6719

Contract Number: DACA31-93-D-0064

U.S. Army Environmental Center

FINAL TECHNICAL PLAN

WOODBRIDGE RESEARCH FACILITY ASBESTOS SURVEY

WOODBRIDGE, VIRGINIA

Prepared for:
U.S. Army Environmental Center
ATTN: SFIM-AEC-BCC (Mr. Jeffrey H. Waugh)
Aberdeen Proving Ground, Maryland 21010-5401

Prepared by:
Horne Engineering Services, Inc.
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"Printed on Recycled Paper."

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June 28, 1995

Commander
U.S. Army Environmental Center
ATTN: ENAEC-EC-A (Mr. Larry Mango)
Aberdeen Proving Ground, MD 21010-5401

Dear Mr. Mango:

Horne Engineering Services, Inc. is pleased to submit the final Technical Plan for the Woodbridge Research Facility Asbestos Survey. All of the comments provided by AEC have been incorporated or responded to in this revision. This plan is submitted in response to the requirements of Section 3.2.4 of DACA31-93-D-0064, Delivery Order 005, CLIN 018. The Technical Plan is composed of three elements: the Work Plan, the Quality Assurance Project Plan, and the Health and Safety Plan. Each of these elements is discussed separately within this document.

If you have any questions please feel free to contact me at (703) 379-5600.

Sincerely,

Van W. Noah
Project Manager

Richard Vance, P.E.
Program Manager

BAB/vwn

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1.0 WORK PLAN INTRODUCTION

This project will identify the locations and condition of Asbestos Containing Materials (ACMs) within the nine buildings present at the Woodbridge Research Facility (WRF), located in Woodbridge, Virginia. Additionally, this project will develop an Operations and Maintenance Plan for the ACMs identified during our asbestos survey. The purpose of this Work Plan is to provide a summary of the existing data and site background information and to outline the procedures to be used during our asbestos survey.

Additionally this work plan will address the management and technical approaches used for performing and controlling the task described in contract number DACA 31-93-D-0064, Delivery Order 018, Woodbridge Research Facility (WRF) Asbestos Survey.

2.0 FACILITIES AND AREAS TO BE EVALUATED

The WRF was established in 1951 as a military radio station. Currently the WRF is under the command of the U.S. Army Laboratory Command; however, in the fall of 1995, the WRF is to be transferred to the U.S. Fish and Wildlife Service. The WRF consists of nine buildings located on 579 acres of government owned land. This asbestos survey encompasses the interior of all nine buildings. United States Army Environmental Center (AEC) requested that two culverts on the northeastern corner of the WRF be included (see Figure 1). The following table generally describes the nine buildings:

Building Number	Current Use	Year Built	Stories	Area Sq/Ft
101	Main Sentry Station	1970	1	1216
102	Sentry Station	1963	1	38
201	Electronic Equipment Facility	1952	1	24306
202	Facility Engineering/Motor Pool	1952	1	15093
203	Electronic Equipment Facility	1952	2	13748
204	Facilities Engineering Storehouse	1964	1	456
210	Sentry Station	1954	1	80
211	Electronic Equipment Facility	1979	3	18000
306	Command and Control Facility	1979	2	1920

3.0 RESULTS OF INITIAL DOCUMENT STUDY

3.1 Asbestos Location Survey

During the initial site meeting Horne Engineering Services, Inc.(Horne Engineering) was provided with the written portion of an asbestos location survey that had been conducted by Biospherics, Inc. (Biospherics), on August 10, 1990. This report addressed suspected ACMs in buildings 201, 202, and 203. The other six building present at the WRF were not addressed in the Biospherics survey. The drawings showing where the ACMs were located were not available for review by Horne Engineering. It should be noted, that the data provided in this report is a good starting point in identifying the ACM which still remains in those buildings. According to the Army Research Laboratories (ARL), all friable ACM has been removed. Sample collection for this project will concentrate on verifying the Biospherics report and documenting the location and extent of the asbestos containing materials in the remaining six buildings. The following is a summary of the asbestos survey results from the Biospherics report organized by building number.

3.1.1 Building Number 201

Of the forty bulk samples collected in this building, ten were asbestos-containing (the Environmental Protection Agency (EPA) defines asbestos-containing as "one which contains greater than 1 percent asbestos by volume"). The materials sampled which were found to contain asbestos included: fibrous block and corrugated paper pipe insulation, debris from pipe insulation in rooms W148 and E155, pipe fitting insulation on fiberglass insulated lines, and flexible duct joints. The materials which were sampled and did not contain asbestos were ceiling plaster, plaster overpour on structural beams, 12" X 12" interlocking acoustical ceiling tiles, and 2' X 4' drop-in acoustical ceiling tiles.

3.1.2 Building Number 202

Of the thirteen bulk samples collected in this building, four were asbestos-containing. The asbestos containing materials included pipe fitting insulation and a fabric flex joint that was hanging from a heater unit. The materials which were sampled and did not contain asbestos were textured ceiling material, 12" X 12" interlocking acoustical ceiling tiles, and 2' X 4' drop-in acoustical ceiling tiles.

3.1.3 Building Number 203

Of the thirty-seven bulk samples collected in this building, sixteen contained asbestos. The materials sampled which were found to contain asbestos included: pipe insulation and pipe

insulation debris in the building's crawl space; stack, boiler, and pipe insulation in the building's boiler room; and pipe insulation, flexible duct joints, one type of floor tile, and ceiling tile mastic in the building's occupied space. The materials which were sampled and did not contain asbestos were fire brick from inside the boiler, fiberglass pipe insulation around fittings on the first and second floors, ceiling plaster, and 2' X 4' drop-in acoustical ceiling tiles.

Biospherics subcontracted Wayne Insulation to conduct an asbestos abatement of the thermal and domestic water system insulation present in buildings 201, 202, and 203. Wayne Insulation was to remove all of the asbestos containing insulation during the abatement. Additional work was done in building 101 through change orders coordinated with the ARL.

3.2 Enhanced Preliminary Assessment

During our initial site meeting, Horne Engineering was also provided with an Enhanced Preliminary Assessment that was conducted by Roy E. Weston, Inc. (Weston), on March 2, 1992. This report addressed many areas of environmental concern on the WRF; however, for the purposes of this report, only the section concerning asbestos (Section 3.11) was reviewed. The following is a summary of the asbestos section of the assessment.

The Weston report stated that all ACM from the domestic water lines, steam lines, and pipe elbows was reportedly abated in the 1980s. Additionally, the report stated that trowelled-on plaster that contained asbestos was also removed. The Weston report references contract documents, dated September 29, 1990, which describe sampling and subsequent ACM abatement that was performed in buildings 201, 202, 203 by Capitol Contractors, Inc. The ACMs which were identified and abated in this effort included pipe insulation, lagging, debris on underlying ceiling tiles, and wall board. According to Mr. Steve Rock, of the ARL, Biospherics and Wayne Insulation were subcontracted by Capitol Contractors, Inc., to perform an asbestos location survey and an asbestos abatement for the WRF. The results of the work are described in paragraph 2.1 above.

The Enhanced Preliminary Assessment also stated that during field activities additional suspect ACMs were identified. These materials included 9" X 9" floor tile in all buildings, pipe insulation on boiler pipes in Building 211, and fire door insulation in Building 201.

4.0 PROJECT MANAGEMENT

4.1 Management Tools

Project Scheduler 6 is one tool used to schedule and manage resources during the performance of contract DACA 31-93-D-0064. Project Scheduler 6 is a PC-based software

package that can be used for planning and tracking projects. Horne Engineering's standard accounting procedures will be used to manage the costs associated with the contract. Horne Engineering will use DELTEK™, a Defense Contract Audit Agency (DCAA) approved automated accounting system, to record and track all costs that are authorized to be charged against the contract. Since the Horne Engineering Project Manager (PjM) is responsible for cost and budget control, only the PjM will be allowed to authorize the expenditure of contract resources.

4.2 Total Quality Management (TQM)

TQM is the quality improvement technique which Horne Engineering uses to continually upgrade the quality of its performance and work products. Horne Engineering will apply TQM to this project.

The PjM will periodically solicit input from the AEC, as well as from Horne Engineering employees regarding suggestions for improving any aspect of the project. The PjM will then "brainstorm" these suggestions with the appropriate personnel to develop and define prospective procedures and methods with real applicability and improvement potential. With the approval of the AEC, the PjM will test and evaluate the improvement derived from the implementation of these new methods and procedures.

4.3 Technical Management

Technical Management will be effected in accordance with Horne Engineering standard operating procedures. The PjM will oversee all aspects of the project. The PjM will also implement Horne Engineering quality assurance/quality control (QA/QC) procedures for all activities and work-products. Horne Engineering program and senior management will review the status of this project through periodic on-site oversight, as well as through monthly program reviews and periodic in-process reviews. The PjM will keep the contracting officer's representative (COR) apprised of task performance through the use of periodic reports and written monthly progress reports. The Horne Engineering Contract Administrator will implement Horne Engineering reporting procedures to ensure that all preparations, format, and submittal requirements established by the CDRL (DD Form 1423) for data to be delivered to the Government are met.

5.0 SCHEDULE AND FIELD ACTIVITIES

5.1 Expected Schedule

This project is currently on schedule to deliver a draft survey report by mid August 1995.

The actual due date of the draft report based on the Statement of Work and the Delivery Order negotiation is October 10, 1995. The schedule has been shortened in order to meet the AEC and ARL desires to have the report completed by mid-August 1995. The report is a required document by Army policy for all Base Realignment and Closure (BRAC) property transfers. Horne Engineering understands that the WRF is scheduled to be transferred before the end of fiscal year 1995. The report needs to be available for transfer negotiations between the Army and the gaining agency.

The PjM will prepare and submit monthly cost and performance reports to the Government. This report will contain the following information:

- Summary of technical activity performed since previous status reports.
- Upcoming activities for the next reporting periods.
- Identification of problem areas which require Government resolution.
- Updates to the schedule and any necessary modifications as agreed to by the Government.

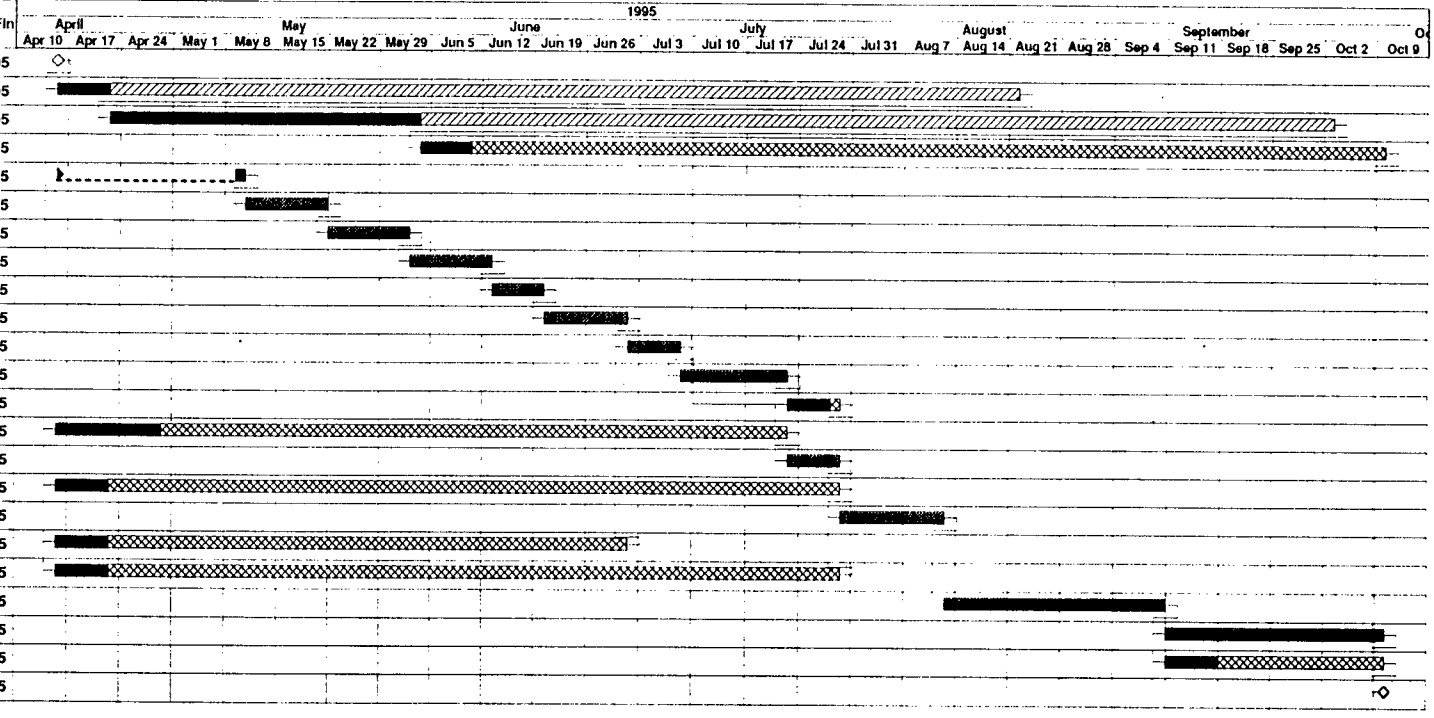
In order to meet the shortened deadline, Horne Engineering has promptly conducted the initial site visit and produced this Technical Plan in a very short period. As discussed at the coordination meeting, the AEC must shorten it's allotted review time from 30 days to less than 10 days to assist in meeting the deadline. One week after approval of this Technical Plan Horne Engineering will start the asbestos survey and sample collection. The survey is scheduled for five days but may take less if no unexpected delays are encountered. The analysis results will not be available for at least one week after collection. Horne Engineering plans to send collected samples in for analysis at the end of each day of collection to help speed the process. Review of the data and writing the draft report is expected to take another two weeks. There is little leeway for unexpected delays or changes. To meet the AEC goal of a draft report by mid-August a real team effort between AEC, ARL, Horne Engineering, and the laboratories is required. The Gantt chart on the following page (Figure 1) depicts the expected schedule of this project.

Woodbridge Asbestos Survey

Horne Engineering And Environmental Services

4501 Ford Avenue, Suite 1100, Alexandria, Virginia 22302-1435

Item	Task #	Task Name	Dura	Sched Star	Sched Fin
1		Award Date	0d	04/14/95	04/14/95
2	11	Draft Mgt Plan	5d	04/14/95	04/20/95
4	12	AEC Review	30d	04/21/95	06/01/95
3	13	Final Mgt Plan	5d	06/02/95	06/08/95
5	31	Initial Site Visit	1d	05/09/95	05/09/95
6	41	Technical Plans, Draft	8d	05/10/95	05/19/95
7	42	AEC comments	8d	05/22/95	05/31/95
8	43	Home Responce to comments	8d	06/01/95	06/12/95
9	44	Final Tech Plan Submittal	5d	06/13/95	06/19/95
10	45	Approval from AEC	8d	06/20/95	06/29/95
11	51	On Site Asbestos Survey	5d	06/30/95	07/06/95
12	52	Results from lab	10d	07/07/95	07/20/95
13	53	Assessing checklists	4d	07/21/95	07/26/95
14	71	Final Building Drawings	10d	04/14/95	04/27/95
16	72	Overlay samples on drawings	5d	07/21/95	07/27/95
15	73	Boiler Plate Report	5d	04/14/95	04/20/95
17	74	Draft Report	10d	07/28/95	08/10/95
18	46	Final Health and Safety plan	5d	04/14/95	04/20/95
19	47	O and M plan	5d	04/14/95	04/20/95
20	75	AEC draft report review	21d	08/11/95	09/08/95
21	76	Home Final report	21d	09/11/95	10/09/95
22	77	IRDMIS data entry	5d	09/11/95	09/15/95
23	81	End of Project	0d	10/09/95	10/09/95



Critical
Critical Milestone
Free Float
Delay
Noncritical
Noncritical Milestone
Total Float (+)
Effort %Complete
Complete
Complete Milestone
Total Float (-)
Summary
Summary Milestone
Baseline
External
External Milestone
Non-Resource

Figure 1 Gantt Chart Showing Expected Schedule of the Project

WP-6

5.2 Sampling

Horne Engineering will collect bulk samples of suspected ACMs from the nine buildings present at the WRF and will have them analyzed by polarized light microscopy to determine their asbestos content. The collection of the bulk samples will be performed in accordance with the Quality Assurance Project Plan by Mr. Bryant Bullock, an AHERA accredited and Virginia licensed asbestos inspector. Bulk sample analysis will be performed by accredited laboratories. The number of bulk samples to be collected will be determined by the AHERA protocols and the bulk sample locations will be resealed and marked with a sample identification number. One duplicate bulk sample will be collected for every twenty bulk samples. Duplicate bulk samples will be sent to Law Engineering, Inc., Chantilly, Virginia. Non-duplicate bulk samples will be sent to Oneil M. Banks, Inc., Bel Air, Maryland. The analytical results from the two laboratories will be compared to determine the validity of the results received. All bulk samples will be collected, preserved, transported, and analyzed in accordance with the AEC Quality Assurance Program and the Draft Asbestos Control document that was produced by the U.S. Army Engineering and Housing Support Center.

The following procedures will be used when collecting asbestos bulk samples at the WRF:

- Equipment for sampling (e.g. a ladder) will be set up in the sampling area.
- Two ounce whirl pack sampling bags will be labeled with an identification number using an indelible marker, sample location, and sample description. This same information will also be recorded on a Chain-of-Custody.
- Identification numbers will be placed on sampling diagrams to denote sample locations.
- Protective equipement will be donned (half face respirator to be worn at all times).
- The area were the sample is to be taken will be moistened to reduce fiber release.
- Samples will be extracted using a clean knife, care will be taken to assure that all layers of the material are sampled and that surrounding materials are not disturbed.
- Samples will be placed in two ounce whirl pack bags and will be tightly sealed.

- The exterior of the bag will be wiped with a wet wipe to remove any stray material.

- Sample locations will be resealed with penetrating asbestos sealant and marked with a sample identification number using an indelible marker.

- Sampling tools will be cleaned with wet wipes and the sampling area will be wet mopped.

- The steps above will be repeated for each sampling location.

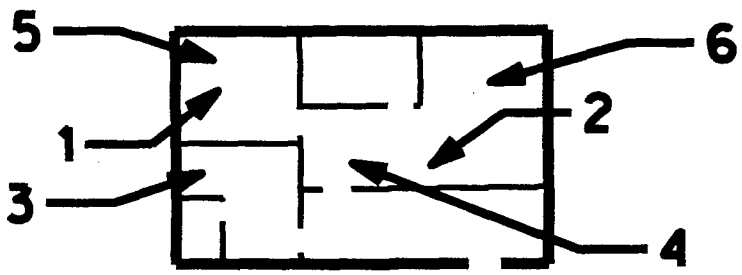
- Protective clothing, wet wipes, and cartridge filters will be discarded in a labeled plastic bag. This bag will be sealed and retained until the laboratory results are received, at this time, the bag will be disposed of as asbestos-contaminated waste if the results for any of the samples are positive for asbestos. The labeled placed on the disposal bag will read: "Danger - Contains Asbestos Fibers - Avoid Creating Dust - Cancer and Lung Disease Hazard," this bag will be disposed of in a state-approved landfill if it is asbestos-contaminated.

On May 9, 1995, Horne Engineering conducted a preliminary asbestos survey of the WRF to determine the locations of suspect ACM. The locations of the suspected ACMs were noted on building plans for the nine buildings. The sample areas, material, description, and approximate number of bulk samples to be collected are noted on Figures 2 through 10. Horne Engineering does not intend to sample 9"x 9" floor tile because the Statement of Work said to assume it to be ACM. Additionally, at the request of Robert P. Craig, P.E., of the ARL, and Mr. Jeffrey H. Waugh, of the AEC, Horne Engineering plans to sample two culverts in the northeastern portion of the WRF. The sampling locations and descriptions in Figures 2 through 11 are based on a one day walk through of the WRF. The number of bulk samples collected may be increased as other suspect ACMs are encountered during the comprehensive asbestos survey. The total number of bulk samples collected will not exceed 205 as per the Statement of Work.

5.3 Field Notes and Documentation

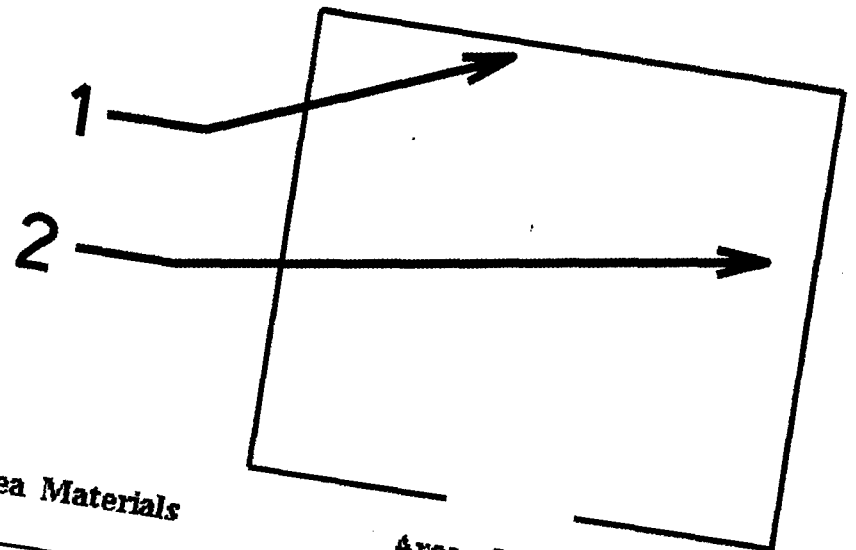
In addition to the sample collection documentation, Horne Engineering will also complete an AEC Asbestos Checklist for each homogeneous material suspected of being an ACM. Each material will be evaluated using the checklist and analysis results to assess any health risk to potential occupants. The survey team will also keep notes on the location and extent of each material. The team will have a copy of the CAD generated floor plans for each building surveyed. The notes will be used to determine the quantity and location of each ACM for the final report.

Figure 2 Building 101



Sample Area	Materials	Area of Occurance	Description	Approx. No. Samples
1	Cove Moulding	Along floor and wall throughout	Black, 6' in height	2
2	Cove Moulding Mastic	Along floor and wall throughout	Brown	2
3	Duct Gasketing Material	HVAC unit in Boiler Room	Flexible gray cloth	1
4	Ceiling Tile	Throughout building		3
5	Duct Binding Material	Duct in Room 103	Black, tar-like duct binding material	1
6	Floor Tile and Mastic	Throughout		3

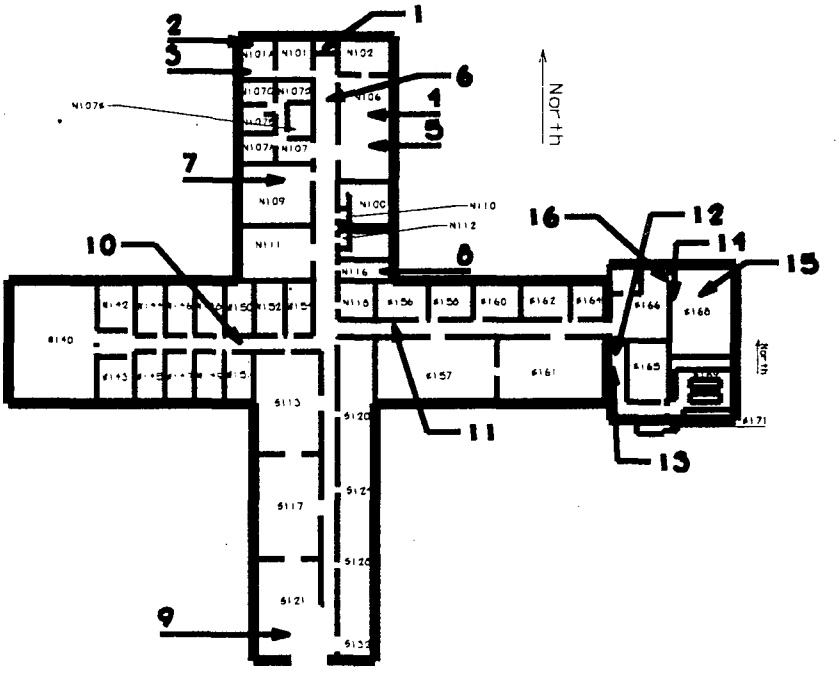
Figure 3 Building 102



Sample Area Materials

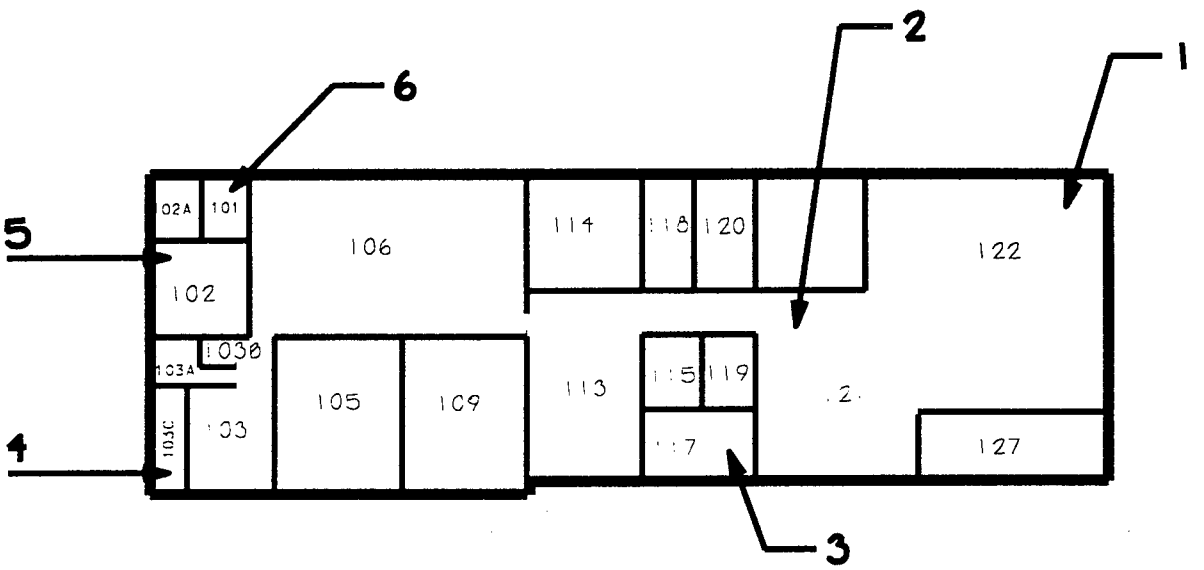
		Area of Occurance	Description	Approx. No. Samples
1	Wall Board and Joint Compound	Throughout		3
2	Counter Top Mastic	On countertops	Bown mastic	2

Figure 4 Building 201



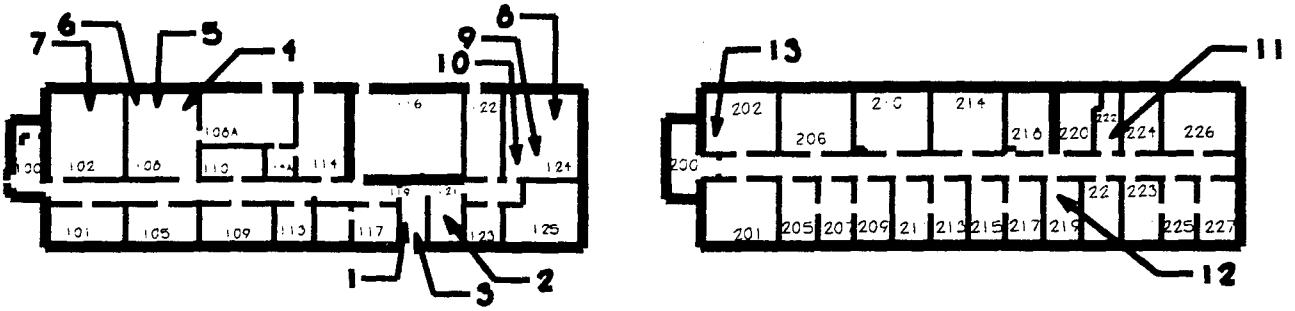
Sample Area	Materials	Area of Occurance	Description	Approx. No. Samples
1	Floor Tile and Mastic	In hallways, and some rooms	12" X 12", tan mottled pattern	3
1	Ceiling Tiles	Throughout	2' X 4'	6
2	Wall Plaster	Throughout	Exterior and interior wall systems	6
3	Drywall-like Primary Ceiling Boards	Above suspended ceiling throughout	4' X 8', white, drywall-like, ceiling boards	3
4	Cove Molding	Throughout	6" high, brown	1
4	Cove Molding Mastic	Throughout	Brown	1
5	Debris In Thermal System Trench	Throughout	Debris	3
6	Cove Molding	Throughout	6" high, brown	1
6	Cove Molding Mastic	Throughout	Brown	1
7	Drywall and Joint Compount	Throughout		3
7	Cove Molding	Throughout	6" high, brown	1
7	Cove Molding Mastic	Throughout	Brown	1
8	Drywall and Joint Compount	Throughout		3
9	Cove Molding	Throughout	6" high, brown	1
9	Cove Molding Mastic	Throughout	Brown	1
9	Floor Tile and Mastic	Storage areas	12" X 12", cream with brown & white mottled pattern	3
10	Ceiling Tiles	Throughout	2' X 4'	3
11	Drywall and Joint Compount	Throughout		3
12	Acoustical Tile	Former Machine Shop	12" X 12", 1" dot pattern	2
13	Acoustical Tile	Former Machine Shop	12" X 12", .5" dot pattern	2
14	Wall Panals	Former Machine Shop	4' X 8', wall panals	2
15	Ceiling Structure	Former Machine Shop		3
16	Fire Door	Former Machine Shop	4' X 8' door, 2" thick	1

Figure 5 Building Number 202



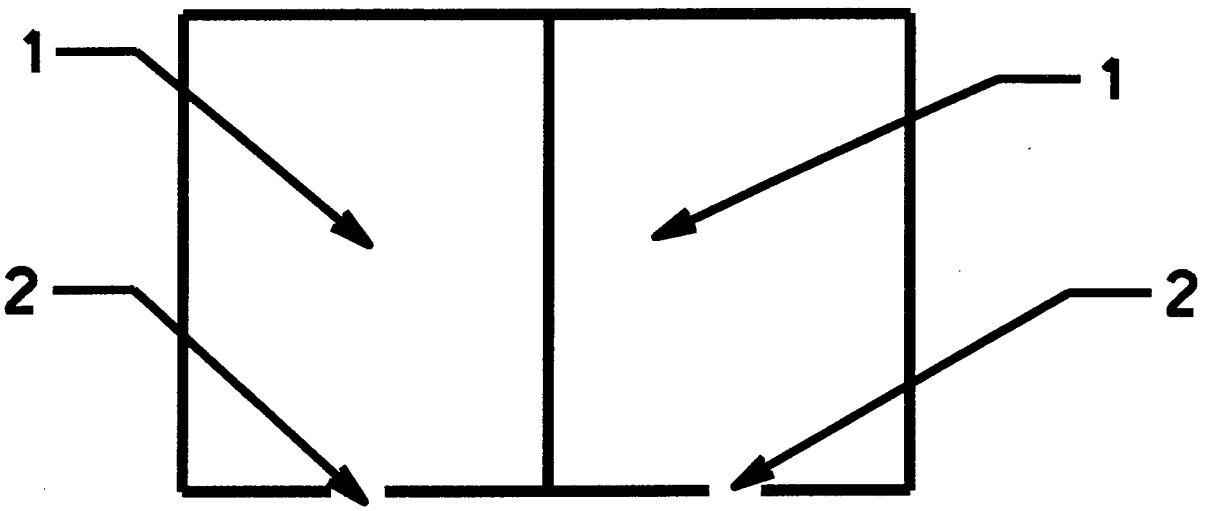
Sample Area	Materials	Area of Occurance	Description	Approx. No. Samples
1	Cove Molding	Throughout	6" high, brown	2
1	Cove Molding Mastic	Throughout	Brown	2
1	Drywall-like Primary Ceiling Boards	Throughout	4' X 8', white, drywall-like, ceiling boards	3
2	Drywall and Joint Compound	Throughout		3
3	Ceiling Tile	Throughout	2' X 4'	3
3	Fibrous Material	Above room 117	Gray fibrous material	2
4	Ceiling Tile	Throughout	12" X 12"	3
5	Floor Tile	Throughout	12" X 12", tan with white & brown mottling	3
6	Drywall and Joint Compound	Room 101, on ceiling		2

Figure 6 Building 203



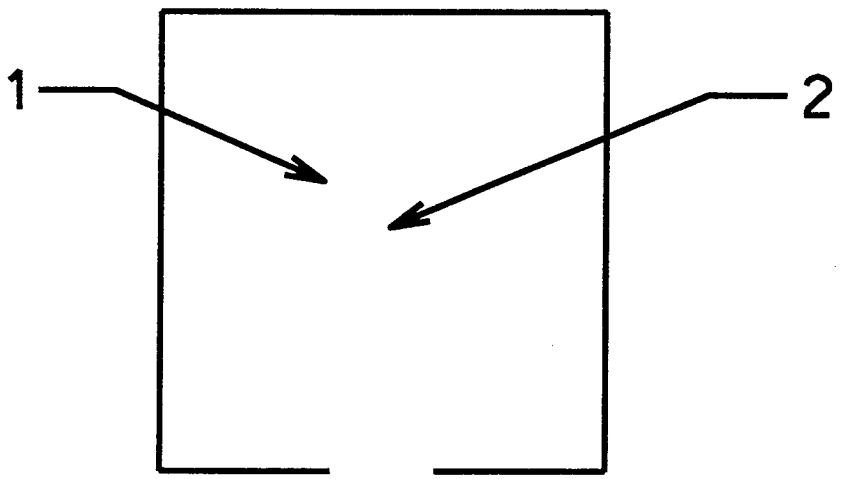
Sample Area	Materials	Area of Occurance	Description	Approx. No. Samples
1	Ceiling Tile	Throughout	2' X 4'	3
1	Floor Tile and Mastic	Throughout	12" X 12", tan with brown, orange, & white mottling	3
1	Cove Molding	Throughout	6" high, brown	2
1	Cove Molding Mastic	Throughout	Brown	2
2	Vinyl Stair Tred	On Stairs	Brown, traction material	2
2	Vinyl Stair Tred Mastic	On Stairs	Brown	2
3	Plaster Wall Material	Throughout	Plaster wall systems	3
4	Mastic	On primary ceiling, 1st floor	Brown	2
5	Drywall and Joint Compound	Throughout, 1st floor		6
6	Plaster Wall Material	By window in several rooms, 1st floor	White powdery plaster material near windows	3
7	Duct Binding Material	Above suspended ceiling, room 102	Black	1
7	Duct Binding Material	Above suspended ceiling, room 102	White	1
7	Duct Binding Material	Above suspended ceiling, room 102	Yellow	1
8	Acoustical Tile	Room 124		1
8	Acoustical Tile Mastic	Room 124		1
9	Suspended Floor Tiles	Room 124		2
10	Cove Molding	Throughout	4" high, brown	2
10	Cove Molding Mastic	Throughout	Brown	2
11	Drywall and Joint Compound	Throughout, 2nd floor		6
12	Corkboard Mastic	Room 219	Brown	2
13	Pressboard	Room 202	Wood fibers bound in resin	2

Figure 7 Building 204



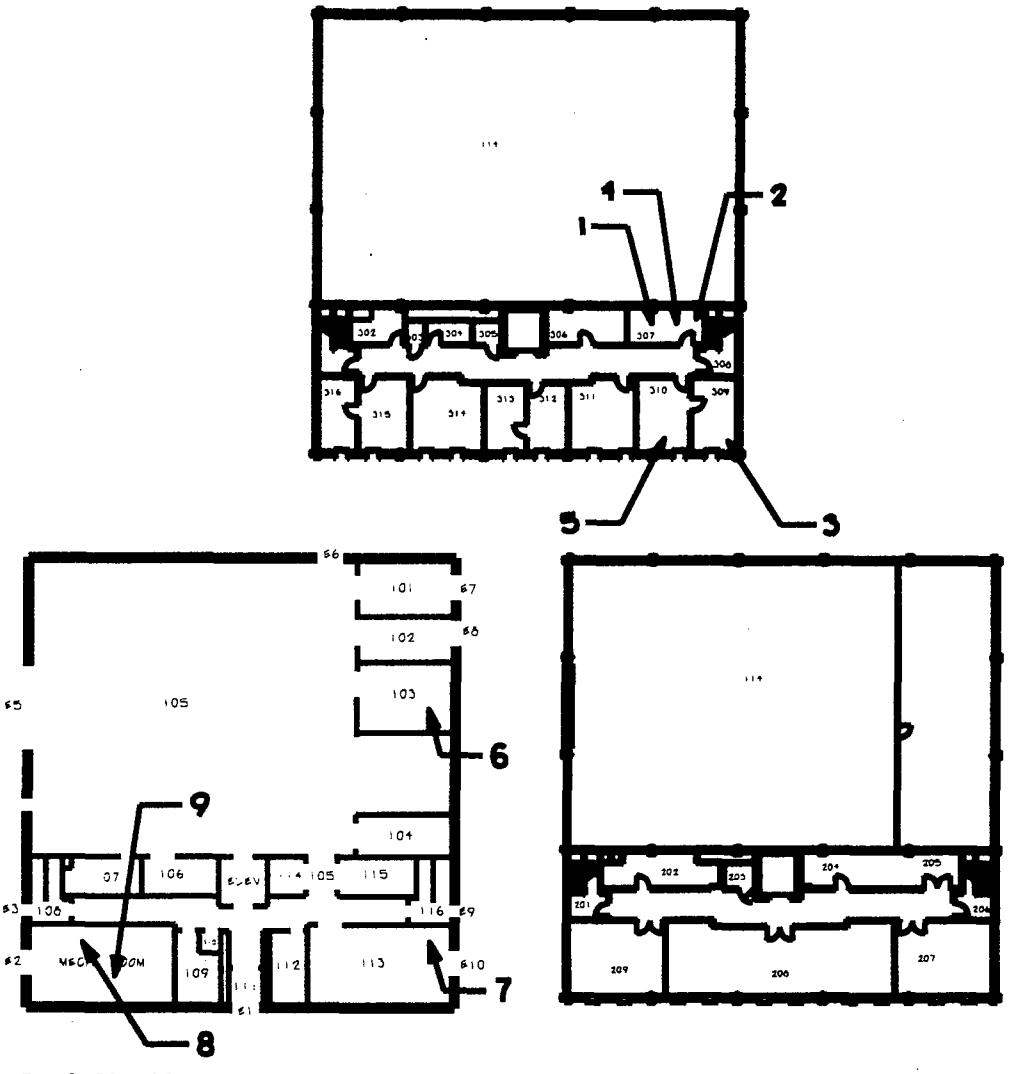
Sample Area	Materials	Area of Occurance	Description	Approx. No. Samples
1	Precast Ceiling	Throughout	Ceiling of the structure	2
2	External Door	North side of building	External Door	2

Figure 8 Building 210



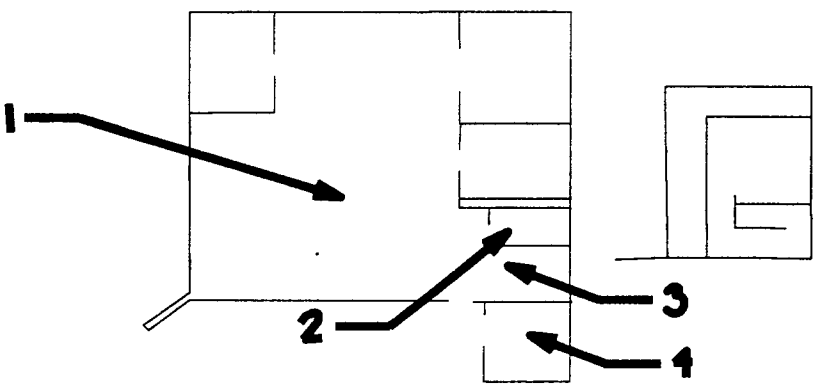
Sample Area	Materials	Area of Occurance	Description	Approx. No. Samples
1	Floor Tile and Mastic	Throughout	12" X 12", floor tile	2
2	Ceiling Board			2

Figure 9 Building Number 211

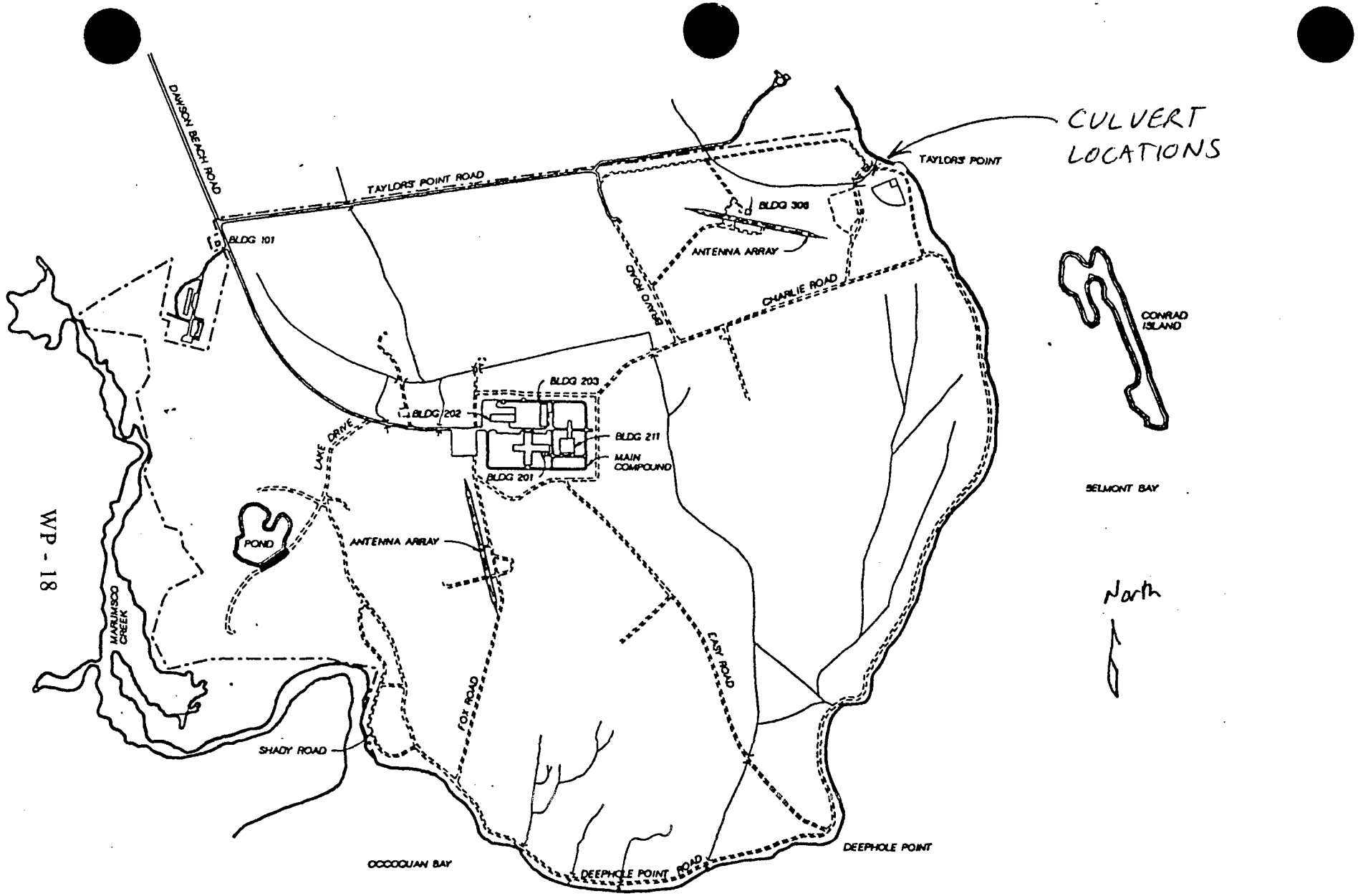


Sample Area	Materials	Area of Occurance	Description	Approx. No. Samples
1	Drywall and Joint Compound	Throughout		3
2	Ceiling Tile	Throughout	2' X 4'	3
3	Floor Tile and Mastic	Throughout	12" X 12", tan & brown mottling	3
4	Cove Molding	Throughout	6" high, brown	2
4	Cove Molding Mastic	Throughout	Brown	2
5	Window Frame Material	Throughout 2nd & 3rd floors	Gray, cementicious material	3
6	Ceiling Material	Room 103		2
7	Floor Tile and Mastic	Room 113	12" X 12"	2
8	Insulation	Mechanical Room		1
9	Duct Gasketing Material	Mechanical Room	Gray cloth	1

Figure 10 Building 306



Sample Area	Materials	Area of Occurance	Description	Approx. No. Samples
1	Drywall and Joint Compound	Throughout		3
2	Floor Tile and Mastic	Bathroom	12" X 12", rust colored	2
2	Cove Molding	Bathroom	4" high, brown	2
2	Cove Molding Mastic	Bathroom	Brown	2
3	Vinyl Stair Tred	On Stairs	Brown, traction material	2
3	Vinyl Stair Tred Mastic	On Stairs	Brown	2
4	Duct Gasketing Material	Mechanical Room	Gray cloth	1



WP - 18

FIGURE 11
SITE MAP
WOODBRIDGE RESEARCH FACILITY, VIRGINIA

Contract Number: DACA31-93-D-0064

QUALITY ASSURANCE PROJECT PLAN

WOODBRIDGE RESEARCH FACILITY ASBESTOS SURVEY

WOODBRIDGE, VIRGINIA

Prepared for:
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"Printed on Recycled Paper."

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1.0 QUALITY ASSURANCE PROJECT PLAN INTRODUCTION

1.1 Purpose and Scope

The purpose of this Quality Assurance Project Plan (QAPP) is to support the implementation of field asbestos survey activities associated with the asbestos survey oriented work efforts conducted by Horne Engineering Service, Inc. (Horne Engineering) at the Woodbridge Research Facility (WRF). The organization, responsibilities for key personnel, and procedures to be followed during asbestos survey activities are covered in this plan. The QAPP shall insure quality assurance/quality control QA/QC in all items of work including that of subcontractors.

1.2 Responsibility

Horne Engineering shall be responsible for the asbestos survey and operation and maintenance portions of project assignments in accordance with the statement of work.

1.3 Progress Payment

The Project Manager shall verify that material, supplies, services and work is in compliance with all contract requirements. In addition, copies of records developed for inspection and required tests shall be furnished to the client as required by the contract.

2.0 COMMUNICATION

The Horne Engineering personnel, which primarily include the site Project Manager, Asbestos Inspector (Inspector), and the Environmental Engineer, shall continually keep the client informed of all activities of the project.

2.1 Project Personnel Quality Control

The Project Manager and the Asbestos Inspector are responsible for planning, directing, and administrating all QAPP activities. They have access to higher management and are responsible for periodic management review on the status of the project. The lines of communication are clearly established from both a contractual and technical perspective. When deviations are detected sufficient to jeopardize quality achievement in any area, they have the authority to take corrective action.

Personnel performing quality assurance functions have organizational freedom, authority, and capability to identify and evaluate quality problems and to initiate, recommend, or provide solutions. Technical personnel are assigned to the project full time for a specific period or part time on an as-need basis. During assignment to the project, those personnel are under the overall direction of the Project Manager for performance of the work.

2.2 Quality Control Inspector

The Project Manager is designated the Quality Control Inspector and is responsible for planning, directing, and administering all quality control activities. Personnel performing quality control functions have organizational freedom, authority, and capability to identify and evaluate problems and to initiate, recommend, or provide solutions.

2.3 Documentation

Formal documents to transmit communications during the asbestos survey include the following, as provided in Appendix A.

- United States Army Environmental Center Asbestos Checklist (AEC Checklist): Is used by the Inspector to document the location, condition, quantity, and accessibility of suspected asbestos containing material (ACM) at the WRF.

- Chain-of-Custody (COC): Is used by the Inspector and the asbestos laboratories to identify, track, and later verify the asbestos bulk sample analytical results.

- Sample Analysis Results: Are used by the Inspector and the laboratory to document the results of the asbestos bulk sample analysis.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

3.1 Program Manager

The Program Manager is a senior technical individual or officer responsible for contractual oversight, business/technical guidance to the Project Manager, and resource allocation within the Horne Engineering project management system. The Program

Manager serves as liaison between Horne Engineering's senior line/corporate management and the Project Manager.

The Program Manager will: (1) review all subcontract agreements; (2) coordinate administrative and support services needed by the project manager; and (3) provide oversight/review of project budgets and schedules.

3.2 Project Manager

The Project Manager will be the responsible overall technical and administrative management of the project. These responsibilities include:

- Preparation of work flow diagrams, schedules, labor allocations, and survey plans;
- Management of all funds for labor and materials procurement;
- Review and administration of all work order changes;
- Successful accomplishment of all contractual obligations including costs, schedules, and technical performance;
- Management of the Project Team toward a unified, productive project accomplishment;
- Format and quality control of all document and data reports; and
- Direct communication and liaison with the client.

3.3 Accredited AHERA Asbestos Inspector

The accredited AHERA Asbestos Inspector is responsible for effective day to day technical management of the asbestos survey and subcontractors assigned to the project. It is the Inspector's responsibility to oversee all related assignments resulting from this work effort. The individual assigned to this role will be under the direction of the Project Manager. The Inspector is the most responsible individual on the project site regarding sampling quality assurance/quality control (QA/QC) and site safety standards. It is the Inspector's responsibility to rigorously oversee and evaluate compliance with the asbestos

survey QAPP plan, Health and Safety Plan, and Work Plan, as well as all relevant company, client, regulatory community, public, and private plans procedures and rules of conduct. In the event of problems in this area, the Inspector is responsible for mandating corrective action through the Project Manager and promptly/directly advising the client. The Inspector will coordinate the efforts of personnel assigned to monitor site activities and will serve as focal point for the client regarding site events related to QA/QC and Health/Safety.

In addition to the above, the Inspector is responsible for the following:

- Provides necessary training to field personnel on the requirements of the asbestos sampling;
- Directs the overall asbestos survey activities; and
- Completes the AEC Checklist and Chain-of-Custodies.

4.0 DOCUMENT CONTROL

The project document and control system is described below. Generally, Horne Engineering's normal system will be implemented. The three major parts of the project document system consists of:

1. Project central files
2. Engineering design and drawing control
3. References

The project central file is maintained by the company administrative assistant. The file includes reports, records of communication, copies of submitals, and references. The engineering and drawing control system and references are maintained by the Project Engineer.

5.0 SAMPLING QUALITY CONTROL

5.1 Scope

This section describes the QAPP requirements applicable to the sampling activities.

5.2 Sampling Protocols

Horne Engineering will collect bulk samples of suspected asbestos containing materials from the nine buildings present at the WRF and will have them analyzed by polarized light microscopy to determine their asbestos content. The collection of the bulk samples will be performed by Mr. Bryant Bullock, an AHERA accredited and Virginia licensed asbestos Inspector, and the bulk sample analysis will be performed by accredited laboratories. A copy of Mr. Bullock's AHERA accreditation and Virginia Asbestos Inspector Licence is included as Appendix D. The number of bulk samples to be collected will be determined by the AHERA protocols and the bulk sample locations will be resealed with penetrating asbestos sealant and marked with a sample identification number using an indelible marker.

One duplicate bulk sample will be collected for every twenty bulk samples. Duplicate bulk samples will be sent to the Law Engineering, Inc., Chantilly, Virginia. Non-duplicate bulk samples will be sent to Oneil M. Banks, Inc., Bel Air, Maryland. The analytical results from the two laboratories will be compared to determine the validity of the results received. Laboratory results on the duplicate bulk samples should not disagree on the presence or absence of asbestos, if significant disagreement exists, additional samples should be collected. Discrepancies may also exist on the percent of asbestos contained within side-by-side samples. For the purposes of this project, discrepancies greater than ten percent should be resampled. Any discrepancies on the specific type of asbestos contained within the ACM are also grounds for resampling and analysis.

All bulk samples will be collected, preserved, transported, and analyzed in accordance with the AEC Quality Assurance Program and the Draft Asbestos Control document that was produced by the U.S. Army Engineering and Housing Support Center.

5.3 Chain-of-Custody

A separate Chain-of-Custody form will be filled out separately for the duplicate and non-duplicate bulk samples. This form is to be provided by the two laboratories

performing the analysis of the bulk samples. A copy of the Chain-of-Custody will be maintained by the client, Horne Engineering, and the respective asbestos laboratory.

5.4 Laboratory Quality Control

5.4.1 Oneil M. Banks Inc., Laboratory

Oneil M. Banks, Inc., Laboratory, Bel Air, Maryland, is accredited by the American Industrial Hygiene Association and is Proficiency Analysis Testing (PAT) competent. A copy of this laboratory's laboratory procedures, quality assurance program, and certification is presented in Appendix B.

5.4.2 Law Engineering, Inc., Laboratory

Law Engineering, Inc., Laboratory, Chantilly, Virginia, is accredited by the National Voluntary Laboratory Accreditation Program. A copy of this laboratory's quality assurance program and certification is presented in Appendix C.

APPENDIX A

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USAEC GUIDELINES FOR ASBESTOS HAZARD ASSESSMENT IN U.S. ARMY FACILITIES

Assessment Process

1. Assessment is used to determine if corrective action is needed, what corrective action to use and prioritizing the corrective actions.

a. Identify the type of Asbestos Containing Material (ACM) by taking bulk samples (i.e., wall board, pipe insulation, surface compound, etc.).

b. Evaluate the potential for fiber release (exposure potential).

c. Identify and assess the current condition of ACM using the following information:

1. Physical damage: If damage is present from vandalism, accidental physical contact or any other cause. Evidence of debris on horizontal surfaces, hanging material, dislodged chunks, scrapings, indentations, or cracking are indicators of poor conditions. If coated surface gives when slight hand pressure is applied or the material moves up and down with light pushing, then the ACM is no longer tightly bonded to its substrate.

2. Water damage: Inspect the area for visible signs of water damage, such as discoloration of or stains on the ACM; stains on adjacent walls or floors; buckling of the walls or floors; or areas where pieces of the ACM have separated into layers or fallen down, thereby exposing the substrate.

3. Deteriorating or delaminating from substrate: Inspect the area for quality of installation (i.e., separating into layers, adhesive failure) or environmental factors which affect the cohesive strength of ACM.

4. ACM in poor condition means the binding of the material is loosing its integrity as indicated by peeling, cracking, or crumbling of the material.

d. Identify potential for future damage, disturbance, or erosion of material, including accessibility of material, frequency the area is used, activity likely to cause damage and any planned changes to the area.

e. Other important factors that must be included in the assessment of ACM are the inherent friability of the material, percentage of asbestos in the material, where material is located, number of people in the area, the duration of occupancy, location of ACM to air plenum or direct airstream and importance of the area.

1. In most cases the asbestos material is covered with a protective jacket of cloth, tape, paper, etc. These bonding materials will prevent the material from becoming friable and/or airborne.

a. Most non-friable materials can be broken without releasing significant quantities or airborne asbestos fibers.

2. Surfacing materials are usually bonded and will not become airborne unless disturbed (i.e. vibration, drilling, etc.).

3. The amount of ACM should be identified as linear feet or square feet.

f. All supporting building documentation should be included in the individual building reports (i.e., building drawings, sampling data, assessment data of homogenous materials, work sheets, etc.).

g. ACM checklists are provided in two parts (Figure 1a and 1b). Use this checklist for assigning risk and exposure numbers. Using the numbers derived from the checklists, enter the matrix in Table 1 and find the corresponding assessment index. Then refer to Table 2 for definition of assessment index. The higher risk and exposure numbers and assessment index letters should be used only if there is a high probability of personnel exposure.

h. Asbestos Management Program requirements are outlined in Chapter 10 of reference a.

i. Recommend following the guidance provided in Chapter 2 of reference b and Chapter 5 of reference c for conducting asbestos surveys.

j. Recommend following the guidance provided in Chapter 4 of reference b and Chapter 6 of reference c for factors involved in assessing ACM.

k. Recommend following the guidance provided in Chapter 6 of reference b and Appendix E for Sampling/Analytical Procedures.

l. The new key definitions reproduced from EPA Final Rule, "National Emission Standards for Hazardous Air Pollutants; Asbestos NESHAP Revision" are as follows:

1. Regulated Asbestos-containing material (RACM) means (a) Friable ACM, (b) Catergory I non-friable ACM that has become friable, (c) Catergory I non-friable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading, or (d) Catergory II non-friable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to power by the forces expected to act on the material in the course of demolition or renovation operations.

2. Catergory I non-friable ACM means asbestos-containing packings, gaskets, resilient floor covering and asphalt roofing products containing more than 1 percent asbestos.

3. Category II non-friable ACM means any material, excluding Category I non-friable ACM, containing more than 1 percent asbestos that, when dry, cannot be crumbled, pulverized, or reduced to power by hand pressure.

4. Friable ACM is any material containing more than 1 percent asbestos by weight that hand pressure can crumble, pulverize or reduce to power when dry, as defined in the National Emission Standards for Asbestos (40 CFR 61.142). ACM with less than 1 percent is not regulated and does not require any action. If the Host Nation, State or Local Government's definition for ACM defers from the USEPA's regulation, the assessor should use the most stringent criteria.

5. Non-friable ACM is any material containing 1 percent asbestos by weight that hand pressure cannot crumble, pulverize or reduce to power when dry, as defined in the National Emission Standards for Asbestos (40 CFR 61.142).

References:

a. AR 200-1, Environmental Protection and Enhancement

b. EPA 560/5-85-024, Guidance for Controlling Asbestos-Containing Materials in Buildings

c. TM 5-612, Asbestos Control

d. Title 40, Code of Federal Regulations, Part 61, Subpart M

e. National Emission Standards for Hazardous Air Pollutants

Figure 1a
USAEC ACM ASSESSMENT CHECKLIST

Installation: Bldg/Rm No.:

Facility/Office: Inspector name/date:

Part 1: DAMAGE ASSESSMENT

Physical. Assess damage based on evidence of surface accumulation; or the condition of the sprayed-on or trowelled-on surface materials; or physical deterioration or delamination of materials using hand pressure.

____(0)None * Non-asbestos materials; or no damage or evidence of material fallout; or material is in fair to good condition; or **non-friable** ACM, (i.e., floor tile, wallboard, etc.); or ACM with less than 1 percent.

____(1)Minimal * Isolated and very small areas (less than 10 percent) of material damage or fallout; or controlled space and accessed by maintenance personnel only; or uncontrolled/ unoccupied space.

____(2)Low * Visible evidence of some surface accumulation; or controlled space and accessed by maintenance personnel only; or uncontrolled/ unoccupied space.

____(3)Moderate* Visible evidence of small areas (less than 10 percent) of surface accumulation; or controlled space and accessed by maintenance personnel only; or uncontrolled/ unoccupied space.

____(5)High * Visible evidence of widespread surface accumulation; or uncontrolled space and easily accessed by occupants.

Water.

____(0) None No water damage.

____(1) Minor Visible water damage (less than 10 percent) of ACM.

____(2) Major Visible water damage (greater than 10 percent) of ACM.

* Note: If any one or a combination of these criteria are met assign the corresponding value and line out the criteria that does not apply.

Proximity to items for repair. If both A and B apply, score the one with the highest rating. (Check all that apply. Maximum of 3 points.)

A. Sprayed-on or Trowelled-on: Could the **friable** ACM be damaged by routine maintenance activities ?

____(0) No routine maintenance is performed within the areas.

____(1) Equal to or greater than 5 ft.

____(2) Equal to or greater than 1 ft but less than 5 ft.

____(3) Less than 1 ft from routine maintenance areas or a ceiling panel contaminated with ACM must be removed.

B. Pipe, Boiler, or Duct insulation: Could damage occur as a result of routine maintenance or by occupants of building.

____(0) No.

____(3) Yes.

Type of ACM.

____(0) * Non-asbestos materials; **or non-friable** ACM, (i.e., floor tile, wallboard, etc.) in good to fair condition; or ACM with less than 1 percent.

____(1) Miscellaneous ACM (i.e. Ceiling tiles, etc).

____(1) * Boiler; or pipe insulation; or other ACM insulation materials (Not accessible to occupants).

____(2) Non-friable ACM (i.e., floor tile, wall board, etc.) in poor condition.

____(2) * Boiler; or pipe insulation; or other ACM insulation materials (Accessible to occupants).

____(3) * ACM on exterior of supply ducts; or capable of being introduced into air ducts (i.e. Deteriorated ACM located in area of air ducts; or above suspended ceilings).

____(4) * Sprayed-on; or trowelled-on surface ACM (Accessible to occupants).

* Note: If any one or a combination of these criteria are met assign the corresponding value and line out the criteria that does not apply.

Percent Asbestos.

____(0) Less than 1 percent ACM.

____(1) 1 to 30 percent ACM.

____(2) 31 to 50 percent ACM.

____(3) Greater than 51 percent ACM.

Note: If the percent asbestos content is less than 1 percent or **non-friable** asbestos (in good to fair condition) then the total for percent asbestos category will be zero (0).

DAMAGE (D) TOTAL_____(Max 20,Min 0)
Bulk sample results should be reported using the following format:

Sample No.	Type Asbestos	%	Source

Analysis performed by
(Lab/Name/Date)_____

Figure 1b
USAEC ACM ASSESSMENT CHECKLIST
Part II: EXPOSURE ASSESSMENT

Material Friability. Defined by USEPA: "hand pressure can crumble, pulverize, or reduce to power when dry."

____(0) Non-Friable	Material (i.e., Floor tile, wall board, Binder's, etc.) in good to fair condition.
____(1) Low Friability	Material difficult to crumble by hand.
____(2) Moderate Friability	Material fairly easy to dislodge and crush.
____(3) High Friability	Material easily reduced to powder; or broken by hand.

Occupant Accessibility to ACM Fibers.

____(0) Low Accessibility *	Materials are not exposed; or totally isolated by permanent barrier; or accessible only during infrequent, occasional maintenance activity; or no air flow from the friable insulating material location to occupants of the building, or storage areas.
____(1) Moderate Accessibility*	Only a small percent of material exposed; or material above a suspended ceiling; or material contacted during maintenance or repair; or material exposed, but not accessible to activity of normal occupants.
____(4) High Accessibility *	A large percent of material exposed; or material accessible to occupants; or airborne transport during normal activities.

* Note: If any one or a combination of these criteria are met assign the corresponding value and line out the criteria that does not apply.

Activity/use.

____(0) None — No Activity/Storage activities.

____(1) Low — Infrequent maintenance activities only.

____(2) Moderate — Frequent maintenance activities only.

____(3) High — Normal occupant activities.

Air Stream/Plenum.

____(0) None — No perceptible air flow in the room or area.

____(1) Present — Air flow and no evidence of ACM present.

____(2) Present — ACM is exposed to perceptible or occasional air streams.

____(3) Present * — Air flow and evidence of ACM present in supply ducts/plenum; or recirculated; or subjected to routine turbulent; or abrupt air movement.

Area of visible surface or damaged ACM.

____(0) Less than 10 cubic or linear feet (small areas should be repaired ASAP).

____(1) 10 to 100 cubic or linear feet.

____(2) 100 to 1000 cubic or linear feet.

____(3) greater than 1000 cubic or linear feet.

For Occupied Facilities Only.

Population. This involves defining average occupancy as the total number of building occupants and outside visitor traffic into a room or area during a 8 hour period. For example, a reception area in a DEH shop has 1 person assigned to the area. There are 15 individuals (including the receptionist) assigned to the building. They have approximately 240 customers (visitors) in the building during a 8 hour period. On average, each customer (visitor) is serviced and departs the building within 30 minutes.

* Note: If any one or a combination of these criteria are met assign the corresponding value and line out the criteria that does not apply.

(Outside visitors x time spent/8 hours) + building occupants = Average occupancy
in area/room

Example: ([240 visitors x 0.5 hours]/ 8 hours) + 15 occupants = 30
.....Score as 2

____(1) Less than 9 or for corridors.

____(2) 10 to 200.

____(3) 201 to 500.

____(4) 501 to 1000.

____(5) Greater than 1001.

____(5) Medical facilities, youth centers, child care facilities, or residential buildings, regardless of the population, will be assigned to this category.

For Unoccupied Facilities Only.

____(0) No ACM or less than 1 percent

____(1) Non-friable ACM in good or fair condition.

____(2) Non-friable ACM in poor condition.

____(3) Friable ACM in good condition.

____(5) Friable ACM with visible evidence of damage.

EXPOSURE (E) TOTAL_____(Max 26,Min 0) Inspection (Date)_____
Note: Provide any other relevant information on observations in the space provided below. If additional space is needed attach additional pages as necessary.

Table 1

Determination of an Assessment Index

Using the Damage and Exposure values derived from the checklist (Figure 1a and 1b), enter the matrix below and find the corresponding assessment index.

		Exposure (4 < E < 28)			
		26-20	19-15	14-8	7-1
Damage (1 < D < 17)	20-16	A	A	B	C
	15-10	A	B	C	D
	9-6	B	C	D	E
	5-1	C	D	E	F

Note: If D and/or E equal zero (0), then the assessment index of **F** will be assigned.

Table 2

Assessment Index	Recommended Management Corrective Actions
A	Immediate Action- Follow-up actions may include isolation of the area, the restriction of access and/or immediate removal of the ACM. If removal is indicated, action planning should include a detailed survey. This condition will require a near term expenditure of funds. Managers must know exactly what needs to be done to eliminate the asbestos hazard and how to use available funds most effectively.
B	Action as Soon as Possible- Initiate a Special O&M* program immediately. Possible follow-up actions may include limiting access to the area and scheduling of removal during periods of low activity in the facility, not waiting for the normal repair and maintenance cycle.
C	Planned Action-Initiate a Special O&M* program. Removal should be scheduled as part of normal repair and maintenance cycle of a facility, minimizing cost and disturbance.
D	Repair-Initiate a Special O&M* program. Damaged areas should be repaired, where "repair" means returning damaged ACM to an undamaged condition to contain fiber release.
E	Monitoring-Continue Special O&M* program. Take steps to prevent damage to the ACM. Monitor the condition of all ACM frequently.
F	No Immediate Action- Continue Special O&M* program until major renovation or demolition requires removal or until assessment factors change.

Assessment by accredited personnel* (in-house or contractor) who are experienced in and qualified to conduct asbestos assessments is required. Accredited personnel are Industrial Hygienists (American Board of Industrial Hygiene (ABIH) certified or who meet the Office of Personnel Management's 0690 classification standard) or other trained personnel with a minimum of 1 year experience in asbestos assessment activities and who are accredited in the specific area they will be responsible for (Inspector management Planner, abatement designer, contractor, supervisor, and abatement worker) as specified in the Toxic Substance Control Act (TSCA) 15 USC Section 2646 (b) (i).

* An enclosure or encapsulation will require an O&M plan to increase their effectiveness.

APPENDIX B

Oneil M. Banks, Inc.

Industrial Hygiene/Toxicology
[illegible]379-4676

336 South Main Street
Bel Air, Maryland 21014

ONEIL M. BANKS, INC.

LABORATORY PROCEDURES AND QUALITY ASSURANCE

PREFACE

To insure that all samples submitted to Oneil M. Banks, Inc. will be analyzed in such a manner as to generate results which are accurate within the limitations of the analytical method utilized, the quality assurance program, described in this LABORATORY PROCEDURES AND QUALITY ASSURANCE manual, shall be followed by all individuals conducting any analysis. In this manual will be found necessary procedures for:
work practices to maintain a contamination-free work space;
procedures for dealing with contamination;
training and maintaining proficiency of analysts;
quality assurance and documentation;
equipment setup, calibration, use and maintenance;
sample receipt, handling, analysis, retention, reporting and record retention.

It is the responsibility of every employee of Oneil M. Banks, Inc. to familiarize themselves with the contents of this LABORATORY PROCEDURES AND QUALITY ASSURANCE manual and to follow the guidelines whenever called upon to analyze a sample or use analytical equipment for field surveys. Quality is vital to our business and it is the responsibility of each staff person to follow and document all Quality Assurance procedures detailed in this manual.

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I WORKING IN THE LABORATORY

1.) All samples are to be logged into the laboratory sample log book before analysis is begun (SEE SAMPLE RECEPTION). The laboratory sample log book is to be kept permanently. Laboratory sample log books not currently in use are to be kept in a locked fireproof box or file cabinet. A laboratory sample log book may be transferred to a secure location for storage after ten (10) years. At the request of the original client, or upon receipt of a Subpoena, a copy of any material in the laboratory sample log book or the client's file may transferred, with Chain of Custody documentation to another person. The request or subpoena and signed Chain of Custody form showing transfer of the copy is to be placed in the client file.

2.) All sample containers and analysis sheets are to bear the laboratory identification number (previously referred to as accession number) (SEE SAMPLE RECEPTION).

3.) All analyses are to be conducted in accordance with procedures outlined in this LABORATORY PROCEDURES AND QUALITY ASSURANCE manual. No deviations will be allowed without the approval of the Laboratory Director.

4.) If an analysis procedure is requested, which is not currently in this manual, a procedure which is published in the NIOSH MANUAL of ANALYTICAL METHODS second or third edition may be utilized upon approval of the laboratory director.

5.) All paper work is to be completed as the analysis is completed. A dated file copy of all reports and analysis sheets is to be placed in the client's file, immediately after the report has been prepared and signed. Present procedure is for client files to be kept permanently. Client files may be transferred to a secure location for storage after ten (10) years. At the request of the original client, or upon receipt of a Subpoena, a copy of any material in the client file may be transferred, with Chain of Custody documentation to another person. The request or subpoena and signed Chain of Custody form showing transfer of the copy is to be placed in the client file. No information from the client file may be released to anyone other than the original client, or to another person upon receipt of a Subpoena, and with notification to the client.

6.) A portion of all samples (Retain Sample) is to be placed into storage immediately after the portion of the sample has been taken for analysis. All Retain Sample containers are to bear the laboratory identification number, date of sampling, customer ID number, and identification/location of the sample. Present procedure is for Retain Samples to be kept permanently. Retain Samples may be transferred to a secure location for storage after ten (10) years. At the request of the original client, or upon receipt of a Subpoena, up to one half (1/2) of the Retain Sample may be transferred, with Chain of Custody documentation to another person. The request or subpoena and signed Chain of Custody form showing transfer of the copy is to be placed in the client file. A representative sample, consisting of a sufficient quantity for analysis must be retained by Oneil M. Banks, Inc. No identified portion of the Retain Sample may be released to anyone other than the original client, or upon receipt of a Subpoena, and with notification to the client, to another person. Portions of the Retain Sample may be used without identification in a sample exchange Quality Assurance program.

If the sample received is too large for storage of the entire portion of the sample not taken for analysis, it is to be disposed of, in a manner to prevent injury to persons or release of any potentially hazardous material into the environment. For instance, excessive portions of bulk asbestos samples are to be placed in the asbestos contaminated waste container and transferred periodically to a licensed asbestos abatement contractor, with signed receipt, for disposal.

7.) Anyone working in the laboratory is to familiarize him/herself with all equipment to be used for the analysis and know the proper procedure for the setup, calibration, maintenance and use of the equipment.

8.) Anyone working in the laboratory must exercise utmost care to keep the laboratory clean and in order. It is also each individual's responsibility to keep all samples in order and to completely fill out all analysis forms.

9.) All work in the laboratory is to be done in such a manner to prevent injury to employees or release of any potentially hazardous quantities of material into the environment.

10.)Procedures for dealing with complaints from clients, have not been developed, since we have not had any complaints. In the event we should receive a complaint, immediately take steps to resolve it. If the clients complaint is unreasonable or would require a major effort to resolve, refer it to the Laboratory Director.

II SAMPLE RECEPTION

1.) All samples to be analyzed by the laboratory must be accompanied by a request for analysis form completely filled out by the person submitting the sample. The form must have the sample tracking information (Chain of Custody Form) also completed as required. To simplify sample reception, whenever possible, samples are to received by laboratory personnel.

2.) All samples received for analysis in our laboratory are to be logged into the LABORATORY SAMPLE LOG BOOK.

3.) The sample will be given the LABORATORY IDENTIFICATION NUMBER (previously referred to as accession number). This will be placed on the request for analysis sheet and the sample container. All information regarding any samples must identify the sample by the laboratory identification number.

4.) Information as to type of analysis requested (see table below), date of sampling, customer ID number, and identification/location of the sample is to be placed accurately into the log book.

5.) If the sample is not considered acceptable, verify with the Laboratory Director, and write the word "REJECTED" in place of results in the log book. (We can not provide criteria for rejecting a sample, since this has never occurred.)

6.) When the analysis is completed the date of analysis, the analyst's initials and the results are entered into the log book.

7.) When the report has been generated, the date of the report and the initials of the person who has generated the report are entered into the log book.

7.) Changes to entries in the log book must be approved by the Laboratory Director and initialed by the person making the change.

CODES FOR THE TYPE OF SAMPLE RECEIVED OR ANALYSIS REQUESTED

Asbestos air sample (NIOSH 7400 PLM Method)	C
Asbestos bulk sample	B
Asbestos swipe sample	S
Wet Chemical	W
Particulates & Dusts	D
Infrared Spectrophotometry	I
Gas chromatography	G
Atomic Absorption	A

III SETTING UP EQUIPMENT:

1.) All equipment is to placed on a solid, level surface to prevent the instrument from falling.

2.) All equipment requiring electrical power is to be supplied power using grounded outlets and power cords. Properly grounded two to three prong adapters may be used if necessary.

3.) All equipment will be set up as directed by the manufacturer. (Refer to the appropriate manufacturer data sheet in the Instrument Log.)

4.) Microscopes used in the counting of asbestos will be aligned for Köhler illumination and have the resolution checked every time samples are to be analyzed (daily)(See Setup of Microscope for Köhler Illumination, Appendix III). This information should be logged into the Instrument Log, along with time, day and signature of laboratory personnel. The resolution of the microscope is also to be determined whenever the microscope is moved.

IV ASBESTOS

A - Determination of fiber concentration in air collected on mixed cellulose ester filters.

1.) Preparation of sample - Laboratory Method (NIOSH 7400)

a.) Label a 2" by 3" plastic bag with the laboratory identification number. This will be used to store the filter membrane and backing pad.

b.) Label a clean 1" by 3" frosted end microscope slide with the sample's identification number.

c.) Remove the label from the cassette and affix it on the reverse of the labelled bag.

d.) Open the cassette and remove the filter and the backing pad.

e.) Using a clean scalpel cut a wedge from the filter and placed on the labeled slide; place the remainder of the filter and the backing pad into the labeled bag. Place the bag into sample storage.

f.) Dissolve the filter using the "Quick Fix" unit with approximately 0.25 mL of acetone. Measure and inject the acetone into the "Quick Fix" with the "silver labeled" 5 mL syringe

g.) Place one drop of Triacetin on the dissolved filter wedge using the "white labeled 5 mL syringe.

h.) Place a clean 22 by 22 coverslip on top of the wedge in such manner as not to trap air bubbles.

i.) Seal the cover slip by coating the edges with nail lacquer.

j.) Outline the wedge with a permanent marker on the underside of the slide.

2.) Preparation of sample - P&CAM 239

a.) Label a 2" by 3" plastic bag for the sample

b.) Label a clean 1 by 3 microscope slide for the sample.

c.) Remove the label from the cassette and affix it to the reverse side of the bag.

d.) Open the cassette and remove the filter and backing pad.

e.) Using a clean scalpel cut a wedge from the filter , place the remainder of the filter and the backing pad in the appropriate bag to be expediently transported to the laboratory for entry into the logbook, identification by laboratory identification number, reanalysis, and storage.

f.) Place a sufficient amount of 1:1 solution of dimethyl phthalate and diethyl oxalate with an appropriate amount of filter membrane dissolved into the solution (0.25 g filter membrane per 5 mL of solution) on the slide in the shape of the

triangle wedge cut from the filter.

g.) Place the wedge on top of the solution and cover with a cover slip in such a manner to prevent the trapping of air bubbles.

h.) Outline the wedge with a permanent marker on the underside of the slide.

i.) Allow the filter to completely dissolve before beginning to count.

3.) Microscope Check out.

Prior to counting the sample it is the duty of the analyst to make sure that the microscope is properly aligned. The following procedures are to be followed prior to counting samples.

a.) Turn light on.

b.) Focus on a specimen.

c.) Adjust microscope for Köhler illumination (See Appendix III).

d.) Use the telescopic eyepiece to bring the phase rings into focus. If the rings are concentric the microscope is in alignment. If not, adjust the position of the phase annulus to make the rings concentric.

e.) Replace the telescopic eyepiece with the Walton-Beckett reticle.

4.) Reference Slide

Prior to counting any samples a reference slide is to be counted. The result of this count is to be verified with the recorded value. If there is a significant difference between the count as recorded and the count the analyst received, the scope should be checked out again and the resolution determined before the scope is used for analysis.

5.) Counting Rules (NIOSH 7400 A/P&CAM 239)

a.) Count only fibers greater than 5 microns in length.

b.) Count only fibers with a length-to-width ratio equal or greater than 3:1.

c.) Count as 1 fiber any fiber which lies within the reticle area.

d.) Count as 1/2 fiber any fiber with only one end inside the reticle area.

e.) DO NOT COUNT any fiber that crosses the reticle boundary more than once or that lies outside the reticle area.

f.) Count bundles, splits and frays as one fiber .

g.) Count enough fields to yield 100 fibers.

h.) Count a minimum of 20 fields.

i.) Stop counting at 100 fields regardless of fiber count.

j.) If any field is greater than 1/6 occluded by debris or fibers do not count the field. (DOES NOT COUNT AS A FIELD COUNTED.)

k.) If 80% or greater of the first 20 fields (16 out of 20) observed are greater than 1/6 occluded, the filter is to be considered overloaded and the sample cannot be counted.

6.) Calculation of fibers/mL

a.) Determine total number of fibers counted.

b.) Divide the fibers counted by the number of fields counted to determine the number of fibers per field.

c.)Multiply the fibers per field by the effective filter area to yield fibers per effective filter area.
(effective filter area for 25 mm cassette - 385)
(effective filter area for 37 mm cassette - 855)

d.) Divide the fibers per effective filter area by the reticle area (0.008) to correct for the area of the reticle.

e.) Determine the volume of air collected in milliLiters by multiplying the flow rate in liters per minute (LPM) by sampling time (minutes) by 1000 (to give milliliters of sample).

f.) Determine the fibers per mL by dividing the corrected fibers per effective filter area by the volume of air collected in milliLiters

7.) 8 hour time-weighted average calculations

Representative 8-hour TWA employees exposure will be determined on the basis of one for more samples representing full shift exposure .

The 8 - hour TWA should be computed using the following formula:

$$TWA = \frac{CaTa + CbTb + \ldots.. CnTn}{480}$$

C is the concentration during any period of time T during which the concentration remains constant.

T is the is the duration in minutes of the exposure at concentration C.

480 is eight hours in minutes.

8.) Report

a.) All reports will list the analytical protocol used.

b.) All reports will list concentration in fibers per milliliter of air, to be reported as follows:

;;

25 mm cassette
sample volume less than 500 Liters - reported to 0.1
sample volume greater than 500 Liters - reported to 0.01
sample volume greater than 2880 Liters - reported to 0.005

37 mm cassette
sample volume less than 1100 Liters - reported to 0.1
sample volume greater than 1100 Liters - reported to 0.01

Filters which fall into the category of being unable to count in that 80% of the first 20 fields observed are more than 1/6 occluded shall be reported as - Unable to Count - Filter Overloaded.

c.) All reports will list OSHA PEL and/or ACGIH TLV in fibers/milliliter.

d.) All reports will include the appropriate disclaimer statement.

e.) All reports will include the date and signature of the microscopist.

9.) Quality Assurance

a.) Laboratory Blanks - When cassettes are received into the laboratory 2% of the cassettes will be analyzed before the cassettes are released for field use. If the result of the laboratory blanks exceed 7 fibers per 100 fields the cassettes are to be returned to the supplier, not released for field use.

b.) Field Blanks - It is recommended that whenever sampling - blanks be included with the samples for laboratory analysis.

c.) Every tenth sample will be recounted for quality assurance, by another analyst, to assure the accuracy of the results. This analysis will be done on a color coded countsheet. At the end of each month the duplicate analyses will be logged into the QC notebook, reviewed by the Laboratory Director, and any discrepancies resolved.

d.) All field counts will be recounted in the laboratory. The results of field counts are preliminary and should be reported as such. Only counts be based upon the results generated by the laboratory can be reported as performed by an AIHA Accredited Laboratory. At the end of each month the duplicate analyses will be logged into the QC notebook, reviewed by the Laboratory Director, and any discrepancies resolved.
;;sk1
e.) PAT samples - PAT samples are to be counted by all those involved with the counting of asbestos samples. The samples are to be counted using both microscopes used for counting asbestos samples. The results reported to NIOSH will be based upon the mean of the results generated by those counting the samples.

10.) Resolution of Differences

Differences in the results of the original count and the quality assurance count will be resolved by the laboratory director. Another proficient analyst will recount the sample in question and the laboratory director will discuss the results with all involved in order to resolve the differences.

11.) Training

Before an analyst will be allowed to count an asbestos sample, he/she must:

a.) Complete the equivalent of the NIOSH 582 Course.

b.) Become familiar with the procedures outlined in NIOSH 7400 (and P&CAM 239 if it is to be used).

c.) Analyze a minimum of 20 actual samples whose results must agree with the results of an experienced analyst.

d.) Show proficiency in sample preparation.

e.) Show proficiency in sample counting by counting the latest PAT samples whose results have been received from NIOSH.

12.) Proficiency

In order to maintain proficiency an analyst must:

a.) Maintain PAT proficiency

b.) Prepare and analyze at least one "non-final" sample per month. This will be reanalyzed by laboratory personnel.

c.) Those who do not maintain proficiency will have to under go retraining which will include a review of the procedures and analysis of at least 10 samples which will be reanalyzed by laboratory personnel.

B - Determination of asbestos in bulk samples.

Record on the POLARIZED LIGHT MICROSCOPY ASBESTOS BULK SAMPLE ANALYSIS form, (A copy of this form is attached.) the name of the client, the laboratory identification number, name of the person who collected the sample, Client's sample ID number, date of sampling, identification of the location from which the sample was taken, photo number, the sample condition as received and the date of the analysis.

1.) Sample preparation

a.) Most samples do not need to prepared for analysis; however wet samples must be air dried prior to analysis.
The agate mortar and pestle can sometimes be used, inside the HEPA filtered hood, in the size reduction of soft or loosely bound materials though this may cause matting of some samples.

b.) Place the sample inside the HEPA filtered hood, then carefully transfer the contents of the sample container onto glassine paper.

c.) It is the responsibilty of the analyst to take a sample for analysis which truly represents the sample received.

2.) Analysis procedure

a.) Examine the material using the stereo microscope inside the HEPA filtered hood. Record on the POLARIZED LIGHT MICROSCOPY ASBESTOS BULK SAMPLE ANALYSIS form:
HOMOGENEITY: Homogeneous [NH] Non-homogeneous, Layered or Mixed. (If sample is not homogeneous, for each different constituent or material in sample record its Appearance, Color, Luster and Shape).
APPEARANCE: [NF] Non-Fibrous, [A] Asbestiform Fiber, [NA] Non-Asbestiform Fiber, [BR] Broomed ends, [BU] Bulbous ends.
SHAPE: [RI] Ribbon, [ST] Straight, [WV] Wavy, [RG] Regular (uniform diameter), [IR] Irregular shape.
LUSTER: [GL] Glassy, [SL] Silky, [PL] Pearly, [RL] Resinous, [ML] Metallic.
Estimate and record the percent of each constituent in the total sample.

b.) Select a glass microscope slide from the box of slides in use. Check the slide under the stereo microscope for any contamination. Place a thin layer of 1.550 high dispersion Cargille refractive index liquid on the microscope slide. Next using forceps select random samples, which are representative of the total sample, at several places from the bulk material. Immerse this material for microscopic analysis in the refractive index liquid, tease apart, cover with a cover glass.

c.) With the sample in 1.550 high dispersion Cargille fluid, examine it using polarized light, bright field illumination at 100 magnification (under the polarizing light microscope, with polarizer plate in, but analyzer and compensator plate out), note its appearance and record the MICROSCOPIC MORPHOLOGY, which should detail the type of fibers, as well as non fibrous material present, appearance or morphology and color as seen under the microscope. Use the same abbreviations for terms as for the stereo microscope. Rotate stage. If color of sample changes, record PLEOCHROISM
YES and colors as seen. (Pleochroism is the absorbtion of different wavelengths of light along different optical axes of an anisotropic substance. The Polaroid filter® is pleochroic, absorbing almost all light in one direction, and very little in the perpendicular direction. No colorless substance can show pleochroism. No colored isotropic substance can show pleochroism. All colored anisotropic substances show pleochroism, although it may be too faint to detect.)

d.) If a particle is isotropic the optical properties will be the same in all orientations. An anisotropic particle will have different optical properties in different directions. Anisotropic fibers have different optical properties perpendicular to the length of the fiber and parallel to the length of the fiber. Polarized light with a known direction of vibration enables us to observe these separately. Determine REFRACTIVE INDEX of one or more fibers of each type, with the fiber running east - west (Parallel to the direction of vibration of the polarizer) by the Becke Line Method. If sample refractive index is close to refractive index of fluid, fiber or particle will not be sharp, if refractive index is very different contrast will be sharp and edges will be dark. If the particle has a higher refractive index than the fluid, it will bend the light inward and concentrate light above it like a magnifying glass. When you focus up (rotate fine focus so that stage moves down and the distance between the particle and the objective increases) the bright line moves into the fiber or particle, and when you focus down (rotate fine focus so that stage moves up) the bright line moves outside fiber or particle, this shows that the refractive index of sample is greater than that of fluid.

If bright line moves into fiber or particle when you focus down and the

bright line moves outside fiber or particle when you focus up, the refractive index of sample is less than that of fluid.
Record >> 1.550, > 1.550, 1.550, < 1.550 or << 1.550.
Repeat for the same fibers with the fiber running north - south (Perpendicular to the direction of vibration of the polarizer).

Record temperature of thermometer in hood,(Lab. Temperature ° C_____) and if more than two degrees from the Index Temperature of the refractive index fluid(Temp ° C_____ from the bottle), use these and the Nominal Refractive Index (NRI) of the fluid (1.550), the Temperature Coefficient of fluid ° C_____ to calculate the Corrected Refractive Index of the fluid _____.
NRI + (Lab.Temp. - Index Temp.)(Temp.Coefficient) = Corrected R I

e.) Birefringence is the difference between the refractive index of an anisotropic particle in different directions (perpendicular to the length of the fiber vs. parallel to the length of the fiber). A numerical value for birefringence can be determined by subtracting the smaller refractive index from the larger. It can be observed qualitatively as follows: Insert analyzer and rotate polarizer perpendicular to the direction of vibration of the analyzer. This will occur when the background is as black as possible. Rotate stage. If sample stays dark, record BIREFRINGENCE as 0 = None (isotropic) otherwise classify as L = Low, M = Medium or H = High degree of birefringence (anisotropism) depending on brightness.

f.) An anisotropic particle will alter the direction of vibration of polarized light except when its axis is aligned with the direction of vibration of the polarized light. If polarizer and analyzer are crossed (the directions of vibration are perpendicular to each other) no light can pass through them.
If an anisotropic particle is placed between the crossed polarizer and analyzer, it will alter the direction of vibration so that light can pass through the particle. Rotate eyepiece with cross hair reticle so that hairs run north - south (parallel to the direction of vibration of the analyzer) and east - west (parallel to the direction of vibration of the polarizer). Rotate stage, if fiber becomes dark when parallel to either of the microscope cross hairs (and to the direction of vibration of the polarizer or analyzer) its optical axis is aligned with the direction of vibration of the polarized light of either the polarizer or analyzer. The optical axis of the fiber is parallel to the fiber length. Report EXTINCTION ANGLE as parallel. If fiber becomes dark when at an angle to the microscope cross hairs, report inclined (oblique) extinction angle. (It is possible to measure the angle between the optical axis and the fiber axis, using the scale and vernier on the rotating stage, but this is not necessary in asbestos determination.) If parts of fiber become bright at one angle and part at another, the optical axis is not constant, but changes along the fiber length. Report wavy (undulose) extinction angle. If the extinction pattern is otherwise, report and describe.

g.) The difference between the refractive index (birefringence) of an anisotropic particle perpendicular to the length of the fiber vs. parallel to the length of the fiber, and the thickness of the fiber determine the interference color. This is expressed as retardation. The retardation,
r = 1000 times the birefringence times the thickness. This is the actual distance in nanometers that the slow component of the light (passing through the higher refractive index) is retarded behind the fast component of the light (passing through the lower refractive index). The retardation can be estimated by noting the interference colors and comparing them with the Michel-Lévy chart.
If the retardation is first order, as with thin chrysotile fibers(50-150 nm) between

crossed polarizer and analyzer, the colors will be gray or white in the brightest positions. Insert the compensator plate (which has a 550 nanometer or full wave retardation, with its higher refractive index at 45 degrees to the analyzer's direction of vibration). Rotate stage. When the brightest position has the slow component (light passing through the higher refractive index of the fiber) parallel to the slow component of the compensator, the retardations will add (550+100=650 which is a blue interference color). The sample fiber will thus appear blue when /. If the refractive index parallel to the length of the fiber is higher than the refractive index perpendicular to the length of the fiber, it will retard the polarized light more. Rotate stage. When the brightest position has the slow component (passing through the higher refractive index of the fiber) parallel to the fast component of the compensator, the retardations will subtract (550-100=450 which is a yellow interference color). The sample fiber will thus appear yellow when \. Record the SIGN OF ELONGATION as positive.

If the refractive index perpendicular to the length of the fiber is higher than the refractive index parallel to the length of the fiber, the sign of elongation is negative and the sample fiber will appear yellow when / and blue when \. If not, recheck refractive index. If so, record sign of elongation negative.

If the refractive index is very much greater than that of fluid, mount another portion of sample in 1.680 refractive index Fluid. Alternatively, remove and discard coverslip. Place slide on hotplate in hood. When 1.550 refractive index fluid has evaporated, remount material in 1.680 refractive index Fluid.
Repeat Becke Line Method. Record >> 1.680, > 1.680, 1.680, < 1.680 or << 1.680.
If refractive index is less than that of fluid, mount another portion of sample in 1.605 refractive index Fluid. Repeat Becke Line Method. Record >> 1.605, > 1.605, 1.605, < 1.605 or << 1.605.
(One of the three should be close enough that fiber is not too clear and Becke line is hard to see. That's the one to use for dispersion staining.) If amosite is suspected, a slide should be prepared using a 1.680 high dispersion Cargille fluid. If Crocidolite is suspected a second slide with refractive index of 1.700. If Anthophyllite, Tremolite or Actinolite is suspected a slide with refractive index of 1.605 should be prepared.

i.) Dispersion Staining is a measure of the difference between the refractive index of the fluid and the refractive index of the particle parallel to the direction of vibration of the polarizer (east - west).
The refractive index differs for different wavelengths of light.
If the particle and the liquid have very different indices of refraction, except for having one index of refraction, for one wavelength (color), in common, all wavelengths except that one will be refracted (bent) sufficiently that they will not pass through the annular stop, and only that color will be seen. If a central stop is used all wavelengths except that one will be refracted (bent) sufficiently that they will pass around the central stop and the color seen will be the result of subtracting out the matching wavelength.
The central stop is usually used since it is easier to see color against a dark background.
By using the polarizer, the dispersion staining color, and the refractive index can be measured at any angle. For asbestos, the dispersion staining colors parallel and perpendicular to the fiber are determined.

Remove analyzer and compensator. Examine the sample with the McCrone dispersion staining objective with the central stop in place to confirm the presence

and type of asbestos present. Rotate stage. Record central stop DISPERSION STAINING color with fiber parallel to horizontal cross hair of microscope. Rotate stage. Record color with fiber perpendicular to horizontal cross hair of microscope. The following chart shows the dispersion staining colors for different types of asbestos material and the Cargille fluid they are mounted in.

CENTRAL STOP DISPERSION STAINING COLORS

MINERAL	RI Liquid	Perpendicular	Parallel
Chrysotile	1.550	Blue	Blue-magenta
Amosite	1.550	Yellow to white	Yellow to white
	1.680	Blue-magenta to pale blue	Golden-yellow
Crocidolite	1.550	Yellow to white	Yellow to white
	1.700	Red-Magenta	Blue-Magenta
Anthophyllite	1.605	Blue	Gold to Gold-Magenta
Tremolite	1.605	Pale blue	Yellow
Actinolite	1.605	Gold-magenta to blue	Gold

j.) If asbestos is not found in the first sample or if only a trace is found, a second random sample should be taken and examined as the first. Does sample contain asbestos? Record [Y] YES or [N] NO. Identify types from the chart and estimate percent of each.

k.) Does sample contain other non asbestos fibers? Identify and record type and estimated percent. CELL = Cellulose, FG or FBGL = Fibrous Glass, MW = Mineral Wool, OTHER or NONE. Record type and estimated percent of other NON ASBESTOS FIBERS on the POLARIZED LIGHT MICROSCOPY ASBESTOS BULK SAMPLE ANALYSIS form, and in the letter report to the client.

l.) Does sample contain other non fibrous material? [Y] YES or [N] NO. Identify type and estimate %. CACO = Calcium carbonate, CASO = Calcium sulfate, MICA, PERLITE, OTHER or NONE

3.) Report of results

a.) NAD - No Asbestos Detected - No asbestos found in two random samplings.

b.) Trace - Asbestos found but the amount present is very low - less than 1%. This is usually the case only when the asbestos is a contaminant or accidental rather than intentional component of the material. If asbestos is found in very low amount, but consistently throughout the sample as a component of the material sampled, identify type and record as 1-5%.

c.) AC - actinolite present in the sample. (state percent present)

d.) AN - anthrophylite present in the sample. (state percent present)

e.) AM - amosite present in the sample. (state percent present)

f.) CH - chrysotile present in the sample. (state percent present)

g.) CR - crocidolite present in the sample. (state percent present)

h.) TR - tremolite present in the sample. (state percent present)

i.) These results together with the percent of each type of asbestos found, the date of analysis, the analyst's initials and the results are entered into the LABORATORY SAMPLE LOG BOOK.

j.) The POLARIZED LIGHT MICROSCOPY ASBESTOS BULK SAMPLE ANALYSIS form must be signed by the Microscopist, and reviewed and signed and sealed by the Laboratory Director. The original is to be filed by Month and Year. A copy may be sent to the client if desired along with the letter report.

4.) Quality Assurance

a.) Every tenth bulk sample will be reanalyzed, by another analyst, to assure the accuracy of the results. This analysis will be done on a color coded worksheet. At the end of each month the duplicate analyses will be logged into the QC notebook, reviewed by the Laboratory Director, and any discrepancies resolved.

b.) A number of Quality Control samples equal to at least 1% of the previous month's samples will be prepared each month by the Laboratory Director, from known materials including NIST standards and previous RTI round robin analysis bulk samples. These samples will be analyzed along with the month's regular samples. All of these bulk samples will be reanalyzed, by another analyst, to assure the accuracy of the results. This analysis will be recorded on a color coded worksheet. At the end of each month the duplicate analyses will be logged into the QC notebook, reviewed by the Laboratory Director, and any discrepancies resolved.

c.) One hundred or more Quality Control samples per year will be exchanged with one or more PLM laboratories. These samples will be analyzed along with the month's regular samples. This analysis will be recorded on a color coded worksheet. When all labs have reported their analyses, any discrepancies will be resolved by rechecking analyses on which one or more laboratories disagree. If our laboratory results are in error, additional training and corrective procedures will be instituted.

d.) NIST NVLAP bulk samples will be analyzed by all analysts involved in bulk asbestos analysis. The results reported will be the consensus of the results of all analysts.

e.) All laboratory supplies must be checked for contamination or deterioration. At least weekly, select at random a glass microscope slide from the box of slides in use. Select at random a glass microscope slide from a new box of slides before putting it into use. Examine the slide under the stereo microscope for any contamination. At least weekly, select at random a microscope coverslip from the box of coverslips in use. Select at random a microscope coverslip from a new box of coverslips before putting it into use. Examine the coverslip under the stereo microscope for any contamination. If no contamination is seen, place a thin layer of 1.550 high dispersion Cargille refractive index liquid on the microscope slide. Next cover with a cover glass and examine under 100 and 400 power magnification using the polarizing light microscope. Use the analyzer and compensator plates, and rotate the stage to make any asbestos contamination more visible. If any contamination is seen recheck substituting in turn slides and coverslips from a new box and 1.550 high dispersion Cargille refractive index liquid from a previously

unopened bottle, to determine which is contaminated. Discard any contaminated material. Repeat using 1.605, 1.680 and 1.700 high dispersion Cargille refractive index liquids. Check any other refractive index liquids in the same way before using them.

At least weekly, place a thin layer of 1.550 high dispersion Cargille refractive index liquid in three places on a microscope slide. Place a tiny amount of 1.55 precision calibrated glass in one location, cover with a cover glass and mark that location. Place a tiny amount of 1.54 precision calibrated glass in the second location, cover with a cover glass and mark that location. Place a tiny amount of 1.56 precision calibrated glass in the second location, cover with a cover glass and mark that location. Compare refractive index of the glass with that of the 1.550 high dispersion Cargille refractive index liquid by the Becke Line Method for each of the three glasses. If refractive index is other than 1.550, recheck procedure substituting 1.550 high dispersion Cargille refractive index liquid from a previously unopened bottle. Discard any refractive index fluid which is not of the correct refractive index. Repeat using 1.605, 1.680 and 1.700 high dispersion Cargille refractive index liquids with the appropriate glasses. Check each new previously unopened bottle of refractive index fluid before putting it into use. Check any other refractive index liquids in the same way before using them.

5.) Resolution of Differences

a.) In the event of a significant difference in the original analysis and the quality assurance analysis, the Laboratory Director will analyze the sample and discuss his findings with those involved to resolve the difference.

b.) In the event of an incorrect analysis of the Quality Control samples, the Laboratory Director will review the principles and procedures with the analyst, after which the analyst will correctly analyse at least four samples prepared by the Laboratory Director, from known materials including previous RTI round robin analysis bulk samples.

c.) In the event of an incorrect analysis of the NIST NVLAP bulk samples or exchange samples, the Laboratory Director will review the principles and procedures with all analysts, after which all analysts will correctly analyse at least four samples prepared by the Industrial Hygiene Manager, from known materials including previous RTI round robin analysis bulk samples.

6.) Training

Oneil M. Banks will provide all persons involved in bulk asbestos analysis education in the aspects of polarized light microscopy theory and its application, and training in the proper use of a polarizing light microscope, including:

a.) Familiarization with the polarizing light microscope and the principles involved.

b.) Familiarization with the procedures used to analyze bulk asbestos samples.

1. Observation and measurement of refractive indices, use of the Becke line, to determine R I,
2. Observation and measurement of birefringence,
3. Observation and measurement of sign of elongation,
4. Observation and measurement of pleochroism,

5. Observation and measurement of extinction characteristics and
6. Contamination control procedures, proper cleaning and calibration methods.

Before an analyst will be considered proficient to analyze for type and percent asbestos present, he/she must complete a qualification program which will include:

a.) Reanalysis of a minimum of 20 samples representative of the type of samples usually analyzed in the laboratory.

b.) Analysis of a number of samples prepared by the Laboratory Director, from known materials including previous RTI round robin analysis bulk samples.

Personnel Files for each analyst will include records of the individual's training, assigned lab procedures, results of Q A testing, reviews of inter and intra operator tests, precision and accuracy data, and corrections, taken to improve deficiencies.

7.) Proficiency

Oneil M. Banks will provide all persons involved in bulk asbestos analysis continuing training in the aspects of polarized light microscopy theory and its application. This will include reference textbooks and seminar type training on a monthly basis. In order to maintain proficiency an analyst must:

a.) Analyze a minimum of four samples each month.

b.) Maintain individual proficiency with the NIST NVLAP bulk samples and the monthly Quality Control samples,

c.) Anyone who fails to maintain proficiency must undergo retraining which consist of:

i) Review of the analysis protocol.

ii) Reanalysis of at least 10 bulk samples representative of the samples received in the laboratory.

iii) Analysis of at least four samples prepared by the Laboratory Director, from known materials including previous RTI round robin analysis bulk samples.

d.) Results of Q A testing, reviews of inter and intra operator tests, precision and accuracy data, deficiencies and actions taken to improve them will be recorded in the proficiency record of each analyst and kept in his or her Personnel File.

8.) Decontamination

a.) If a spill of the bulk suspected asbestos containing material occurs in the laboratory:

i) Stop work immediately.

ii) HEPA vacuum the area where the spill occurred, then proceed to vacuum area within a three foot range of spill.

iii) Wet wipe contaminated surface areas with amended water.

b.) After analysis sampling instruments, workspace and microscope are to be wiped clean before any other analysis is to take place. The coverslips, glass slides, glassine papers and wet Kimwipes are to be placed in the asbestos contaminated waste container.

C - Swipes

1.) Preparation of sample - Any debris on the filter is removed and analyzed as a bulk sample. The filter is then analyzed as an air sample.

2.) Analytical procedure - see procedure for air and bulk analysis.

3.) Report of results

a.) Debris removed is reported as type and percent of asbestos other fibers and non-fibrous material present.

b.) Filter PCM count is reported as fibers per cm^2

4.) Quality Assurance

Ten percent of all swipe samples will be reanalyzed for quality assurance.

5.) Resolution of Differences

If the result of the original analysis and the quality assurance differ significantly, the laboratory manager will reanalyze the sample and discuss the results with those involved with the sample analysis.

6.) Training

Before an analyst will be allowed to analyze a swipe sample, he must be proficient in both bulk and air sample analysis.

7.) Proficiency

An analyst must maintain proficiency in both bulk and air sample analysis in order to conduct analysis of swipes.

VI Gravimetric Particulates

Particulate samples are to be collected on cassettes with 2 matched filters.

1.) Sample Preparation

a.) The inlet and outlet caps are removed from the cassette.

b.) The cassette is placed in a desicator with fresh desicant for a period of at least 12 hours. (a 24 hour period is preferred)

2.) Check out of balance

a.) The balance is placed on a solid surface which is free of interfering vibrations.

b.) The balance is leveled .

c.) With no weight on the balance pan the balance is zeroed.

d.) A weight of known mass is weighed to determine if the balance is functioning properly. If the weight of the known differs significantly from the recorded weight, the instrument is not to be used until the problem is resolved to the satisfaction of the laboratory manger.

3.) Analysis

a.) Carefully open the cassette.

b.) Carefully remove and separate the filters.

c.) Weigh the 1st filter and record its weight.

d.) Weigh the 2nd filter and record its weight.

e.) Calculate the differences in the weights of the two filters.

4.) Reports

a.) All reports will list the analytical protocol used.

b.) All reports will list concentration in mg/m^3.

c.) All reports will list OSHA PEL and/or ACGIH TLV in mg/m^3.

d.) All reports will include the appropriate disclaimer statement.

e.) All reports will include the date and signature of the analyst.

5.) Calculations

$$\frac{\text{Difference in the weight of the two filters in mg}}{\text{Volume collected in liters}} \times 1000 = mg/m^3$$

(Volume collected = flow rate (LPM) X time (in minutes)

X REFERENCES

The following references have been obtained:

McCrone, Walter C., McCrone, Lucy B., and Delly, John Gustav, Polarized Light Microscopy, McCrone Research Institute

McCrone, Walter C., The Identification of Asbestos by Polarized Light Microscopy, McCrone Research Institute

McCrone, Walter C., Asbestos Identification, McCrone Research Institute, 1988

Allen, Roy M. Practical Refractometry, Cargille Laboratories, Inc.

Reference Manual, McCrone Research Institute

Campbell, W. J., Blake, R. L., Brown, L. L., Cather, E. E. and Sjoberg, J. J., Selected Silicate minerals and Their Asbestiform Varieties, U. S. Dept. of the Interior

The following references have been ordered.

The ASTM draft method was ordered as soon as we became aware of its availability.

Abramowitz, Mortimer, Microscope Basics and Beyond, Olympus

Jones, Norris J. & Bloss, F. Donald, Laboratory Manual for Optical Minerology, Burgess Publishing Co., Minneapolis, Minn.

other reference texts on Optical Minerology/Crystalography will be added.

APPENDIX I: USE OF HEPA FILTERED HOOD FOR SAMPLE PREPARATION

Upon receiving bulk sample, label container with Oneil M. Banks laboratory log book number.

1.) Clean hood before analysis. Using spray bottle of water with clean Kimwipe, thoroughly clean inside of hood area so that no particles can be seen by naked eye. Discard Kimwipe in asbestos waste container. Next, clean area with hepa filtered vacuum.

2.) Turn on hood at small switch box to the right of hood by rotating knob clockwise.

3.) Carefully open container of possible asbestos containing material, inside of hood. Keep open top of the container pointed toward the rear of the hood. NO MORE THAN ONE SAMPLE UNDER HOOD AT ANY TIME.

4.) Place sample on glassine paper in the center of the stage of zoom scope.

5.) When analysis is complete, put material back in the original container. Discard glassine paper in asbestos waste container.

6.) Using spray bottle of water with clean Kimwipe, thoroughly clean inside of hood area so that no particles can be seen by naked eye. Discard Kimwipe in asbestos waste container. Next, clean area with hepa filtered vacuum.

7.) Turn off hepa hood by turning knob on the right side of hood counter clockwise.

MAINTENANCE OF HEPA FILTERED HOOD

1.) If problems arise with hepa hood (17" hood, 12 X 12 Hepa, 85 cfm blower with variable speed control) contact Miller Fabrications, Inc. Phone (919) 876-3848

APPENDIX II: USE OF ZOOM SCOPE FOR BULK SAMPLES

1.) Place sample on glassine paper in the center of the stage of zoom scope.

2.) Rotate diopter ring on both eyepieces to setting "0".

3.) Loosen pillar lock lever and rotate microscope body to the right and left, as well as push it up and down, until sample is brought into approximate focus, and then clamp.

4.) Rotate zoom control ring to maximum magnification setting "4"(40 power if ten power eyepieces are used).

5.) A) Looking through the right eyepiece with your right eye, focus on the specimen with focusing knobs.
B) Rotate zoom control ring to minimum magnification "0.7"(7 power if ten power eyepieces are used).
C) If specimen is out of focus at this setting, rotate right diopter ring to bring it into focus, but do not touch focusing knobs.
D) Again rotate zoom control ring to maximum magnification "4". If the image of specimen goes out of focus, repeat steps 2 & 3.
E) Look through through left eyepiece with your left eye, and rotate left diopter ring to focus on specimen without using right diopter ring, and without touching focusing knobs.

6.) Hold right and left eyepiece tubes with both hands and push the tubes together, or pull them apart laterally, whichever is required, while looking through the eyepieces with both eyes, until perfect binocular vision is obtained.

7.) Rotate zoom control ring until you can obtain the desired magnification.

HELPFUL HINTS

1) When analyzing very hard, or cementitious substances, observe material first under zoom scope then place substance in cleaned agate mortar and use pestle to crush into fine particles, then observe under stereo zoom scope.

2) When analyzing floor tile check preformed edges if possible because sometimes where sample was molded fibers can be easily seen. Also, when analyzing floor tile make sure to thoroughly analyze mastic layer.

MAINTENANCE OF ZOOM SCOPE

1.) Before and after use of zoom scope, area around zoom scope and stage of scope should be cleaned thoroughly. To clean area use clean paper towel and water. Thoroughly saturate area and wipe dry. Discard paper towel in asbestos waste container. Next use hepa vacuum, vacuum area and stage so that no debris can be seen.

2.) To clean the lens of the eye piece use a small amount of distilled water and cotton swab, and in a circular motion wipe lens clean.

3.) If any problems occur with zoom scope , 7x-40X, Binoc. catalog number

olysz3100 contact McCrone Accessories and Components, 850 Pasquinelli Drive, Westmont, Illinois 605559 (312) 887-7100.

4.) If scope is repaired or otherwise removed from the HEPA hood, repeat all checkout and alignment steps before putting it into service.

5.) All calibration and maintenance of microscope will be recorded in the INSTRUMENT LOG section for that microscope as will any removal of defective equipment from service until repaired.

APPENDIX III: SETUP OF MICROSCOPES FOR KÖHLER ILLUMINATION

Köhler illumination is a high intensity, even illumination in which the field diaphragm is imaged in the object plane, and the aperture diaphragm and lamp filament are imaged in the back focal plane of the objective. The image of the lamp filament is focused in the plane of the substage aperture diaphragm and the image is observed at its conjugate focus in the back focal plane of the objective using a Bertrand lens or the centering phase telescope. The image of the lamp filament must fill the full objective aperture. The image of the adjustable field diaphragm is focused and centered in the plane of the preparation and the lamp filament must be adjustable in all directions.

1.) Follow this procedure at the beginning of each day or work shift, and anytime the microscope has been moved or alignment may have been disturbed.

2.) Fully rack up condenser with top lens swung in.

3.) Focus on specimen (slide coverslip preparation) with 40x objective.

4.) While viewing close down field diaphragm (lamp field stop in microscope base).

5.) Slightly lower condenser until field diaphragm is in optimum focus.

6.) Use the two condenser centering screws to center image of field stop in field of view.

7.) Open up field stop almost to edge of field of view, fine focus, and verify centering before opening further to just clear field of view.

8.) Insert Bertrand lens or the centering phase telescope, or remove the ocular and look down the bodytube to see the back focal plane of the objective.

9.) Focus the image of the lamp filament in the back focal plane of the objective by moving the lamp bulb fixture.

10.) Center the image of the lamp filament in the back focal plane of the objective by moving the lamp bulb.

11.) Remove Bertrand lens or centering phase telescope, and adjust the substage aperture diaphragm for optimum contrast and illumination.(Opening the diaphragm too much will cause an increase in glare which will reduce resolution.)

APPENDIX IV: ALIGNMENT OF POLARIZED LIGHT MICROSCOPE

1.) Follow this procedure at the beginning of each day or work shift, and anytime the microscope has been moved or alignment may have been disturbed.

2.) After adjusting for Köhler illumination, orient the polarizer and analyzer at 90° to each other by inserting the analyzer, looking through the eyepieces, and rotating the polarizer to obtain the darkest possible field.

3.) Place a slide with particles on it on the stage. Looking through the right eyepiece with your right eye, focus on the specimen with focusing knobs. Look through through left eyepiece with your left eye, and rotate left diopter ring to focus on specimen without using right diopter ring, and without touching focusing knobs.

4.) Hold right and left eyepiece tubes with both hands and push the tubes together, or pull them apart laterally, whichever is required, while looking through the eyepieces with both eyes, until perfect binocular vision is obtained.

5.) Use focusing ring on ocular to focus crosshairs of reticle sharply. Orient the ocular crosshairs to coincide with the privileged directions of the polarizer and analyzer by rotating the eyepiece with the reticle until the crosshairs are vertical and horizontal as you look through the eyepieces.

6.) Adjust the position of the slide to center a particle under the crosshairs. Rotating the stage and observe whether the particle moves away from the center. If it does, loosen the stage locking screws and adjust the particle position by moving the stage to move the particle half way to the center. Rotate the stage. When the particle appears to circle the crossing point of the ocular crosshairs, center the particle under the crosshairs and repeat until the particle no longer moves away from the center. Lock the stage in position, and recheck.

APPENDIX V: CARE AND CLEANING OF THE MICROSCOPES

1.) Dust particles on eyepieces will cause patches in the image, or reduce sharpness of the image. Therefore, when microscope is not in use a cover should be placed over microscope.

2.) If a structure is found in the image which is suspected of being extraneous to the specimen, use the following to trace the problem.

A) If the trouble can be eliminated by slight adjustment of the condenser, the cause must be sought in the bulb of the lamp, the lamp condenser, or the filter in front of it.

B) If the condenser adjustment does not produce any result, the next step is to turn the focusing control, which should eliminate all faults due to soiling of the condenser front lens or the specimen. If this does not produce any change, slightly turn first the objective and then the eyepiece, and you will immediately notice in which case the foreign body follows the rotation. Dust particles are most clearly seen when the aperture diaphragm has been fully closed, because in this case the depth of focus is at its greatest.

3.) Clean outer lens faces with grease-free brush, dust free linen cloth or cotton swab and distilled water, produced easily by breathing upon the surface to be cleaned.

MAINTENANCE OF MICROSCOPE

1.) If light source does not illuminate, carefully unscrew light bulb housing under the base of the scope. Carefully slide out bulb housing and replace bulb. Be sure not to touch new bulb.

2.) If any problems occur with the operation of the scope contact Baltimore instruments, 4610 Harford Road, Baltimore, Maryland 21214, phone (301) 426-3656

3.) If scope is repaired or otherwise removed from the HEPA hood, repeat all checkout and alignment steps before putting it into service.

4.) All calibration and maintenance of microscope will be recorded in the INSTRUMENT LOG section for that microscope as will any removal of defective equipment from service until repaired.

APPENDIX IV: QUICKFIX OPERATING INSTRUCTIONS

1.) Plug into 115 volt outlet; turn on switch on.

2.) Red light indicates unit is ready. Preheat approximately one minute.

3.) Place filter wedge on glass slide

4.) Place glass slide on stage and position filter under nozzle at bottom of unit.

5.) Draw approximately 0.2 ml of acetone into syringe. Insert syringe through rubber top. Inject acetone.

6.) Remove slide immediately and apply 1 drop of triacetin to the center of cleared filter wedge.
7.) Cover with cover slip.

MAINTENANCE OF QUICK FIX

1.) To replace the rubber septum, unscrew the plastic injection port and pop out the septum with a pen. Replace septa are available from MAC, 1-800-MAC-8122.

2.) To replace the fuse, unscrew the fuse holder and replace with a 3 Amp 250 250V 3AG style fuse. These are also available from MAC.

3.) Periodic maintenance: to expel any accumulation of particles, inject air through cooled system using compressed air or a full syringe of acetone.

APPENDIX V: EQUIPMENT RECORDS/INSTRUMENT LOG

1.) Loose leaf notebook files are maintained which contain a section for each microscope and major piece of equipment. These Equipment Records serve as the INSTRUMENT LOG. Each section contains the manufacturer's name, model, serial number of the instrument or serial numbers of major components which comprise it, manufacturer's instruction manuals, and maintenance/service literature.

2.) All calibration and maintenance of microscope will be recorded in the INSTRUMENT LOG section for that microscope as will any removal of defective equipment from service until repaired. Such information will be dated, and include the number of the last sample analyzed before and repeat analyzed after return to service, and the initials of the analyst.

The American Industrial Hygiene Association

is proud to acknowledge that

Oneil M. Banks, Inc.

Bel Air, MD

Laboratory ID# 8860

has fulfilled the requirements for Industrial Hygiene Laboratory Accreditation and has earned distinguished recognition as an

AIHA Accredited Laboratory

since October 1, 1984 through October 1, 1996

subject to continued compliance with AIHA accreditation criteria.

November 15, 1993

Date Prepared

President
American Industrial Hygiene Association

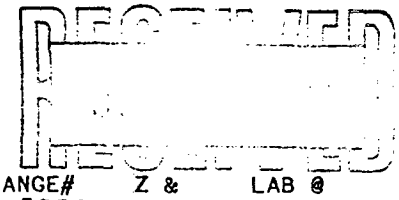
Donald J. Hart

260

Certificate Number

Chairman
Laboratory Accreditation Committee

PROFICIENCY ANALYTICAL TESTING (PAT) PROGRAM
INDIVIDUAL LABORATORY REPORT FOR ROUND 121
LAB ID=08860
ONEIL M. BANKS, INC., BEL AIR, MD 21014



CONTAMINANT (ABV.)	UNIT	SAMPLE NO.	REPORTED RESULTS	REFERENCE VALUES *	ACCEPTABLE RANGE# LOWER	UPPER	Z & SCORE	LAB @ PERFORMANCE
ASBESTOS (ASB)	(F/MM2)	1	441.7000	507.4937	181.1879	998.2209	-0.50	A
	(F/MM2)	2	214.6000	357.8406	95.7931	786.5756	-1.40	A
	(F/MM2)	3	85.6000	190.5754	30.6595	487.2044	-1.65	A
	(F/MM2)	4	116.3000	165.9330	26.9882	423.0419	-0.82	A

* Reference values are the mean of the reference laboratories based on original scales except for asbestos. Asbestos results are calculated based on transformed data. Therefore, asbestos performance limits are not symmetrical to the reference values.

\# Upper limit: reference value + 3 standard deviations
Lower limit: reference value - 3 standard deviations

& Z Score = (reported result-reference value)/standard deviation

@ A: Analysis acceptable -: Results not reported
H: Results > upper limit (Z > 3), not acceptable
L: Results < lower limit (Z < -3), not acceptable

PROFICIENCY ANALYTICAL TESTING(PAT) PROGRAM
LABORATORY YEAR-TO-DATE PERFORMANCE REPORT FOR ROUND 121
LAB ID=08860

SAMPLE TYPE	ROUND	ROUND * PERFORMANCE	ACCUMULATED PERFORMANCE 4 ROUNDS (%)		2 ROUNDS (%)		PROFICIENCY RATING #
ASBESTOS	118	4/4					
	119	4/4					
	120	4/4					
	121	4/4	16/16	100	8/8	100	P

* The denominators represent the number of total samples analyzed.
The numerators represent the number of acceptable results.

\# P : Proficient N: Nonproficient -: Not Rated
Performance ratings are based on accumulated results over four rounds (one year). A lab's performance on each sample type is rated proficient (P), if: 1) three-fourths (75%) or more of the accumulated results over four rounds are acceptable or 2) for the last two rounds, all samples are analyzed and the results are 100 % acceptable. If a laboratory receives samples for a contaminant and does not report the data, no rating will be given for that contaminant.

APPENDIX C

LAW
ENGINEERING AND ENVIRONMENTAL SERVICES

May 18, 1995

Mr. Bryant Bullock
Horn Engineering, Inc.
4501 Ford Avenue
Suite 1100
Alexandria, Virginia 22302

Subject: **Quality Assurance Plan**
LAW's Asbestos Laboratory
Washington, D.C. Branch

Dear Mr. Bullock:

Law Engineering and Environmental Services, Inc. (LAW) is pleased to be considered to analyze quality assurance bulk asbestos samples on your project. We have included a copy of our *Quality Assurance Manual for the Bulk Asbestos Laboratory.* We have also enclosed a copy of our most current National Voluntary Laboratory Accreditation Program (NVLAP) certificate.

We appreciate your consideration for LAW to serve as your consultant on this project. If you have any questions or if we may be of further assistance, please contact us.

Sincerely,

LAW ENGINEERING AND ENVIRONMENTAL SERVICES, INC.

Dennis C. Ertel, Jr.
Staff Scientist

Paul J. Bruner, Jr., P.E.
Principal Engineer

DCE/PJB:dce

Enclosures: Quality Assurance Manual for the Bulk Asbestos Laboratory
NVLAP Certificate

LAW ENGINEERING, INC.
4465 BROOKFIELD CORPORATE DRIVE • CHANTILLY, VA 22021
(703) 968-4700 • FAX (703) 968-4778

ONE OF THE LAW COMPANIES

QUALITY ASSURANCE MANUAL FOR THE BULK ASBESTOS LABORATORY

Law Engineering
Washington D.C. Branch
Chantilly, Virginia
March, 1989

PURPOSE

The purpose of this laboratory is to detect and confirm the presence of asbestos minerals (chrysotile, amosite (fibrous grunerite), crocidolite, fibrous anthophyllite, fibrous tremolite and fibrous actinolite) in construction, insulation, miscellaneous building materials, and soils. This laboratory will report the type of asbestos detected and the percentage of asbestos in the sample submitted. Quantification of asbestos materials will be performed by visual estimation (as indicated on bulk sample analysis sheets).

GENERAL

All preliminary analyses will be performed under a HEPA glovebox or hood which will be smoke tested semi-annually to demonstrate sufficient air flow to prevent any escape of fibers. All countertops and exposed surfaces will be wet wiped weekly. Glovebox air will be isolated from building HVAC and exhausted outside immediately after leaving the lab. Access to the laboratory will be limited to authorized personnel. A caution sign stating that asbestos, a known health hazard, is handled within will be posted at the entrance as well as a control log. All persons entering this laboratory must sign the log, unless they are in the medical surveillance program and approved by the lab manager.

Analysis and identification will be performed in general accordance with part 1 of the EPA test method EPA-600/M4-82-020 (Appendix 3-1): "Interim Method for the Determination of Asbestos in Bulk Insulation Samples" with the following exceptions: high dispersion refractive index oils will be used when appropriate and quantification of component percentages will be by visual estimate.

This manual shall serve as a reference of minimum guidelines for the operational and technical aspects of the Bulk Asbestos Laboratory for the Washington Branch of Law Engineering, Inc. It is to be used in conjunction with Section 3 of Law Engineering's "Work and Test Procedures for Asbestos Services".

TRAINING

All analysts are required to have a background in geology with successful completion of courses and/or experience covering mineralogy, crystallography, optical mineralogy and petrology. Within three months of starting to perform analyses, each analyst trainee will successfully complete the McCrone Institute's course "Microscopical Identification of Asbestos". Prior to completion of this course, all samples will be re-analyzed by experienced analyst with any discrepancies discussed and resolved. The laboratory will maintain a set of reference samples (NVLAP Proficiency samples will be used) and each analyst trainee will be required to correctly analyze at least 5 of these samples prior to becoming a qualified analyst. All 5 samples must be analyzed at one time without error. As outside courses pertaining to bulk sample analysis and laboratory quality control become available, every effort will be made to allow analysts to attend.

A computer program, tracker, will be used to enter data and generate a field data detail report, a request of analysis report, and individual bulk analysis sheets.

EQUIPMENT AND SUPPLIES

Refractive index of the three oils (1.55, 1.605, 1.68) used in asbestos identification will be checked whenever a new bottle is opened. Date of calibration will be written on the bottle. If a bottle of oil is still in use after 6 months, the oil will be recalibrated.

Microscope alignment will be checked and calibrated daily.

R.I. oils will be checked for contamination at least once a week, any oil found to be contaminated will be disposed of immediately. Contamination checks will consist of the following: Each Monday morning, prior to starting production, each analyst will mount a sample of the laboratory standard (reagent grade NaCl) in each of the three major oils. These mounts will be inspected under the PLM with crossed polars for any evidence of asbestos contamination.

A notebook will be kept in which alignment and contamination checks will be documented. Air flow in the glovebox or hood will be smoke tested at least once every six months.

SAMPLE HANDLING

Upon receipt of the samples, the containers will be checked for damage or signs of cross-contamination. Samples will fail inspection if there is one open container of asbestos-containing materials in the package, or two or more open containers. If the samples do not pass inspection, the client will be notified immediately and the samples will be handled as per his instructions. If the samples pass inspection they will be placed in a plastic bag with the date of receipt written on the bag.

Prior to analysis, the following information will be entered into the laboratory log book: job name, job number, date of receipt, sample number and billing information. Each sample will be assigned a unique laboratory log number. All documentation pertaining to the samples should refer to this number. The laboratory log book will indicate the sample's custody status.

After analysis and Q.A. re-analysis, the samples will be placed in the laboratory storage cabinet. Any samples that are to be disposed of will be bagged in asbestos disposal bags and taken to the client. In the case of complaints by clients concerning lab results, the sample in question will be reanalyzed and the new results compared to the original results. Discrepancies will be reported to the client. If the sample has been disposed of, a new sample may be submitted by the client for analysis and verification.

SAMPLE PREPARATION

After the sample is logged in, the sample container will be emptied (under the hood) onto a clean watch glass and examined under the microscope. Any fibers noted will be mounted on

a glass slide in the appropriate R.I. oil and examined under the PLM. Fibers will be identified using refractive index, morphology, dispersion colors, and any other pertinent optical properties. Estimate of percentage will be made based on both stereoscope and PLM examination. All optical data will be listed on the analysis sheet. If no fibrous material is noted during PLM examination, several slides of the sample will be mounted and examined for signs of fibrous material. Estimate of quantity of fibrous material in these samples will be made based on PLM examination alone. All fibrous material in the sample will be identified and quantified. Identification of the non-fibrous material in the sample will be at the discretion of the individual analyst.

QUALITY ASSURANCE

One laboratory analyst personnel will be selected to fill the position of QA monitor and laboratory administrator. That person's responsibility will be to maintain day to day QA procedures and to handle laboratory administrative duties. The QA monitor will report to the laboratory supervisor or department manager.

Each analyst will keep their production separate from that of the other analysts. At the end of each job, prior to any release of that job's results, the quality assurance monitor (or other qualified analyst) will randomly select at least 10% of each analyst's production to be re-tested.

If there is only one analyst, the QA monitor will send the selected samples and analyses to another NVLAP accredited lab (either a Law Engineering or non-affiliated lab) for re-analysis. Both original and second analyses will be bound in a QA record book. If the analyses disagree significantly on the presence, type or amount of asbestos in any sample, all of that day's sample will be re-analyzed and any discrepancies resolved. If the analysts agree that he original analysis was in error, that analyst will have his reanalyzation percentage increased to 20% for at least one month or until the department manager is satisfied that no systematic problem exists. If the analysts disagree significantly on the percentage of detectable asbestos, but not on the presence or absence of it, the discrepancy will be resolved and the original, the second and the agreed upon analyses will be placed in the QA record book. In this case a revised analysis will be sent to the client and/or put in the job file.

If there are two or more analysts, the QA monitor, or another qualified analyst, will randomly pick 10% of each analyst's daily production to be re-analyzed before the results are released. If a discrepancy occurs, the results will be discussed and resolved. In the case of a negative or false positive, all samples analyzed the day on which the error was made by the analyst who made the error will be re-analyzed by another analyst prior to release of results. As above, the analyst who made the error will have his re-analysis percentage increased.

The laboratory will participate in the NIST-NVLAP Proficiency sample program. Each analyst will be required to analyze samples from this program without consultation with other analysts. Results will be discussed and any discrepancies resolved. Any analyst who is unsuccessful in analyzing these samples will have his re-analysis increased to 20% for a period of at least one month or until the QA monitor and Lab Supervisor are satisfied that no problem exists.

The laboratory will participate in an inter-laboratory QA program. This program will consist of a quarterly "round robin" type exchange of at least 4 representative samples with at least 2 other non-affiliated laboratories. Each qualified analyst will analyze these samples without prior consultation with other participating analysts. This program is to be implemented by 6/1/89.

RECORDKEEPING

A personnel file will be set up for each analyst. This file will contain the following information: date hired, analyst's resume, a copy of the approval letter from a qualified microscopist, copies of the McCrone certificates for the completion of the "Microscopical Identification of Asbestos" and "Advanced Asbestos Analysis" courses and any other training certificates that the analyst has received, original copies of reference sample analyses, resolution of any analytical discrepancies.

A laboratory QA file will be maintained. This file will contain copies of all re-analyses with attached original analyses. These sheets will be bound up in groups of 100 and will be kept in the lab indefinitely.

A summary of overall laboratory performance and individual analyst performance will be submitted to the department manager on a monthly basis. A copy of this report will be posted in the laboratory. Records of sample analysis will be kept in two places:

1. Original copies of all analysis sheets will be bound up in groups of 200 and will be kept on file indefinitely.

2. Copies of typed analyses will be filed in job folders.

United States Department of Commerce
National Institute of Standards and Technology

NVLAP®

ISO/IEC GUIDE 25:1990
ISO/IEC GUIDE 58:1993
ISO 9002:1994

Certificate of Accreditation

DEPARTMENT OF COMMERCE ★ UNITED STATES OF AMERICA ★

LAW ENGINEERING, INC.
CHANTILLY, VA

is recognized under the National Voluntary Laboratory Accreditation Program for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. These criteria encompass the requirements of ISO/IEC Guide 25 and the relevant requirements of ISO 9002 (ANSI/ASQC Q92-1987) as suppliers of calibration or test results. Accreditation is awarded for specific services, listed on the Scope of Accreditation for:

BULK ASBESTOS FIBER ANALYSIS

January 1, 1996
Effective until

For the National Institute of Standards and Technology

NVLAP LAB CODE: 1847

APPENDIX D

CERTIFICATE NUMBER 09726

THIS IS TO CERTIFY THAT

Bryant Bullock

HAS MET THE ATTENDANCE REQUIREMENTS AND SUCCESSFULLY COMPLETED THE EXAM IN THE COURSE ENTITLED

AHERA Building Inspector

Biospherics Incorporated
TRAINING PROVIDER

12051 Indian Creek Court, Beltsville, MD 20705
ADDRESS

21-17-10I
COURSE APPROVAL NUMBER

2/6-8/95
COURSE DATE

2/8/96
EXPIRATION DATE

STUDENT'S SIGNATURE

Rachel Riley/ Rachel Riley
COURSE DIRECTOR (NAME AND SIGNATURE)

STATE OF MARYLAND

For more information call MDE (410) 631-3844.

ORIGINAL STATE SEAL IS BLUE

DEPARTMENT OF PROFESSIONAL AND OCCUPATIONAL REGULATION
COMMONWEALTH OF VIRGINIA
3600 West Broad Street, Richmond, VA 23230
Telephone: 1 (804) 367-8500

EXPIRES ON
03-31-96

LICENSE NUMBER
3303 001930

VIRGINIA ASBESTOS LICENSE
INSPECTOR LICENSE

BRYANT A BULLOCK
11941 GOODWOOD DR

FAIRFAX VA 22030

(SEE REVERSE SIDE FOR NAME AND/OR ADDRESS CHANGE)

Contract Number: DACA31-93-D-0064

HEALTH AND SAFETY PLAN

WOODBRIDGE RESEARCH FACILITY ASBESTOS SURVEY

WOODBRIDGE, VA

Prepared for:
U.S. Army Environmental Center
ATTN: SFIM-AEC-BCC (Mr. Jeffrey H. Waugh)
Aberdeen Proving Ground, Maryland 21010-5410

Prepared by:
Horne Engineering Services, Inc.
4501 Ford Avenue, Suite 1100
Alexandria, Virginia 22302

Approved By: _____ 6/28/95

Project Manager Date

"The work contained in this document was conducted under Contract DACA31-93-D-0064 for the U.S. Army Environmental Center (AEC). The publication of this document does not indicate endorsement by the AEC, nor should the contents be construed as reflecting the official position of the AEC."

HEALTH AND SAFETY PLAN TABLE OF CONTENTS

HEALTH AND SAFETY PLAN LIST OF DEFINITIONS

Air-Purifying Respirator (APR). A respirator that relies on air-purifying elements, such as filters, cartridges, or canisters, to remove contaminants from inhaled air.

Confined Space (CS). An enclosed space that: is large enough and so configured that an employee can bodily enter and perform assigned work; has limited or restricted means for entry or exit; is not designed for continuous employee occupancy; and has one or more of the following characteristics:

- Contains or potentially contains a hazardous atmosphere.
- Contains a material with the potential for engulfment of an entrant.
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls, or a floor that slopes downward and tapers to a smaller cross-section.
- Contains any other recognized serious safety or health hazard.

Confined spaces possibly encountered by Horne Engineering personnel may include, but are not limited to:

- Aboveground and underground storage tanks, tank cars, process vessels, boilers, bins, tank trailers, septic tanks, or other tank-like compartments usually having one or more manholes for entry.
- An open-topped space more than 4 feet deep, such as a trench, test pit, bin, silo, vat, tub, utility vault, vessel, and floating roof storage tank.
- Manholes, sewers, storm and sanitary tunnels, pipelines, ventilation or exhaust ducts, and similar structures.
- Abandoned buildings.

Hazardous Substance. Any substance designated or listed as follows:

- Under Section 101(14) of compensative Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA);
- Any biological agent and other disease causing agent as defined under Section 104(33) of CERCLA;
- Any substance listed by the US Department of Transportation as a hazardous material under 49 CFR 172.101 and applicable appendices; and
- Identified as a hazardous waste in that exposure to it results or may result in adverse affects on the safety and health of employees.

Hazardous Waste. A waste or combination of wastes, as defined in 40 CFR 261.3 or those substances defined in 49 CFR 171.8.

Hazardous Waste Operation. Any field operation conducted that involves employee exposure to hazardous wastes, hazardous substances, or any combination of hazardous wastes and hazardous substances.

Protection Factor. The minimum anticipated protection provided by a properly functioning respirator to a given percentage of properly fitted and trained users. The protection factor is a ratio between the ambient concentration and the inhaled concentration of a contaminant.

Respiratory Protection. Any device worn to protect the wearer from inhaling hazardous atmospheres, including half-facepiece and full-facepiece Air-Purifying Respirators (APRs), Self-Contained Breathing Apparatus (SCBA), and Supplied Air Respirators (SAR).

Site Health and Safety Plan. A written site-specific plan establishing the policies and procedures which must be followed to minimize the risk of injury or illness to site workers and the public. Before work begins on a hazardous waste operation, this plan must be signed by both the Project Manager and the Corporate Health and Safety Officer.

1.0 SITE INFORMATION

1.1 Site

PROJECT:	Woodbridge Research Facility Asbestos Survey
CONTRACT:	DACA31-93-D-0064
LOCATION:	Woodbridge Research Facility, Woodbridge, Virginia
SCHEDULED DATES:	May 1995 - August 1995

1.2 Key Personnel

Project Manager:	Mr. Van Noah
Project Health and Safety Officer:	Dr. Oneil Banks, CIH
Site Supervisor:	Mr. Van Noah
Hazardous Waste Operations Coordinator:	Mr. Bryant Bullock
Site Health and Safety Supervisor:	Mr. Bryant Bullock

2.0 INTRODUCTION

Personnel involved in field sampling and exploration at sites where hazardous wastes may be present are potentially exposed to a variety of hazards including:

- Inhalation of toxic airborne contaminants
- Skin contact with contaminated soil and water
- Presence of flammable/combustible vapors
- Oxygen-deficient atmospheres
- Heat stress due to protective clothing and environmental conditions
- Physical hazards inherent to field operations (e.g., working near heavy equipment or at remote locations)

Adequate planning is needed prior to performing work at these sites to minimize the risk of employee injury or illness. In order to meet the goal of minimizing risk, Horne Engineering developed a site health and safety plan.

The Horne Engineering team is committed to the protection of the safety and health of its employees. This plan, a part of Horne Engineering's site health and safety plan, is designed to comply with Occupational Safety and Health Act (OSHA) regulations for

hazardous waste workers (29 CFR 1910.120), as well as OSHA regulations for general industry and for construction. It is the intent of this program to comply with all applicable federal, state, local, and appropriate Department of Defense (DOD) standards and regulations.

2.1 Purpose

The purpose of this plan is to communicate the Horne Engineering team's basic policies and procedures regarding health and safety during the performance of this project.

The procedures and requirements in this document apply to all Horne Engineering and subcontractor personnel involved in the field aspects of hazardous waste operations. All visitors who enter the work zones at the site will also be required to follow these requirements.

2.2 References

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

- AR 200-1, Environmental Protection and Enhancement.
- EPA 560/5-85-024, Guidance for Controlling Asbestos Containing Material in Buildings.
- TM 5-612, Asbestos Control.
- Title 40, Code of Federal Regulations, Part 61, Subpart M.
- National Emission Standards for Hazardous Air Pollutants.
- "Health and Safety Requirements Manual," Engineering Manual 385-1-1, October 1992.
- Occupational Health and Safety Administration Standards (29 CFR 1910 and 1926).

- NIOSH/OSHA/USCG/EPA "Occupational Health and Safety Guidance Manual for Hazardous Waste Site Activities," October 1985.

- American National Standard Practices for Respiratory Protection, ANSI Z88.2-1992.

- "Safety and Occupational Health Document Requirements for Hazardous, Toxic and Radioactive Waste," ER 385-1-92, December 13, 1991.

- NIOSH Pocket Guide to Chemical Hazards, June 1990.

- Tomes Plus, Volume 15, Micromedex Inc., Expiration January 1993.

- "The Installation Restoration Program Toxicology Guide," July 1989, Harry G. Armstrong Aerospace Medical Research Laboratory, Aerospace Medical Division, Air Material Command, Wright-Patterson AFB, OH 45433-6573. (Copies of this document are available from: 5285 Port Royal Road, Springfield, VA.)

- Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, ACGIH, 1993-1994.

- American National Standard for Occupational and Educational Eye and Face Protection, ANSI Z87.1-1968.

- National Standard Safety Requirements for Industrial Head Protection, ANSI Z89.1-1969.

- American National Standard for Men's Safety-Toe Footwear, ANSI Z41.1.-1967.

- American National Standard for Emergency Eyewash and Shower Equipment, ANSI Z358.1-1981.

- Virginia Occupational Health and Safety Codes Board's Confined Space Standard.

3.0 EMERGENCY INFORMATION

3.1 Emergency Situations

All hazardous waste site activities present a potential risk to on site personnel. During routine operations, risk is minimized by establishing good work practices, staying alert, and using proper personal protective equipment (PPE). Unpredictable events such as physical injury, chemical exposure, or fire may occur and must be anticipated.

Accidents resulting in any fatality, lost-time, injury, or illness, hospitalization of three or more personnel, or property damage to government or contractor property (which occurred during the performance of the contract) equal to or greater than $2,000.00 must be telephonically reported to AEC, SFIM-AEC-ETP, (410) 671-4811, as soon as possible, but not later than two hours after occurrence and reported in writing within five days of occurrence on DA Form 285 (Appendix A). All other accidents/incidents must be telephonically reported to AEC, SFIM-AEC-ETP, (410) 671-4811, within eight hours of occurrence.

Emergency conditions are considered to exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on site; or
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.

3.2 Emergency Procedures

3.2.1 Overview

The following emergency procedures should be followed:

- Notify all key personnel and agencies in the event of an emergency. A list of the applicable phone numbers should be available at the site. This list should be posted conspicuously at the site.
- Personnel on site should use the "buddy" system (teams).

- Buddies should pre-arrange hand signals or other means of emergency signals for communications in case of being out of hearing range.

- Visual contact should be maintained between "teams" on site with other field personnel remaining in close proximity in order to assist each other in case of emergencies.

- In the event that any member of the field crew experiences any adverse effects or symptoms of exposure while on site, the entire crew should immediately halt work and act according to the instructions provided by the Site Supervisor or Site Health and Safety Supervisor (SHSS).

- The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated should result in the evacuation of the on site personnel and re-evaluation of the hazard and the level of protection required.

- In the event that an accident occurs, the Site Supervisor is to complete an Accident Report Form. Follow-up action should be taken to correct the situation that caused the accident.

3.2.2 Personal Injury

In case of personal injury at the site, the following procedures should be followed:

- On site personnel certified in first aid shall administer treatment to an injured worker.

- The victim should be transported to the nearest hospital or medical center. If necessary, an ambulance should be called to transport the victim.

3.2.3 Chemical Exposure

If a member of the field crew is exposed to chemicals, the procedures outlined below should be followed:

- Another crew member (buddy) should remove the individual from the immediate area of contamination.

- Precautions should be taken to avoid exposure of other individuals to the chemicals.

- If the chemical is on the individual's clothing, first rinse the clothing if possible, and then the clothing should be removed if it is safe to do so.

- If the chemical has contacted the skin, the skin should be washed with copious amounts of water, for at least 15 minutes.

- In case of eye contact, an emergency eye wash should be used. Eyes should be washed for at least 15 minutes.

- If necessary, the victim should be transported to the nearest hospital or medical center. The nature of the injury may require that an ambulance should be called to transport the victim.

- All chemical exposure incidents must be reported in writing by the Project Manager on an Accident Report Form.

3.3 Site-Specific Information

A list of phone numbers for agencies and key personnel for this project is presented Appendix B of this Health and Safety Plan and will be available on site. This list is for use in the event of an emergency and will be conspicuously posted on site. Directions to the nearest hospital, both mapped and written, are also included.

4.0 RESPONSIBILITIES

4.1 Project Manager

The project manager will direct the site operations. The project manager is primarily responsibility for:

- Assuring the effective implementation of the policies and procedures contained in the Horne Engineering Health and Safety Program.

- Assuring that adequate resources are made available to provide for the health and safety of the project team.

- Approving the site specific Health and Safety Plan and any amendments to it.

- Assuring compliance with this Plan and the Program.

- Assuring that all personnel are aware of the potential hazards at the site and that proper procedures for handling those hazards, including any health and safety provisions in this plan, are implemented.

- Provide authorization to perform work on site for personnel that have met medical surveillance and training requirements.

- Assuring required personal protection equipment is available and utilized properly by all site personnel.

- Monitoring the safety performance of personnel to ensure that mandatory health and safety procedures are adequate and correcting any performances that do not comply with this health and safety plan.

- Consulting with Health and Safety Officer.

- Preparation and submittal of any and all project reports including progress, accident, incident, and contractual.

4.2 Project Health and Safety Officer

The Project Health and Safety Officer (PHSO) is a Certified Industrial Hygienist with experience in hazardous waste field investigation and remediation. The PHSO reports directly to the Project Manager on matters of safety and health. Specific project responsibilities include:

- Develop and implement the Horne Engineering Health and Safety Program.

- Approve each site-specific Health and Safety Plan, as delineated in the program.

- Certify personnel as having satisfied the training and medical requirements for hazardous waste operations.

- Respond to questions on issues of worker related Health and Safety on this project.

4.3 Site Supervisor

The Site Health and Safety Supervisor has responsibility for the safe execution of project field activities. Specific responsibilities include:

- Enforce the Site Health and Safety Plan.

- Stop unsafe practices.

4.4 Hazardous Waste Operations Coordinator (HWOC)

The individual appointed by the Director of each Horne Engineering team office location is responsible for coordinating the health and safety aspects of activities involving hazardous waste operations within his/her Regional Office. Minimum qualifications include a bachelor's degree in a scientific field, 40 hours of hazardous waste operations training, and experience in field work at hazardous waste sites. Responsibilities include:

- Assist the PHSO through coordination of their respective office's Hazardous Waste Operations Program, including:

  - Medical Surveillance
  - Personal Protective Equipment
  - Training
  - Monitoring Instruments
  - Record Keeping

- Perform a preliminary evaluation of tasks which potentially involve employee exposure to hazardous waste for the purpose of making an initial assessment of the scope of work necessary to control site health and safety risks.

- Maintain and issue PPE and monitoring instruments.

4.5 Site Health and Safety Supervisor

The individual located on a hazardous waste site who has been assigned responsibility for site safety and health. Each site will be assigned a SHSS. The SHSS will have completed the following OSHA courses: 40-hour training, 8-hour supervisors training, and all applicable 8-hour refresher training. In addition, receipt of current first aid and cardiopulmonary resuscitation (CPR) certifications must be made and the SHSS must have at least 3 days of on site experience. The SHSS reports to the Site Supervisor and will be on site whenever field work is being performed. The primary responsibilities of the SHSS are:

- Advise the Project Manager and Site Supervisor on all health and safety related matters involved at the site.
- Implement the Health and Safety Plan.
- Conduct weekly health and safety meetings.
- Monitor workers for signs of heat or cold stress.
- Ensure that the field crews observe the appropriate work practices.
- Stop work upon determination of an imminent safety hazard, emergency situation, or other potentially dangerous situations (i.e., changes in weather conditions) where this action is appropriate.
- Assume command during an emergency incident to implement the site emergency response plan.
- Report any safety violations to the project manager.
- Investigate any incidents that result in injury or illness, property damage, fire, explosion, or chemical release and submit a written report to the Project Manager and Project Health and Safety Officer within three days of the incident.
- Consider the responsibility for safety and the authority to enforce safety to be a matter of first importance.

- Be the leader in using proper personal safety gear and set an example in following the rules that are being enforced on other members of the team.

- Enforce the use of proper personal safety equipment and take appropriate corrective action when proper personal protective safety equipment is not being used.

- Understand that proper maintenance of tools and equipment and general "housekeeping" will provide the environment to promote and enforce safety.

- Inspect all safety related equipment (such as first aid kits, monitoring instruments, respirators, PPE, etc.) at least once a week to remove any defective materials from service, and arrange for the prompt replacement of damaged or missing items.

- Ensure that the equipment operators have had adequate training and thoroughly familiar with their equipment, its controls, and its capabilities prior to commencement of activities.

4.6 Other Field Personnel

All personnel engaged in site activities or field activities are required to become thoroughly familiar with, and to conform to, the provisions of this plan, and other safety directives as may be considered appropriate by Project Manager, Site Supervisor, PHSO, and Site Health and Safety Supervisor. Personnel are encouraged to offer ideas, suggestions or recommendations regarding any operational condition, procedure or practice, that may enhance the safety of site personnel or the public. Their primary responsibilities will be:

- Perform all required work safely.

- Familiarize themselves with and understand the site health and safety plan, including proper use of PPE.

- Report any unsafe conditions to supervisory personnel.

- Be aware of signs and symptoms of potential exposure to site contaminants and thermal stress.

5.0 HAZARD ANALYSIS

5.1 Hazard Assessment

Different levels and types of hazards can be expected to be encountered during site operations. Each activity presents specific occupational hazards which must be addressed. The purpose of the hazard assessment is to identify suspected conditions or activities that may pose occupational hazards or immediate danger to the life or health of site personnel. This assessment also provides information needed to make the appropriate selection and application of PPE.

5.2 Physical Hazards

Physical hazards that may be encountered during work activities could include: slips, trips, falls, strains, cuts, bruises, puncture wounds, pinch points from heavy equipment, falling objects, splinters, heat, cold, electrical hazards, noise, drowning, and confined spaces. Exposure to these hazards will be minimized by using engineering controls, safe work practices and appropriate PPE (such as steel toe/ steel shank boots, hard hats, gloves, and hearing protection).

5.3 Chemical Hazards

Exposure to asbestos fibers during an asbestos survey is possible. Asbestos has been implicated as a causative agent in asbestosis, lung cancer, mesothelioma, and several other diseases of the respiratory tract. Due to its hazardous nature, site personnel must be careful to avoid contact with asbestos containing materials and to minimize fiber release when collecting bulk samples. Because asbestos is a particulate toxic contaminant, National Institute for Occupational Safety and Health (NIOSH) approved air purifying respirators with high efficiency particulate air (HEPA) filters will be worn during bulk sampling of suspected ACMs . The use of engineering controls, safe work practices, and PPE will minimize exposure to potential site contaminants.

5.4 Biological Hazards

Biological hazards such as poisonous snakes, disease-bearing ticks, and mosquitos may be encountered. To protect against these hazards, on site personnel will be required to wear long pants and boots that extend over the ankle. Insect repellant should also be applied as an effective deterrent. In some instances, infectious waste materials such as hospital wastes, raw sewage, or animal carcasses may be encountered. Special work

practices and medical surveillance may be required when such materials are potentially present.

6.0 PERSONAL PROTECTION

6.1 Overview

Protective clothing and respiratory protection help prevent on site workers from coming in contact with asbestos. It is imperative that PPE be appropriate to protect against the potential hazards for each work site. The selection of protective equipment will be based upon the types, concentrations, and routes of personal exposure that may be encountered.

There are four (4) levels of personal protection recommended by the Environmental Protection Agency. Based on the presence of asbestos, all workers will be required to use Level C protection. Level C is specified when contamination levels require protection from bodily contact and the filtering of breathing air. The following is a description of the equipment required for this project:

Levels of Protection:

- **MODIFIED LEVEL C**

  Chemically resistant Tyveks® (polycoated/sarnax).
  Full-face, air purifying respirator (APR).
  NIOSH/MSHA approved HEPA air purifying cartridges.
  Hard hat.
  Hearing protection (as applicable).

6.2 Respiratory Protection (General)

6.2.1 Scope

The respiratory protection policy applies to all Horne Engineering employees and subcontractors who wear respirators on the job. Improper use of respirators can be hazardous to the employee's safety and health. Selection of the wrong equipment may result in the employee's being unknowingly exposed to the hazard, thus inhaling harmful

concentrations. Respirators that are not properly maintained, inspected, and cleaned can reduce the protection afforded, cause skin irritation, and place a greater strain on the respiratory system. An improper respiratory program may give the employee a false sense of security that could lead to harmful exposures. The purposes of this policy are to ensure that employees who must wear respirators are adequately protected and that respirator usage complies with the requirements of the OSHA Respiratory Protection Standard (29 CFR 1910.134).

Horne Engineering and its subcontractors must supply appropriate respiratory protection. In order to ensure appropriate respiratory protection, Horne Engineering requires that the PHSO, or designee, approve a written task-specific safety plan or standard operating procedure before a respirator is to be worn. This plan or procedure describes the anticipated respiratory hazard, the feasible engineering and work practice controls to reduce the hazard, the monitoring necessary to measure the hazard, the correct respirator for each job, action levels for upgrading or downgrading respiratory protection, and personnel authorized to perform each task requiring respiratory protection. This requirement applies to all Horne Engineering worksites, including client-owned facilities.

6.2.2 Responsibilities of Employees

a. Project Managers:

- Inform the PHSO of those operations for which respiratory protection may be required, including emergency situations. In conjunction with the PHSO, or designee, determine whether engineering controls or administrative controls can be used to limit the hazard to workers involved.

- In conjunction with the PHSO or designee, prepare, approve, and implement a safety plan or standard operating procedure whenever Horne Engineering employees may be exposed to a respiratory hazard.

- Inform potentially affected employees about the safety plan or standard operating procedure.

- Provide adequate resources for respiratory protection, including staffing, equipment, and training.

- Take immediate measures to protect health and safety and promptly investigate to determine the degree of hazard when made aware of unsafe or potentially unsafe workplace atmosphere.

- Ensure that authorized personnel appropriately wear the assigned respiratory protection. Conduct frequent, random inspections of workers' respiratory protection during work operations.

- Ensure that subcontractors to Horne Engineering who must wear respiratory protection submit evidence of medical approval for respirator use and training in respirator use, including a fit test, within the prior 12 months, and are apprised of the respiratory protection requirements for their assigned work. Horne Engineering shall not provide clients or subcontractors with respiratory protection devices.

b. HWOC

- Maintain, distribute, and store respiratory protection equipment.

- Conduct periodic inspections of respiratory protection equipment.

- Issue respirators and associated equipment to authorized employees.

- Perform respirator fit tests, as needed.

c. Horne Engineering and Subcontractor Personnel

- Wear respirators only if authorized to do so. Authorized personnel have successfully completed an initial training course in respirator usage, are annually retrained, and are annually medically certified for respirator usage.

- Shall not wear respirators, nor be exposed to potentially hazardous atmospheres, unless specifically authorized.

- Properly inspect, use, maintain, clean, and store assigned respiratory protection equipment in compliance with the requirements of this program.

- Notify supervisor immediately of any suspected safety or health hazards associated with the use of respiratory protection.

- Use respirators in accordance with instructions provided by Horne Engineering.

- Must be clean-shaven wherever the respirator facepiece seals to the wearer's skin.

- Shall wear a respirator spectacle kit whenever the individual wears a full-face respirator if corrective lenses are required.

- Shall not alter or modify respirators in any way.

- Read the site safety plan or standard operating procedure before undertaking any tasks which may require respiratory protection.

6.2.3 Selection and Assignment

Horne Engineering and its subcontractors shall purchase only respirators that are certified by NIOSH/MSHA. Horne Engineering and its subcontractors shall not mix or replace components of a respirator system with parts from different manufacturers, unless such interchanges have been specifically approved by NIOSH/MSHA.

Horne Engineering and its subcontractors shall furnish all respirators worn by their respective employees at no cost to the employee. Except in a training class in a safe atmosphere, employees shall not wear respirators supplied by clients or subcontractors and shall not permit clients or subcontractors to wear Horne Engineering-owned or leased respirators.

No Horne Engineering or subcontractor employee shall be assigned a respirator unless the HWOC has determined that the employee is authorized to wear a respirator by virtue of current training and medical certificates. For APRs, the HWOC must also determine that the employee has been properly fit tested, within the past 12 months, for the specific make and model being issued. For half-face respirators, fit testing is required within six months before use. At the discretion of the HWOC, respirators may be individually assigned or may be issued from a pool on a need-to-use basis. When a respirator is assigned to an employee, the HWOC shall also provide written instructions for the inspection procedure that the wearer shall perform before and after each use.

All assigned respirators remain the property of the employer and must be returned to the employer upon demand. No employee shall remove a respirator from inventory without the prior approval of the HWOC.

a. APRs. The inventory is limited to only a few manufacturers in order to provide company-wide consistency in training, fit testing, and inventory of spare parts

and cartridges. If an employee who requires a respirator cannot be successfully fit tested with the respirator models in the inventory, Horne Engineering or the respective subcontractor shall provide the opportunity for the employee to be fit tested with other respirators and shall supply a respirator that provides a proper fit. Except for this type of individual need, any decision to purchase a respirator make and model not in Horne Engineering's or the subcontractor's inventory must be approved by the PHSO.

b. Fit Testing. At a minimum, qualitative fit testing using isoamyl acetate and irritant smoke must be conducted annually on all individuals who will wear a full-face APR and semiannually for half-face APR wearers. Such qualitative fit tests should follow the procedures outlined in Section I and III of Appendix D to 29 CFR 1910.1025 and should be conducted by the HWOC or an experienced person designated by the HWOC. Additional fit testing, such as more frequent intervals or modified protocols, shall be specified in the site safety plan or standard operating procedure, when applicable. Personnel are authorized to wear only those respirators for which they have been successfully fit tested.

6.2.4 Site Safety Plan or Standard Operating Procedure Requirement

A written and approved site safety plan or standard operating procedure shall be prepared before each project or task requiring respirator use. Examples of such projects or tasks include hazardous waste site field work, asbestos surveys and abatement oversight, underground storage tank investigation or remediation, confined space entries, and client property visits that entail potential respiratory hazards. In preparing and approving such plans and procedures, the following shall apply, at a minimum:

- The tasks shall be described.
- The hazard(s) shall be identified for each task.
- Engineering and work practice controls shall be evaluated.
- Hazard monitoring shall be specified.
- The specific respirator(s) shall be specified for each task and for various ranges of hazard monitoring results.
- The authorized personnel shall be named and any restrictions on their ability to perform the tasks or wear respiratory protection shall be noted.

- The site safety plan or standard operating procedure shall be approved by signature of the task manager and the PHSO or the PHSO's designee.

In prescribing respiratory protection, the following selection criteria shall apply, at a minimum:

- Respirators shall be worn whenever the permissible exposure limit (PEL) is exceeded and whenever 50 percent of the PEL is exceeded for a period of one hour or longer during a work shift. In some cases, such as asbestos abatement in some states, or other carcinogenic exposures, respirators are required regardless of the concentration.

- APRs shall not be permitted when atmospheric contaminants exceed the OSHA PEL by a factor of 10, unless the wearer has successfully completed a quantitative fit test, within the past 12 months, that demonstrates a higher protection factor.

- APRs shall not be selected for protection against substances that lack adequate warning properties, unless the service life of the cartridge is specified and field concentrations do not exceed specified amounts, or the cartridge/canister has an end-of-service indicator.

- Cartridges/canisters shall be selected that remove the contaminants present in the hazardous atmosphere. Laboratory breakthrough data shall be consulted. APRs shall not be used for protection against those contaminants for which the respirator manufacturer warns that its cartridges are not effective.

6.2.5 Medical/Surveillance Requirements

Personnel shall not be assigned to tasks requiring the use of respirators unless it has first been medically determined that these individuals are physically able to perform the work and use the equipment. The protocol for the medical examination of Horne Engineering employees shall be determined by the Horne Engineering Corporate Medical Director, with approval of the PHSO. The protocol for medical examinations for subcontractor personnel shall be determined by a licensed physician selected by the respective subcontractors. See Section 8.0 Medical Surveillance Program, for further details. The medical exam shall be performed by a licensed physician, preferably one who is experienced or board-certified in Occupational Medicine.

Upon receipt of a satisfactory Preliminary Assessment signed by the examining physician, the Horne Engineering employee may participate in respirator training. No Horne Engineering employee shall wear a respirator in a hazardous atmosphere until the PHSO has received a Final Assessment signed by the Corporate Medical Director. Any limitations or restrictions noted by the Corporate Medical Director shall be observed. Respirator users must renew their medical certification annually, or at an interval recommended by the Corporate Medical Director.

If employees who wear respirators are also involved in Horne Engineering's hazardous waste operations program, the requirements for the above medical examination are satisfied by the exam received under that program and need not be duplicated.

Wearing of contact lenses while using respirators is not permitted. Respirator users who must wear corrective lenses, as confirmed by the examining physician, shall, with the written approval of the HWOC, be issued corrective safety lenses in a respirator spectacle kit that are designed to fit inside the facepiece of their full-face respirator.

6.2.6 Training Requirements

Personnel must be trained in the proper use and limitations of respirators according to the requirements of this section. Both supervisors and workers shall be trained. The HWOC must also be trained to ensure that he or she is able to maintain and issue respiratory protection equipment correctly.

Before wearing respirators, personnel shall receive training which shall include, at a minimum:

- Overview of regulatory requirements and Horne Engineering's Respiratory Protection Program.
- Responsibilities of individuals involved in the program.
- Nature, extent, and effects of respiratory hazards to which the employee may be exposed.
- Operation, limitations, and capabilities of the respirators selected.
- Proper inspection, maintenance, care, and storage of respirators.

- Procedures for respirator failure or emergency situations.

- Demonstrations and hands-on training in how to wear, fit, and adjust respirators and how to test the face-to-facepiece seal to determine proper fit.

- Exercises in which personnel wear respirator(s) in a safe air environment to become familiar with feel and fit.

- Fit testing.

Training shall be updated annually. Training certificates signed by the instructor shall be issued to each trained employee. The PHSO and HWOC shall maintain copies of each training certificate in their respective office health and safety files.

The above respiratory protection training is included in training provided under the OSHA 40-hour hazardous waste site worker training and need not be repeated if the employee is enrolled in that program.

6.2.7 Inspection, Cleaning, Maintenance, and Storage of Respirators

Respiratory protection equipment shall be properly inspected, cleaned, maintained, and stored to retain its original effectiveness. All persons who are assigned a respirator shall be personally responsible for regularly cleaning, disinfecting, inspecting, and storing their assigned respirators as required by this section. The HWOC shall be responsible for inspecting, storing, and distributing respirators kept in the office supply.

6.2.7.1 Inspection by Wearer

Respirator wearers shall inspect their respirators for defects **before and after each use** as delineated in the written inspection procedures that accompanied their respirator upon assignment.

Defective or ill-fitting respirators shall not be used and shall be returned to the HWOC immediately for replacement or repair. Personnel who cannot obtain an adequate fit check shall inform the HWOC and be fit tested according to the requirements of Section 6.2.3.b. Respirators that are not adequately clean shall be returned to the most recent wearer, who is responsible for cleaning and disinfecting the respirator according to the manufacturer's instructions.

6.2.7.2 Inspection by HWOC

On a quarterly basis, the HWOC will inspect individually assigned respirators and office supply respirators according to the inspection procedures provided by the respirator manufacturer. The HWOC shall inspect respirators kept ready for emergencies at least monthly. The HWOC shall keep records of these inspections and note findings in a logbook. The HWOC will also check the cleanliness of the respirators. Personnel whose respirators have not been maintained in good working order shall be reported to their supervisor, who will immediately correct the situation.

6.2.7.3 Inspection by Supervisors

Since supervisors are responsible for ensuring that their workers comply with this program, supervisors shall conduct frequent random inspections of respiratory protection worn by their employees during work operations, and take appropriate disciplinary action when necessary. A review of the supervisor's enforcement of this program shall be included in his or her annual performance evaluation.

6.2.7.4 Repair

Replacement or repair of respirators shall be done only by the HWOC, or designee, with parts designed for the respirator according to the manufacturer's instructions. No attempt shall be made to replace components or to make adjustments or repairs beyond the manufacturer's recommendations. All replacement parts must be identical to the original parts in order to maintain the NIOSH/MSHA certification.

6.2.7.5 Cleaning and Disinfecting

After each use, respirators shall be cleaned by the wearer according to these minimum cleaning requirements:

- Wet-wipe entire respirator with a damp, clean cloth.
- Wipe with an approved respirator sanitizer wipe, particularly those areas which contacted the face or person's breathing air.
- Upon completion of each project, or when transferring the respirator to another user or back to the equipment pool, further clean and disinfect using a sanitizing solution and instructions provided by the manufacturer. Place the

completely dry facepiece in a plastic bag, seal it with tape, and initial the sealing tape. A respirator shall not be transferred from one employee to another until the most recent wearer has cleaned and disinfected it according to the manufacturer's instructions. An initialed tag with the date of the disinfection must be attached.

6.2.7.6 Storage

After inspection, cleaning, and necessary repair, the wearers shall store respirators in labeled plastic bags and protect them against dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. Before storing them in lockers, cabinets, desks, or other locations, the wearers must place the bagged respirators in clean storage cartons, packing them so that the facepieces rest in a normal position and are not distorted. APRs shall not be stored with cartridges attached. Respirators placed at stations and work areas for emergency use should be quickly accessible at all times and should be stored in marked compartments built for that purpose.

6.2.7.7 APR Cartridges

Cartridges shall not be used if their packaging is open or torn. Upon receipt of new cartridges, the HWOC shall mark each package with the date received. Chemical cartridges (except for particulates only) or canisters that are more than one year old shall be discarded without using. Cartridges with marred, torn, or missing labels shall be crushed and discarded without using. Cartridges shall not be used for longer than one working day, unless specifically authorized in the site safety plan or standard operating procedure. In some instances, the duration of use may be less than one working day, as specified in the site safety plan or standard operating procedure. Cartridges shall not be cleaned with any solution, including water or alcohol. Transfer of used cartridges between personnel is not permitted. After use, APR cartridges shall be crushed and discarded by the wearer according to site safety plan or SOP instructions. In some instances, used cartridges may be considered to be hazardous waste and shall be handled accordingly.

6.2.8 Use of Respirators

Horne Engineering and subcontractor personnel shall wear only those respirator makes and models for which they have received hands-on respirator training or retraining. For APRs, this training must have occurred within 12 months before use. In addition, a fit-test with the specific make and model must have been successfully completed and documented within 12 months before use, at a minimum.

Respirators shall not be worn when conditions prevent a good face-to-facepiece seal. Such conditions may include but are not limited to:

- Growth of beard or sideburns, or a skull cap, hat, or other headgear that projects under the facepiece.

- Absence of one or both dentures, or facial scars or deformities that affect the fit of the facepiece.

- Corrective glasses or temple bars that extend through the sealing edge of full facepiece.

As part of the donning procedure, the wearer shall perform positive and negative pressure checks on the face-to-facepiece seal. If these fit checks indicate a possible leak, the user shall readjust the facepiece and recheck. If the readjustment fails to correct the fit problem, the wearer shall report this problem to the Supervisor, who shall either issue another respirator or perform fit testing using the qualitative fit test procedure, until a satisfactory fit is obtained.

If ambient temperatures are at or below freezing, or if condensation interferes with vision, a nosecup shall be worn when full-face respirators are used.

Employees shall return to a safe area to replace APR cartridges whenever breathing resistance increases, when chemical breakthrough is detected, or to wash their faces and respirators as necessary in order to prevent skin irritation. Employees may elect to upgrade their level of respiratory protection, up to the maximum level authorized by the site safety plan or standard operating procedure, even if monitoring results do not indicate the need.

In any operation requiring respiratory protection, the on site supervisor shall have at least 5 days of prior experience in wearing the specified respirator.

At a minimum, respirator wearers shall take a break every 2 hours, during which they shall return to a safe area and remove the respirator. More frequent breaks may be specified.

At the end of the work day, respirators shall be cleaned and disinfected. Used cartridges shall be crushed and properly disposed of.

6.2.9 Record keeping and Program Evaluation

Training certificates, as well as respirator fit test records, shall be stored by Horne Engineering and respective subcontractor(s) for the duration of employment, plus 1 year. Medical certificates and records are stored in accordance with OSHA standards for medical records (29 CFR 1904). These certificates will be maintained on site at all times.

APR respirator inspection records shall be kept by the HWOC for 1 year. Inspections conducted in the field by supervisors shall be submitted to the HWOC.

The HWOC shall monitor the effectiveness of this respirator program by maintaining frequent communications with respirator wearers and by conducting periodic inspections of the respirators. Problems identified shall be resolved by the HWOC, with assistance from the PHSO, as needed. HWOC may make unscheduled site audits of field activities that require respiratory protection. Any observed deficiencies shall be reported to the project manager and PHSO.

The PHSO may audit any portion of the Respiratory Protection Program. Such audits include records reviews, office audits, and field visits.

Any injury and accident report involving respiratory hazards shall be promptly and thoroughly investigated by the HWOC and PHSO. A written report shall be prepared that analyzes the incident and recommends preventative and follow-up actions.

6.3 Eye and Face Protection

Protective eye and face equipment shall be specified, provided, and worn whenever there is a reasonable probability of injury that could be prevented by the use of such equipment. Such determination may be made by the Task Manager, supervisor, or PHSO. Employees who are regularly assigned to eye hazard areas shall be personally issued a pair of safety glasses with side shields. Corrective lenses for these safety glasses are provided by Horne Engineering for its employees, but the employee is responsible for obtaining a current prescription. Horne Engineering shall replace corrective lenses whenever the prescription changes and may provide new frames every 2 years for its employees. For personnel not regularly assigned to eye hazard areas, the employer shall provide visitor's safety spectacles or goggles. Safety glasses must meet the specifications of American National Standards Institute (ANSI) Z87.1-1989.

6.4 Hearing Protection

Whenever Horne Engineering or subcontractor employees are assigned to work in areas where the sound level may exceed 85 decibels as measured on the A scale slow response, Horne Engineering or the respective subcontractor shall make hearing protectors available. Disposable protectors and ear inserts shall be provided in their original protective wrapping and ear inserts shall be individually assigned. Ear muffs shall be provided in clean, sanitary condition. Employees shall be given the opportunity to select the most comfortable model from a variety provided by the HWOC.

Whenever it is reasonably anticipated that Horne Engineering or subcontractor employees shall be exposed to an 8-hour time weighted average of 85 decibels or greater, the task manager and PHSO, or designee, shall develop and approve a written hearing conservation plan that specifies monitoring, audiometric testing, engineering and work practice controls, training, and hearing protector attenuation. The use of hearing protectors shall be mandatory.

6.5 Other Personal Protective Equipment

Other PPE may include hard hats, chemically protective steel toe and steel shank safety shoes, lab coats, and coveralls. When such equipment is required, as determined by the PHSO, it shall be issued by the HWOC. Such equipment shall be selected to provide proper protection. The individual wearer shall be responsible for the proper inspection, use, and maintenance. When the equipment is no longer needed, it shall be returned to the HWOC in a clean, working condition.

7.0 HEALTH AND SAFETY PROCEDURES

7.1 Site Specific Health and Safety Plans

A site specific health and safety plan that meets the requirements of 29 CFR 1910.120(I) and (l), at a minimum, must be prepared for every field work assignment. Each plan must be reviewed and approved by the Horne Engineering Project Manager and the PHSO. Each team member must be provided a copy of the plan before field work starts, must read it, and must sign a statement that the plan has been read and understood. A pre-entry site safety briefing is required of all team members before they start field operations. This briefing shall review the site health and safety plan and the emergency response plan.

The site specific health and safety plan must be amended and the amendments approved by both the Project Manager and the PHSO when new tasks are added to the scope of work, new field team members are assigned to the field operation, site conditions change, or a significant change in schedule (such as several months) occurs. The site health and safety plan must be submitted to the client before field operations start.

7.2 Unsafe Situations

All employees are directed to bring to the attention of the most readily accessible supervisor any unsafe condition, practice; or circumstance associated with, or resulting from, site activities. In case of immediate hazard to employees or the public, any employee on the scene should take all practicable steps to eliminate or neutralize the hazard, this may include leaving the site. Follow-up consultation with the Project Manager or Supervisor must then be made at the first opportunity. In such circumstances the Project Manager or Supervisor must take, or cause to be taken, the necessary steps to ensure that the project can be completed safely. Such steps may include changes in procedure, removal or neutralization of a hazard, or consultation with appropriate experts. In cases where the hazard is not immediate, the employee should consult the supervisor or management regarding appropriate corrective measures. Application of this rule requires exercising good judgment and common sense by all employees.

7.3 Personal Precautions

The following personal precautions must be followed, at a minimum:

- Eating, drinking, chewing gum or tobacco, smoking, or any practices that increase the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated.

- Hands and face must be thoroughly washed upon leaving the work area.

- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate, or discolored surfaces; or lean, sit, or place equipment on drums, containers, or on soil suspected of being contaminated.

Medicine and alcohol can exacerbate the effect from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel on response operations where the potential for absorption, inhalation, or ingestion of toxic substances exists unless

specifically approved by a qualified physician who has been appraised of the workplace hazards. Alcoholic beverages intake should be avoided during response operations.

7.4 On Site Personal Requirements

At a minimum the following on site personal requirements should be followed:

- All personnel going on site must be thoroughly briefed on anticipated hazards, and trained on equipment to be worn, safety procedures, emergency procedures, and communications. A formal health and safety meeting will be held weekly as a minimum with informal meeting as required.

- Visual contact must be maintained between crew teams on site and site safety personnel.

- All field personnel should make full use of their senses to alert themselves to potentially dangerous situations which they should avoid, e.g., presence of strong and irritating or nauseating odors.

- Personnel should practice unfamiliar operations prior to operations.

- Field personnel, shall be familiar with the physical characteristics of the site, including:

  - wind direction in relation to the working area.
  - accessibility to associates, equipment, and vehicles.
  - communications.
  - site access.

- Personnel and equipment in the working area should be kept to a minimum, consistent with effective site operations.

- All visitors to the job site must comply with the health and safety plan procedures. PPE may be modified for visitors depending on the situation. Any modifications must be approved by the PHSO.

- The nearest hospital or medical care facility shall be located. Emergency phone numbers (police, fire, hospital, ambulance, poison center) shall be available on site in case of incident.

7.5 General Work Practices

At a minimum, the following general work procedures should be implemented:

- At least one copy of this procedure shall be available at each job work site.

- Removal of contaminated soil from protective clothing or equipment by blowing, shaking, or any other means which disperse contaminants into the air is prohibited.

- Transportation and disposal of contaminated materials shall comply with all applicable local, state, and federal regulations. These items will be addressed by the transporter and disposer.

- Containers shall be moved only with the proper equipment and shall be secured to prevent dropping or loss of control during transport.

7.6 Safety Procedures

7.6.1 Housekeeping

The first requirement for safe field operations is that the safety supervisor understands and fulfills the responsibility for maintenance and "housekeeping" on and around the field equipment. To meet this goal, suitable storage locations should be provided for all tools, materials and supplies so they can be conveniently and safely handled. In addition, work areas, platforms, walkways, scaffolding, and other accesses should be kept free of materials, debris and obstructions and substances such as ice, grease or oil that could cause a surface to become slick or otherwise hazardous.

7.6.2 Hand Tools

There are almost an infinite number of hand tools that can be used on or around equipment and in repair shops and more than an equal number of instructions for proper use. "Use the tool for its intended purpose" is the most important rule. The following are

a few specific and some general suggestions which apply to the safe use of several hand tools that are often used on and around equipment.

- When a tool becomes damaged, either repair it before using it again or get rid of it.

- When using a hammer, any kind of hammer for any purpose, wear safety glasses and require all others around you to wear safety glasses.

- When using a chisel, any kind of chisel, for any purpose, wear safety glasses and require all others around you to wear safety glasses.

- Keep all tools cleaned and orderly stored when not in use.

- Use wrenches on nuts - don't use pliers on nuts.

- Use screwdrivers with blades that fit the screw slot.

- When using a wrench on a tight nut - first use some penetrating oil, use the largest wrench available that fits the nut, when possible pull on the wrench handle rather than pushing, and apply force to the wrench with both hands when possible and with both feet firmly placed. Always assume that you may lose your footing - check the place where you may fall for sharp objects.

7.6.3 Travel

The individual who transports equipment on and off a site should:

- Be properly licensed and should only operate the vehicle according to federal, state and local regulations.

- Know the traveling height (overhead clearance), width, length and weight of the equipment with carrier and know highway and bridge load, width and overhead limits, making sure these limits are not exceeded with and adequate margin.

- Remove all ignition keys when a equipment is left unattended.

7.6.4 Loading and Unloading

- Use ramps of adequate design that are solid and substantial enough to bear the weight of the equipment with carrier - including tools.
- Load and unload on level ground.
- Use the assistance of someone on the ground as a guide.
- Check the brakes on the equipment carrier before approaching loading ramps.
- Distribute the weight of the equipment, carrier and tools on the trailer so that the center of weight is approximately on the center-line of the trailer and so that some of the trailer load is transferred to the high of the pulling vehicle. Refer to the trailer manufacturer's weight distribution recommendations.
- The equipment and tools should be secured to the hauling vehicle with ties, chains and/or load binders of adequate capacity.

7.6.5 Tires, Batteries and Fuel

Tires on the equipment must be checked daily for safety and during extended travel for loss of air and they must be maintained and/or repaired in a safe manner. If tires are deflated to reduce ground pressure for movement on soft ground, the tires should be inflated to normal pressures before movement on firm or hilly ground or on streets, roads and highways. Under inflated tires are not as stable on firm ground as properly inflated tires. Air pressures should be maintained for travel on streets, roads and highways according to the manufacturer's recommendations. During air pressure checks, inspect for:

- Missing or loose wheel lugs.
- Objects wedged between dual tires or embedded in the tire casing.
- Damaged or poorly fitting rims or rim flanges.
- Abnormal wear, cuts, breaks or tears in the casing.

The repair of truck and off-highway tires should only be made with required special tools and following the recommendations of a tire manufacturer's repair manual.

Batteries contain strong acid. Use extreme caution when servicing batteries.

- Batteries should only be serviced in a ventilated area while wearing safety glasses.
- When a battery is removed from a vehicle or service unit, disconnect the battery ground clamp first.
- When installing a battery, connect the battery ground clamp last.
- When charging a battery with a battery charger, turn off the power source to the battery before either connecting or disconnecting charger leads to the battery posts. Cell caps should be loosened prior to charging to permit the escape of gas.
- Spilled battery acid can burn your skin and damage your eyes. Spilled battery acid should be immediately flushed off of your skin with lots of water. Should battery acid get into someone's eyes, flush immediately with large amounts of water for 15 minutes and see a physician at once.
- To avoid battery explosions, keep the cells filled with electrolyte, use a flashlight (not an open flame) to check electrolyte levels and avoid creating sparks around the battery by shorting across a battery terminal. Keep lighted smoking materials and flames away from batteries.

Special precautions must be taken for handling fuel and refueling the equipment or carrier.

- Only use the type and quality of fuel recommended by the engine manufacturer.
- Refuel in a well-ventilated area.
- Do not fill fuel tanks while the engine is running. Turn off all electrical switches.

- Do not spill fuel on hot surfaces. Clean any spillage before starting an engine.
- Wipe up spilled fuel with cotton rags or cloths - do not use wool or metallic cloth.
- Keep open lights, lighted smoking materials and flames or sparking equipment well away from the fueling area.
- Turn off heaters in carrier cabs when refueling the carrier or the equipment.
- Do not fill portable fuel containers completely full to allow expansion of the fuel during temperature changes.
- Keep the fuel nozzle in contact with the tank being filled to prevent static sparks from igniting the fuel.
- Do not transport portable fuel containers in the vehicle or carrier cab with personnel.
- Fuel containers and hoses should remain in contact with a metal surface during travel to prevent the buildup of static charge.

8.0 MEDICAL SURVEILLANCE PROGRAM

8.1 Medical Monitoring (General)

All personnel on site shall have successfully completed a baseline medical examination by an occupational physician in accordance with requirements as specified in 29 CFR 1910.120, paragraph (f) and 1910.134, paragraph (e)(6). Personnel shall be found to be medically qualified for work prior to assignment at the project site. If one year has elapsed since the baseline exam, an updated medical history and examination will be required prior to the project start.

8.2 Surveillance Program (Environmental Physicals)

The content of the medical examination shall be determined by a licensed physician, who is Board Certified in Occupational Medicine. Upon completion or

submittal of a competed medical examination, the medical examination record shall be reviewed by a physician who is Board Certified in Occupational Medicine. Based upon this review, the physician shall submit a Final Assessment to the employer.

Post exposure medical examinations will be conducted in the event of development of work related symptoms or over exposure. In addition, pre- and post-exams may be required for a specific project based on the types and levels of contaminants present (i.e. heavy metals, PCBs, etc.).

8.3 Records

Medical records shall be held by the physician. The employer shall be issued a medical assessment for each employee examined that certifies fitness for work and for respirator usage and that describes any work restrictions. The employee shall be provided complete and confidential information about the examination findings by the physician. The medical records shall be retained for 30 years after employment termination.

9.0 TRAINING PROGRAM

All on site personnel shall complete a training program which meets the requirement specified in 29 CFR 1910.120, paragraph (e).

General site workers engaged in operations which are exposed or potentially exposed to hazardous substances and health hazards will receive a minimum of 40 hours of instruction off site and 3 days of supervised actual field experience.

Workers on site only occasionally for a specific limited task and who are unlikely to be exposed over permissible exposure limits and published exposure limits will receive a minimum of 24 hours of instruction. In addition, 1 day of supervised actual field experience will be required.

Workers regularly on site who work in areas where no health hazards or possibility of exposure exists require 24 hours of instruction and 1 day on supervised actual field experience.

On site managers and supervisors directly responsible for employees engaged in hazardous waste operations will receive 8 hours of specialized training in addition to the requirement for general site workers (40 hour).

10.0 THERMAL EXPOSURE

10.1 Overview

Adverse weather conditions are important considerations in planning and conducting site operations. Extremes in hot and cold weather can cause physical discomfort, loss of efficiency and personal injury.

10.2 Heat Stress

Heat stress can result when the protective clothing decreases natural body ventilation even when temperatures are moderate. Working under various levels of personal protection may require the wearing of low permeability disposable suits, gloves and boots. This clothing will prevent most natural body ventilation. Discomfort due to increased sweating and body temperature (heat stress) will be expected at the work site.

Recommendations to reduce heat stress include:

- Drinking plenty of fluids (to replace loss through sweating)
- Wearing cotton undergarments to act as a wick to absorb moisture.
- Making adequate shelter available for taking rest breaks to cool off.

For extremely warm weather, follow these additional recommendations:

- Wearing cooling devices to serve as a heat sink (the additional weight may affect efficiency).
- Shifting working hours to early morning and early evening, avoiding the hottest time of the day.
- Rotating crews wearing the protective clothing.
- Establishing and following work-rest regimens.

Monitoring of personnel wearing PPE should commence when ambient temperatures exceed 70 degrees Fahrenheit. Frequency of monitoring can be found in Table 10-1.

At least two on site personnel shall receive training and be certified in both cardiopulmonary resuscitation and first aid by the American Red Cross or equivalent.

Additionally, Horne Engineering training complies with 29 CFR 1910.1001 as cited below:

> The employer shall institute a training program for all employees who are exposed to airborne concentrations of asbestos at or above the action level and/or excursion limit and ensure their participation in the program.
>
> (I) Training shall be provided prior to or at the time of initial assignment and at least annually thereafter.
>
> (ii) The training program shall be conducted in a manner which the employee is able to understand. The employer shall ensure that each employee is informed of the following:
>
> (A) The health effects associated with asbestos exposure;
>
> (B) The relationship between smoking and exposure to asbestos in producing lung cancer:
>
> © The quantity, location, manner of use, release, and storage of asbestos, and the specific nature of operations which could result in exposure to asbestos;
>
> (D) The engineering controls and work practices associated with the employee's job assignment;
>
> (E) The specific procedures implemented to protect employees from exposure to asbestos, such as appropriate work practices, emergency and clean-up procedures, and personal protective equipment to be used;
>
> (F) The purpose, proper use, and limitations of respirators and protective clothing;
>
> (G) The purpose and a description of the medical surveillance program required by paragraph (l) of this section;
>
> (H) The content of this standard, including appendices.
>
> (I) The names, addresses and phone numbers of public health organizations which provide information, materials, and/or conduct programs concerning smoking cessation. The employer may distribute the list of such organizations contained in Appendix I, to comply with this requirement.
>
> (J) The requirements for posting signs and affixing labels and the meaning of the required legends for such signs and labels.

TABLE 10-1 HEAT STRESS MONITORING FREQUENCY			
Temperatures (°F)	Level D	Modified Level	Level C or B
>90°	Every 45 minutes	Every 30 minutes	Every 20 minutes
85-90°	Every 60 minutes	Every 45 minutes	Every 30 minutes
80-85°	Every 90 minutes	Every 75 minutes	Every 60 minutes
75-80°	Every 120 minutes	Every 105 minutes	Every 90 minutes

The site safety officer will conduct the following heat stress monitoring required for those individuals performing continuous work wearing PPE at temperatures greater than 70 degrees Fahrenheit.

- Heart rates (HR) should be measured by counting the radial pulse for 30 seconds as early as possible in the rest period. The HR at the beginning of the rest period should not exceed 110 beats per minute. If the HR exceeds 110 beats per minute the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period stays the same. The HR should be measured again at the end of the rest period to make sure that it has dropped to normal.

- Body temperatures should be measured orally with a clinical thermometer as early as possible in the rest period. Oral temperatures (OT) at the beginning of the rest period should not exceed 99° Fahrenheit (F). If OT exceeds 99°F, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period stays the same. OT should be measured again at the end of the rest period to make sure that it has dropped below 99°F.

11.0 HAZARD COMMUNICATION

In order to handle materials in a safe manner, employees must understand the physical and health hazards associated with the materials, the appropriate handling methods, and the procedures that must be followed in case of emergency. During new employee orientation, and whenever a potentially hazardous material is introduced into the work area, employees must be provided with appropriate hazard information and instructions. An inventory and a file of Material Safety Data Sheets (MSDS) for all hazardous materials used or stored in the workplace must be kept in each workplace and

made readily accessible to employees. All potentially hazardous materials, i.e., flammables, combustibles, compressed gases, explosives, organic peroxides, oxidizers, pyrophoric chemicals, unstable (reactive) chemicals, water reactive chemicals, carcinogens, and toxins, must be properly labeled. The Operations Manager/ Director within each office is responsible for designating an MSDS coordinator and for implementing these requirements.

Regulatory agencies have developed lists of hazardous substances, but as a practical matter, all chemical substances are covered by this policy. These include laboratory chemicals, reprographic chemicals, art supplies, cleaning supplies, pesticides, and any other chemical substances purchased or used by Horne Engineering or its subcontractors.

This policy complies with the federal OSHA Hazard Communication Standard, 29 CFR 1910.1200. Individual states may have requirements that are more stringent than the federal standard. The Operations Manager/Director of each Horne Engineering office is responsible for determining if additional state requirements apply and for supplementing this policy so that it complies with these requirements. At Horne Engineering field locations, the Project Manager is responsible for compliance with this policy.

12.0 CONFINED SPACE ENTRY PROGRAM

12.1 General

When collecting bulk samples it may be necessary to enter crawl spaces or other confined spaces. Confined spaces (CS) present unique hazards because of their configuration and/or contents. If air circulation is restricted, hazardous atmospheres may accumulate quickly. There may be entrapment hazards. The limited space can increase the risk of injury or death by making employees work closer to hazards than they otherwise would. Workplace hazards encountered elsewhere, such as electrical shock and contact with machinery and chemicals, may also be encountered in confined spaces, but may be exacerbated by the conditions of CS work. Asphyxiation, fire(s) and explosion, toxic atmosphere, engulfment, and mechanical hazards have all been identified as causes of fatalities in CS entries. Historically, the largest number of fatalities have been untrained rescuers.

12.2 Scope

During the performance of an asbestos survey, it is sometimes necessary to enter crawl spaces and utility conduits which are often classified as CS. The purpose of this section is to ensure that CS operations by Horne Engineering personnel are conducted in a manner that will protect worker health and reduce accidental injury, illness, and death associated with personnel entering, working in, and exiting from confined spaces. The procedures and requirements of this section apply to Horne Engineering and Horne Engineering subcontractor personnel working in and around CS.

Horne Engineering's CS program contains the following policies, which are designed to protect employees:

- Only trained personnel who are familiar with the requirements of this program shall be authorized to participate in CS operations.

- A CS entry permit must be issued and approved by the PHSO and project manager before the performance of any work within a CS. This permit shall become a part of the permanent record of the project site. A copy of the permit will be posted at all entrances to the space. If the CS operation is located at a hazardous waste site, this permit will be part of the site health and safety plan for work operations.

- The SHSS may also serve as a CS attendant if no other site operations that remove the SHSS's attention from the CS operation take place.

- The buddy system will be strictly enforced — no personnel may work alone at a confined space site. At least one attendant must be in position each time an Horne Engineering worker has entered the CS.

- Access and egress for confined spaces must meet the requirements of the OSHA standard for means of egress, 29 CFR 1910.37. Portable ladders used to gain access to a CS must meet the requirements of 29 CFR 1910.25, .26, and .27.

- Any deviation from these CS entry procedures requires the prior written approval of the PHSO.

LIST OF ACRONYMS

APR	Air-Purifying Respirator
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CS	Confined Space
DOD	Department of Defense
EPA	Environmental Protection Agency
HWOC	Hazardous Waste Operations Coordinator
MSHA	Mine Health and Safety Administration.
NIOSH	National Institute of Occupational Health and Safety.
OSHA	Occupational Health and Safety Administration.
PEL	Permissible Exposure Limit
PHSO	Project Health and Safety Officer
SAR	Supplied Air Respirator
SCBA	Self-contained Breathing Apparatus

APPENDIX A

U.S. ARMY ACCIDENT REPORT Instructions

General. The unit having the accident must investigate it and complete this report. Complete the shaded portions ***only*** for: Military off-duty, non-fatal accidents; and military on-duty accidents resulting in less than 20 lost workdays. [redacted]nts involving 20 or more lost workdays [redacted] total property damage of $2,000 or more [redacted]quire completion of the entire report. Type or legibly print the report. Items may be continued on a blank sheet of paper and attached to the report. Items listed below are keyed to the block numbers of DA Form 285, May 91. Items not listed here are self explanatory. Specific questions concerning this form should be referred to the local safety office.

SECTION A - Accident Information

Note: This section should be completed for the initial report and for any changes to a previously submitted report.

1. Check "INITIAL" if this is the first report on the accident. Check "CHANGE" if this report is a change to a previously submitted report of the accident.

2. Enter the 6-digit Unit Identification Code *(UIC)* for the unit responsible for the accident *(e.g., WXXXXX)*.

3. Provide military unit information for the unit listed in Block *2*.

a. Full military address *(e.g., C Troop, 1 17 Cavalry, Ft. Bragg, NC 12345-6789)*.

b. Provide the unit branch *(e.g., Armor, Infantry, Transportation)*.

4. Enter the year, month, and day of the accident *(e.g., 90 11 07 {7 November 1990})*.

5. Enter the military time the accident occurred *(e.g., 0815, 2300)*.

7. Check either item *a* or *b*, depending on the location of the accident.

8. If item *a* is checked, state name of post or installation *(e.g., Ft. Bragg, NC; Federal Center, Atlanta, GA; Ft. Hood, TX; Shaw AFB, SC)*.

[redacted]heck item *a* if accident occurred in a [redacted] of hostile fire or enemy action, but not as a [redacted] of such fire/action. This includes direct preparation for combat, actual combat, or redeployment from a combat theater.

10. Check "Yes" of explosives *(C-4, TNT)*, ammunition, or pyrotechnics were involved and explain in Block *63* its involvement and specify the National Stock Number *(NSN)*.

11. Give enough detail to find the exact location of the accident *(e.g., building number, street or highway name, state and/or country)*. Also state the type of location *(e.g., road intersection, tank trail, family housing, firing range)*.

SECTION B - Personnel Information

Note: Complete this section for each individual involved and/or injured in the accident. "Involved"means any person who was injured, or who took actions, or made decisions which caused or contributed to the accident. If more than one person was involved, enter information on one person on the initial form and complete only Sections A and B on additional forms for others. Staple all forms together.

16. Enter individual's rank/grade *(e.g., E5/SGT, O3 CPT, GS-11, WG-8)*. Complete for all Government personnel.

17. Enter individual's full MOS/Job Series *(e.g., 54E20, 11B40, GS-301)*.

18. Provide individual's full ***Military*** address for all Government personnel. If this address is not the same as that in Block *3a*, provide the unit UIC.

21 State how many continuous hours without sleep this individual was on-duty prior to the accident.

[redacted]RM 285, JAN 92 *(Instructions)*

22. Indicate how many hours of continuous sleep this individual had in the past 24 hours.

23. State the estimated number of days this individual will be away from work *(totally unable to perform any work, bed rest/on quarters)*. Does not include days hospitalized.

24. State the estimated *(or actual)* number of days this individual is hospitalized *(inpatient/admitted)* receiving treatment. Days hospitalized for "observation only" are not reported.

25. State the estimated number of days this individual will not be able to perform his or her regular duties *(light duty, profile)*.

26. Check appropriate block. If more than one applies, check the most severe.

28. For this individual's "most severe injury", check the appropriate block(s) *(no more than 3)* that indicate the cause of the injury.

29. **Number** the body part(s) most seriously injured *(no more than 3)* in their order of priority *(the most serious first)*. Be as specific as possible.

30. For each body part numbered in block *29*, place a corresponding number to indicate the type of injury received *(select only the most serious)*.

31. Check the appropriate block that best describes the individual's action at the time of the accident. If Block *31gg* is checked, complete Blocks *76* and *77* of Section H, as indicated by these instructions.

32. Provide a short but detailed explanation of the item checked in Block *31*.

Note: For this report, the following definitions apply:

Tactical Training - Training in a field environment that uses or develops combat or combat support skills.

Field Exercise and Tactical Training - This begins when the individual reports to his or her primary duty location for movement to the field site and ends when he or she arrives back at the primary duty location from the field.

33. Check "Yes" if activity listed in Block *31* was part of a field exercise. State name of exercise if it has a name *(e.g., Team Spirit, Reforger)*.

42. If vision enhancement device(s) were used, specify type and model numbers, and whether they caused the accident *(e.g., Night Vision Goggle, AN-PVS5A)*

43. Provide standard or reference *(Soldier's Manual, AR, TM, etc.)*, if it exists, that covers performance of the activity identified in Block *31*.

46. Provide a simple explanation of the mistake(s) or how the activity or task was performed incorrectly *(e.g., SGT Smith improperly backed his M915 truck without a ground guide)*.

47. **In your opinion,** why was the mistake made or the activity performed incorrectly? Check the most important reason.

51. Check the block corresponding to the piece of equipment associated with the person in Block *12 (e.g., SGT Adams was driving the "at-fault" HMMWV; his name will be in Block 12, and his vehicle will be Item a in Section C below)*.

SECTION C - Property/Material Involved

Complete Blocks *52-59* on each piece of property or item of equipment involved in the accident *(whether damaged or not)*. Include Army and non-Army, as well as equipment whose use or misuse contributed to the accident. Include up to 3 items of equipment on the initial form. Use additional blank sheets of paper for other equipment if necessary, continuing letter sequence *(e.g., A, B, C, D, and E)*.

52. Type of equipment *(e.g., sedan, truck, generator)*.

53. Full military equipment model number or civilian make *(e.g., M109A2, M60A2, Ford Taurus, M16 Rifle)*.

55. Estimated cost of damage *(ECOD)* or actual cost of damage *(ACOD)* for each piece of property, which includes costs of parts and labor

57. Indicate if this specific item was being towed ***at the time of the accident.***

58. If Block *57* is "yes", indicate which item was doing the towing.

60. Complete for each component or part whose failure or malfunction contributed to the accident. Include the EIR/QDR number in Block *60e*.

61. Indicate how and why each component or part failed or malfunctioned by selecting from the lists provided and entering the appropriate number in the blocks provided.

SECTION D - Environmental Conditions Involved

62. Check the environmental conditions present at the time of the accident *(no more than 3)* by checking appropriate blocks, whether contributing to the accident or not. Also check whether they caused or contributed to the accident.

SECTION E - Accident Description/Narrative

63. Fully describe the sequence of events that lead up to and caused the accident. Explain how and why the accident occurred. Also include information required from Blocks *10* and *47*.

SECTION F - Corrective Action and Command Review

Note: The level of command review *(Company, Battalion, Division, etc.)* is determined by either the major Army command *(MACOM)* or installation policy.

65. Fully describe all actions taken, planned, or recommended to eliminate the cause(s) of this accident. Actions should be identified as appropriate at unit level, and all the way up to HQDA level.

SECTION G - SAFETY OFFICE USE ONLY

71. MACOM responsible for this accident *(FORSCOM, TRADOC, etc.)*.

SECTION H - Special Interest/Supplemental Information

This section is for use by the U.S. Army Safety Center, MACOMs, or interested safety offices to obtain additional "Special Interest/Supplemental Information" on this accident as needed *(e.g., M1 tank fires, tactical parachute accidents, etc.)*. Blocks *76* and *77* have been designated for collection of supplemental information on parachuting accidents.

Blocks *76* and *77*. If Block *31gg* was checked, provide the following supplemental information for each individual:

a. Name of jumper;
b. Jumper height;
c. Jumper weight;
d. Type of jump *(static line, non-tactical; static line, mass technical, freefall, non-tactical; freefall, tactical)*;
e. Type of parachute and model;
f. Jumper's equipment *(list)*;
g. Weight of equipment;
h. Wind direction and speed at
(1) Jump height,
(2) Drop zone;
i. Jump altitude;
j. Jumper's position in stick and door exited;
k. Time pre-jump conducted;
l. Date of last jump and type of jump;
m. Number of previous jumps;
n. Date graduated from basic airborne training *(year and month)*;
o. Type of aircraft;
p. Accident cause(s). Improper exit, static line injury, broken static line, parachute malfunction, entanglement, lost or stolen air, oscillation, unstable position, dragged on DZ, tree landing, drop zone hazard *(specify)*, or other.

U.S. ARMY ACCIDENT REPORT

For use of this form, see AR 385-40; the proponent agency is OCSA

FOR USASC USE ONLY

Requirement Control Symbol CSOCS-308

SECTION A - ACCIDENT INFORMATION

1. CHECK ONE
   - ☐ a. INITIAL
   - ☐ b. CHANGE

2. UIC (Unit Identification Code) (6-Digit Code of Unit Having Accident)

3a. UNIT NAME AND MILITARY ADDRESS

3b. BRANCH (Armor, Infantry, etc.)

4. DATE OF ACCIDENT

a. YR	b. MO.	c. DAY

5. TIME OF ACCIDENT (Local Military Time)

6. PERIOD OF DAY (Check one)
   - ☐ a. Day
   - ☐ b. Night

7. ACCIDENT OCCURRED (Check one)
   - ☐ a. On Post
   - ☐ b. Off Post

8. IF ON POST, NAME OF INSTALLATION/FACILITY

9. ACCIDENT OCCURRED DURING (Check one)
   - ☐ a. Combat
   - ☐ b. Non-Combat

10. WERE EXPLOSIVES OR AMMUNITION INVOLVED OR PRESENT?
   - ☐ Yes (See Instruction Book)
   - ☐ No

11. EXACT LOCATION OF ACCIDENT (Detailed enough to locate site) (State type of location.)

SECTION B - PERSONNEL INFORMATION

12. NAME (Last, First, MI)

13. SOCIAL SECURITY NUMBER (SSN)

14. AGE

15. SEX (Check)
   - ☐ a. Male
   - ☐ b. Female

16. RANK OR GRADE

17. MOS OR JOB SERIES

18. ADDRESS (Use Official Address for All Military or Government Personnel) (If different than block 3, add UIC.)

19. DUTY STATUS AT TIME OF ACCIDENT (Check one)
   - ☐ a. On Duty
   - ☐ b. Off Duty

20. FLIGHT STATUS (Check one)
   - ☐ a. Yes
   - ☐ b. No

CONTINUOUS DUTY (hrs.) (Without sleep)

22. HRS SLEEP IN LAST 24

23. DAYS LOST (Est. no. of days lost from work; not counting day of injury. Bed rest on quarters.)

24. DAYS HOSPITALIZED (Est. no. of days hospitalized receiving treatment; not for observation only.)

25. DAYS OF RESTRICTED WORK ACTIVITY (Est. number of days person cannot perform regular duties; light duty/profile.)

26. SEVERITY OF ILLNESS/INJURY (Check One)

- ☐ a. **Fatal.**
- ☐ b. **Permanent Total Disability.** Person can never again do gainful work
- ☐ c. **Permanent Partial Disability.** Person loses or can never again use a body part
- ☐ d. **Days Away from Work.** Person misses one or more workdays; bed rest on quarters.
- ☐ e. **Restricted Work Activity.** Person is temporarily unable to perform regular duties; light duty/profile
- ☐ f. **First Aid Only.** Person has one-time treatment of minor injury. (No lost work days.)
- ☐ g. **No Injury.**

27. CLASSIFICATION AT TIME OF ACCIDENT (Check)

- ☐ a. Active Army
- ☐ b. Army Civilian
- ☐ c. Army Contractor
- ☐ d. Nonappropriated Fund (NAF)
- ☐ e. Other U.S. Military
- ☐ f. ROTC
- ☐ g. Dependent
- ☐ h. NGB Tech
- ☐ i. NGB IDT
- ☐ j. NGB AT
- ☐ k. NGB ADSW
- ☐ l. NGB AGR
- ☐ m. NGB ADT
- ☐ n. USAR IDT
- ☐ o. USAR AT
- ☐ p. USAR ADT
- ☐ q. USAR FTM
- ☐ r. Foreign Nat. Direct Hire
- ☐ s. Foreign Nat. Indirect Hire
- ☐ t. Foreign Nat. KATUSA
- ☐ u. Foreign Mil. Attached to the U.S. ARMY
- ☐ v. Public
- ☐ w. Not reported

28. CAUSE OF INJURY/OCCUPATIONAL ILLNESS (Check the most serious)

- ☐ a. Struck Against
- ☐ b. Struck By
- ☐ c. Fell from Elevation
- ☐ d. Fell from Same Level
- ☐ e. Caught In/ Under/ Between
- ☐ f. Rubbed/abraded
- ☐ g. Bodily Reaction
- ☐ h. Overexertion
- ☐ i. Exposure
- ☐ j. External Contact
- ☐ k. Ingested
- ☐ l. Inhaled

29. BODY PART(S) AFFECTED (Check primary) (No more than 3)

- ☐ a. Body (General)
- ☐ b. Head
- ☐ c. Forehead
- ☐ d. Eyes
- ☐ e. Nose
- ☐ f. Jaw
- ☐ g. Neck
- ☐ h. Trunk
- ☐ i. Chest
- ☐ j. Heart
- ☐ k. Back
- ☐ l. Shoulder
- ☐ m. Arm
- ☐ n. Wrist
- ☐ o. Hand
- ☐ p. Fingers
- ☐ q. Leg
- ☐ r. Knee
- ☐ s. Ankle
- ☐ t. Foot
- ☐ u. Toes
- ☐ v. OTHER (Specify)

30. TYPE OF INJURY/ILLNESS (Check the most serious)

- ☐ a. Burns (Chemical)
- ☐ b. Burns (Thermal)
- ☐ c. Amputation
- ☐ d. Decompression Sickness
- ☐ e. Asphyxiation (Suffocation)
- ☐ f. Fractures
- ☐ g. Dislocation
- ☐ h. Abrasions
- ☐ i. Concussion
- ☐ j. Sprain/Strain
- ☐ k. Cuts/Lacerations
- ☐ l. Contusion
- ☐ m. Puncture Wound
- ☐ n. Hernia, Rupture
- ☐ o. Frostbite
- ☐ p. Heat Stroke
- ☐ q. Heat Exhaustion
- ☐ r. Noise Injury/Illness

DA FORM 285, AUG 80 AND DA FORM 285-1, AUG 80 ARE OBSOLETE

SECTION B - PERSONNEL INFORMATION *(Continued)*

31. Person's action(s) at time of accident *(Check one and explain in Block 32.)*

a. Soldiering	j. Test/Study/Experiments	s. Fabricating	aa. Hobbies
b. Combat Soldiering	k. Educational	t. Handling Material/Passengers	bb Passenger
c. Physical Training	l. Information and Arts	u. Janitorial/ Housekeeping/ Grounds Keeping	cc. Human movement
d Weapons Firing	m Food and Drug Inspection		dd. Horseplay
e. Engineering or Construction	n. Laundry/Dry Cleaning Services	v Food/Drink Preparations	ee Bystanding/spectating
f Communications	o Pest/Plant Control	w Supervisory	ff. Personal Hygiene/Food/Drink Consumption/Sleeping
g. Security/Law Enforcement	p. Operating Vehicle or Vessel	x. Office	gg. Parachuting *(See Instructions)*
h. Fire Fighting	q. Handling Animal	y. Counseling/Advisory	
i. Patient Care *(People/Animals)*	r Maintenance/Repair/Servicing	z. Sports	

32. SPECIFIC DESCRIPTION OF ACTIVITY/TASK

33 ON FIELD EXERCISE *(Check one)*
- ☐ a. Yes (If YES, specify name of exercise.)
- ☐ b. No

34. ACTIVITY PART OF TACTICAL TRAINING? *(Check one)*
- ☐ a. Yes
- ☐ b. No

35. Type of training facility being used *(Check one)*

a. Garrison	d. NTC	g. Std. range facility/ live fire
b. Local training area	e. JRTC	h. Other *(Specify)*
c. Major training area	f. CMTC	

36. Type of training participating in at the time of accident *(Check/specify)*

a. School *(Specify)*			
b. Unit →	(1) Platoon	(2) Crew	(3) Individual
c. On-the-job training	d. Other *(Specify)*		

37. Last time individual received training prior to accident on activity specified in block 31? *(Check one)*

a. 0 - 3 months	e 1 - 2 years
b. 3 - 6 months	f. More than 2 years
c. 6 - 9 months	g. Never
d. 9 - 12 months	h. Not applicable

38. Required protective equipment

CHECK APPROPRIATE BLOCK(S)	AVAILABLE? YES	AVAILABLE? NO	USED? YES	USED? NO	N/A
a. Seat belt					
b. Helmet					
c Goggles/glasses					
d. Gloves					
e Ear plugs					
f Other *(Specify)*					

39. INDIVIDUAL LICENSED TO OPERATE VEHICLE/EQUIPMENT? *(Check one)*
- ☐ a. Yes ☐ b. No ☐ c. N/A

40. DID ALCOHOL CAUSE/CONTRIBUTE TO THIS ACCIDENT? *(Check one)*
- ☐ a. Yes ☐ b. No ☐ c. Unknown

41. If drugs caused/ contributed to this accident, check appropriate block.
- a. Prescription
- b. Illegal
- c. Over-the-counter
- d. None

42. Were vision enhancement devices being used? *(Check appropriate block.)*
- a. Yes *(Specify type/model in c and d.)*
- b. No

c. TYPE	d. MODEL

43. Standard/Reference covering activity/task
- a Soldier's Manual *(Task No.)*
- b CTT *(Task No)*
- c AR/TM/FM *(Specify)*
- d SOP
- e. None *(Go to block 45.)*

44. WAS ACTIVITY/TASK PERFORMED IAW STANDARD/REFERENCE? *(Check one)*
- ☐ a. Yes ☐ b. No *(If NO, complete blocks 46-47.)*

45. DID INDIVIDUAL MAKE A MISTAKE? *(Check one)*
- ☐ a. Yes *(If YES, complete blocks 46-47)* ☐ b No

46. What was the mistake? How was the activity/task performed incorrectly? *(Explain below.)*

47. Why was mistake made/activity performed incorrectly? *(Check the most important reason and specify in Block 63.)*

a. Inadequate school training *(content/amount)*	f. In a hurry	k. Inadequate services
b. Inadequate unit training *(content/amount)*	g Poor/bad attitude	l Improper equipment design
c. Inadequate on-the-job training *(content/amount)*	h Lack of rest/sleep	m. Inadequate written procedures *(AR, TM SOP)*
d Fear/ excitement	i. Effects of alcohol/drugs	n. Improper supervision
e. Overconfident in own/others abilities	j. Inadequate facilities	o. Other *(Specify in narrative)*

SECTION B - PERSONNEL INFORMATION *(Continued)*

Time licensed on this vehicle *(Check one)*	49. Total AMV driving mileage *(Check one)*	50. Total time in unit *(Check one)*
☐ a Less than one year	☐ a. Less than 1,000 miles	☐ a Less than 6 months
☐ b One to two years	☐ b. 1,000 - 5,000 miles	☐ b. 6 months - 1 year
☐ c Over two years	☐ c. 5,000 - 10,000 miles	☐ c. Over one year
☐ d Unlicensed	☐ d. Over 10,000 miles	

51. WHICH ITEM FROM SECTION C APPLIES TO THE INDIVIDUAL NAMED IN BLOCK 12? *(This is needed in order to relate the person in block 12 to the equipment/vehicle below.)*

☐ Item A ☐ Item B ☐ Item C ☐ OTHER *(Specify)*

SECTION C - PROPERTY/MATERIAL INVOLVED *(Whether Damaged or Not)*

	ITEM A	ITEM B	ITEM C
52 Type of item			
53 Model number			
54 Ownership *(DOD, DA, POV, Unit, Person)*			
55 Dollar cost of damage			
56 Rollover protection system installed?	☐ Yes ☐ No ☐ NA	☐ Yes ☐ No ☐ NA	☐ Yes ☐ No ☐ NA
57 Was this item being towed?	☐ Yes ☐ No ☐ NA	☐ Yes ☐ No ☐ NA	☐ Yes ☐ No ☐ NA
58 If towed, enter letter for item doing towing			
59 Types of collision codes *(Pick up to three from list below and enter in blocks.) (In sequence.)*			

Types of Collisions

1 - Going forward and collided with moving vehicle
2 - Going forward and collided with parked vehicle
3 - Collision while backing
4 - Collision with pedestrian
5 - Collision with object (other than vehicle/pedestrian
6 - Overturned
7 - Ran off the road
8 - Jackknifed
9 - Going forward and rear-ended moving vehicle
10 - Going forward and rear-ended parked vehicle
11 - Collision while turning
12 - Other *(Specify)*

60. **Component/Part that Failed/Malfunctioned** *(Complete this section if a materiel failure/malfunction caused/contributed to the accident.)*

	ITEM A	ITEM B	ITEM C
a. National Stock Number			
b. Part Number			
c. Describe Part			
d. Manufacturer's Identification Code			
e. EIR/QDR Number			

61 How/Why Part Malfunctioned *(Select code from "How" list below and enter in first block; select code from "Why" list and enter in second block.)*	ITEM A HOW	ITEM A WHY	ITEM B HOW	ITEM B WHY	ITEM C HOW	ITEM C WHY

***How Part Failed/Malfunctioned* Codes**

1 - Overheated/burned/melted
2 - Froze *(temperature)*
3 - Obstructed/pinched/clogged
4 - Vibrated
5 - Rubbed/worn/frayed
6 - Corroded/rusted/pitted
7 - Overpressured/burst
8 - Pulled/stretched
9 - Twisted/torqued
10 - Compressed/hit/punctured
11 - Bent/warped
12 - Sheared/cut
13 - Decayed/decomposed
14 - Electric current action
15 - Unknown/Other
Blank - Not reported

***Why Part Failed/Malfunctioned* Codes**

1 - Improper equipment design
2 - Inadequate maintenance
3 - Inadequate manufacture of equipment
4 - Inadequate written procedures *(AR, TM, SOP)*
5 - Improper supervision
6 - Unknown
7 - Other *(Specify in narrative)*

SECTION D - ENVIRONMENTAL CONDITIONS INVOLVED

62. Environmental conditions. *(Check environmental conditions present and indicate if condition caused/contributed to the accident.)*

ENT	CAUSED CONTRIBUTED	CONDITION	PRESENT	CAUSED CONTRIBUTED	CONDITION
		a Clear/dry, visibility unlimited			k Wind gust turbulence
		b Bright, glare			l Vibrate, shimmy, sway, shake
		c Dark, dim			m Radiation, laser, sunlight
		d Fog, condensation, frost			n Holes, rocky rough, rutted, uneven
		e Mist, rain, sleet, hail			o Inclined/steep
		f Snow, ice			p Slippery *(not due to precipitation)*
		g Dust, fumes, gasses, smoke, vapors			q Air pressure *(bends, decompression, altitude, hypoxia)*
		h Noise, bang, static			r Lightning, static electricity, ground
		i Temperature/humidity *(cold, heat)*			s OTHER *(Specify)*
		j Storm, hurricane, tornado			

SECTION E - ACCIDENT DESCRIPTION/NARRATIVE *(From blocks 10, 47)*

63. GIVE THE SEQUENCE OF EVENTS THAT AMPLIFY/EXPLAIN WHAT HAPPENED, LEADING UP TO AND INCLUDING THE ACCIDENT. ***(Explain why accident happened.)***

64a. PRINTED/TYPED NAME OF PERSON COMPLETING THIS REPORT	64b RANK	64c. TITLE	
64d. SIGNATURE		64e. DATE OF SIGNATURE *(YY/MM/DD)*	64f. TELEPHONE NO.

SECTION F - CORRECTIVE ACTION AND COMMAND REVIEW

66. DESCRIBE THE ACTIONS TAKEN, PLANNED, OR RECOMMENDED TO ELIMINATE THE CAUSE(S) OF THIS ACCIDENT *(from unit level up to HQDA)*

66a. PRINTED/TYPED NAME OF COMMANDER	66b. RANK
66c. SIGNATURE	66d. DATE OF SIGNATURE *(YYMMDD)* / 66e. TELEPHONE NO

	a. TYPED NAME	b. SIGNATURE	c. TITLE	d. RANK / DATE
67				
68				
69				

SECTION G - *SAFETY OFFICE USE ONLY*

70. LOCAL REPORT NO	71. MACOM

72. Accident type *(Check choice)*

	a. Army Motor Vehicle		h. Other Army Vehicle		o. Personal Injury - Other
	b. Army Combat Vehicle		i. Fire		p. Property Damage - Other
	c. Army Operated Vehicle		j. Chemical Agent		q. POV - On Official Business
	d. POV - Not on Official Business		k. Explosive		r. Space
	e. Marine Diving		l. Missile		s. Commercial Carrier/Transportation
	f. Marine Underway		m. Radiation		
	g. Marine Not Underway		n. Nuclear		

73. NAME OF SAFETY POINT OF CONTACT *(POC)*	74. PHONE NO. OF SAFETY OFFICE POC *(AUTOVON, Commercial, Etc.)*	75. DATE REPORT COMPLETED BY SAFETY OFFICE *(YYMMDD)*

SECTION H - SPECIAL INTEREST AND/OR SUPPLEMENTAL INFORMATION

76	
77	
78	

APPENDIX B

Emergency Telephone Numbers

Fire Department ..... 911 or (703) 494-4171
OWL Co. 12
Montgomery Avenue, Woodbridge

Ambulance ..... 911 or (703) 370-4101
Choice American Ambulance Services, Inc.
Alexandria, VA

Medical Care ..... 911 or (703) 670-1363
Potomac Hospital
2300 Opitz Blvd.
Woodbridge, VA

Police ..... 911 or (703) 792-6500
Garfield Police Dept.

National Capital Poison Control Center (Regional) ..... (202) 625-3333

Information and Response Organizations

CHEMTREC ..... (800) 424-9300

National Poison Control Center ..... (800) 458-5842

TSCA Hotline ..... (202) 554-1404

Centers for Disease Control (CDC) ..... (404) 452-4100
(404) 329-2888

National Response Center ..... (800) 424-8802

EPA Environmental Response Team (ERT) ..... (201) 321-6660

Resource Conservation and Recovery Act (RCRA) Hotline ..... (800) 424-9346

Project Personnel

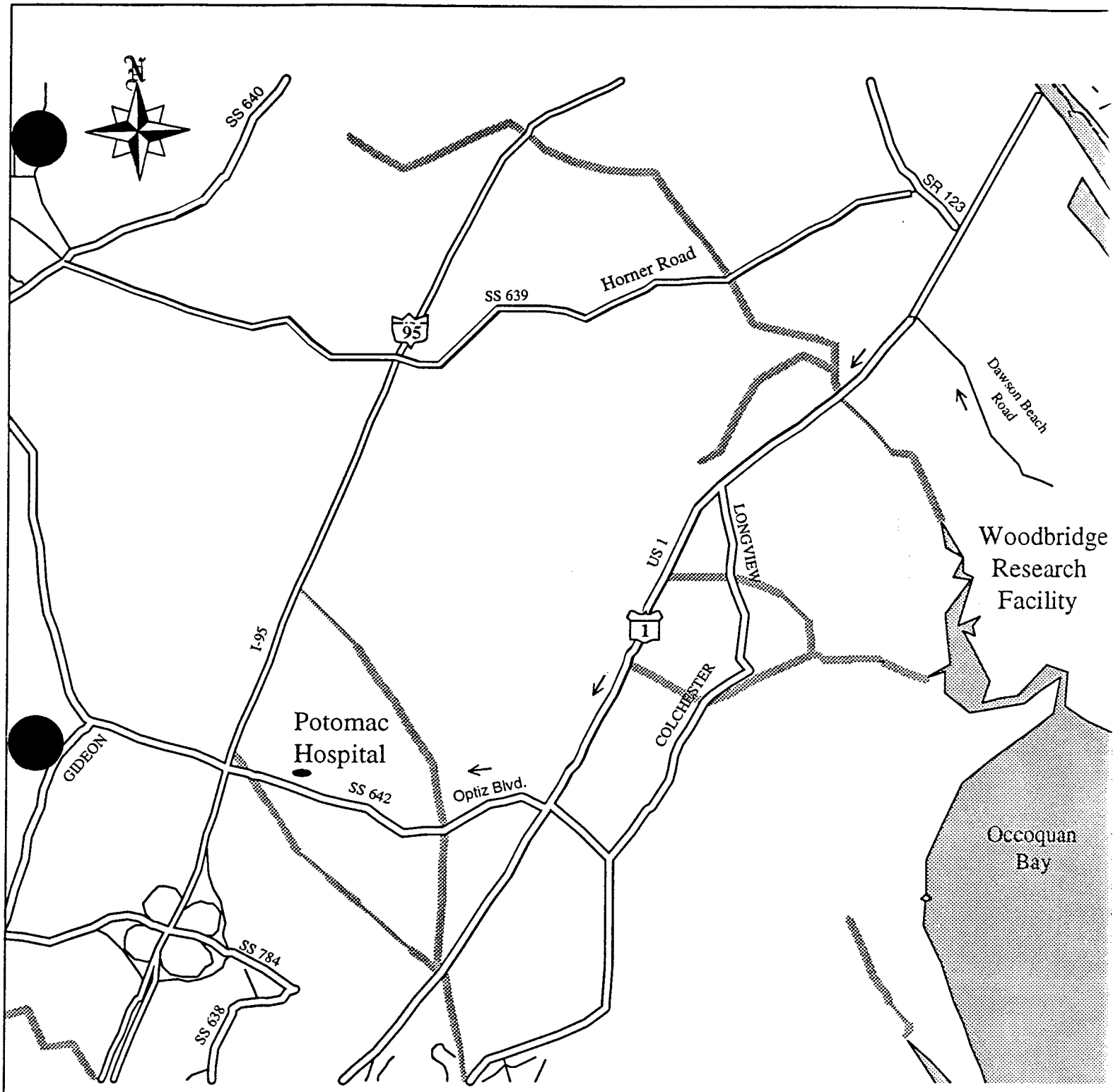
Larry Mango (USAEC Coordinator) ..... (410) 671-1568

Jeff Waugh (BCD, USAEC) ..... (410) 671-1610

William Howser (TSD-Safety, USAEC) ..... (410) 671-6866

Tod Waltemeyer (Site Manager, WRF) ..... (703) 490-2511

Van Noah (Project Manager, Horne) ..... (703) 379-5600



Scale: 1" ≅ 2000 feet

Directions

Leave Woodbridge Research Facility on Dawson Beach Road.
Turn left on Route 1.
Turn right on Optiz Boulevard.
Turn into hospital emergency entrance.

Horne Engineering and Environmental Services, Inc.

Route to Potomac Hospital from Woodbridge Research Facility

(Distance to Hospital ≅ 4 miles)