customer service representative which includes communicating information to clients concerning sample handling, applicability of EPA methodologies, relaying their needs to the laboratory personnel, and interpreting results when requested. At the same time Ms. Malik also manages and supervises small environmental projects. As needed, Ms. Malik is responsible for soliciting Aquatec's services to environmental consulting and engineering firms. She is also responsible for responding to RFP/RFQ's requiring technical expertise.

From September 1989 to April 1990, Ms. Malik became a full time project director for Stone & Webster Engineering Corporation who was conducting a multi-site investigation for New York City Department of Environmental Conservation. The scope of work consisted of receiving approximately 500 samples over a six week period for the full Target Compound List plus a number of additional conventional parameters. Duties included supervising large shipments of lab packs, daily inspection of samples arriving at Aquatec, communication with the client and final publication of data packages. Due to the large scope of work, Ms. Malik provided support in primary data review for both the volatile organics and metals laboratories. She additionally supported the metals instrumental laboratory by operating one of Aquatec's Inductively Coupled Plasma Spectrophotometer (ICP).

PROJECT RELATED EXPERIENCE (continued)

1982-1987, University of Vermont

Ms. Malik was a Graduate Teaching Assistant responsible for instructing the advanced freshman inorganic chemistry laboratory.

1981-1982, State University of New York at Buffalo

Ms. Malik was an Undergraduate Research Assistant synthesizing organometallic compounds with subsequent kinetic studies.

Resume

R. MASON McNEER, Ph.D.

Senior Chemist

EDUCATION

B.S. University of Chicago, 1948
Ph.D. University of Chicago, 1952

PROFESSIONAL ASSOCIATIONS

American Chemical Society
Phi Beta Kappa
The Society of the Sigma Xi

PROFESSIONAL HISTORY

Summers, 1970-1973; Full time, 1974-Present
Aquatec, Inc., South Burlington, VT, Chemist

Summers, 1968-1970
Biological Division, Webster-Martin, Inc., South Burlington, VT,
Chemist

Summers, 1952-1967
Department of Water Resources, State of Vermont, Chemist

1951-1974, Professor, 1965-1974
Department of Chemistry, Norwich University, Northfield, VT,

REPRESENTATIVE EXPERIENCE

1974-Present

Evaluation of analytical work performed for clients in private industry. Including the detailed review of analytical data produced by the organic and inorganic laboratories.

Technical resource for the laboratory in the fields of organic and inorganic analytical chemistry.

Provides consultation to clients in private industry in applying various methods of chemical analysis and in interpreting analytical results.

1974-1983

Project Director, Ecological Studies, Vermont Yankee Nuclear Power Station, Vernon, Vermont.

Resume

JOSEPH J. ORSINI JR., Ph.D.

Metals Laboratory Section Head

EDUCATION

- Ph.D. University of Vermont, 1989
(Analytical Chemistry)
- B.A. Plattsburgh College of Arts and Science, State University
of New York, 1982
(Chemistry)

PROFESSIONAL ORGANIZATIONS

American Chemical Society, Division of Inorganic Chemistry
Analytical Chemistry, and Industrial and Engineering Chemistry
Green Mountain Section of American Chemical Society

EDUCATIONAL TRAINING

9/82 to 9/88 - University of Vermont, Burlington, Vermont.
Candidate for Dr. of Philosophy under Professor William E. Geiger.
Specializing in the electrochemistry of organometallic rhodium,
palladium and manganese compounds. Included speciation studies of
rhodium hydrogenation catalysts via high speed cyclic
voltammetry.

9/79 to 5/80, summers 1980, 1981 and 1982. Plattsburgh College of
Arts and Science, Plattsburgh, New York. Studied mixed-valence
benzotriazolato copper clusters using electron paramagnetic
resonance spectroscopy.

REPRESENTATIVE EXPERIENCE

1988-Present

Trace Metals Analysis Laboratory Section Head responsibilities
include personnel management, ICP analysis and development for ICP,
furnace and cold vapor analyses. Recently developed ICP hydride
methodologies for the analysis of arsenic and selenium in difficult
matrices.

1982-1988 - Ph.D. Candidate at the University of Vermont
Expertise in modern electroanalytical techniques including voltammet-
ric and coulometric methods.

Synthesis of organometallic, inorganic and organic compounds.

Experienced with nuclear magnetic resonance spectroscopy including use
of fourier transform instruments to study various nuclei in static and
dynamic environments.

Use and interpretation of mass spectral data.

Strong background in manipulations of air sensitive materials by
schlenk and vacuum line techniques.

REPRESENTATIVE EXPERIENCE (Continued)

Spectroscopic techniques including electron paramagnetic resonance, ultraviolet, visible and infrared spectroscopy.

Utilized gas chromatography in the analysis of organics from organo-metallic decomposition reactions.

Working knowledge of computerized data analysis and simulations of cyclic voltammograms and nuclear magnetic resonance spectra.

PUBLICATIONS

"Two-Dimensional Dynamic Jahn-Teller Effects in a Mixed-Valence Benzotriazolato Copper Cluster, $\text{Cu}_5(\text{BTA})_6(\text{RNC})_4$," Kokoszka, G.F.; Baranowski, J.; Goldstein, C.; Orsini, J.; Mighell, A.D.; Himes, V.L.; and Siedle, A.R. J. Am. Chem. Soc. 1983, 105, 5627.

"ESR Spectra of New Dicopper (II) Complexes of Novel Binucleating Ligands, Karlin, K.D.; Cruse, R.M.; Kokoszka, G.F.; and Orsini, J.J. Inorg. Chim. Acta 1982, 66, L57.

RELATED EMPLOYMENT

9/82 to 9/88: Teaching Assistantship at University of Vermont.

9/81 to 5/82: Teaching Assistantship at Plattsburgh State College, Plattsburgh, New York.

Summers of 1980, 1981 and 1982: Undergraduate Research Assistant with professor Gerald F. Kokoszka, Plattsburgh, New York.

Resume

MARTHA E. ROY

Project Director

EDUCATION

B.A. St. Michael's College, Winooski, Vermont, 1983
(Biology)

M.S. University of Vermont, Burlington, Vermont, 1985
(Limnology)

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, VT, 1985-Present

University of Vermont, Burlington, Vermont, 1983-1985

St. Michael's College, Winooski, Vermont, 1981-1982

REPRESENTATIVE EXPERIENCE

1988-Present

Project Director of four EPA and Superfund affiliated projects. Responsibilities include client contact, initiation of required analysis, and coordination of results and supportive documentation into a data package for the client. Also responsible for maintaining Aquatec's laboratory certifications.

1985-1988

As a QA/QC Assistant, primarily responsible for the review of inorganic data generated at Aquatec. Other duties included some review of GC and GC/MS data, communicating with clients, organizing final client reports, and supervising two large government contracts.

1983-1985

During this time period worked at the University of Vermont as a laboratory instructor and research technician. Duties included teaching laboratory sessions, supervising work study students, collecting water and benthic samples as part of an acid rain study, and doing extensive data analysis on the information gathered.

Resume

ANGELA d. SHAMBAUGH

Biologist

EDUCATION

B.A. University of Montana, 1982
(Botany/German)
M.A. University of Montana, 1989
(Botany with emphasis on Phycology)

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, VT, 1986-Present
University of Montana Biological Station, Flathead Lake, MT.
1985-1986
University of Montana Botany Department, Missoula, MT 1983-1985

PROFESSIONAL ASSOCIATIONS AND CERTIFICATIONS

Fulbright Scholarship Recipient, August 1982 to September 1983,
Universitaet Regensburg, Federal Republic of Germany
Phycological Society of America

REPRESENTATIVE EXPERIENCE

1986-Present

The biology section conducts evaluations of a variety of water bodies and biological communities ranging from bacteria to fish. Ms. Shambaugh's responsibilities reflect this varied format, with primary responsibilities being analysis of algae investigation, and serving as Biology Laboratory Coordinator. She evaluates daily laboratory data for precision and completeness. Other responsibilities include designing/conducting experiments utilizing electron microscopy, preparation of otoliths for age analysis for light microscopy, microbiological water testing, biotoxicity testing, field sample collection, and report generation.

1983-1989

Ms. Shambaugh's master thesis focused on the relationships among individual benthic algae in a nutrient-limited environment. The spatial aspects of this community were evaluated using scanning electron microscopy and light microscopy. Development and growth of the benthic community were followed from bare substrate to maturity, identifying individual species and their role in community architecture.

1985-1986

As a research assistant at the University of Montana Biological Station, Ms. Shambaugh identified and enumerated phytoplankton samples from Flathead Lake. Other responsibilities included collection of monthly field samples (including zooplankton, water quality,

REPRESENTATIVE EXPERIENCE (continued)

chlorophyll and carbon-14 photosynthesis samples); preparation of chlorophyll and C₁₄ samples for analysis, preparation of P₃₂ samples for scintillation analysis, and production of report summaries for publication purposes.

1983-1985

Botanical teaching assistant responsibilities during this period included development of laboratory classes for undergraduate students in plant physiology, general biology, and phycology.

1982-1983

As a Fulbright Scholarship recipient in the Federal Republic of Germany, Ms. Shambaugh was employed in the electron microscopy laboratory, Universitaet Regensburg Biology Department. Her responsibilities included specimen preparation and operation of transmission and scanning electron microscopes.

Resume

GEORGE W. STARBUCK

President

EDUCATION

B.A. University of Vermont, 1962
(Biology and Chemistry)

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, VT, 1970-Present
President and Chairman of Board of Directors
Webster-Martin, Inc., South Burlington, VT
Aquatic Biologist and Director of Water Quality Division,
1965-1968; Chief Executive Officer, 1968-1970; Vice President
and Corporate Director, 1970-1975
Vermont Department of Water Resources, Montpelier, VT, 1962-1965
Aquatic Biologist

SPECIALIZED TRAINING

Thermal Pollution and Thermal Addition to the Marine Environment
M.I.T. summer session on Engineering of Heat Disposal from Power
Generation, 1972
Biological Aspects of Thermal Pollution - U.S. Public Health
Service, 1966
Graduate studies in Biology, University of Vermont, 1965-1966
Bio-assay and Pollution Ecology - U.S. Public Health Service, 1965

PUBLIC SERVICE EXPERIENCE

Corporator and Advisory Council, Bank of Vermont, 1982-1986
Chairman, American Diabetes Association, Vermont Affiliate,
1986-1987; Vice Chairman, 1984-1986
Member, Water Resources Research Council, University of Vermont,
1980-1984
Committee Member, Vermont D.U., 1977-1978
Trustee, Village of Essex Junction, VT, 1974-1977
Member, New England Regional Commission, Committee on Aquaculture,
1967-1969

REPRESENTATIVE EXPERIENCE

1970-Present

Mr. Starbuck organized Aquatec, Inc. in 1970 as a company designed to provide industry and government with a wide range of environmental services. In addition to his administrative responsibilities as President of Aquatec, he is directly involved with project reports and publications of the company. Since Aquatec's inception, Mr. Starbuck

REPRESENTATIVE EXPERIENCE (continued)

has directed the company to keep pace with National Environmental issues. He has supervised and provided consulting services for industry, local, state and federal governmental agencies and private developers. He is active in the environmental permit process and current issues such as EPA Superfund and priority pollutant surveys and analysis.

1965-1970

An environmental division at Webster-Martin was established by Mr. Starbuck and he was responsible for conducting biological surveys, water quality analyses, weed and algae control projects and related studies. He established and supervised long-term physical, chemical and biological monitoring programs and prepared environmental statements and reports for submission to regulatory agencies. In 1968 Mr. Starbuck established a Hydrographic Studies Division which conducted dye diffusion surveys and bathymetric surveys as well as temperature, salinity and current measurement studies throughout much of the United States.

1962-1965

As an aquatic biologist, Mr. Starbuck conducted baseline environmental studies for classification of Vermont State water and was responsible for collection and identification of aquatic biota, chemical analysis of surface water and wastewater from primary and secondary sewage treatment plants. During this period he studied and designed systems to alleviate aquatic nuisances and conducted baseline biological surveys of Lake Champlain.

Resume

GARY B. STIDSEN

Section Head, Organic Extraction and
Gas Chromatography Laboratories

EDUCATION

B.S. Norwich University, Northfield, VT, 1981
(Environmental Engineering Technology)

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, VT, 1982-Present

SPECIALIZED TRAINING

Finnigan Mat Institute "ITD Data System Operation" Training
Course, 1988
Hewlett Packard High Resolution Capillary Chromatography
School, 1984

REPRESENTATIVE EXPERIENCE

1986-Present

Section Head of the Organic Laboratory including the Extraction Laboratory and the Gas Chromatography Laboratory. Areas of analysis include pesticides/PCBs, base/neutral/acids, herbicides, volatile organic compounds in water, soil, air, and biota samples. Methods of analysis followed are the EPA 500, 600, 800 and NIOSH methods and methods according to protocols set by New York State, EPA Superfund, etc. Responsible for training of personnel, flow of samples through the laboratory and instrument maintenance. Provide technical input for collection of air, soil and water samples designed for organic analysis.

1987-1988

Project: Responsible for the sample preparation of soils for the Love Canal Habitability Study performed by New York State. The object of the project was to compare the concentration of targeted organic compounds from the Emergency Declaration Area around Love Canal to other areas in Niagara Falls and Buffalo, New York.

1985-1986

Project: Responsible for the sample preparation and gas chromatograph analysis for PCBs as Congeners of 1700 water, soil and biota samples from the New Bedford Harbor, Massachusetts area under the EPA Superfund. Work in the Extraction Laboratory included extraction and extensive clean up of the sample extracts. In the Gas Chromatography Laboratory the sample extracts were analyzed for PCBs as Congeners using electron capture detection with low parts per trillion detection limit in the sample extracts.

REPRESENTATIVE EXPERIENCE (continued)

1983-1986

Worked as a chemist in the Extraction Laboratory and the Gas Chromatography Laboratory. In the Extraction Laboratory samples were prepared for organic analysis, including pesticide/PCBs, base/neutral/acids, and herbicides. Analysis performed in the Gas Chromatography Laboratory included pesticide/PCBs, herbicides, base/neutral/acids by GC, and volatile organic compounds.

1982-1983

Worked as a chemist in the Inorganic Laboratory. Analysis performed included COD, BOD, nitrate, nitrite, phosphate, sulfur, pH, turbidity, oil and grease, solids, metals by flame atomic adsorption, formaldehyde, hardness, alkalinity, fluoride, and TOC. Also during this time period collected air samples using the techniques in EPA Method 5, and organic compounds in air using techniques in EPA Method 25.

1982

Worked with the Aquatec Survey Division. Survey experience consisted of building layouts and horizontal control for power lines. Instrumentation used included a one second Theodolite, Kern DM502, and a KNE Range IV for determining distances.

Resume

NEAL E. VAN WYCK

Laboratory Director

EDUCATION

B.A. University of Vermont, 1982
(Chemistry)

M.S. University of Arizona, 1985
(Physical Chemistry)

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, VT, 1985-Present
University of Arizona, Tucson, AZ, 1982 - 1985

SPECIALIZED TRAINING

Waste Testing and Quality Assurance Symposium, EPA, 1988

REPRESENTATIVE EXPERIENCE

1990-Present

Responsible for coordinating the overall activities of the analytical laboratories on a daily basis and providing long-term direction as Aquatec's Laboratory Director. Responsibilities include scheduling analytical work and personnel, developing new methods and technologies, and working with Technical Support to develop procedures to automate the review and reporting of analytical data.

1985-1990

Chemist and Project Director for Environmental Chemical Analysis. Involvement with extensive chemical analysis programs for hazardous waste site characterization, discharge monitoring and delisting petitions. Specific laboratory analysis responsibilities have included the supervision of the Analytical Atomic Spectroscopy Group and the development of Inductively Coupled Plasma Emission Spectrometry for trace metals determination.

1982-1985

Research and Teaching Assistant in the University of Arizona Department of Chemistry. Teaching responsibilities included preparation of lectures and supervision over general and advanced physical chemistry laboratory sections. Research activities centered about nonlinear optical investigations of thin films and surfaces. Various multi-photon techniques were explored and developed. They are surface coherent Anti-Stokes Raman Spectroscopy, Surface Second Harmonic Generation Spectroscopy and Two Photon Spectroscopy in Film Organic Optical Waveguides.

Resume

KIM BRYANT WATSON

Project Director

EDUCATION

B.S. cum laude, Norwich University, 1981
(Environmental Engineering Technology)

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, Vermont, 1982-present
Project Director, Environmental Engineering Technologist,
Quality Control Specialist
Vermont Agency of Environmental Conservation, 1981-1982
Air and Solid Waste Technician

PROFESSIONAL ASSOCIATIONS AND CERTIFICATIONS

Norwich University Engineering Society
President and co-founder of Chi Beta Chapter of Tau Alpha Phi

REPRESENTATIVE EXPERIENCE

1988-Present

Project Director of Superfund and government contracts, final review and publication of USEPA Superfund data package submittals. USEPA Special Analytical Service Solicitations Contact.

1987-1988

LCIC Habitability Study; responsible for daily electronic upload of GC/MS analytical data to project bulletin board. Responsible for review and final-publication of analytical data.

1986-1987

PCB study, New Bedford, MA. Performed review and quality control of GC/MS analysis for the development of analytical procedures published in "Application of a Mixed-Method Analytical Scheme for Analysis of PCB in Water and Sediment Samples from a Polluted Estuary," Richard A. McGrath, William Steinhauer and Siegfried Stockinger (1987).

1983-1988

Close association with quality control/quality assurance associated with USEPA Superfund projects. Co-author of Analytical Laboratory Standard Operating Procedures Sections on QA/QC.

1982-1983

Extraction Lab Technician

REPRESENTATIVE EXPERIENCE (continued)

1981-1982

Environmental Engineering design of solid waste disposal facilities for the State of Vermont Solid Waste Program. Assistant author of State Certifications of Solid Waste facilities. Performed water quality monitoring at the majority of the solid waste facilities in the State of Vermont.

Resume

JOHN W. WILLIAMS

Toxicity Laboratory Section Head

EDUCATION

B.S. University of Massachusetts, 1968
(Marine Fisheries Biology)

Graduate-level courses completed:

Harvard University, 1984-1985

(Biochemistry, Molecular Biology)

Boston University, 1983

(Statistics for the Biological Sciences)

Southeastern Massachusetts University, 1976

(Estuarine Ecology)

PROFESSIONAL HISTORY

Aquatec, Inc., South Burlington, VT, 1990-Present

Cosper Environmental Services, Northport, NY, 1989-1990

Battelle Ocean Sciences, Duxbury, MA, 1975-1989

PROFESSIONAL ASSOCIATIONS

Society of Environmental Toxicologist and Chemists (co-author on
several research papers)

National Association of Underwater Instructors

SPECIALIZED TRAINING

Solid-phase Sediment Tests (USCOE), Sludge Tests (EPA), Drilling
Fluid Tests.

Supervised and conducted GLP (Good Laboratory Practices) and
non-GLP toxicity studies using dosing and flow-through
systems.

Supervised organism culture facility (species: Mysidopsis bahnia,
Cyprinodon variegatus, Menidia beryllina, Arbacia punctulate,
Champia parvula).

Operated research vessels to 42'.

Supervised SCUBA operations, NAUI certified instructor.

REPRESENTATIVE EXPERIENCE

1990-Present

Mr. Williams supervises the toxicity testing laboratory personnel.
Responsibilities include scheduling testing, QA/QC procedures and
analysis of samples with marine and fresh water organisms.

REPRESENTATIVE EXPERIENCE (continued)

1989-1990

Managed operation of an aquatic toxicity testing and consulting laboratory located on Long Island in Northport, New York. Work focused on NPDES biomonitoring, both marine and freshwater.

Resume

KIRK F. YOUNG

QC Supervisor

EDUCATION

Virginia Military Institute, Lexington, VA, 1969 to 1970
B.S. Lehigh University, Bethlehem, PA, 1970 to 1973
(Civil Engineering)

PROFESSIONAL CERTIFICATION

Currently certified as a Professional Engineer in the Commonwealth of Virginia and the State of Vermont.

REPRESENTATIVE EXPERIENCE

1981-Present

Aquatec, Inc., South Burlington, VT

Performance of industrial wastewater treatability studies and design of hazardous waste treatment and disposal processes.

Daily administration of the laboratory's work within U.S. Environmental Protection Agency's Contract Laboratory Program from 1983 to 1988. The position was one of coordinating related laboratory activities as well as directing the effort of detailed review, validation and publication of the analytical data. During this period, the laboratory participated extensively in special analytical services work in support of EPA regional needs and national program development.

Current participation in the operational aspects of the laboratory, with a focus on detailed project planning and the implementation of specialized project work. In addition to this, is the responsibility for directing the effort of detailed review, validation and publication of analytical data from the GC/MS laboratory and directing activities associated with data validation services.

1978-1981

Donald L. Hamlin, Consulting Engineers, Inc., Essex Junction, VT, Professional Engineer

Project Engineer for the design and construction of municipal wastewater treatment facilities, with experience in the design of secondary and advanced treatment processes, site planning, and construction supervision.

1974-1978

Commonwealth of Virginia/Northern Regional Office of the State Water Control Board, Engineer

Shared responsibility for conducting engineering inspections and reviewing plans and specifications of municipal and industrial wastewater treatment facilities throughout the time of employment.

REPRESENTATIVE EXPERIENCE (continued)

Coordination for the industrial wastewater program within the region which, in addition to regulatory duties, included the responsibility for engineering review of industrial waste treatment proposals.

Administration of the Construction Grants Program established under Public Law 92-500, involving Virginia municipalities within the Washington, D.C. metropolitan area. This work included new facilities planning, review of treatment designs, and the allocation of grant funds.

Aquatec, Inc. - LABORATORY PERSONNEL

Date: November 1990

FULL NAME	TITLE	HIGHEST DEGREE				AREA OF STUDY		Primary * DUTIES						Primary ** WORK AREA				YRS. EXP.	TYPE *** EXP.								
		HS	AA	BS	MS	PhD	Major	Minor	A	B	C	D	E	F	1	2	3		4	U	H	I	P				
Joseph K. Comeau	VP-Chemistry					X	Analytical Chemistry		X						X		X		24								X
R. Mason McNeer	Sr. Chemist					X	Organic Chemistry	Math		X					X		X		38					X			X
Neal E. Van Wyck	Chemistry Lab Director				X		Physical Chemistry		X							X	X		4								X
Kirk F. Young	QC Supervisor			X			Civil Eng.		X	X						X	X		15								X
Joseph Edwin	Chemist					X	Chemistry		X								X		14				X				X
Richard T. Gomez	Chemist				X		Bio-chemistry	Cell Biology						X	X		X		15					X	X		X
Karen R. Chirgwin	QA Officer				X		Bio-statistics		X	X					X	X			4								X
Gary B. Stidsen	GC Section Head			X			Env. Eng. Technology		X	X							X		8								X
Nicholas C. Santo	Chemist			X			Chemistry			X						X			15								X
Joseph J. Orsini	Metals Section Head					X	Chemistry		X	X					X				2								X
Pauline T. Malik	Chemist					X	Chemistry			X					X	X	X		2								X
Martha E. Roy	Chemist				X		Limnology		X	X						X	X		4								X
Philip C. Downey	Bio. Lab Director					X	Fisheries		X						X		X		11								X
Angela d. Shambaugh	Biologist				X		Botany	German		X							X		3								X
Richard A Evans	Biologist				X		Aquatic Science	Statistics		X								X	2				X				X
Kim B. Watson	Chemist			X			Env. Eng Technology		X							X	X		7				X				X
Bennye A. Ames	Chemist			X			Env. Eng. Technology			X							X		10				X				X

* = DUTIES

** = WORK AREA

*** = TYPE EXPERIENCE

A. Supervisor
B. Data Analysis
C. Analyst

D. Lab. Assistant
E. Project Manager
F. Other

1. Inorganics
2. Microbiology

3. Organics
4. Biology

U. University/Government Lab.
H. Hospital

I. Industry
P. Private Lab.

(September '89)

Aquatec, Inc. - LABORATORY PERSONNEL

Date: November 1990

FULL NAME	TITLE	HIGHEST DEGREE					AREA OF STUDY		Primary * DUTIES						Primary ** WORK AREA				YRS. EXP.	TYPE *** EXP.			
		HS	AA	BS	MS	PhD	Major	Minor	A	B	C	D	E	F	1	2	3	4		U	H	I	P
Jeffery J. Rusik	Chemist			X			Agriculture			X					X				10	X			X
Kathleen R. O'Hara	Chemist			X			Env. Science			X					X				9				X
David H. Hardwick	Wet Chem. Section Head			X			Bio-chemistry		X	X					X				12	X			X
Kristine L. Aubin	Chemist			X			BIO-chemistry		X						X				3				X
Kelly A. Thompson	Chemist			X			Chemistry			X							X		5				X
Janet A. Morton	Chemist			X			Biology	Chemistry	X								X		4	X			X
Bryce E. Stearns	Chemist			X			Env. Science			X							X		6	X			X
James C. Vose	Chemist			X			Chemistry			X							X		13			X	X
David L. Banks	Programmer			X			Computer Science		X								X		6				X
William R. DesJardins	Chemist			X			Biology			X							X		10				X
Jon P. Wilkinson	Chemist			X			Env. Engineering			X							X		4				X
Bradley W. Chirgwin	Chemist			X			Biochemistry			X							X		2				X
Michael R. Veilleux	Chemist			X			Ecology			X							X		2				X
Caroline I. Camara	Chemist			X			Biochemistry		X	X							X		2				X
Cindy M. Petersen	Chemist			X			Biology			X							X		4				X
James W. Madison	Chemist			X			Geology	Env. Sci.		X							X		4				X
Jeff S. Tanguay	Chemist			X			Env. Studies			X							X		3				X

* = DUTIES ** = WORK AREA *** = TYPE EXPERIENCE

A. Supervisor D. Lab. Assistant 1. Inorganics U. University/Government Lab. I. Industry

B. Data Analysis E. Project Manager 2. Microbiology H. Hospital P. Private Lab.

C. Analyst F. Other 3. Organics 4. Biology

(September '89)

Aquatec, Inc. - LABORATORY PERSONNEL

Date: November 1990

FULL NAME	TITLE	HIGHEST DEGREE					AREA OF STUDY		Primary * DUTIES						Primary ** WORK AREA				YRS. EXP.	TYPE *** EXP.			
		HS	AA	BS	MS	PhD	Major	Minor	A	B	C	D	E	F	1	2	3	4		U	H	I	P
Mark P. Biercevicz	Technician			X			Natural Res. Conservation			X							X	3				X	
Constance C. Dumas	Biologist			X			Med. Tech.			X						X		15			X	X	
Nicholas R. Staats	Biologist			X			Biology			X							X	4		X		X	
Puy N. Tam	Technician	X					General			X	X							4				X	
Carol M. Sullivan	Chemist			X			Chemistry			X						X		2				X	
Stanley G. Brinkman	Technician	X					General			X						X		4				X	
Vanaja A. Sayala	Technician			X			Chemistry			X					X			3				X	
Maureen R. Henry	Technician	X					General						X	X	X	X		2				X	
Janine L. Banks	Sample Custodian	X					Management		X					X	X	X		5				X	
Frederick P. Cota	Technician	X					General			X					X			2				X	
Richard W. St. Pierre	Technician	X					General			X					X			2				X	
William A. Schmidt	Technician		X				Engineering			X						X		2				X	
David J. Peterson	Chemist			X			Env. Engineering			X						X		2				X	
Denise M. Gregory	Chemist			X			Env. Science			X					X			1				X	
Karol A. Wilson	Chemist			X			Biology		X							X		1				X	
Lisa A. Usher	Chemist			X			Env. Science			X					X			1				X	
Scot P. Swanborn	Chemist			X			Env. Science			X						X		4				X	

* = DUTIES ** = WORK AREA *** = TYPE EXPERIENCE

A. Supervisor D. Lab. Assistant 1. Inorganics U. University/Government Lab. I. Industry

B. Data Analysis E. Project Manager 2. Microbiology H. Hospital P. Private Lab.

C. Analyst F. Other 3. Organics 4. Biology

(September '89)

[illegible]

* = DUTIES	** = WORK AREA	*** = TYPE EXPERIENCE
A. Supervisor	1. Inorganics	U. University/Government Lab.
B. Data Analysis	2. Microbiology	I. Industry
C. Analyst	3. Organics	H. Hospital
	4. Biology	P. Private Lab.

(September '89)

APPENDIX B

Analytical Methodologies

A - Water and Wastewater Analysis

Method	Description
110.2	Color (std. units)
120.1	Conductivity (umhos/cm)
130.2	Total Hardness as CaCO3
150.1	pH (std. units)
160.1	Total Dissolved Solids
160.2	Total Suspended Solids
160.3	Total Solids
160.4	Volatile Total Solids
160.5	Settleable Solids (ml/L)
180.1	Turbidity (NTU)
200	Digestion, ICP, fu Sb
200	Digestion, fu, fl/ICP Ag
200	Digestion, fl
200.7	Silver, Total
200.7	Aluminum, Total
200.7	Arsenic, Total
200.7	Boron, Total
200.7	Barium, Total
200.7	Beryllium, Total
200.7	Calcium, Total
200.7	Cadmium, Total
200.7	Cobalt, Total
200.7	Chromium, Total
200.7	Copper, Total
200.7	Iron, Total
200.7	Potassium, Total
200.7	Lithium, Total
200.7	Magnesium, Total
200.7	Manganese, Total
200.7	Molybdenum, Total
200.7	Sodium, Total
200.7	Nickel, Total
200.7	Lead, Total
200.7	Antimony, Total
200.7	Selenium, Total
200.7	Silicon, Total
200.7	Tin, Total
200.7	Strontium, Total
200.7	Titanium, Total
200.7	Thallium, Total
200.7	Vanadium, Total
200.7	Zinc, Total
202.1	Aluminum, Total
202.2	Aluminum, Total
204.1	Antimony, Total
204.2	Antimony, Total
206.2	Arsenic, Total
208.1	Barium, Total
208.2	Barium, Total
210.1	Beryllium, Total
210.2	Beryllium, Total
213.1	Cadmium, Total
213.2	Cadmium, Total
215.1	Calcium, Total

A - Water and Wastewater Analysis

Method	Description
218.1	Chromium, Total
218.2	Chromium, Total
218.4	Chromium, Hexavalent
220.1	Copper, Total
220.2	Copper, Total
231.1	Gold, Total
231.2	Gold, Total
236.1	Iron, Total
236.2	Iron, Total
239.1	Lead, Total
239.2	Lead, Total
242.1	Magnesium, Total
243.1	Manganese, Total
243.2	Manganese, Total
245.1	Mercury, Total
246.1	Molybdenum, Total
246.2	Molybdenum, Total
249.1	Nickel, Total
249.2	Nickel, Total
258.1	Potassium, Total
270.2	Selenium, Total
272.1	Silver, Total
272.2	Silver, Total
273.1	Sodium, Total
273.2	Sodium, Total
279.1	Thallium, Total
279.2	Thallium, Total
282.1	Tin, Total
282.2	Tin, Total
286.1	Vanadium, Total
286.2	Vanadium, Total
289.1	Zinc, Total
289.2	Zinc, Total
300.0	Ion Chromatography
305.1	Acidity (as CaCO3)
310.1	Alkalinity (as CaCO3)
320.1	Bromide
325.3	Chloride
330.1	Total Residual Chlorine
330.4	Total Residual Chlorine
335.1	Cyanide, Total & Amenable
335.1	Cyanide, Amenable to Cl2
335.2	Cyanide, Total
340.2	Fluoride
350.1	Ammonia-Nitrogen
350.2	Ammonia-Nitrogen
351.3	Total Kjeldahl Nitrogen
353.3	Nitrate/Nitrite Nitrogen
354.1	Nitrite Nitrogen
360.2	Oxygen, Dissolved
365.2	Orthophosphate as P
365.2	Phosphate, Total as P
370.1	Silica, Dissolved
375.4	Sulfate

A - Water and Wastewater Analysis

Method	Description
376.2	Sulfide
377.1	Sulfite
405.1	BOD5
410.1	Chemical Oxygen Demand
413.1	Oil & Grease
415.1	Organic Carbon, Total
418.1	Petroleum Hydrocarbons
420.1	Phenols, Total
420.1	Phenols, Total
425.1	MBAS (mg LAS/L)
450.1	Organic Halides, Total

B - Organic Compounds in Drinking Water

Method	Description
501.1	Trihalomethanes
501.2	Trihalomethanes
502.2	Volatile Organics
503.1	Volatile Aromatics
504	EDB and DBCP
505	Pesticides/PCB's
505	Drinking Water Pesticide
510.1	Trihalomethanes
515	Herbicides
515	Drinking Water Herbicide
524.2	Volatile Organics

C - Organics in Municipal Industrial Wastewater

Method	Description
601	Purgeable Halocarbons
601-602	Purgeable Organics
602	Purgeable Aromatics
603	Acrolein & Acrylonitrile
604	Phenols
606	Phthalate Esters
607	Nitrosamines
608	Pesticides/PCB's
609	Nitroaromatics/Isophoron
610	Polynuclear Aromatics
611	Haloethers
612	Chlorinated Hydrocarbons
613	Dioxin, Screen
614	Organophosphorus Pest.
615	Chlorinated Herbicides
619	Triazine Pesticides
622	Organophosphorus Pest.
624	Volatile Organics
625	Semivolatile Organics
625	Acid Extractables
625	Base/Neutral Extractable
680	Pesticides/PCB's

Method	Description
100262	Chlorophyll a, (ug/l)
1002CIF	Phytoplankton (units/l)
907A	Bacteria, Total (CFU/ml)
907C	Bacteria, Total (CFU/ml)
908A	Coliform, Total (col/100ml)
908C	Coliform, Fecal (col/100ml)
909A	Coliform, Total (col/100ml)
909C	Coliform, Fecal (col/100ml)
910B	Strep., Fecal (col/100ml)
918A	Bact., Iron (qualitative)
918C2	Bact, Iron Prof (col/100ml)
918C2A	Bact, Spha/Lept (col/100ml)
918C2D	Bact, Het. Iron (col/100ml)
9213D	E. Coli (CFU/100ml)
AQBAC1	Coliform, Total (P/A)
AQBAC2	Coliform, Total (CFU/100ml)
BA1	Bioassay F.M. Embryo
BA2	Bioassay F.M. Larval
BA3	Bioassay C-Daphnia Repr.
BA4	Bioassay Daphnia AC. 48
BA5	Bioassay F.M. AC. 48
BAM1	Coliform, Total (CFU/g)
BAM2	Coliform, E. Coli (CFU/g)
BAM3	Bacteria, Total (CFU/g)
BAM4	Salmonella Spp (P/A)
BAM5	Salmonella Spp (P/A)
ISOGRID1	Yeast & Mold, Total (Col/g)
ISOGRID2	Bact., Gram Neg. (CFU/g)
ISOGRID3	Staph. aureus (Col/g)

Method	Description
1010	Ignitability (F)
1110	Corrosivity
1310	EP Tox Extraction(metals
1310	EP Tox Ext.(Pest/Herb)
3005	Digestion, fl/ICP W, D/R
3010	Digestion, fl/ICP W, T
3020	Digestion, fu W,fl/ICP A
3020	Digestion, fu W, As/Se
3040	Dissolution
3050	Digestion, fl/ICP O
3050	Digestion, fu O,fl/ICP A
3510	Sep. Funnel Liq-Liq Ext.
3520	Continuous Liq-Liq-Ext.
3530	Acid-Base Cleanup Ext.
3540	Soxhlet Extraction
3540	Soxhlet Extraction
3550	Sonication Extraction
3820	Hexadecane Ext. & Screen
6010	Silver, Total
6010	Aluminum, Total
6010	Arsenic, Total
6010	Boron, Total
6010	Barium, Total
6010	Beryllium, Total
6010	Calcium, Total
6010	Cadmium, Total
6010	Cobalt, Total
6010	Chromium, Total
6010	Copper, Total
6010	Iron, Total
6010	Potassium, Total
6010	Lithium, Total
6010	Magnesium, Total
6010	Manganese, Total
6010	Molybdenum, Total
6010	Sodium, Total
6010	Nickel, Total
6010	Lead, Total
6010	Antimony, Total
6010	Selenium, Total
6010	Silicon, Total
6010	Strontium, Total
6010	Titanium, Total
6010	Thallium, Total
6010	Vanadium, Total
6010	Zinc, Total
7040	Antimony, Total
7041	Antimony, Total
7060	Arsenic, Total
7080	Barium, Total
7090	Beryllium, Total
7091	Beryllium, Total
7130	Cadmium, Total

Method	Description
7131	Cadmium, Total
7190	Chromium, Total
7191	Chromium, Total
7196	Chromium, Hexavalent
7196	Chromium, Hexavalent
7210	Copper, Total
7211	Copper, Total
7420	Lead, Total
7421	Lead, Total
7470	Mercury, Total
7471	Mercury, Total
7520	Nickel, Total
7521	Nickel, Total
7740	Selenium, Total
7760	Silver, Total
7761	Silver, Total
7840	Thallium, Total
7841	Thallium, Total
7910	Vanadium, Total
7911	Vanadium, Total
7950	Zinc, Total
7951	Zinc, Total
8010	Halogenated Volatiles
8015	Nonhalogenated Volatiles
8020	Aromatic Volatiles
8030	Acrolein/Acrylon./Aceton
8040	Phenols
8060	Phthalate Esters
8080	Organochlorine Pest/PCB'
8080	PCB's on Wipes
8080	EP Tox Pesticides
8090	Nitroaromatics/Cyc.Keton
8100	Polynuclear Aromatics
8120	Chlorinated Hydrocarbons
8140	Organophosphorus Pest.
8150	Chlorinated Herbicides
8150	EP Tox Herbicides
8240	Volatile Organics
8270	Semivolatile Organics
8270	Acid Extractables
8270	Base Neutral Extractable
8280	Dioxin (Subcon)
8310	Polynuclear Aromatics
9010	Cyanide, Total & Amenable
9010	Cyanide, Total
9010	Cyanide, Amenable to Cl2
9010A	Cyanide, Total
9020	Total Organic Halides
9030	Sulfides
9040	pH (std. units)
9041	pH Paper Method
9045	Soil pH (std. units)
9045	Soil pH (std. units)
9050	Conductivity (umhos/cm)

Method	Description
9060	Total Organic Carbon
9070	Oil/Grease, Total Recover
9071	Oil/Grease
9080	Cation-Exch. (Am. Acetate
9081	Cation-Exch. (Sod. Acetate
9095	Paint Filter Liquids
TCLP	TCLP Metals Extraction
TCLP	TCLP Organic Extraction
TCLP	TCLP Volatile Extraction

F - CLP Methods

Method	Description
CLP.HCA	Aroclors/Toxaphene GC/EC
CLP.HCAT	HC Aroclors/Toxaphene &P
CLP.HCEA	Extract. Analysis by GC/M
CLP.HCEE	Extractable Ex. & Screenin
CLP.HCPP	HC Pesticides/PCB's
CLP.HCPS	Phase Separation
CLP.HCV	VOA Analysis by GC/MS
CLP.HCVE	VOA Extraction & Screening
CLP.INORG	CLP Cyanide
CLP.MET	Selenium, Total
CLP.METALS	CLP Metals
CLP.METALS	CLP Metals
CLP.PESTAN	CLP Pest./PCB Analysis
CLP.PESTEX	CLP Pest./PCB Extraction
CLP.SEMIAN	CLP Semivolatile Analyysi
CLP.SEMIEX	CLP Semivolatile Extract
CLP.VOL	CLP Volatile Analysis

Method	Description
ICPHYD	Arsenic, Total
ICPHYD	Selenium, Total
IN101	Air Particulate Mass
IN154	ALA
IN162	Alkalinity (as CaCO3)
IN166	Ammonia-Nitrogen
IN171	Ash %
IN241	BOD (___Add.Rd. @\$5 ea.)
IN266	Heating Value (BTU/lb.)
IN291	Bulk Density/Sieve
IN316	Chloride, Total Inorgani
IN368	Chlorine, Total
IN375	CHN (% w/w)
IN380	Cyanide, Total
IN421	Density (g/ml)
IN423	Density (g/ml)
IN425	Density (g/g)
IN526	Formaldehyde (ppm at 25C
IN528	Formaldehyde (ppm at 25C
IN530	Formaldehyde (mg/Kg)
IN532	Formaldehyde(Qualitative
IN558	ICP Semi-Quantitat. Scan
IN584	Inorganic Carbon in Soil
IN585	Inorganic Carbon in Wate
IN610	IR Scan
IN623	% Solids
IN625	Moisture/Ash
IN630	Moisture/Ash Woodchips
IN633	Nitrate-Nitrite Nitrogen
IN634	Nitrite-Nitrogen
IN636	Odor (Qualitative)
IN661	Oil/Grease
IN662	Oil/Grease (mg/Kg)
IN670	Petroleum Hydrocarbons
IN688	pH (std. units)
IN701	Phosphorus, Total
IN703	Reactivity
IN703	Reactive Cyanide
IN703	Reactivity Description
IN703	Reactive Sulfide
IN708	Phosphate, Total as P
IN714	Strontium
IN780	Total Kjeldahl Nitrogen
IN847	Total Organic Carbon
IN849	Total Organic Carbon
IN899	Total Organic Halide
IN951	Water (%) by Karl Fische

G - Aquatec Organic Analysis

Method	Description
OR101	Acetic Acid
OR127	Low Molec. Wgt. Alcohols
OR128	Low Molec. Wgt. Alcohols
OR154	Low Molec. Wgt. Amines
OR155	Low Molec. Wgt. Amines
OR180	Aromatics in Gasoline
OR207	B.T.E.X. (ug/l)
OR208	B.T.E.X. (ug/Kg)
OR209	B.T.E.X. &Hydrocar.(ug/l
OR210	B.T.E.X. & Hydrocarbons
OR211	Halogenated Org.Air Tube
OR212	B.T.E.X. in Air Tubes
OR260	Chlorinated Hydrocarbons
OR313	Ethylene Glycol
OR366	Fuel Oil Fingerprint
OR370	Volatile Hydrocarbons
OR372	Volatile Hydrocarbons
OR445	IPA/Acetone
OR472	NMP/Butyl Acetate-Water
OR499	Naphthalene (ug/l)
OR524	PCB's in Sludge
OR526	PCB's in Oil (ppm)
OR530	PCB Congeners in Water
OR531	PCB Congeners in Soil
OR532	PCB Congeners in Tissue
OR533	PCB Congeners in Waste
OR554	Perchloroethylene (ug/l)
OR580	Polynuclear Aromatics
OR606	Pyridine Compounds
OR607	Pyridine Compounds
OR620	GC Solvent Scan 2 (%v/v)
OR633	BNA Screen in Water
OR634	BNA Screen in Other
OR635	Pesticide Screen in Water
OR636	Pesticide Screen in Other
OR638	VOA Screen in Water
OR639	VOA Screen in Other
OR739	VOC(7-Hall/PID) in Water
OR741	VOC (6-Hall/PID) in Water
OR745	GC Solvent Scan 1 (%v/v)
OR792	Air Monitoring Groups
OR938	624 Modified Soil
OR951	Added Compound GC/MS

APPENDIX C

Certifications

VERMONT DEPARTMENT OF HEALTH
LABORATORY CERTIFICATION
DRINKING WATER

Laboratory: Aquatec, Inc.

Address: 75 Green Mt. Dr.

So. Burlington, Vt. 05403

Site Visit Date: 6/7/90

Site Visit Team: Harold Stowe

Joseph Ceresa

Enclosed is the report of our inspection of your laboratory. Based upon this report and on proficiency tests, your lab is certified for the chemical analysis of drinking water for:

X	Inorganics:	Residual Chlorine	Nitrate	Fluoride
		Turbidity	Nitrite	
X	Metals:	Arsenic	Copper	Mercury
		Barium	Chromium	Selenium
		Cadmium	Lead	Silver

Volatile Organic Compounds

X	THM:	Chloroform	Bromoform	BromodiChloroMethane	diBromoChloroMethane
X	Regulated VOC's:		Vinyl Chloride		CarbontetraChloride
		Benzene	12-diChloroEthane		triChloroEthylene
		111-triChloroEthane	11-diChloroEthylene		p-diChloroBenzene
X	EPA List 1 VOC's:		ChloroBenzene		EthylBenzene
		Toluene	cis/trns-12-diChloroEthylene		12-diChloropropane
		Styrene	cis/trns-13-diChloroPropylene		*22-diChloropropane
		o-diChloroBenzene	tetraChloroEthylene		*112-triChloroEthane
		m-diChloroBenzene	*13-diChloroPropane		*11-diChloroPropylene
		11-diChloroEthane	*1122-tetraChloroEthane		*diBromoMethane
		o-Xylene	*1112-tetraChloroEthane		*BromoMethane
		m-Xylene	*o-ChloroToluene		*diChloroMethane
		p-Xylene	*p-ChloroToluene		*BromoBenzene
		*Chloroethane	*ChloroMethane		*123-triChloroPropane
X	*Compounds certified for identification only.				

X	Pesticides:	Endrin	Methoxychlor	Chlordane	Toxaphene
X	Herbicides	24-D	245-TP		

X Full Certification

---- Provisional, pending completion of recommended changes in procedure.
---- Interim, pending on site confirmation of completed changes.

This Certification Expires: 7/31/91

Harold Stowe, Certification Officer

6/25/90

Date

AquaCertC90

6/25/90

WP XI

John R. McKernan, Jr.
Governor



Rollin Ives
Commissioner

STATE OF MAINE
DEPARTMENT OF HUMAN SERVICES
AUGUSTA, MAINE 04333

PUBLIC HEALTH LABORATORY
221 State Street
Augusta, Maine 04333
Telephone (207) 289-2727

CERTIFICATION BY RECIPROCITY

AQUATEC, INC.
75 GREEN MOUNTAIN DRIVE
SOUTH BURLINGTON, VT. 05403

Is certified by reciprocity for all regulated organic and inorganic Chemical Primary Drinking Water Standards listed on the drinking water certificate issued by the State of VERMONT for drinking water samples originating in the State of Maine.

Certification by reciprocity does not apply to microbiological contaminants.

This certificate is valid for one year from date of issue provided it is attached to a copy of a current valid VERMONT drinking water certificate issued under the provisions of the Safe Drinking Water Act.

Date of Issue October 25, 1989

A handwritten signature in cursive script, reading "Michael C. Sodano".

Michael C. Sodano
Laboratory Certification Officer
Laboratory Improvement Program
Public Health Laboratory

MCS/rpk

**The State of New Hampshire
Department of Environmental Services
CERTIFICATE OF APPROVAL
Drinking Water Analysis**

Under the provisions of the Regulations in WS 306, as adopted under RSA 148 - B, the Department of Environmental Services hereby issues a certificate to Aquatec, Inc.

Located at 75 Green Mountain Drive in S. Burlington, VT
for the following analyses of:

FULL CERTIFICATION: Antimony, Arsenic, Barium, Berullium, Cadmium,
Cheomium, Copper, Lead, Mercury, Nickel, Selenium, Silver,
Nitrate-N, Nitrite-N, Fluoride, Insecticides, 2,4-D, Silvex,
Trihalomethanes, Volatile Organics, Total Filterable Residue, pH,
Turbidity, Alkalinity, Corrosivity, Sodium, Calcium, Total Cyanide,
Total Coliform by Membrane Filtration, Total Coliform by MPN

PROVISIONAL CERTIFICATION: Thallium

The names of the laboratory personnel to whom this Certificate is issued are: Neal VanNuck,
J. Comeau, G. Stidsen, D. Hardwick, J. Orsini, P. Downey, C. Dumas,
K. Young, R.M. McNeer, J. Edwin, M. Roy and K. Watson

CERTIFICATE NUMBER 200690-B

DATE OF ISSUE December 19, 1990

EXPIRATION DATE December 18, 1991

Charles D. Wyce
Certifying Officer

**The State of New Hampshire
Department of Environmental Services
CERTIFICATE OF APPROVAL
Wastewater Analysis**

Under the provisions of the Regulations in WS 306, as adopted under RSA 148 - B, the Department of Environmental Services hereby issues a certificate to Aquatec Inc.

Located at 75 Green Mountain Drive in So. Burlington, VT
for the following analyses of:

FULL CERTIFICATION: Aluminum, Arsenic, Beryllium, Cadmium, Cobalt,
Chromium, Copper, Iron, Mercury, Manganese, Nickel, Lead, Selenium,
Vanadium, Zinc, Antimony, Silver, Thallium, Titanium, Molybdenum,
Strontium, pH, TDS, Total Hardness, Calcium, Magnesium, Sodium,
Potassium, Total Alkalinity, Chloride, Fluoride, Sulfate, Ammonia-N,
Nitrate-N, Orthophosphate, TKN, Total Phosphorus, COD, BOD, TOC,
Total Cyanide, Oil & Grease, Non-Filterable Residue, Total Phenolics,
Total Residual Chlorine, Specific Conductance, PCBs in Water,
PCBs in Oil, Pesticides and Volatile Organics

PROVISIONAL CERTIFICATION: NONE

The names of the laboratory personnel to whom this Certificate is issued are: Neal VanWlych,
J. Comeau, G. Stidsen, D. Hardwick, J. Orsini, P. Downey, C. Dumas,
K. Young, R.M. McNeer, J. Edwin, M. Roy and K. Watson

CERTIFICATE NUMBER 200690-B

DATE OF ISSUE December 19, 1990

EXPIRATION DATE December 18, 1991

Charles N. Hayes
Certifying Officer

PROPERTY OF

NEW YORK STATE DEPARTMENT OF HEALTH

DAVID AXELROD, M.D. COMMISSIONER



Expires 12:01 AM April 1, 1991
ISSUED April 1, 1990
REVISED August 11, 1990

INTERIM CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

(Issued in accordance with the Laws of New York State)
pursuant to Section 502 of the Public Health Law

Laboratory ID. Number 10391

Director: Dr. Joseph Comeau

Laboratory Name: Aquatec Inc.

Number & Street: 75 Green Mountain Drive

City, State, Zip: S. Burlington VT 05403

VALID AT THIS ADDRESS ONLY

is hereby APPROVED as an Environmental Laboratory for the category

ENVIRONMENTAL ANALYSES/SOLID AND HAZARDOUS WASTE

All approved subcategories and/or analytes are listed below:

Characteristic Testing :

Corrosivity

Ignitability

Reactivity

Toxicity

Metals II (ALL)

Polynuclear Aromatic Hydrocarbons (ALL)

Phthalate Esters (ALL)

Purgeable Aromatics (ALL)

Volatile Chlorinate Organics (ALL)

Miscellaneous :

Cyanide, Total

Hydrogen Ion (pH)

Sulfide (as S)

Haloethers (ALL)

Nitroaromatics Isophorone (ALL)

Polychlorinated Biphenyls (ALL)

Priority Pollutant Phenols (ALL)

Purgeable Halocarbons (ALL)

Acrolein and Acrylonitrile (ALL)
Chlorophenoxy Acid Pesticides (ALL)
Chlorinated Hydrocarbon Pesticides (ALL)
Chlorinated Hydrocarbons (ALL)
Metals I (ALL)
Organophosphate Pesticides (ALL)

Herbert W. Dickerman, M.D., Ph.D.

Director

Wadsworth Center for Laboratories and Research

PROPERTY OF
NEW YORK STATE DEPARTMENT OF HEALTH
DAVID AXELROD, M.D. COMMISSIONER



Expires 12:01 AM April 1, 1991
ISSUED April 1, 1990
REVISED August 11, 1990

INTERIM CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

(Issued in accordance with the Laws of New York State)
pursuant to Section 502 of the Public Health Law

Laboratory ID. Number 10391

Director: Dr. Joseph Comeau

Laboratory Name: Aquatec Inc.
Number & Street: 75 Green Mountain Drive
City, State, Zip: S. Burlington VT 05403

VALID AT THIS ADDRESS ONLY

is hereby APPROVED as an Environmental Laboratory for the category

POTABLE WATER NON-POTABLE WATER

All approved subcategories and analytes are listed on the attached addendum

Herbert W. Dickerman, M.D., Ph.D.
Director
Wadsworth Center for Laboratories and Research

Potable Water

Drinking Water Bacteriology

Coliform, Total
Standard Plate Count

Drinking Water Pesticide/Herbicides

2,4-D
Endrin
lindane
methoxychlor
2,4,5-TP (Silvex)
Toxaphene

Drinking Water Volatile Aromatics

Benzene
Bromobenzene
n-Butylbenzene
sec-Butylbenzene
tert-Butylbenzene
Chlorobenzene
2-Chlorotoluene
4-Chlorotoluene
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Ethyl benzene
Hexachlorobutadiene
Isopropylbenzene
p-Isopropyltoluene (p-Cymene)
n-Propylbenzene
Styrene
Toluene
1,2,3-Trichlorobenzene
1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
m-Xylene
o-Xylene
p-Xylene

Drinking Water Metals

Arsenic, Total
Barium, Total
Cadmium, Total
Chromium, Total
Copper, Total
Iron, Total
Lead, Total
Mercury, Total
Manganese, Total
Selenium, Total
Silver, Total
Sodium, Total
Zinc, Total

Drinking Water Trihalomethanes

Bromodichloromethane
Bromoform
Dibromochloromethane
Chloroform

Drinking Water Microextractables

1,2-Dibromoethane
1,2-Dibromo-3-chloropropane

Drinking Water Non-Metals

Alkalinity
Chloride
Color
Corrosivity
Fluoride, Total
Calcium Hardness
Hydrogen Ion (pH)
Nitrate (as N)
Solids, Total Dissolved
Sulfate (as SO₄)

Drinking Water Volatile Halocarbons

Bromochloromethane
Bromomethane
Carbon tetrachloride
Chloroethane
Chloromethane
Dibromomethane
Dichlorodifluoromethane
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethane
cis-1,2-Dichloroethane
trans-1,2-Dichloroethane
1,2-Dichloropropane
1,3-Dichloropropane
2,2-Dichloropropane
1,1-Dichloropropane
cis-1,3-Dichloropropane
trans-1,3-Dichloropropane
methylene chloride
1,1,1,2-Tetrachloroethane
1,1,2,2-Tetrachloroethane
Tetrachloroethane
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethane
Trichlorofluoromethane
1,1,2-Trichloropropane
vinyl chloride

Mon - Potable Water

Demand	Residue	Wastewater Bacteriology
Biochemical Oxygen Demand	Solids, Total Dissolved	Coliform, fecal
Chemical Oxygen Demand	Solids, Total Suspended	Standard Plate Count
	Solids, Total	Coliform, Total
Mineral	Nutrient	Wastewater Metals I
Acidity	Ammonia (as N)	Barium, Total
Alkalinity	Kjeldahl Nitrogen, Total	Cadmium, Total
Chloride	Nitrate (as N)	Calcium, Total
Fluoride, Total	Nitrite (as N)	Chromium, Total
Calcium Hardness	Orthophosphate (as P)	Copper, Total
Hardness, Total	Phosphorus, Total	Iron, Total
Sulfate (as SO ₄)		Lead, Total
		Magnesium, Total
Wastewater Metals II	Wastewater Metals III	Manganese, Total
Aluminum, Total	Cobalt, Total	Nickel, Total
Antimony, Total	Gold, Total	Potassium, Total
Arsenic, Total	Molybdenum, Total	Silver, Total
Beryllium, Total	Palladium, Total	Sodium, Total
Chromium VI	Platinum, Total	
Mercury, Total	Tin, Total	Acrolein and Acrylonitrile
Selenium, Total	Thallium, Total	Acrolein
Vanadium, Total	Titanium, Total	Acrylonitrile
Zinc, Total		
	Chlorinated Hydrocarbons	
Benzidines	2-Chloronaphthalene	Dioxins
Benzidine	Hexachlorobenzene	2,3,7,8-Tetrachlorodibenzo-p-dioxin
3,3'-Dichlorobenzidine	Hexachlorobutadiene	
	Hexachloroethane	Nitrosamines
	Hexachlorocyclopentadiene	4-Nitrosodimethylamine
Haloethers	1,2,4-Trichlorobenzene	N-Nitrosodiphenylamine
Mis(2-chloroethyl)ether		N-Nitrosodi-n-propylamine
Dis (2-chloroisopropyl) ether	Nitroaromatics and Isophorone	
Bis(2-chloroethoxy)methane	2,4-Dinitrotoluene	
4-Chlorophenylphenyl ether	2,6-Dinitrotoluene	Polychlorinated Biphenyls
4-Bromophenylphenyl ether	Isophorone	PCB-1016
	Nitrobenzene	PCB-1021
Phthalate Esters		PCB-1023
Benzyl butyl phthalate		PCB-1040
Diisobutyl phthalate		PCB-1049
Dibutyl phthalate		PCB-1054
Diethyl phthalate		PCB-1066
Diphenyl phthalate		
Dimethyl phthalate		

Non - Potable Water

Polynuclear Aromatics

Acenaphthene
 Anthracene
 Acenaphthylene
 Benzo(a)anthracene
 Benzo(a)pyrene
 Benzo(b)fluoranthene
 Benzo(g,h,i)perylene
 Benzo(k)fluoranthene
 Chrysene
 Dibenzo(a,h)anthracene
 Fluoranthene
 Fluorene
 Indeno(1,2,3-cd)pyrene
 Naphthalene
 Phenanthrene
 Pyrene

Purgeable Halocarbons

Bromodichloroethane
 Bromoform
 Bromoethane
 Carbon tetrachloride
 Chloroethane
 2-Chloroethylvinyl ether
 Chloroform
 Chloroethane
 Dibromodichloroethane
 Dichlorodifluoromethane
 1,1-Dichloroethane
 1,2-Dichloroethane
 1,1-Dichloroethene
 trans-1,2-Dichloroethene
 1,2-Dichloropropene
 trans-1,2-Dichloropropene
 cis-1,2-Dichloropropene
 Methylene chloride
 1,1,2,2-Tetrachloroethane
 Tetrachloroethane
 1,1,1-Trichloroethane
 1,1,2-Trichloroethane
 Trichloroethene
 Trichlorofluoromethane
 Vinyl chloride

Priority Pollutant Phenols

4-Chloro-3-methylphenol
 2-Chlorophenol
 3,4-Dichlorophenol
 2,4-Dimethylphenol
 3,4-Dinitrophenol
 2-methyl-4,6-dinitrophenol
 2-Nitrophenol
 4-Nitrophenol
 Pentachlorophenol
 Phenol
 2,4,6-Trichlorophenol

Chlorinated Hydrocarbon Pesticides

Aldrin
 alpha-BHC
 beta-BHC
 delta-BHC
 Lindane
 Chlordane Totals
 4,4'-DDE
 4,4'-DDE
 4,4'-DDT
 Dieldrin
 Endosulfan I
 Endosulfan II
 Endosulfan sulfate
 Endrin
 Endrin aldehyde
 Heptachlor
 Heptachlor epoxide
 Methoxychlor
 Toxaphene

Organophosphate Pesticides

Azinphos methyl
 Diazinon
 Disulfoton
 Demeton-O
 Demeton-S
 Malathion
 Carbofenthrin ethyl
 Carbofenthrin methyl

Purgeable Aromatics

Benzene
 1-Chlorobenzene
 1,2-Dichlorobenzene
 1,3-Dichlorobenzene
 1,4-Dichlorobenzene
 Ethyl Benzene
 Toluene
 Total Xylenes

Chlorophenoxy Acid Pesticides

Misopha
 2,4-D
 2,4,5-T
 2,4,5-TP (Silvex)

Volatile Chlorinated Organics

Benzyl chloride
 Spiclorohydrin

Wastewater Miscellaneous Analytes

Boron, Total
 Cyanide, Total
 Phenols
 Oil & Grease Total Recoverable
 Specific Conductance
 Surfactant (MBAC)
 Silica, Dissolved
 Color
 Corrosivity
 Bromide
 Organic Carbon, Total
 Sulfide (as S)
 Hydrogen Ion (pH)
 Temperature



The Commonwealth of Massachusetts
Department Of Environmental Quality Engineering
Lawrence Experiment Station

37 Shattuck Street, Lawrence, Massachusetts 01843

CERTIFICATION FOR ENVIRONMENTAL ANALYSIS

LABORATORY: VT008
Aquatec
75 Green Mountain Drive
South Burlington, VT 05403

DATE: 01/01/91

EXPIRATION DATE: 12/31/91

DIRECTOR: Dr. Joseph Comeau
802-658-1074

PRIMARY CATEGORIES (DRINKING WATERS)

FULL CERTIFICATION: Trace Metals, Nitrate, Fluoride, Pesticides, Herbicides,
Trihalomethanes, Corrosivity Series, Sodium, Cyanide

PROVISIONAL CERTIFICATION: Volatile Organics

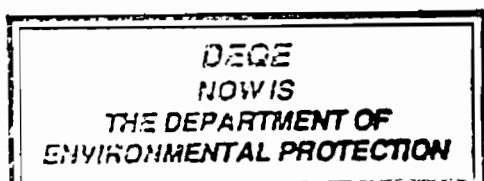
SECONDARY CATEGORIES (OTHER MATRICES)

FULL CERTIFICATION: Metals, Minerals, Nutrients, Demand, PCBs, Pesticides, Volatile
Halocarbons, Volatile Aromatics, Cyanide, Oil & Grease, Phenolics

PROVISIONAL CERTIFICATION: None at Present

This certificate supercedes all previous certificates issued to this laboratory.
Reporting of analyses other than those authorized above shall be cause for revocation of
certification.

Original Certificate, not copies, must be displayed in a prominent place at all times.
Certification subject to approval by OGC.



John E. Delaney
John E. Delaney, Ph.D., Director,
Division of Environmental Analysis



State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF FINANCIAL MANAGEMENT, PLANNING & GENERAL SERVICES
CN 402

TRENTON, N.J. 08625-0402

Fax # (609) 633-3727

March 13, 1991

Ronald S. Tuminski
Director

Aquatec, Inc.
74 Green Mountain Drive
So. Burlington, VT 05403

Manager: Joseph Comeau

Lab ID# 85760

Dear Mr. Comeau:

Enclosed is your 1990-91 Annual Certified Parameter List. This list must be conspicuously displayed at your laboratory. The permanent wall certificate will be mailed to you within the next two weeks.

Your cooperation in this matter is appreciated.

Sincerely,

Dottie Correnti-Petersack
Dottie Correnti-Petersack (17)
Administrative Analyst I
Bureau of Revenue

DCP/ch-208
Enclosures
cc: Jerry Bundy



STATE OF NEW JERSEY
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF QUALITY ASSURANCE
ANNUAL CERTIFIED PARAMETER LIST FOR 1990-1991

AQUATEC, INC.

(85760)

IS CERTIFIED TO PERFORM THE ANALYSES
BELOW UNTIL JUNE 30 1991.

DRINKING WATER LABORATORY CERTIFICATION

LIMITED CHEMISTRY

- 932 NITRATE, CADMIUM REDUCTION
- 935 FLUORIDE-ELECTRODE
- 944 TURBIDITY
- 945 CHLORINE RESIDUAL
- 947 CHLORIDE, HG OR AG NITRAT
- 949 ABS/LAS METHYLENE BLUE
- 951 PH, GLASS ELECTRODE
- 952 TOT DISS SOLIDS, TOT RES
- 953 HARDNESS, EDTA
- 956 SULFATE, GRAVIM OR TURBID

METALS

- 912 HG, MANUAL COLD VAPOR
- 914 AS, GRAPHITE FURNACE
- 916 CD, GRAPHITE FURNACE
- 918 PB, GRAPHITE FURNACE
- 920 SE, GRAPHITE FURNACE

DRINKING WATER LABORATORY CERTIFICATION

METALS

954 NA, ATOMIC ABSORPTION
961 BARIUM, ICAP
963 CHROMIUM, ICAP
965 SILVER, ICAP
966 COPPER, ICAP
967 IRON, ICAP
968 MANGANESE, ICAP
969 ZINC, ICAP

ORGANICS

941 ORGANOCHLORINE PESTICIDES
ENDRIN
LINDANE
METHOXYCHLOR
TOXAPHENE
942 CHLOROPHENOXY ACID HERB
2,4-D
2,4,5-TP(SILVEX)
943 TRIHALOMETHANES
CHLOROFORM
BROMOFORM
BROMODICHLOROMETHANE
DIBROMOCHLOROMETHANE

WATER POLLUTION LABORATORY CERTIFICATION

LIMITED CHEMISTRY

00076 TURBIDITY
00080 COLOR
00095 SPECIFIC CONDUCTANCE

WATER POLLUTION LABORATORY CERTIFICATION

LIMITED CHEMISTRY

00300 DISS OXYGEN-WINKLER
00310 BOD-5 DAY
00340 COD
00400 HYDROGEN ION-PH
00410 ALKALINITY
00436 ACIDITY
00505 TOT VOLATILE SOLIDS
00530 SUSP SOLIDS
00545 SETT SOLIDS-VOLUMETRIC
00556 OIL AND GREASE
00605 ORGANIC NITROGEN
00610 AMMONIA NITROGEN
00615 NITRITE
00625 TOT KJELDAHL NITROGEN
00630 NITRATE
00665 PHOSPHORUS, TOT AS P
00671 ORTHOPHOSPHATE AS P
00680 ORGANIC CARBON, TOTAL
00720 CYANIDE, TOTAL
00722 CYANIDE, AMEN TO CHLOR
00745 SULFIDE
00900 HARDNESS

WATER POLLUTION LABORATORY CERTIFICATION

LIMITED CHEMISTRY

00940 CHLORIDE
00945 SULFATE
00951 FLUORIDE, TOTAL
01032 CR HEX
32730 PHENOLS
38260 SURFACTANTS
70300 TOT DISS SOLIDS

METALS

00915 CALCIUM (ICAP)
00925 MAGNESIUM (ICAP)
00929 SODIUM (ICAP)
00935 POTASSIUM (ICAP)
01002 ARSENIC (AA)
01005 BARIUM (ICAP)
01010 BERYLLIUM (ICAP)
01025 CADMIUM (ICAP)
01030 CHROMIUM (ICAP)
01035 COBALT (ICAP)
01040 COPPER (ICAP)
01045 IRON (ICAP)
01051 LEAD (AA)

WATER POLLUTION LABORATORY CERTIFICATION

METALS

01055 MANGANESE (ICAP)
01059 THALLIUM (AA)
01060 MOLYBDENUM (ICAP)
01065 NICKEL (ICAP)
01075 SILVER (ICAP)
01085 VANADIUM (ICAP)
01090 ZINC (ICAP)
01097 ANTIMONY (AA)
01105 ALUMINUM (ICAP)
01145 SELENIUM (ICAP)
71900 MERCURY (AA)

THIS LIST MUST BE CONSPICUOUSLY DISPLAYED WITH THE PERMANENT
CERTIFICATE AT THE LABORATORY



DEPARTMENT OF THE ARMY
MISSOURI RIVER DIVISION, CORPS OF ENGINEERS
P.O. BOX 103, DOWNTOWN STATION
OMAHA, NEBRASKA 68101-0103

REPLY TO
ATTENTION OF

July 25, 1989

Geotechnical, Chemistry &
Materials Branch

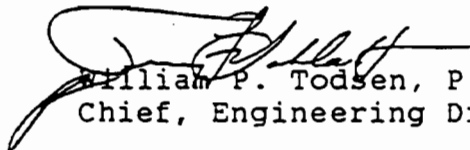
Aquatec, Inc.
75 Green Mountain Drive
South Burlington, VT 05403

Gentlemen:

Your laboratory has been evaluated by the U. S. Army Corps of Engineers for multiple-media sample analysis of Volatile and Semivolatile Organics, Organochlorine Pesticides, PCBs, Chlorinated Herbicides, Polynuclear Aromatic Hydrocarbons, RCRA Metals, Phenols, Total Organic Carbon, Cyanide and Total Recoverable Petroleum Hydrocarbons. Enclosed for your information is a copy of the Laboratory Inspection Report.

The period of validation is eighteen (18) months from the date of this letter. During the eighteen month period, the Corps of Engineers reserves the right to conduct additional laboratory auditing and/or to suspend validation status if deemed necessary. This lab validation does not guarantee the award of any contracts from a Corps of Engineers Contracting Officer. If you have any questions or comments, please contact Mr. C. R. Mao at (402) 221-7494.

Sincerely,


William P. Todsén, P.E.
Chief, Engineering Division

Enclosure

CEMRD-ED-GC (200)

17 July 1989

MEMORANDUM THRU

CEMRD-ED-GC *hick*

CEMRD-ED-G *TWS*

CEMRD-~~ED~~

FOR FILES (CEMRD-ED-GC)

SUBJECT: Laboratory Inspection and Evaluation - Aquatec Inc.,
Burlington, VT - 28 June 1989

1. General:

a. Date of inspection: 28 June 1989.

b. Contract for which laboratory will be used:

North Pacific Division Laboratory General QA

c. Description of contract: Chemical analysis of metals, volatile organics, semi-volatile organics, pesticides, PCB's and TRPH in water, sediment and soil samples; cyanide, TOC, phenols, PAH and herbicides in water.

d. General information on laboratory inspected:

Business Name: Aquatec, Inc.

Street Address: 75 Green Mountain Drive.

City and State: South Burlington, VT 05403

Phone: (802) 658-1074

Number employed: 60; about two thirds classified as chemists.

Additional information: Aquatec corporate offices and laboratory are at the one location, which also provides boats, sampling crews and full sampling capabilities. They were among the first eighteen EPA CLP laboratories and have remained a CLP lab ever since. Aquatec holds certifications from New Hampshire, Maine, New York and Massachusetts. The average sample turnaround time in the lab is two weeks. The building contains 22,300 square feet, 3,500 of which are devoted to analytical activities.

CEMRD-ED-GC

SUBJECT: Laboratory Inspection and Evaluation - Aquatec Inc.,
Burlington, VT - 28 June 1989

2. Summary of Inspection Results:

a. The audit sample results from Aquatec were outstanding. They were the most responsive of labs recently worked with, and submitted one of the best data packages we have received. They analyzed the samples with a high degree of accuracy, experiencing minor problems with only one parameter, TRPH.

b. The laboratory has a large number of qualified personnel, has adequate instrumentation, and an average sample turnaround time of two weeks. This should allow them to support most, if not all, USACE contracts.

c. Aquatec was inspected by Marcia Davies of CEMRD-ED-GC. The detailed results are addressed below and an inspection check list is available upon request.

3. Interviews:

a. George W. Starbuck, President, Joseph Comeau, Chemistry Laboratory Director, Martha Roy, Contract Project Manager, and Karen Chirgwin, Quality Assurance Office were present during the Entrance Interview. Topics discussed were Aquatec's corporate policies and experience in the HTW fields, the USACE QA Program, and audit sample results.

b. At the conclusion of the inspection an exit interview was held with Joseph Comeau, Martha Roy and Karen Chirgwin. The latter two persons accompanied the inspector to lead the lab tour and answer questions. The TRPH problem was discussed at this time, but no conclusions could be drawn. The lab was asked to communicate further with C.R. Mao and/or Prem Arora of CEMRD.

4. Conclusions:

a. A full set of performance audit samples was successfully analyzed by the laboratory on the first attempt and a very complete data set sent for evaluation.

b. The laboratory's Quality Assurance Program Plan was reviewed and found to contain the information required and a sample SOP notebook was quickly surveyed by the inspector. Each analytical department maintains its own set of SOP's.

c. Aquatec has a corporate emphasis on quality control/quality assurance and has build up a well trained group to do data analysis and assessment. Internal quality control practices are ratable as excellent.

CEMRD-ED-GC

SUBJECT: Laboratory Inspection and Evaluation - Aquatec Inc.,
Burlington, VT - 28 June 1989

d. A corporate maintenance department is staffed with technicians who have been factory trained in the repair and upkeep of all the major instruments in the lab as well as the water purification/delivery systems, air handling, and refrigerators. The temperature in the refrigerators is computer monitored with an alarm system for unacceptable excursions.

e. No major or minor deficiencies which would adversely affect the ability of the lab to conduct the required analyses were noted.

5. Summary:

This is an outstanding laboratory with very complete capabilities. They do not subcontract samples to other labs. They have excellent facilities and staff and a very good sample turnaround. They are responsive and eager to work in a problem solving mode as well as on routine samples, and have good capabilities for doing so.



MARCIA C. DAVIES
Chief, HTW Chemistry Review Section

APPENDIX F
QA/QC SHORT FORM

APPENDIX F

QA/QC SHORT FORM

**REMEDIAL INVESTIGATION OF
MALTA ROCKET FUEL AREA
SUPERFUND SITE,
TOWNS OF MALTA AND STILLWATER
SARATOGA COUNTY, NEW YORK**

(Project Officer's Signature) Dennis Colton by NK

(Project Officer's Name) Dennis Colton

(Project Quality Assurance Officer's Signature) Gregory K Shkuda

(Project Quality Assurance Officer's Name) Gregory K. Shkuda, Ph.D.

1. Project Name: Malta Rocket Fuel Area Superfund Site
2. Project Requested by: CERCLA II - 90219
3. Date of Request: October 5, 1989
4. Date of Project Initiation: October 5, 1989
5. Project Officer: Dennis Colton
6. Quality Assurance Officer: Gregory K. Shkuda, Ph.D.
7. Project Description:
 - A. Objective and Scope of Statement: The object of the remedial investigation (RI) is to identify sources of contamination, to define the nature and extent of contamination at the site, to assess the potential risk to human health and the environment and to initiate the development and evaluation of potential remedial alternatives.
 - B. Data Usage: Data will be collected to characterize the quality of all media at the specific areas of concern. If contamination is identified, focused data activities will be developed to fulfill the purpose of the RI and to meet data quality objectives.
 - C. Monitoring Network Design and Rationale: New monitoring wells will be installed at 23 locations to supplement the existing ground-water monitoring network. The purpose of these wells is to expand the site hydrogeologic characterization into downgradient areas, and in known disposal areas, define ground-water flow patterns, and investigate the horizontal and vertical extent of contaminant migration. Soil samples will be collected at areas of concern with exact locations to be determined by soil gas surveys. Geophysical surveys will be performed to determine if buried drums are present. Surface water and sediment samples will be collected where applicable.
 - D. Monitoring Parameters and their Frequency of Collection: Many of the tasks included in the field investigation involve analysis of samples for the Target Compound List (TCL) plus boron. The TCL contains a number of compounds including volatile organic compounds (VOCs), semivolatile organic compounds, pesticides, polychlorinated biphenyls (PCBs), and metals. Wipe samples at specific locations will be analyzed for PCBs and radiation.

E. Parameter Table:

Parameter	Number of Samples	Sample Matrix	Analytical Method Reference	Sample Preservation	Holding Time
TCL: Volatiles	149+	Soil	CLP	Hydrochloric acid	14 days Extraction 40 days Analysis
TCL: Semivolatiles	149+	Soil	CLP	Unpreserved	7 days Extraction 40 days Analysis
TCL: Pesticides/PCBs	149+	Soil	CLP	Unpreserved	7 days Extraction 40 days Analysis
TCL: Metals (except Mercury)	149+	Soil	CLP	Nitric acid	6 months
Mercury	149+	Soil	CLP	Nitric acid	28 days
Cyanide	149+	Soil	CLP	Sodium hydroxide + ascorbic acid	14 days
TCL: Volatiles	106	Water	CLP	Unpreserved	7 days Extraction 40 days Analysis
TCL: Semivolatiles	106	Water	CLP	Unpreserved	7 days Extraction 40 days Analysis
TCL: Pesticides/PCBs	106	Water	CLP	Unpreserved	7 days Extraction 40 days Analysis
TCL: Metals (except Mercury)	106	Water	CLP	Unpreserved	6 months
Mercury	106	Water	CLP	Unpreserved	28 days
Cyanide	106	Water	CLP	Unpreserved	14 days
TCL: Volatile	36	Air	CLP	Unpreserved	14 days
Particulates	36	Air	CLP	Unpreserved	6 weeks

8. Project Fiscal Information (Optional): Not Applicable.

9. Schedule of Tasks and Products: Figure 6.

10. Project Organization and Responsibility:

The following is a list of key project personnel and their corresponding responsibilities:

Ted Loukides - sampling operations

Ted Loukides - sampling QC

Aquatech, Inc. - laboratory analysis

Aquatech, Inc. - laboratory QC

Laine Vignona - data processing activities

Laine Vignona - data processing QC

Gregory K. Shkuda, Ph.D. & Dennis Colton - data quality review

Laine Vignona - performance auditing

Ted Loukides - systems auditing

Gregory K. Shkuda, Ph.D. - overall QA

Dennis Colton - overall project coordination

11. Data Quality Requirements and Assessments: Refer to Laboratory QAPP.

Data Representativeness: All data should be representative of actual conditions at the sampling location. The soil, sediment, surface-water, and ground-water sampling network was designed to provide data representative of site conditions. Considerations for evaluating the representativeness of the data include, but are not limited to, the location being sampled, the methods used to obtain environmental samples at the site, and the appropriateness of the analytical method to the type of sample obtained.

Data Comparability: Comparability will be achieved by utilizing standardized sampling and analysis methods and data reporting format. The analytical results from the ground-water samples from the existing monitoring wells will be compared to the existing ground-water data base. An evaluation will be performed to determine whether analysis for the TCL has identified any other compounds that were previously unknown at the site.

Data Completeness: Completeness is a measure of the amount of valid data obtained from the measurement program, compared to the total amount collected. The validity of the collected data will be evaluated by utilizing the appropriate QA/QC guidelines and laboratory completeness requirements.

12. Sampling Procedures:

- Ambient Air - Tenax tubes.
- Soil-Gas - Field GC.
- Soil - Split-spoon sampler.
- Ground Water - Dedicated bailers.
- Sediment - Stainless-steel trowel.
- Radioactive Wipe Sampling - Sterile filter paper.
- PCB Wipe Sampling - Silanized glass wool and hexane solution.

13. Sample Custody Procedures: Sample custody procedures are designed to provide documentation of preparation, handling, storage, and shipping of all collected samples. Samples collected during the site investigation will be the responsibility of identified persons from the time they are collected until the derived data, are incorporated into the final report. Stringent chain-of-custody procedures will be followed to document sample possession.

14. **Calibration Procedures and Preventive Maintenance:** All sampling equipment will be calibrated according to manufacturer's specifications. Calibration procedures for laboratory equipment used in the analysis of environmental samples will be performed in accordance with those specified in the USEPA CLP SOW and the laboratory QAPP.

The Equipment Manager will keep an inventory of the equipment in terms of item (model and serial number), quantity, and condition. Each item of equipment will be signed out when in use, and its operating condition and cleanliness checked upon return. The Equipment Manager will conduct routine checks on the status of equipment, and will be responsible for stocking of spare parts and equipment readiness.

15. **Documentation, Data Reduction, and Reporting:**

- A. **Documentation** - Field log books, documentation logs, and photographs will be used to document the data collection activities. All incoming data will be logged and dated. All information generated from field activities will be documented on appropriate forms. All laboratory documentation will be placed in the project file. Full Contract Laboratory Program (CLP) documentation will be maintained for the purpose of validating analytical data collected during the RI.

- B. **Data Reduction and Reporting** - The reduction of the field data will consist of summarizing the raw field data, including the well logs, and sample locations. Data will be presented in the form of tables, well logs, illustrations, and graphs, as deemed appropriate by the RI Project Manager.

The analytical data, including quality control samples, will be reported in tabular form with identification of sample number, matrix, parameters, detection limits, and detected concentrations. Any compounds detected in blank samples will be noted in the table and footnoted on other samples.

16. **Data Validation** - A qualified chemist will analyze the analytical package using the procedures described in USEPA Region II CLP Inorganic and Organic Data Review (USEPA, 1990a & 1990b) and Preliminary Data Review (SOP No. HW-6 and SOP No. HW-2) package.

17. **Performance and Systems Audits:** Performance audits of laboratories participating in the CLP are performed quarterly in accordance with the procedures and frequencies established by USEPA for the CLP.

Systems audits will be performed on a continuous basis, as appropriate, to assure that the work is being implemented in accordance with the approved project SOPs and in an overall satisfactory manner.

18. **Corrective Action:** The QA program will enable problems to be identified, controlled, and corrected. Potential problems may involve non-conformance with the SOPs and/or analytical procedures established for the project or other unforeseen difficulties. Any person identifying an unacceptable condition will notify the RI Project Manager. The RI Project Manager, with the assistance of the RI Project Officer and RI Quality Assurance Officer, will be responsible for developing and initiating appropriate corrective action and verifying that the corrective action has been effective.

The laboratory maintains an internal closed-loop corrective action system which operates under the direction of the Laboratory Quality Assurance Officer. This system has been designed to identify and correct both immediate and long-term problems.

19. **Reports:** The following reports will be generated during the course of the RI:

- Literature Search Report.
- Site Security Survey Report.
- Preliminary RI Report.
- Final RI Report.

APPENDIX G

HEALTH AND SAFETY PLAN ENCLOSURES

THE UNDERSIGNED VISITORS REQUIRE ENTRANCE TO THE EXCLUSION ZONE AND HAVE THOROUGHLY READ THE HEALTH AND SAFETY PLANS, UNDERSTAND THE POTENTIAL HAZARDS AT THE SITE AND THE PROCEDURES TO MINIMIZE EXPOSURE TO THE HAZARDS, WILL FOLLOW THE DIRECTION OF THE SITE HEALTH AND SAFETY OFFICER, AND WILL ABIDE BY THE HEALTH AND SAFETY PLAN.

[illegible]

TAILGATE SAFETY MEETING

Client _____ Prepared by _____
 Date _____ Project _____
 Work Location _____ Project Number _____
 Type of Work to be Done _____

SAFETY TOPICS PRESENTED

Chemical Hazards _____
 Physical Hazards/Underground Utilities _____
 Protective Clothing/Equipment _____
 Special Equipment _____
 Emergency Procedures _____
 Hospital/Clinic _____ Phone () _____
 Paramedic Phone () _____
 Hospital Address _____
 Other _____

ATTENDEES

NAME PRINTED

SIGNATURE

Meeting Conducted By _____
 Name Printed _____ Signature _____

Note: This tailgate safety form must be completed daily.

Bureau of Labor Statistics
Supplementary Record of
Occupational Injuries and Illnesses

U.S. Department of Labor



This form is required by Public Law 91-596 and must be kept in the establishment for 5 years. Failure to maintain can result in the issuance of citations and assessment of penalties.

Case or File No.

Form Approved
O.M.B. No. 1220-0020

Employer

1. Name

2. Mail address (No. and street, city or town, State, and zip code)

3. Location, if different from mail address

Injured or Ill Employee

4. Name (First, middle, and last)

Social Security No.

5. Home address (No. and street, city or town, State, and zip code)

6. Age

7. Sex (Check one)

Male ☐

Female ☐

8. Occupation (Enter regular job title, not the specific activity he was performing at time of injury.)

9. Department (Enter name of department or division in which the injured person is regularly employed, even though he may have been temporarily working in another department at the time of injury.)

The Accident or Exposure to Occupational Illness

If accident or exposure occurred on employer's premises, give address of plant or establishment in which it occurred. Do not indicate department or division within the plant or establishment. If accident occurred outside employer's premises at an identifiable address, give that address. If it occurred on a public highway or at any other place which cannot be identified by number and street, please provide place references locating the place of injury as accurately as possible.

10. Place of accident or exposure (No. and street, city or town, State, and zip code)

11. Was place of accident or exposure on employer's premises?

Yes ☐

No ☐

12. What was the employee doing when injured? (Be specific. If he was using tools or equipment or handling material, name them and tell what he was doing with them.)

13. How did the accident occur? (Describe fully the events which resulted in the injury or occupational illness. Tell what happened and how it happened. Name any objects or substances involved and tell how they were involved. Give full details on all factors which led or contributed to the accident. Use separate sheet for additional space.)

Occupational Injury or Occupational Illness

14. Describe the injury or illness in detail and indicate the part of body affected (E.g., amputation of right index finger at second joint; fracture of ribs; lead poisoning; dermatitis of left hand, etc.)

15. Name the object or substance which directly injured the employee (For example, the machine or thing he struck against or which struck him, the vapor or poison he inhaled or swallowed, the chemical or radiation which irritated his skin, or in cases of strains, hernias, etc., the thing he was lifting, pulling, etc.)

16. Date of injury or initial diagnosis of occupational illness

17. Did employee die? (Check one)

Yes ☐

No ☐

Other

18. Name and address of physician

19. If hospitalized, name and address of hospital

Date of report

Prepared by

Official position