SAMPLING AND ANALYTICAL PLAN FOR THE EXTENT OF MERCURY CONTAMINATION IN BUILDING 252

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Prepared for

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CONTENTS

CONTENTS (Continued)

TABLES

FIGURES

Section 1
INTRODUCTION

McClellan Air Force Base Building 252 was previously the location of instrument repair and testing operations. In early 1990, much of these operations were moved to other locations and building renovation activities were initiated to convert the facility to office space. In May 1990, while removing construction materials from the second floor, mercury was found in some vacuum lines that apparently had been used to vacuum up mercury spilled during instrument service and testing.

The Base Bioenvironmental Group (SGB) conducted a sampling effort to determine if mercury was present throughout the building. Mercury was detected in all swipe (wipe) samples taken, with many of the results undetermined due to concentrations over the calibrated range.

With these results, the Base determined that a more extensive sampling and analysis needed to be completed and evaluation of potential decontamination methods conducted. From this information, a decontamination plan will be developed. The intent of the plan will be to describe the decontamination approach and to set cleanup standards for materials to be removed from the building and for the remaining structure. Once the renovation/decontamination has been completed and confirmation testing conducted, the building will be put back in service.

This Sampling and Analytical Plan (SAP) describes the sampling and analysis program developed to characterize mercury contamination in and around Building 252. The objectives of this plan are:

- To provide operating guidelines to field sampling personnel for the sampling activity.
- To provide guidance for sampling and analysis quality control/quality assurance.
- To define the sampling health and safety procedures.
- To give the California Department of Health Services (DOHS) the opportunity to review and comment on the site sampling program prior to the initiation of the field work.

This Sampling and Analytical Plan was developed in conjunction with and is accompanied by a Health and Safety Plan (HASP). The HASP covers all relevant health and safety aspects for personnel in the Site Sampling Team (SST). In addition, the SAP contains a section on Quality Assurance/Quality Control (QA/QC) that describes quality assurance objectives, calibration of equipment and laboratory analysis.

This SAP contains the following topics:

- Investigation objectives
- Site background
- Site description
- Description of existing data
- Sampling plan rationale
- Sampling and analytical methods and procedures
- Analytical plan
- Quality assurance/quality control
- Project schedule
- Project organization
- Health and safety
- References

CH2M HILL, under an existing contract with McClellan AFB, will conduct the sampling and analysis investigation. The result of this investigation will be a report that provides the analysis results and recommends a decontamination approach for the building.

Section 2
INVESTIGATION OBJECTIVES

The objective of this investigation is to estimate the extent of mercury contamination in and around Building 252 and to recommend procedures for cleanup and decontamination of the building. To accomplish these objectives, sampling and analyses will be separated into two stages: sampling and analyses to define the extent of contamination on various media, and sampling and analyses to test possible cleanup scenarios.

In order to achieve the eventual goal of building decontamination and future use, the following assumptions are being made:

- The building will be gutted of essentially all internal components.
- These internal components must be disposed of in a manner consistent with existing regulations.
- In some cases decontamination of certain media may not be possible or cost effective. These media (example--carpets) will probably be disposed of in a Class I landfill.
- Other internal components may be able to be decontaminated, especially compared to the cost of Class I disposal. These media (example--wallboard) must be tested for decontamination effectiveness.
- Other internal components that are non-porous, such as metal duct work, will be able to be decontaminated by standard procedures of vacuuming, washing or wiping, or other non-destructive methods. These media could then be reused, sold as scrap, or disposed of in an appropriate manner.
- The remaining shell of the building will be able to be decontaminated using standard procedures by vacuuming, washing, and/or abrasive blasting.

Under these assumptions, cleanup procedures for certain media that cannot be cost-effectively decontaminated and cleanup procedures for the building shell need not be tested. However, cleanup testing does need to occur for internal construction media such as walls and ceilings.

Section 3
SITE BACKGROUND

SITE DESCRIPTION

The +50-year-old Sacramento Air Logistics Center (ALC) is a key part of the Air Force Logistics Command, lifeline of the aerospace team. The command is headquartered at Wright-Patterson AFB, Ohio; the Sacramento center is one of five such facilities located at strategic points around the country. Each of these centers provides support to the Air Force's other major commands in key areas of management, procurement, supply distribution and transportation, and maintenance and repair. Each center supports certain aircraft, weapon systems, and various items and commodities.

At Sacramento ALC, aircraft such as the F/EF/FB-111, A-10, F-4, and C-12A/D are kept combat-ready. Surveillance and warning systems, radar sites, space systems such as the Space Shuttle, missile tracking stations, and airborne and ground power generators are also maintained and repaired (Ref. 1).

SITE HISTORY

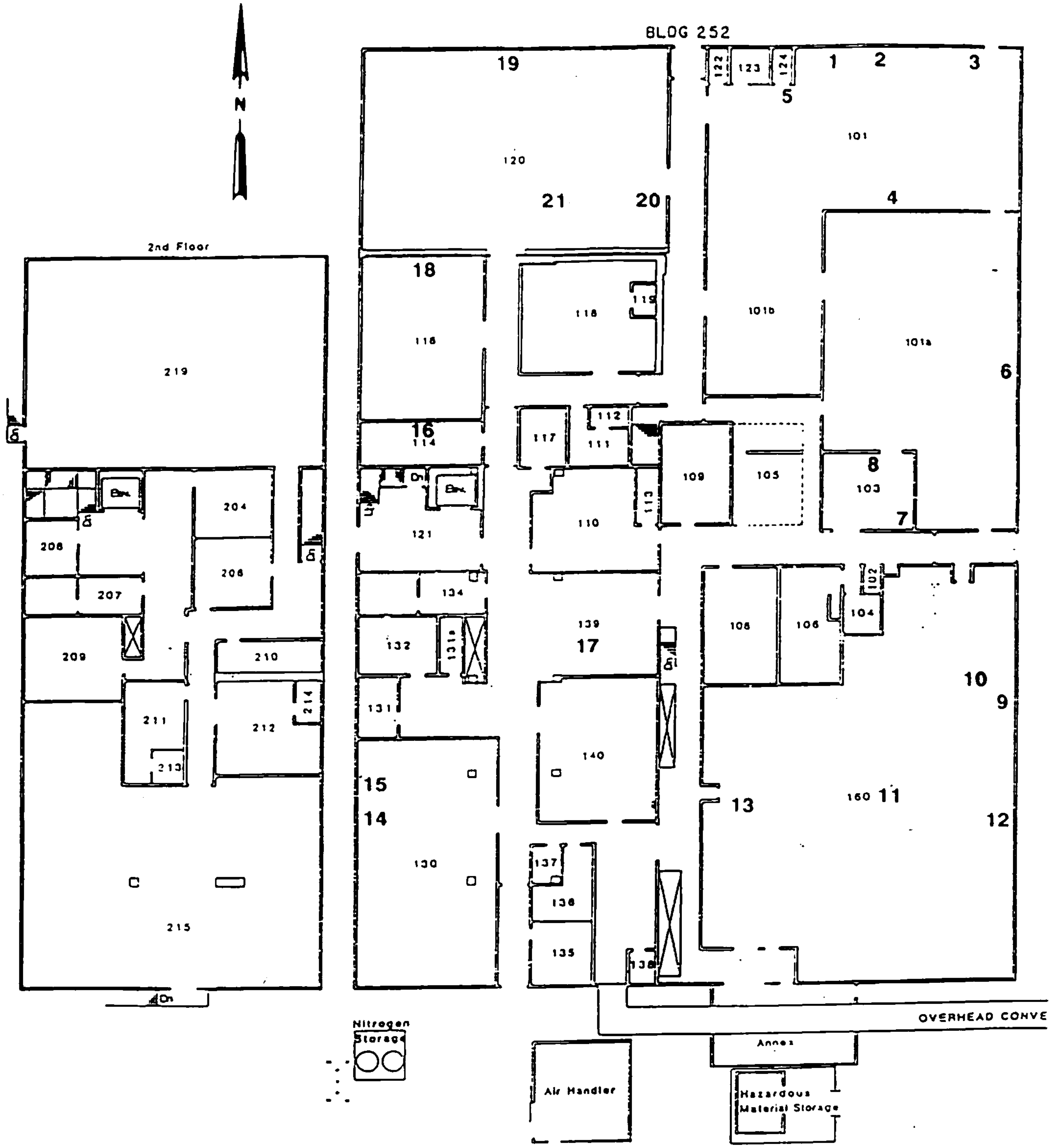
The facility of concern is Building 252 and areas immediately outside of Building 252 on McClellan Air Force Base. In support of Sacramento ALC's mission, Building 252 was the location of maintenance and repair operations for various instrumentation. These operations resulted in occasional spills of mercury. Spills were cleaned up through direct recovery and/or vacuuming.

In early 1990, most of the operations were relocated and renovation activities were initiated to convert the building to office space. During initial stages of the renovation mercury was discovered in some of the vacuum line piping. This prompted the collection of swipe (wipe) samples by the Base and closure of the building.

Because of the existence of mercury contamination within and possibly around Building 252, an initial site visit was conducted.

DESCRIPTION OF EXISTING DATA

An initial sampling and analytical effort was undertaken on 22 May 1990 by McClellan Air Force Base to determine the existence of mercury contamination. Swipe samples were taken at various locations within Building 252. The locations of these samples are shown in Figure 1.



SOURCE: McCLELLAN AIR FORCE BASE

FIGURE 1

LOCATION OF McCLELLAN AIR FORCE BASE BIOENVIRONMENTAL (SGB) SWIPE SAMPLING ON 22 MAY 1990

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Mercury was found in all swipe samples (see Table 1). The highest readings were found inside Room 101. The indication from these results is that mercury may be found in most parts of Building 252 with locational "hot spots."

Because this initial sampling and analytical effort found mercury throughout Building 252, a confirmatory sampling and analytical effort is planned. The rationale for the confirmatory sampling plan is presented in Section 4. In order to develop a plan for the sampling/analysis effort, an initial site visit was conducted by CH2M HILL.

INITIAL SITE VISIT

The objective of the initial site visit was to familiarize the CH2M HILL planning and sampling team with the site and to provide an initial survey of the building. Results of the initial site visit were used to prepare this SAP.

The CH2M HILL team, accompanied by McClellan AFB personnel, proceeded through the building as shown in Figure 2. A Jerome Mercury Vapor Analyzer was used to analyze the ambient air for the concentration of mercury vapor. The results of the analyses are shown in Figure 3. Both the breathing zone and the floor zone were analyzed in many of the building's rooms. Following are results of the two zones, breathing/floor, by location in milligrams of mercury per cubic meter (mg/m^3) of air (a"-" designates that no reading was taken in this zone):

- Room 160: 0/0, 0/0, 0/0.001
- Hallway between Rooms 103 and 104: 0/0.009, 0.002/0.002
- Room 105: 0/0.002
- Hallway outside Room 105: 0.002/0.002
- Room 101b: 0.002/0.004
- Room 101a: 0.003/0.004, -/0.005
- Inside and outside Room 131: 0/0, 0/0
- Room 116: 0/0.003
- Room 120: 0.001/0.006, -/0.001, -/0.003, -/0.003, 0.005/0.002
- Room 101: 0/0.004 -/0.001, -/0.002, 0.001/-
- Room 121: 0/0.002
- Room 219: 0.003/0.007, 0.004/-, -/0.004, -/0.002, -/0.003
- Outside Room 208: 0.001/0.004
- Room 215: 0.002/-, 0.002/0.003, -/0.005
- Hallway outside Room 160 near exit: 0.009/- and 0.012/- (while walking);
- Basement: 0.003 above floor; 0.001/0.001 near compressed air tank; 0.003 near overhead pipes; and 0.003 inside updraft duct (not shown in Figure 3).

Table 1 Results of Mercury Swipe Samples Taken Within Building 252 on 22 May 1990			
Location Number[a]	Location	Mercury Concentration (ug/swipe)[b]	SGB Number[c]
1	Room 101 workbench	29.72	WW-90-422
2	Room 101 north wall	>0.50[d]	WW-90-423
3	Room 101 northeast corner	53.33	WW-90-424
4	Room 101 south wall	0.21	WW-90-425
5	Room 101 baseboard	3312.44	WW-90-426
6	Room 101A east wall	0.48	WW-90-427
7	Room 103 southeast corner	>0.50[d]	WW-90-428
8	Room 103 north wall	0.42	WW-90-429
9	Room 160 supply cabinet	>0.50[d]	WW-90-430
10	Room 160 supply air vent	>0.50[d]	WW-90-431
11	Room 160 wall cabinet	>0.50[d]	WW-90-432
12	Room 160 exhaust vent	>0.50[d]	WW-90-433
13	Room 160 AC diffuser	>0.50[d]	WW-90-434
14	Room 130 light fixture	0.02	WW-90-435
15	Room 130 vacuum	>0.50[d]	WW-90-436
16	Room 144 north wall	4.87	WW-90-437
17	Room 139 break room vent	>0.50[d]	WW-90-438
18	Room 116 north wall air vent	>0.50[d]	WW-90-439
19	Room 120 north wall	>0.50[d]	WW-90-440
20	Room 120 south wall vent	>0.50[d]	WW-90-441
21	Room 120 work table	>0.50[d]	WW-90-442

[a]Location number is shown in Figures 3 and 4.
[b]Micrograms per swipe.
[c]SGB number is the log book number.
[d]Sample exceeded calibration range.

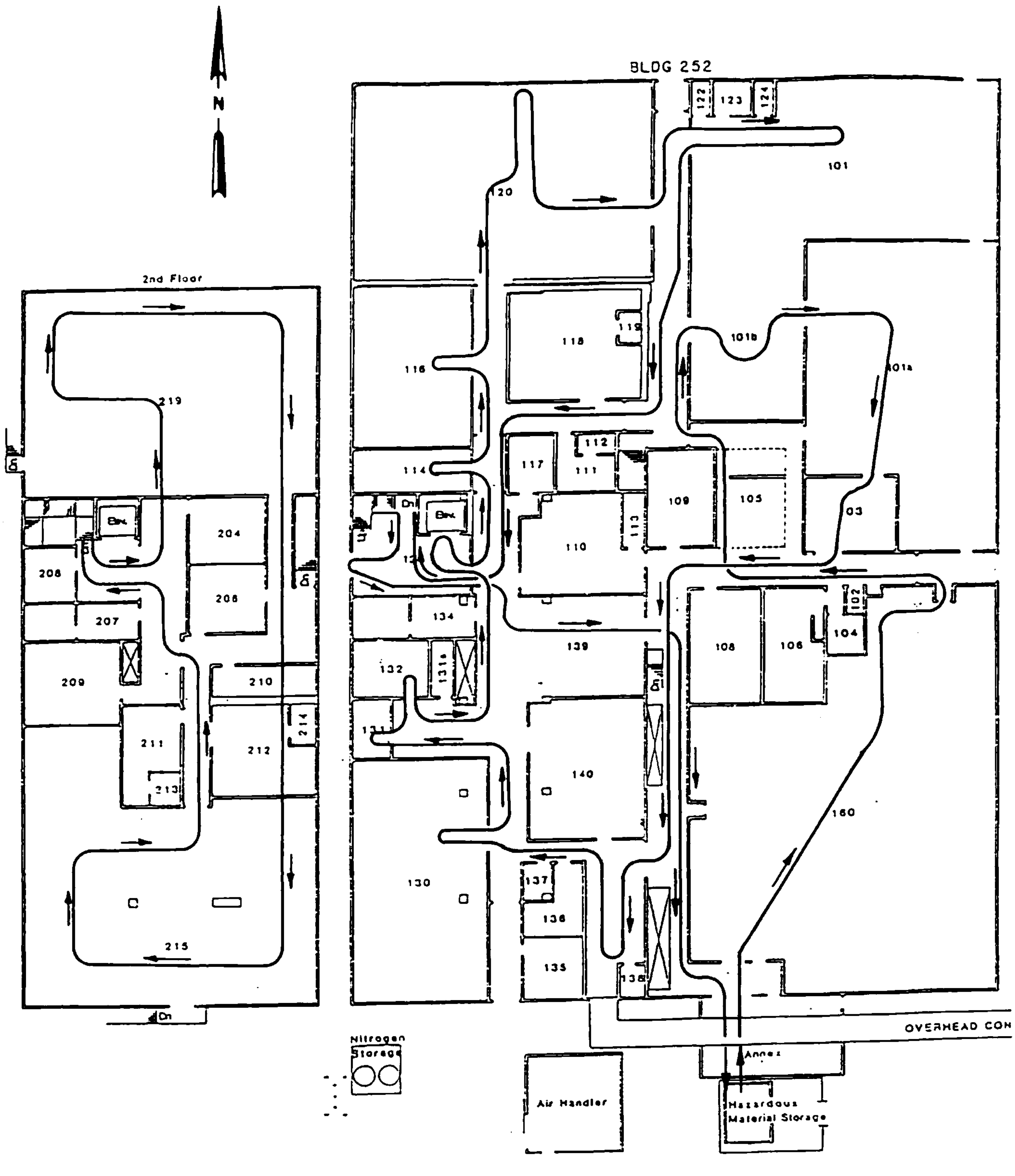

FIGURE 2

PATH THROUGH BUILDING 252 DURING INITIAL SITE VISIT

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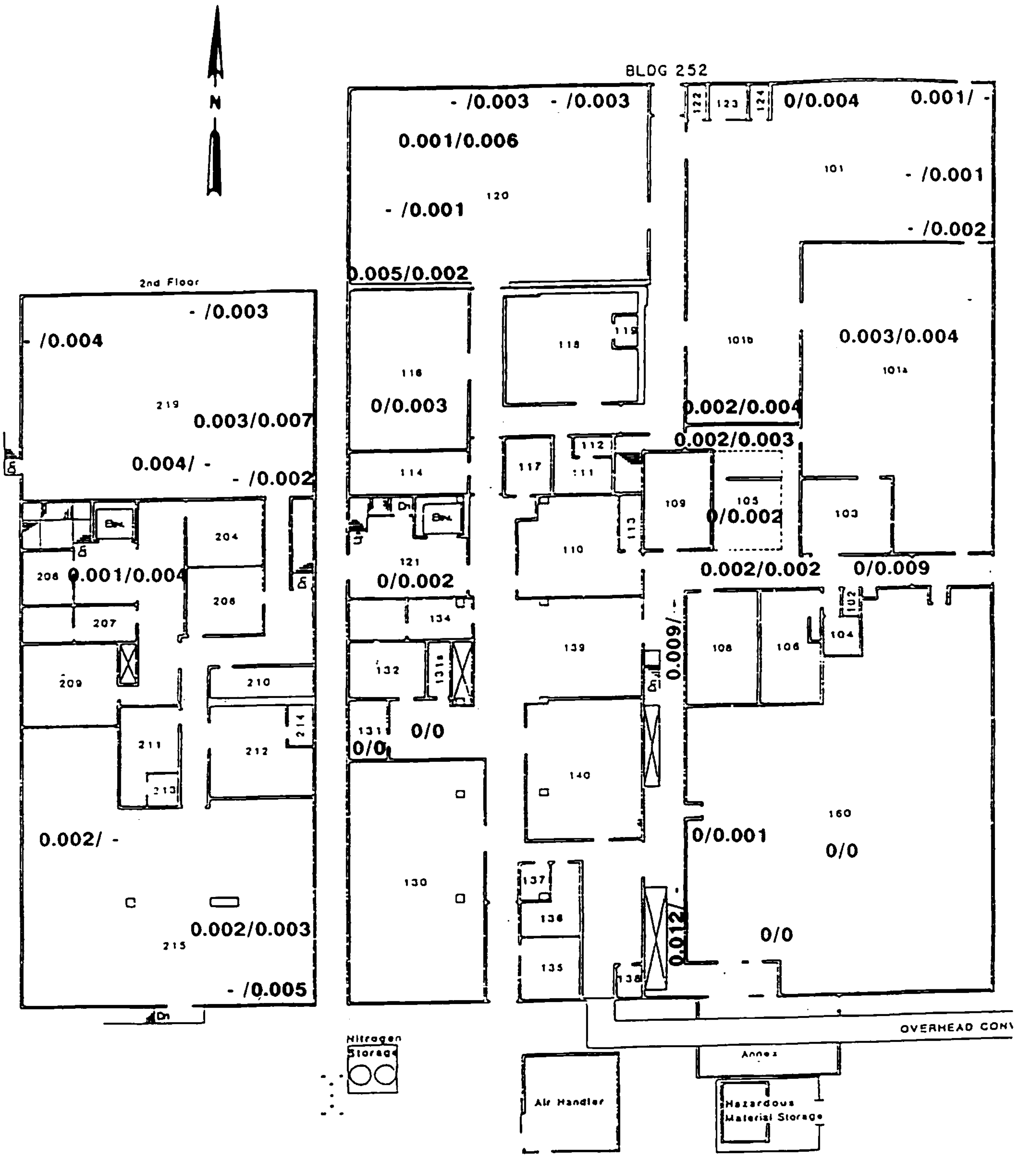

FIGURE 3

MERCURY VAPOR CONCENTRATIONS IN MICROGRAMS PER CUBIC METER FOR THE BREATHING ZONE/FLOOR ZONE OF BUILDING 252

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Outside the building, the following readings were found at specific locations (not shown in Figure 3):

- Dumpsters in northeast corner of building: 0, 0, 0
- Ground near north door next to Room 122: 0.002, 0.002
- South door next to Room 130: 0
- Inside shop vacuum hopper: 0.021, 0.019

In summary, levels of mercury vapor found throughout Building 252 varied from zero to 0.012 mg/m^3. Generally, higher levels were found at the floor zone versus the breathing zone. The air handling ducts did not show appreciably different mercury vapor concentrations compared with ambient air in the rooms. However, the highest concentrations inside the building were found in the breathing zone around the four-person investigation group while the group was walking together. These concentrations were probably the result of mercury-contaminated dust being kicked up from the floor. The highest reading was found inside the hopper for the shop vacuum outside the west side of the building. This hopper may have received mercury from the instrument maintenance and repair operations within the building. The low-level readings outside the north door near the ground show that additional samples should be taken outside the building to determine the existence of fugitive mercury.

Section 4
SAMPLING PLAN RATIONALE

The overall rationale is to determine if mercury contamination is ubiquitous throughout Building 252, what media are contaminated, and effectiveness of potential remedial alternatives. To meet these objectives, a two-stage sampling effort will be carried out. Stage 1 will consist of wipe, sweep, and chip sampling for determination of the extent of mercury contamination on various surfaces and equipment within Building 252. Stage 2 will explore several future remedial efforts, therefore, the efforts of Stage 2 will amount to an onsite "bench-scale" test of some remedial options.

The initial sampling and analytical effort conducted by the Bioenvironmental (SGB) group indicated that low levels of mercury are present with the possibility of local "hot spots." Therefore, this sample plan rationale intends to confirm and expand on the SGB sampling. Building 252 will be treated as one unit or sampling site because in the shell (foundation, floor, walls, and roof) is one structural unit. A wide dispersion of sampling locations is planned to explore the premise that the building contains mercury throughout and to locate local "hot spots." To verify this premise, wipe, sweep, chip (Stage 1), and building material (Stage 2) samples will be analyzed for total mercury to determine if the California TTLC regulatory limits are exceeded. Evaluation in terms of TTLC (20 mg/kg) will be to determine disposal requirements for materials to be removed from the building. This is not a building cleanup objective for the remaining structure. Cleanup objectives will be recommended in the subsequent decontamination plan.

Wipe samples give information on the amount of mercury contamination adhered or adsorbed on a surface. The wipe cloth will contain a mild solvent to absorb any mercury from the selected surface. The sweep sample provides the concentration of mercury in loose material not adhered to a particular surface. Therefore, sweeps will show the association of mercury with dust throughout the building. Finally, chip samples will be used to determine the presence of mercury within the building construction material. If mercury is present within these materials, a more rigorous remediation technique may be required compared to limited surface contamination only.

The location of the proposed Stage 1 wipe, sweeps, and chip sampling in Building 252 is shown in Figure 4 and Tables 2, 3, and 4. The sample locations were selected to determine mercury concentrations in some areas that have not yet been sampled and also to confirm concentrations at previous SGB sampling points.

Table 2
Proposed Wipe Sample Locations

Room	Sample Area	Next to SGB Location Number
160 05 - 109	Southwall	N/A
Northwall Between 138 and 160 05-108	Wall	N/A
Inside North Door 05-118 Between 101 and 120	Wall	N/A
121 05-101	Floor ✓	N/A 17
121 05-102	Wall ✓	N/A
05-116 ~~121~~ 2nd Fl Women's Restroom	~~HVAC~~ Counter top	N/A
139 05-106	Ceiling Tile	N/A
Inside South Door Hallway Between 135 and 130 05-107	Wall	N/A
130 05-105	West Wall	N/A
219 05 - 114	West Wall	N/A
219 05- 115	East HVAC	N/A
215 05 -112	East Wall	N/A
215 05 - 113	Well HVAC	N/A
Basement 05 117	Wall	N/A
101 05 -119	Baseboard	5
120 05-104	North Wall	19
114 05-103	North Wall ✓	16
103 05-120	North Wall	8
101A 05 - 122	East Wall	6
160 05 - 110	East Wall Exhaust Vent	12
Vacuum Hopper West side of building 05-121	Inside Hopper (accessible areas)	N/A

05-111 Batch Blank

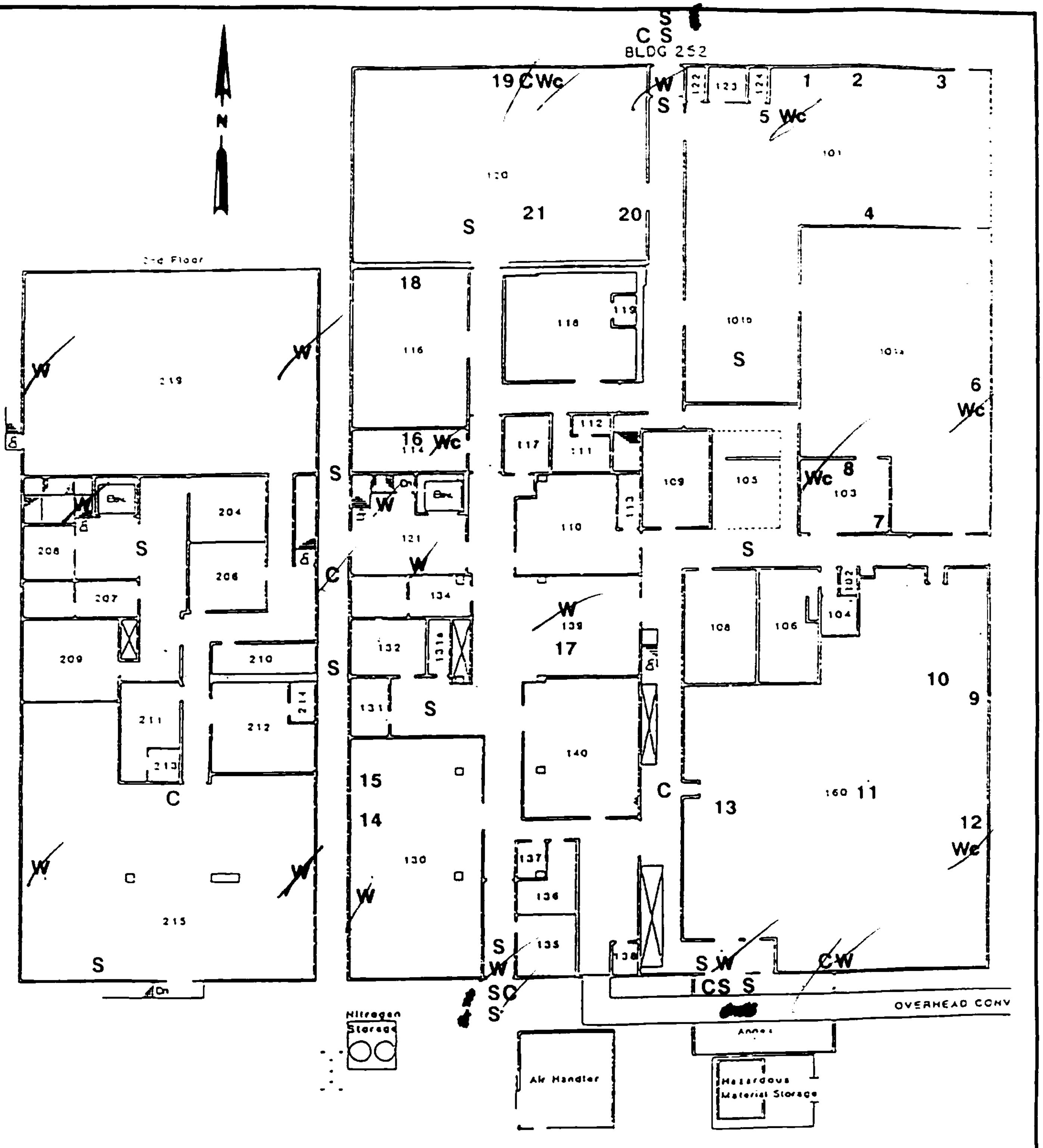
05-123 Batch Blank

Table 3
Proposed Sweep Sample Locations

Room	Sample Area
Inside South Door Hallway Between Rooms 135 and 130	Floor
Outside South Door Hallway Between Rooms 135 and 130	Concrete Ground
Outside South Door Hallway Between Rooms 135 and 130	Soil
Inside South Door Hallway Between Rooms 138 and 160	Floor
Outside South Door Hallway Between Rooms 138 and 160	Concrete Ground
Outside South Door Hallway Between Rooms 138 and 160	Soil
Inside North Door	Floor
Outside North Door	Concrete Ground
Outside North Door	Soil
North of House Vac Hopper	Concrete Ground
South of House Vac Hopper	Concrete Ground
Hallway Outside of Rooms 131 and 132	Floor
120	Floor
Hallway Between Rooms 108 and 109	Above Ceiling Tiles
101 b	Above Ceiling Tiles
Second-Story Hallway	Floor
215	HVAC
Basement	HVAC
Basement	On Top of Equipment
Roof	Roof Near Outlet of High Pressure Exhaust

Table 4
Proposed Chip Sample Locations

Room	Sample Area
Under House Vacuum Hopper 05-201	Concrete Ground
Outside South Door Hallway Between Rooms 135 and 130 05-202	Concrete Ground
Outside South Door Hallway Between Rooms 138 and 160 05-212	Concrete Ground
Outside North Door 05-211	Concrete Ground
Room 215 05-210	Floor
Basement 05-209	Floor
Roof	Roof Near Outlet of High Exhaust Pressure
Hallway Between Rooms 140 and 160 05-208	Floor ~~05-208~~
Room 120 05-203, 05-204-MS, 05-205 MSD	North Wall 05-206 ← dup
Room 160 05-207	South Wall



LEGEND

W - WIPE

Wc - CONFIRMATORY WIPE

S - SWEEP

C - CHIP

NOTES:

1. LOCATION OF BASEMENT AND ROOF SAMPLES NOT SHOWN
2. NUMBERS DESIGNATE LOCATION OF McCLELLAN AFB BIOENVIRONMENTAL (SGB) SWIPE SAMPLING

FIGURE 4

LOCATION OF PROPOSED WIPE, SWEEP, AND CHIP SAMPLING IN BUILDING 252

SOURCE: McCLELLAN AIR FORCE BASE

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In addition to the samples identified in Tables 2, 3, and 4, and locations shown in Figure 4, up to 20 additional samples may be taken by the sampling team to identify concentrations in other areas or media. The sampling team will coordinate with Base Environmental (EM) to determine the most suitable locations for these discretionary samples. Examples of locations that may be sampled include the outside shed on the northwest side of the building, mechanical equipment in the basement, HVAC receiving tank in the basement, and additional samples in air system ductwork.

The sampling plan does contain some sample points outside of Building 252, along possible migration pathways (see Figure 4). These pathways are the north doorway, the two south doorways, the shop vacuum hopper area on the west side of the building and the roof area near the high vacuum exhaust (not shown in Figure 4). These pathways were chosen due to workers exiting the building, water escaping the building with possible contaminants, and ventilation locations of the shop and the high vacuum lines.

If it is determined that contaminants have been released from the building, McClellan AFB will follow CERCLA notification requirements to inform agencies of the release areas and concentrations detected.

The Stage 2 effort, will consist of hand-cleaning various surfaces by vacuuming or wiping with solutions that may be capable of absorbing the mercury adhered to or adsorbed on the surface. These surfaces will include walls and ceiling tiles. The surface of these matrixes will be analyzed for total mercury before and after cleaning to determine the cleaning efficiency of the decontamination solutions and the hand-cleaning operations. This onsite feasibility test will be performed concurrently subsequent to the Stage 1 sampling effort. The location of surfaces will be determined in the field.

During the sampling effort the sampling teams will conduct an inspection of the building to inventory materials to be removed during subsequent construction, and to identify other potential concerns such as potential PCB or asbestos materials. No sampling will be conducted to confirm these materials at this time. Therefore, identification of asbestos, PCB, or other wastes will be based on observations only and should not form the basis for cleanup procedures. If other waste materials are potentially present, additional sampling may be required.

Section 5
SAMPLING AND ANALYTICAL METHODS AND PROCEDURES

GENERAL

This section outlines procedures and equipment for the collection of representative wipe, chip, and sweep samples to determine potential surficial contamination (Ref. 2). These methods of sampling were appropriate for surface and subsurface contamination and will be used during the Stage 1 sampling effort. The Stage 2 sampling for the feasibility study will sample for surficial contamination using field modified sampling techniques.

METHOD SUMMARY FOR STAGE 1 SAMPLES

Since surface situations vary widely, no universal sampling method can be recommended. Rather, the method and implements used must be tailored to suit the specific sampling location. The sampling locations selected were based upon the potential for contamination as a result of manufacturing processes or personnel practices.

To collect a wipe sample for surface substances, a sample location will be measured and marked off. The sample location will be wiped within a 10 cm x 10 cm perimeter form to standardize the wipe area. With the sampler wearing a new pair of surgical gloves, a sterile gauze pad will be opened, and soaked with solvent. This pad is then stroked firmly over the sample surface; first vertically, then horizontally, to ensure complete coverage.

Chip sampling is appropriate for porous surfaces and is generally accomplished with either a hammer and chisel, or an electric hammer. The sampling device will be cleaned and wrapped in clean, autoclave aluminum foil until ready for use. To collect the sample, a measured and marked off area is chipped both horizontally and vertically to an even depth of 1/4 inch.

Sweep sampling is an effective method for the collection of dust and/or residue on porous or nonporous surfaces. To collect such a sample, an appropriate area is measured off. Then, while wearing a new pair of disposable surgical gloves, a dedicated brush is used to sweep material into a dedicated dustpan. The sample is then transferred to the proper sample container.

Samples collected by all three methods are then sent to the laboratory for analysis.

Activities associated with sampling, including logging, labeling, chain-of-custody, packing, and transportation, are discussed in Section 7.

METHODS SUMMARY FOR STAGE 2 SAMPLES

Stage 2 sampling will be used to assess potential cleanup alternatives for certain internal construction media. These media will include walls, ceiling tiles, and one additional media to be identified as the study progresses.

To assess remediation methods, an area of wall, ceiling tile, or other media suspected of having surface contamination will be selected for testing. This area will then be divided into four squares measuring 20 cm x 20 cm. Each square is then subdivided into four squares of 10 cm x 10 cm.

One of the two lower squares in each 20-cm area will then be cut with a sharp knife and the surface material will be peeled off and retained for total mercury analysis.

The diagonal upper 10-cm square within each 20-cm area will then be tested for a different cleanup alternative, as follows:

- **Area 1**--Wipe 10-cm area with clean wipe pad and deionized water. Cut and peel surface after wiping. Retain wipe and surface materials for separate analyses.
- **Area 2**--Wipe 10-cm area with a clean wipe pad and mild solvent, such as 0.1N HNO_3. Cut, peel, and retain samples as above.
- **Area 3**--Wipe 10-cm area with a clean wipe pad and a stronger solvent (to be determined). Cut, peel, and retain samples as above.
- **Area 4**--Vacuum 10-cm area with industrial equipment similar to that used for building decontamination. After vacuuming, cut area perimeter and peel off surface material for analysis.

This procedure will help determine the total mercury content of the uncleaned surfaces, amount of mercury removed by three wipe methods, and the residual mercury remaining on the surface after "remediation." The procedure will be repeated for each media to be tested.

EQUIPMENT

Lab clean glass sample containers (I-Chem or equivalent) of 4 or 8 ounce size
Bound field notebook
Chain of custody records (see Section 7)
Seals for sample security documentation (see Section 7)
Sample labels (see Section 7)
Disposable surgical gloves
Sterile wrapped pads (3" x 3")
0.1N HNO_3 (HPLC) Grade Solvent
Medium sized 0.1N HNO_3 cleaned paint brushes
Medium sized 0.1N HNO_3 cleaned chisels
"Exacto" knives with 0.1N HNO_3 cleaned blades
0.1N HNO_3 cleaned aluminum foil

REAGENTS

0.1N pesticide or HPLC grade Nitric Acid
De-ionized water

PROCEDURES FOR STAGE 1 SAMPLES

WIPE SAMPLE COLLECTION

1. Choose appropriate sampling points and measure off designated area (100 square centimeters).

2. To facilitate later calculations, record location of surface area to be wiped.

3. Don a new pair of disposable surgical gloves.

4. Open new sterile package of pad.

5. Soak the pad with solvent 0.1N HNO_3. Let any excess run off.

6. Wipe the surface area within the 10 cm x 10 cm perimeter form using firm strokes. Wipe vertically, then horizontally to insure complete surface coverage.

7. Place the gauze pad in a 4 or 8 ounce I-Chem or equivalent glass sample container with a Teflon-lined cap.

8. Cap the sample container, label bottle and place in a double plastic bag. Record all pertinent data in the field log book. Complete chain of custody record before taking the next sample.

9. Place on ice inside an ice chest.

10. Upon completion of sampling, place chain-of-custody form inside cooler. Place custody seal on cooler.

11. Follow proper decontamination procedures (see Decontamination Procedures subsection in Section 5), then deliver ice chest with sample(s) to the laboratory for analysis.

SWEEP SAMPLE COLLECTION

1. Choose appropriate sampling points and measure off designated area 10 cm x 10 cm perimeter form.

2. Record location of surface area to be swept to facilitate later calculations.

3. Don new pair of disposable surgical gloves.

4. Sweep measured area using dedicated 0.1N HNO_3 cleaned brush, collecting sample in a dedicated 0.1N HNO_3 dustpan.

5. Transfer sample from dustpan to sample container.

6. Place a teflon-lined cap on the sample container. Attach the label and place the container in a double plastic bag. Record all pertinent data in the field log book. Complete the chain of custody record before taking the next sample.

7. Place on ice inside an ice chest.

8. Follow proper decontamination procedures.

9. Upon completion of sampling, place chain-of-custody form inside ice chest, place custody seal on cooler, then deliver sample(s) to the laboratory for analysis.

CHIP SAMPLE COLLECTION

The sampling of porous surfaces is generally accomplished by using a chisel and hammer or electric hammer. The sampling device (e.g., chisel, knife, spatula, etc.) will be cleaned using pesticide grade 0.1N HNO_3. It is then wrapped in 0.1N HNO_3 cleaned aluminum foil, and custody sealed for identification. The sampling device should remain in this wrapping until it is needed. Each sampling device should be used for taking one sample only.

1. Choose appropriate sampling points and measure off designated area with 10 cm x 10 cm perimeter forum.

2. Record location of sample area to be chipped to facilitate later calculations.

3. Don a new pair of disposable surgical gloves.

4. Open 0.1N HNO_3-cleaned chisel.

5. Chip the sample area horizontally, then vertically to a even depth of approximately 1/4 inch.

6. Place the sample in a 4 or 8 ounce I-Chem or equivalent glass sample container. Attach the label and place container in a double plastic bag. Record all pertinent data in the field log book. Complete the chain of custody record before taking the next sample.

8. Place sample on ice inside an ice chest.

9. Follow proper decontamination procedures.

10. Upon completion of sampling, place chain-of-custody form inside cooler, ..ace custody seal on cooler, then deliver sample(s) to the laboratory for analysis.

PROCEDURES FOR STAGE 2 SAMPLES

For each of the media to be tested (wall, ceiling tiles, other) the following procedures will be followed:

1. Select media area, such as a wall, that is suspected of having surface contamination. For ceiling tiles, remove a tile to a suitable work area.

2. Mark off four squares measuring 20 cm x 20 cm. For walls, these should be in a line parallel to the floor.

3. Subdivide each 20-cm square into four 10-cm x 10-cm quadrants.

4. Select one lower 10-cm square in the first 20-cm area. Cut the perimeter of this square with a sharp knife and peel off the wall surface using a square-bladed knife or sharp chisel. For walls, remove as little of the inner wallboard material

as possible. For ceiling tiles, remove the surface to a depth of approximately 1/4 inch.

5. Place surface samples in glass sample bottle, label, and retain for analysis as previously described.

6. Select the diagonally opposite upper 10-cm square in the first test area and wipe with a clean wipe pad and deionized water, as described in wipe sampling procedures. Place wipe pad in sample container and retain for analysis.

7. After wiping the 10-cm area, and taking care not to induce new contamination to the wiped area, cut and peel off the surface as described in paragraph 4 above. Retain for analysis.

8. Repeat steps 4 through 7 for the next two areas, substituting a mild solvent, such as 0.1N HNO_3, for the deionized water in one of the areas, and a stronger solvent (to be determined) in the third area.

9. Repeat steps 4 and 5 for the remaining area, then vacuum the diagonally upper square thoroughly with an industrial vacuum, such as may be used for remediation. After vacuuming, cut and peel the surface as described above.

10. Repeat procedure for other media to be tested.

Assuming that three media will be tested, that each test will generate 11 samples, and that no QC samples will be collected for the remediation test, the total samples for Stage 2 will be 33: 24 surface material samples and 9 wipe samples.

CALCULATIONS

For the wipe samples, results will be given in milligrams (mg) or micrograms (ug) or another appropriate weight of mercury per unit wipe area (100 square centimeters). For sweep and chip samples, results will be given in analyte weight per unit sweep or chip sample weight.

DECONTAMINATION PROCEDURES

The following personnel decontamination procedure will be used upon exiting Building 252 following sampling activities:

- Outer boot removal
- Outer glove removed

- Hard hat and air purifying respirator removal
- Tyvek removal
- Inner glove removal
- Wash hands, face, and any exposed areas with soap and water

All disposable personnel safety gear will be placed in a large plastic trash bag. The proper storage and disposal of the bag is the responsibility of McClellan Air Force Base.

Reusable safety equipment, such as respirators, will be decontaminated by the following method:

- Wash with respirator cleanser or TSP solution
- Rinse with potable water
- Wash with 0.1N HNO_3
- Rinse with potable water
- Dry

Liquids generated from washing and rinsing operations will be contained in a drum for subsequent disposal by McClellan AFB.

The following sweep and chip tool decontamination procedure will be used following sampling activities:

- Wash sampling tool with laboratory grade detergent
- Rinse twice with potable water
- Rinse with 0.1N HNO_3
- Rinse with potable water
- Rinse with deionized water
- Dry
- Wrap with 0.1N HNO_3-cleaned aluminum foil.

Section 6
ANALYTICAL PLAN

The following is the Scope of Work (SOW) for laboratory services in support of the mercury analytical effort. The performing laboratory will provide Department of Health Services approved I-Chem (or equivalent) 4 or 8 ounce glass sample containers. CH2M HILL will provide wipes, sweep brushes, sweep pans, chip chisels, chain-of-custody forms, water-proof plastic bags, vermiculite or equivalent absorbent material, and ice chests of adequate volume. The wipes, sweep brushes, sweep pans, chip chisels must be cleaned and sealed in 0.1N HNO_3-cleaned aluminum foil. The laboratory will ship sample containers and coolers to the Site Sampling Team (SST) and must provide adequate sample documentation. After analysis, the laboratory may ship samples back to McClellan AFB for disposal. The final analysis report is required to be submitted to the Project manager within approximately 5 working days after the date of last sample shipment. The exact date and time of shipment and delivery will be specified.

Table 5 is an estimate of the number and type of analyses required.

Table 5
Laboratory Analyses Summary

Matrix	Method Number	Number of Samples[a]	Analytical Parameters
Stage 1 Wipe	EPA 7470/7471	25	Total Mercury
Stage 1 Sweep	EPA 7470/7471	24	Total Mercury
Stage 1 Chip	EPA 7470/7471	12	Total Mercury
Stage 2 Wipe	EPA 7470/7471	9	Total Mercury
Stage 2 Surface Materials	EPA 7470/7471	24	Total Mercury

[a]Includes the following QA/QC samples where applicable: field blank (wipe samples) and field duplicate.
[b]Surface materials from different matrixes resulting from the on-site feasibility test of remedial options.

Section 7
QUALITY ASSURANCE/QUALITY CONTROL

General quality assurance/quality control (QA/QC) objectives for this investigation are to develop and implement procedures for obtaining and evaluating data of known quality that can used to determine the extent of mercury contamination within and surrounding Building 252. To achieve these QA/QC objectives, it is necessary that measurement data have an appropriate degree of accuracy and reproducibility, along with assurance that samples collected are appropriately representative of actual field conditions.

Specific QA/QC objectives are to:

- Establish sampling and sample preparation techniques in such a manner that analytical results are representative of the media and conditions being measured.

- Analyze a sufficient number of field and laboratory duplicate samples to establish the sampling and analytical precision, the objective of which is ±20 percent. Field duplicate samples will be collected at a rate of 10 percent, if possible. Laboratory duplicate samples will be performed according to the rate established for the normal laboratory QC program, or at a minimum of 5 percent.

- Collect and analyze a sufficient number of field blank samples to evaluate the potential for contamination from wipes, solvents, or sample containers. For wipe samples, a blank (unused wipe gauze) will be collected for each sampling event. This consists of a sterile gauze pad, wet with the solvent, and placed in a prepared sample container. Field blanks of the wipe gauzes will be collected on 10 percent of total wipe samples.

- Analyze sufficient number of laboratory method blank, matrix spike, and matrix spike duplicate samples (minimum of 5 percent of the total number of samples) internally within the laboratory to effectively evaluate results against numerical QA goals established for precision (±20 percent) and accuracy (75 to 125 percent recovery).

Data quality is assessed in terms of representativeness, comparability, precision, accuracy, and completeness of the data. These are discussed below.

REPRESENTATIVENESS

Representativeness is a measure of how closely the measured results reflect the actual concentration of the chemical parameters in the sampled media. Considerable attention has been given to developing a sampling strategy that will provide representative concentrations. EPA/DOHS approved analytical methods will be used to determine mercury concentrations.

Sampling and sample preparation procedures are described so that results are representative of the matrix and conditions being measured. Sample-handling protocols for storage, preservation, and transportation have been developed to preserve the representativeness of samples. Proper documentation will establish that protocols have been followed and sample identification and integrity assured. Field duplicate and/or replicate samples (where applicable) will be used to assess sampling, sample preparation, and method variation. Field blanks will be collected and analyzed at a frequency of at least 10 percent of Stage 1 wipe samples. Laboratory method blanks will be analyzed at a minimum rate of 5 percent or one per day.

COMPARABILITY

The objective of this parameter is to assure that data developed during the investigation are comparable within defined limitations.

To achieve comparability, the same sampling team, sampling methods, sample handling methods, and analytical methods will be used, as described in this plan.

PRECISION

Precision of the data is a measure of the degree of agreement of the data when more than one measurement is taken on the same sample. Scatter is commonly attributable to sampling activities and/or chemical analysis. For duplicate measurements, precision can be expressed as the relative percent difference (RPD). Analysis of laboratory and field duplicate samples will serve to measure the precision of sampling and sample analysis. Matrix spike and matrix spike duplicate samples will be analyzed at a frequency of 5 percent or one per day, whichever is more frequent or applicable, to determine the precision of the analytical method. The precision goal for this study is ±20 percent RPD.

ACCURACY

Accuracy is a measure of error between reported test results and true sample concentration. Inasmuch as true sample concentrations are not known, accuracy is usually inferred from recovery data as determined by sample spiking. The preferred method for sample spiking is to add a known amount of the constituent to a split sample in the field. Because of the inherent difficulties associated with any field spiking, this method will not be used in this project. Rather, the laboratory will spike and analyze matrix spiked and matrix spiked duplicate wipe and sweep samples only at a frequency of 5 percent or one per day, whichever is more frequent or applicable. Perfect accuracy would be defined by 100 percent recovery; acceptable accuracy for the parameters of interest is 75 to 125 percent.

COMPLETENESS

Completeness is a measure of the amount of valid data obtained from the analytical measurement system compared to the amount that was expected to be obtained under correct, normal conditions. It is defined as the total number of samples taken for which acceptable analytical data are generated divided by the total number of samples collected and multiplied by 100. The completeness objective for the parameter is 90 percent.

SAMPLE DESIGNATIONS

A CH2M HILL sample number system will be used to identify each sample for chemical analysis, including field blanks, and field duplicates. The Project Engineer will maintain a sample log book that will give the field sample number, complete description of the sampling location, and other pertinent data such as the time and date of the sample, whether it is a normal or field QC sample (blank or duplicate), and initials of sampler.

The field sample number will begin with the number 05 (Delivery Order 5005), followed by a three-digit sequential number beginning with 001. Therefore,

- Sample 05-001 = 1st sample collected
- Sample 05-002 = 2nd sample collected
- Sample 05-003 = 3rd sample collected
- Sample 05-099 = 99th sample collected

This simplified numbering system minimizes field and laboratory errors or duplications, and allows field QC samples to be submitted to the laboratory "blind." The field sample log book and sampler's notes provide the sample location, type, and other information to support data evaluation.

The sample number and other pertinent information will also be recorded on the sample label, as shown in Figure 5.

SAMPLE PRESERVATION AND SHIPMENT

Field samples will be sealed from light and placed on ice in an ice chest packed with sufficient material to protect against breakage. The amount of ice will be sufficient to keep samples cold until they are placed in the walk-in refrigerator at the laboratory. The ice chests will be shipped to the laboratory daily via a next-day delivery service.

Upon receipt of each sample set by the laboratory, each ice chest will be inspected and any problems reported to the field supervisor. Samples will be logged into the laboratory system and immediately placed into a refrigerator at a temperature of 4°C.

SAMPLE SEALS

Seals will be placed on ice chests when they are left unattended. The seals will be signed and dated and placed on each side of the coolers. Figure 6 presents a typical sample custody seal.

FIELD DOCUMENTATION

Data and calculation sheets identified for each sampling method will be filled out as sampling progresses. These sheets will be checked for accuracy and completeness by the field supervisor at the end of each day. In addition, the Project Engineer will maintain a daily field log. This daily log will identify, at a minimum, onsite personnel, locations sampled, sampling procedures, and any abnormal occurrences. This log will be attached to the appropriate data and calculation sheets, and two copies of this data package will be submitted to the project files on a weekly basis.

As previously described, a bound sampling log book will also be maintained onsite.

I-Chem Research

23787-F Eichler Street
Hayward, California 94545
(415) 782-3905

104 Quigley Blvd.
New Castle, Delaware 19720
(302) 322-3808

(800) 443-1689

SITE NAME	DATE
ANALYSIS	TIME
	PRESERVATIVE

SPECIALTY CLEANED CONTAINER

FIGURE 5
TYPICAL SAMPLE CONTAINER LABEL
McCLELLAN AIR FORCE BASE

CH2M HILL

CUSTODY SEAL

Date ______________________ ______________________

Signature ______________________ ______________________

FIGURE 6
TYPICAL CUSTODY SEAL
McCLELLAN AIR FORCE BASE

CH2M HILL

CHAIN-OF-CUSTODY RECORD

A chain-of-custody record will accompany each sample shipment, and each time the samples change hands, the sender and receiver will sign and date the chain-of-custody record. When samples are shipped to the laboratory, a copy of the chain-of-custody record will be retained and attached to the daily field sheets, and the laboratory will be instructed to sign its copy of the chain-of-custody record and return a copy along with the analytical results. The following information will be included on the chain-of-custody record.

- Sample number
- Signature of sampler
- Date and time of collection
- Place of collection
- Type of sample
- Number and type of container
- Inclusive dates of possession
- Signature of receiver

A sample chain-of-custody record is shown in Figure 7.

CH2M HILL CHAIN OF CUSTODY RECORD

PROJECT NUMBER	PROJECT NAME	
CLIENT NAME		
REPORT TO:	COPY TO:	
REQUESTED COMPLETION DATE	LABORATORY	

STA NO	DATE	TIME	COMP	GRAB	SAMPLE DESCRIPTION	NUMBER OF CONTAINERS	ANALYSES REQUESTED	REMARKS

FOR LAB USE ONLY

LAB # ____

PROJ # ____

ACK ____ VERIFIED ____

DATE INVOICED ____

NO. OF SAMPLES ____ pg ____ of ____

DISPOSITION: D R ____ DATE

SAMPLED BY AND TITLE (SIGNATURE) 1	DATE/TIME	RELINQUISHED BY (SIGNATURE) 2	DATE/TIME	RECEIVED BY: (SIGNATURE) 3	DATE/TIME

RELINQUISHED BY: (SIGNATURE) 4	DATE/TIME	RECEIVED BY: (SIGNATURE) 5	DATE/TIME	RELINQUISHED BY: (SIGNATURE) 6	DATE/TIME	RECEIVED BY LAB: (SIGNATURE) 7	DATE/TIME

REMARKS ____

SAMPLING PROGRAM: SDWA ☐ NPDES ☐ RCRA ☐ OTHER ____ (SPECIFY)

SAMPLE SHIPPED VIA: ☐ UPS ☐ BUS ☐ FED-EX ☐ HAND OTHER ____

AIR BUS BILL NUMBER

DISTRIBUTION: WHITE – ORIGINAL ACCOMPANIES SHIPMENT PINK – COPY TO COORDINATOR FIELD FILES YELLOW – CLIENT

REV 6/87 FORM 340

FIGURE 7

CHAIN-OF-CUSTODY RECORD

McCLELLAN AIR FORCE BASE

CH2M HILL

Section 8
PROJECT SCHEDULE

The project schedule is presented in Table 6.

Table 6
1990 Project Schedule

Project Milestones	May	June	July
Notice to Proceed	5/24		
Initial Site Visit	5/31		
Technical Memorandum		6/11	
Draft Sampling and Analysis Plan		6/19	
Receive Review Comments		6/21	
Final Sampling and Analysis Plan		6/27	
Sample Building 252 and Environs			7/2-7/10
Submit Samples for Analysis			7/3-7/11
Receive Analytical Results			7/16
Submit Draft Report			7/23

Section 9
PROJECT ORGANIZATION

Staff members for this project are listed below. Their title, project responsibility, and office location are also noted.

Project Administrator/ Project Manager	Wayne Pearce--Division Manager Sacramento, California
Project Engineer	Robert A. Evangelista--Environmental Engineer Sacramento, California
Project Scientist	Susan Keydel--Environmental Scientist San Francisco, California
Field Technicians	To be assigned
Technical Reviewer	Stan Sturges--Environmental Engineer Corvallis, Oregon

A quality assurance official will not be assigned to this project unless requested. The project manager is responsible for project data quality. The technical reviewer is independent of field, laboratory, and project management responsibilities.

Section 10
HEALTH AND SAFETY

The Health and Safety Plan (HASP) is located in Appendix A.

Various protective programs must be implemented prior to collecting wipe, chip, or sweep samples. Prior to initiation of sampling, the site HASP will be reviewed with specific emphasis placed on the protection program planned for direct contact tasks. Standard safe operating practices will be followed such as minimizing contact with potential contaminants in both the vapor phase and solid matrix through the use of respirators and disposal clothing.

The appropriate safe work practices will be used.

Particulate or metals contaminants:

1. Avoid skin contact with and/or incidental ingestion of dusts.
2. Utilize long-sleeve protective gloves.

Physical hazards associated with wipe, chip, or sweep samples:

1. Lifting injuries associated with electric hammer; moving equipment.

2. Heat/cold stress as a result of exposure to extreme temperatures and protective clothing.

3. Slip, trip, fall conditions as a result of site obstacles.

4. Restricted mobility due to the wearing of protective clothing.

5. Exposure to pinch hazards and chip projectiles associated with chipping, chiseling, and hammering.

Section 11
PHASE I REPORT

At the conclusion of sampling and analysis activities, CH2M HILL will prepare a report that summarizes the following items:

- Sampling activities completed
- Results of sample analyses
- Inventory of building materials and potential for decontamination
- Recommendations for decontamination procedures and cleanup activities

It is anticipated that this report will form the basis for building decontamination planning, scheduling, and costing.

Section 12
REFERENCES

1. The Golden State Salutes McClellan Air Force Base, Marcoa Publishing Incorporated, San Diego, California, 1987.

2. U.S. EPA Environmental Response Team, Standard Operating Procedure 2011, G.S.A. Depot, Edison, NJ, December 1988.

Appendix A contains the CH2M HILL Site Safety Plan (Health and Safety Plan - HASP) covering potential activities that may be required under CH2M HILL's master contract with McClellan AFB. Therefore, activities described in the HASP and Attachments A and B, may not specifically apply to work at Building 252. Attachment C contains the Addendum information specific to Building 252 sampling.

CH2M HILL
SITE SAFETY PLAN

I. GENERAL INFORMATION

CLIENT: McClellan Air Force Base JOB NO: SAC28722.05
PROJECT MANAGER: E. Wayne Pearce
SITE NAME: McClellan Air Force Base (MAFB)
SITE LOCATION: McClellan Air Force Base, California
PURPOSE OF FIELD VISIT(S): Source testing, site survey, waste minimization and treatability studies, site inspections (see Attachment A).
DATE OF VISIT(S): April 30, 1990 through 1991
BACKGROUND INFORMATION: Complete ___ Preliminary X
INFORMATION AVAILABLE FROM: SAC (office)
OVERALL HAZARD SUMMARY: Serious ___ Moderate ___
Low ___ Unknown X

II. SITE CHARACTERISTICS

A. Site Description and Overview of Planned Activities (attach site map):

- McClellan Air Force Base is located north of Sacramento, California. According to Dave Faulkner (Navy), the base is approximately 3 miles north-south and approximately 2 miles east-west in length
- The description of planned activities are listed in Attachment A
- The base is on the Central California Valley with excellent city street and interstate highway access. Access by air is excellent
- Toxic or hazardous substances known or expected onsite, discussion of physical and chemical properties, and probable pathways of migration or dispersion will be addressed on a task-specific basis in the CH2M HILL Site Safety Plan Addendum (see attached addendum form)
- Emergency response support is available from MAFB. First response is obtained from the fire department and calls can be made to the department directly or through the duty officer (see telephone numbers Section VI, J). The base has a Disaster Response Force, as second response, which consists of military personnel, the bioenvironmental group, and the on-base clinic.

B. Status (active, inactive, unknown; and nature of any site activity):

Active Air Force base

C. History (worker or nonworker injury; complaints from public; previous investigations or remedial action):

The MAFB is a RCRA facility and a CERCLA site. The site is on the National Priority List.

D. Principal Materials Handling Activities (type, amount, and location of wastes or hazardous materials disposed of, stored, treated, or handled at the site):

Not applicable.

E. Features and Unusual Features (water supply, telephone, radio, power lines, gas lines, watermains, suspect terrain, etc.):

Utility lines, both above ground and below ground, may pose a safety hazard for team members during excavation or boring. If a driller is used, the driller must maintain a safe clearance (at least 20 feet) between overhead utility lines and the drill-rig mast at all times during site operations. The location of utility lines must be determined prior to startup and the utility must be contacted 48 hours prior to excavation or drilling by contacting Underground Services Alert at 800/422-4133 and Tom Egan, MAFB Engineering at 916/643-4875.

III. WASTE CHARACTERISTICS

A. Waste Type(s):

Liquid _X_ Solid _X_ Sludge _X_ Gas _X_

B. Characteristic(s):

Corrosive _X_ Ignitable _X_ Radioactive __ Mixed Waste __

Volatile _X_ Toxic _X_ Reactive __ Unknown __ Other (name) __

IV. HAZARD EVALUATION

A. Overall Hazard Level:

The hazard level of each activity will be assessed and reported on the addendum form.

B. Chemical Hazards:

The major types of processes in operation on the base are paint removal, painting, plating, and foundry. Each process has overall types of chemicals that are associated with the process. For example, in the removal of paint, paint removers containing compounds such as methylene chloride, are used. In the painting operations, toluene- and xylene-based paints are applied to parts. Plating processes contain several types of chemicals including degreasers, acids, rust removers, and cyanide. Finally, foundries may contain metallic fumes. The above processes are not inclusive of all the base operations as are the examples of the process associated chemicals. Therefore, for each task and/or site visit, a SSP addendum will be attached to the overall SSP which addresses each site's hazard. The addendum will contain more detailed information on chemical hazards and will address task and/or site-specific chemical hazards.

C. Physical Hazards:

The major potential physical hazards possible at the site are: flammability of vapors, explosive conditions; utilities; moving and mobile equipment; trips, slips, and falls; and heat stress. These physical hazards may not represent every site at MAFB, therefore, for each task and/or site, a SSP addendum will contain more detailed information on physical hazards and will address task and/or site-specific physical hazards.

Explosions of vapor in confined spaces can be fatal, and workers must be attentive to this danger and guard against carelessness at all times. The lower explosive limit (LEL) is compound specific. When the vapors are heavier than air, their explosivity and flammability hazard are increased. Vapors will tend to concentrate near the ground and in low lying areas, and will not be readily mixed or diluted with ambient air. When monitoring LEL, it is important to take measurements at ground level. In order to prevent explosivity and flammability hazards, each team member must make sure that no spark sources, such as lighters, matches, unapproved flashlights, etc., are brought into the exclusion zone. The Site Safety Coordinator (SSC) must inspect the exclusion zone for spark sources including wiring, motors, etc., and enforce the requirements for fire prevention, including intrinsically safe electrical equipment, spark arrestors on vehicles, and exclusion of unauthorized personnel.

D. Hazards Posed by Site Activities:

Hazards may exist from moving process equipment (such as pumps and conveyors and mobile equipment (such as forklifts). Personnel must be alert for these hazards, and protect clothing and hair from entrapment in equipment, and use common sense in these situation. To protect from slips, trips, and falls,proper precautions and good judgement must be exercised. Personnel should be especially alert when working near pits and excavations. Exercising caution, using safe ladder practices, and using the buddy system around stacks is important.

E. Heat and Cold Stress Hazards:

Heat stress is a hazard of concern during summer months. Heat stress at hazardous waste sites usually occurs because impermeable protective clothing decreases natural body ventilation. Attachment B addresses heat stress hazards specifically.

F. Biological Hazards:

G. Unusual Hazards:

(Note: List unique hazards of site, if any.) (Insects, snakes, microbes, etc.)

H. Hazards Posed by Chemical Substances Provided by CH2M HILL:

In accordance with 20 CFR 1910.1200, Hazard Communication, Material Safety Data Sheets are provided for the following chemicals: (list) (Examples, sample preservatives, calibration gases, etc.)

V. PROCEDURES

A. SITE ORGANIZATION:

Map/Sketch Attached Yes   Site Secured Yes

Perimeter Identified Yes

Zone(s) of Contamination Identified No

B. SITE PERSONNEL:

Team Organization

Team Member/Office	Responsibility
Wayne Pearce/SAC	Project Administrator/Observer
W.R. (Bill) Faught/CVO	Project Manager/Level C SSC
Robert Evangelista/SAC[b]	Project Engineer/Level C SSC
John Castleberry/SAC	Project Scientist/Level C SSC
Susanne Davis/SAC[b]	Project Scientist/Level C SSC
Bill Morgan/MGM	Project Scientist/Level C SSC
Chris Corley/SAC	Project Scientist/Level C SSC
John Spitsley/RDD[a]	Project Scientist/Observer
Yusaf Baxausa/SFO[a]	Project Scientist/Observer
Allison Gammel/SFO[a]	Project Scientist/Observer
Pamela Beekley/SAC[a]	Project Scientist/Observer
Sue Keydel/SFO	Project Scientist/Level C SSC

[a]Observers must remain in clean areas and upwind of the exclusion zone. Observers will not conduct sampling activities.

[b]Authorization of Susanne Davis and Robert Evangelista for fieldwork and eligibility for SSC is pending upon evidence of training, medical surveillance, and experience.

Each of the team members named above has been certified as fit for the anticipated work by the CH2M HILL medical surveillance program, and has completed the training requirements of 29 CFR 1910.120. In addition, each is currently certified by the American Red Cross, or equivalent, in both first aid and CPR.

C. ONSITE ENGINEERING CONTROLS:

Onsite engineering controls include covers for waste piles and cuttings and barricades to keep unauthorized people from entering contaminated areas.

D. WORK PRACTICES:

Site personnel will avoid any visibly contaminated areas onsite. In general, work practices shall be designed to decrease time of exposure, increase distance to the source, or shield the exposed individual.

E. PERSONAL PROTECTIVE EQUIPMENT:

Basic Site Level of Protection:

A ____ B ____ C _X_ D _X_

Polycoated Tyvek coveralls with nitrile outer gloves and latex inner gloves will be worn when splash protection is needed. Nitrile outer gloves and latex inner gloves will be worn during sampling and when handling samples. Safety glasses, hard hat, and neoprene steel toe/shank boots will be worn while onsite. A TLD or equivalent badge must be worn by all team members.

Level C will include the equipment listed above plus a full-face air purifying respirator (APR) with organic vapor cartridges (GMC-H).

Task	Initial Level of Protection
Site inspection and walkthrough	Level D
Source testing	Level C (may be downgraded to Level D by SSC if HNu readings are less than 1 ppm.)
Treatability studies	Must prepare an amendment with further descriptions of each activity to be conducted.
Other tasks	Must prepare an amendment with further descriptions of task

F. GENERAL HAZARDOUS WASTE SITE MONITORING EQUIPMENT AND PROCEDURES:

Periodic monitoring of the site is required to determine the effectiveness of engineering controls, to re-evaluate levels of protection, and determine if site conditions have changed. At a minimum, monitor at the beginning of each shift, periodically (e.g., every 15 minutes) throughout the work, whenever work begins at a new area onsite or when different contaminants are encountered or a different work activity begins. Specific monitoring locations and frequencies are given below.

Carefully inspect each piece of monitoring equipment prior to work startup. Failure of any of the equipment listed below to work properly must be reported to the Project Manager immediately.

1. Explosimeter/0_2 meter: Calibrate prior to each day's activities according to manufacturer's instructions. Recharge at the end of each day. Monitor (Note to Preparer: Specify frequency, location) and record measured levels in the log book (Note to Preparer: Specify frequency).
   Action levels:

   Explosive Atmosphere (measured at source, i.e., borehole, test pit, etc.)

   Action Levels (measured at the borehole):

   - Less than 5 percent LEL--Continue drilling.
   - Greater than 5 to 20 percent LEL--Continue drilling with caution.
   - Greater than 20 percent LEL-Shutdown drilling operations and allow area to ventilate until LEL falls below 10 percent before resuming work. Mechanical ventilation (i.e., blower) may be required to reduce flammable vapors to below 20 percent. Do not place blower in atmospheres greater than 20 percent of the LEL.

Oxygen (measured in breathing zone)

≤19.5%	Shut down drilling operations and ventilate until O_2 increases to above 19.5%
19.5% to 25%	Monitor
≥25%	Evacuate

2. Rad-mini (used at sites where exposure to ionizing radiation is not expected): Check background and check response using a Coleman lantern mantle. Monitor continuously and record location and time of alerts in the log book.

   Action levels: The Rad-Mini is used on initial entry to sites or where exposure to radiation is not expected but may occur (trenching operations, opening containers, etc.). The Rad-mini sounds an alarm at 10 mRem/hr. Site personnel will mark the spot where the alarm occurred, leave the site following as nearly as possible the path taken into the site, and call the Project Manager to arrange for health physics support. The following action levels apply during routine use of radiation survey meters at sites where exposure to radiation is not expected but may be possible.

   - Background to 1 mR/hr above background--continue operations; identify zone of radiation contamination and minimize work time in this area.

   - 1 mR/hr to 2 mR/hr above background--notify SSP approver of measurements and any unusual conditions or specific control measures.

   - Greater than 2 mR/hr above background--stop operations; evacuate work area; and notify SSP approver. Field work will require health physics evaluation and protection measures to be implemented before proceeding with field activities.

3. HNU (with 10.2 eV Lamp): Calibrate prior to each day's activities, according to manufacturer's instructions. Record calibration in the SSC log book. Recalibrate after cleaning the lamp or when background levels drift. This instrument is sensitive to humidity and may require periodic lamp cleaning if it is humid. Monitor for background concentrations (specify frequency, location) and then upon initial entry record measured levels in the log

books (specify frequency). Monitor continuously while drilling or performing intrusive activities. Readings should be recorded every 1/2 hours.

Action levels: Note to preparer: Action levels for the 10.2 eV HNU are specified based on knowledge of the contaminants present, the response of the instrument to those contaminants or mixtures of contaminants, weather conditions, engineering controls, and level of personal protection being worn. In situations where information does not exist for a more informed decision, monitor continuously, record readings at a minimum of 15-minute intervals and use the following action levels:

Reading	Action/PPE
0-1 ppm above background[a,b]	Level D; continue monitoring
>1-5 ppm above background[b]	Level C; full facepiece respirator with GMC-H cartridges. Continue monitoring.
>5 ppm	Call safety plan approver

[a]Background is established offsite and upwind before the start of daily activities.
[b]Readings are taken in the breathing zone over a 5-minute period.

G. SITE ENTRY PROCEDURES:

- Conduct Site Safety briefing before starting field activities
- Determine wind direction, install wind flags, and establish work zones onsite (e.g., exclusion zone; contamination reduction zone; and support zone)
- Set up decontamination facilities.
- If toilet facilities are not located within a 3-minute walk from the decontamination facilities, either provide a chemical toilet and hand washing facilities or have a vehicle available (not the emergency vehicle) for transport to nearby facilities.

- Conduct site entry monitoring using the HNu, explosimeter/ O_2 detector and Rad mini.

H. <u>WORK LIMITATIONS</u>: (Time of day, etc.)

- No eating, drinking, or smoking onsite.
- No contact lenses onsite.
- No facial hair that would interfere with respirator fit.
- Buddy system at all times in exclusion zone.
- CH2M HILL employees to wear TLD badges or equivalent at all times when on or near the site.
- Site work will be performed during daylight hours whenever possible. Any work conducted during hours of darkness will require the following minimum illumination intensity:

General Site Areas	5 foot-candles
First Aid Station/Office/Lab	30 foot-candles
Storerooms, Changehouse, Toilets, Rest Areas	10 foot-candles

- Motors used in the exclusion zone will be non-sparking electrical motors or equipped with spark arrestors.
- Fuel supplies will be properly stored and grounded.

I. <u>DECONTAMINATION PROCEDURES</u>:

Set up decontamination area upwind of the exclusion zone. Water and TSP detergent should be placed in buckets prior to beginning work. The decontamination area should be a sufficient distance from the work in the exclusion zone so that the decon area will not become contaminated by splashing water or flying dirt.

Personnel Decontamination Procedures:

Wash boots and outer gloves in detergent and water, rinse, and remove outer gloves; remove and bag coveralls; if cotton coveralls are used, bag in plastic bags and wash prior to rewearing; remove respirator, if worn; remove surgical gloves and dispose in a plastic trash bag; wash hands and face; sanitize respirator nightly, if used; take a shower and wash hair as soon as possible after leaving the site.

Equipment Needed:

Buckets, detergent, cleaner-sanitizer, brushed, garbage bags, hand soap, and paper towels.

For Sampling Equipment:

Follow procedures outlined in sampling plan.

For Heavy Equipment:

Wash off the bucket of the backhoe or the drilling equipment with detergent and water; rinse in water. Use the hNu to monitor the backhoe or drilling equipment. If hNu readings are detected from the equipment, steam clean it prior to removing it from the site.

Documentation:

It is the responsibility of the SSC to make sure that all equipment coming offsite is properly decontaminated according to the procedures outlined above. At a minimum, visual indication of contamination will be removed, and no organic vapors detectable above background should remain. The equipment and samples will be clean, dry, and free from stains, deposits, encrustations, or discoloration. Documentation of decontamination must be made in the field log notebook, which will bec ome part of the permanent project file. A suitable tag is to be placed on each piece of decontaminated CH2M HILL equipment (or group of equipment, such as a bag of hand tools) stating the date of decontamination and initialed by the SSC.

J. MATERIAL HANDLING PROCEDURES:

The following general material handling procedures apply:

- Drums and containers meeting the appropriate DOT, OSHA, and EPA regulations for the waste contents (e.g., decon water) will be used.

- Site operations will be organized to minimize the amount of drum or container movement.

- DOT salvage drums and suitable quantities of absorbent will be available and used on sites where hazardous waste spills could occur.

- Electrically powered material handling equipment used to transfer decon solutions will meet the requirements of 29 CFR 1910.307 for the classification of materials being handled.

Disposal of Materials Generated During Field Work:

- Material generated during field work (decontamination fluids, disposable protective gear or sampling devices, drilling cuttings, well development fluids, etc.) will be considered as contaminated and handled accordingly unless adequate monitoring or analytical data exists to properly classify the materials as non-hazardous.

- Material generated offsite (well drilling fluids, etc.) will be returned to the site unless otherwise specified by the site owner or responsible party.

- Ultimate responsibility for disposal of the material rests with the site owner or responsible party. CH2M HILL may coordinate analysis, packaging, storage, transport and disposal of waste material, but will not assume responsibility for the waste (i.e., sign manifests as generator, etc.). Prior to beginning field work, the waste handling procedures will be agreed to with the client, site owner, and/or responsible party.

- Laboratory samples will be returned to the site, client, site owner, or responsible party for disposal following analysis unless otherwise specified.

VI. EMERGENCY RESPONSE PLAN

A. Pre-Emergency Planning:

The SSC is to perform the following pre-emergency planning tasks before starting field activities and will coordinate emergency response with the operating facility when appropriate:

- Locate nearest telephone to the site and inspect onsite communications (air horns, two-way radios).
- Confirm and post emergency telephone numbers (Form 311) and route to hospital.
- Post site map marked with locations of emergency equipment and supplies.
- Review emergency response plan for applicability to any changed site conditions, alterations in onsite operations, or personnel availability.
- Drive route to hospital.
- Evaluate capabilities of local response teams.
- Where appropriate and acceptable to the client, inform emergen cy room/ambulance service and emergency response teams of anticipated types of site emergencies.
- Designate one vehicle as the emergency vehicle; place hospital directions and map inside; keep keys in ignition during field activities.
- Inventory and check-out site emergency equipment and supplies.
- Setup emergency personnel decontamination station(s).

B. Personnel Roles and Lines of Authority:

The SSC takes the lead in emergencies. The SSC has the authority to stop any site activities posing an immediate health and safety hazard to site personnel and must notify the Project Manager or designee as soon as practical of this action. The Project Manager is ultimately responsibl e for health and safety of the CH2M HILL workers.

C. <u>Training</u>:

At least two personnel currently certified in both first-aid and CPR will be present during field activities within the exclusion zone. The site's Emergency Response plan will be reviewed in the initial site safety briefing and will include:

- Emergency procedures for personnel injury, or suspected overexp osures, fires, explosions, chemical, and vapor releases.
- Location of onsite emergency equipment and supplies of clean water.
- Local emergency contacts, hospital routes, evacuation routes, and assembly points.
- Site communication and location of nearest phone to the site.
- Names of onsite personnel trained in first aid and CPR.
- Notification procedures for contacting CH2M HILL's medical consultant and team member's occupational physician.
- The emergency response plan will be rehearsed at least once before site activities begin, and periodically afterwards.
- New workers on the site will be briefed on the emergency response plan before entering the exclusion zone.

D. <u>Communications</u>:

The "buddy system" will be enforced for field activities involving potential exposure to hazardous, toxic or radioactive materials, and during any work within the exclusion zone. Each person will observe his/her partner for symptoms of chemical overexposures or heat stress and provide emergency assistance when warranted. Personnel working in the exclusion zone will maintain line of sight contact or maintain communications (e.g., two-way radios) with the site support facilities. Offsite communications will consist of either onsite telephone service or using the nearest telephone to the site.

E. <u>Emergency Signals</u>:

The following emergency signals shall be used:

Grasping throat with hand	Emergency--help me
Thumbs up	OK; understood
Grasping buddy's wrist	Leave site now
2 short blasts or sounds, repeated	All clear
Continual sounding of horn	Emergency--leave site

F. PPE and Emergency Equipment and Supplies:

The following emergency equipment and supplies will be available onsite with the locations marked on the site map and posted in the support zone:

- 20-lb ABC fire extinguisher(s)
- First-aid kit
- Stretcher or blanket
- Supplies of clean water
- Eye wash
- Deluge shower (when required for emergency decon)
- PPE (protective clothing, boots, and gloves)
- Air monitoring equipment

G. Emergency Recognition and Prevention:

Prevention of emergencies will be aided by the effective implementation of the health and safety procedures specified in this SSP. The initial site safety briefing will emphasize recognition of the types of emergencies anticipated onsite. Periodic safety briefings will be conducted by the SSC as field activities proceed. Hazards that warrant specific emergency recognition and prevention techniques will be discussed.

H. Site Security and Control:

(Note to preparer: Identify, locate, and describe road and approaches to site, security measures such as fencing and guards, flagging or other means of marking zones, and access control procedures, such as sign-in logs, access control points, etc.)

I. Emergency Medical Treatment and First-Aid:

- Prevent further injury, perform appropriate decontamination, and notify the SSC and the Project Manager.
- Initiate first aid and get medical attention for the injured immediately.
- Depending upon the type and severity of the injury, call the medical consultant and/or occupational physician.
- Notify the Health and Safety Manager.
- Notify the injured person's personnel office.
- Notify the client representative.
- Prepare an incident report. The SSC is responsible for preparing and submitting the report to the Director of Health and Safety and to the CH2M HILL corporate personnel office within 48 hours.
- The SSC will assume charge during a medical emergency.

J. Emergency Routes and Telephone Numbers (Map to be Posted)

	Building 123
Duty Officer	32751 (on base) 916/643-2751 (of base)
Police	112 (on base) 916/643-6168 (off base)
Fire	117 (on base) 916/643-5622 (off base)
Emergency Assistance	116 (on base)
Ambulance	116 (on base)
Site Contact	916/643-3675--Charles Miles
Utilities	34875 (on base) 916/643-4875 (off base)
McClellan Clinic	35420 (on base) 916/646-8420 Urgent Care Hours: 0730 to 1900
General Hospital	American River Hospital 4747 Engle Road. Carmichael, CA 95608 916/848-2100

Directions to Hospital	Exist McClellan Air Force Base through the main gate to Watt Avenue. Turn right onto Watt Avenue and travel south to Whitney Avenue. Turn left onto Whitney Avenue and travel east to Mission Avenue. Turn left onto Mission Avenue and travel north to Engle Road. Turn right (east)onto Engle Road. Hospital is at 4747 Engle Road. (See attached map.)
CHEMTREC	800/424-9300
TOSCA Hotline	202/554-1404
CDC	404/452-4100
National Response Center	800/424-8802
EPA ERT Emergency	201/321-6660
RCRA Hotline	800/424-9346

K. Emergency Decontamination: Personnel will be decontaminated to the extent feasible (usually a "gross decon" or deluge) but life saving and first-aid procedures take priority over personnel decontamination efforts. The personnel decontamination procedures specified in Section V.J of this SSP will apply for injuries deemed non-life threatening by the SSC.

L. Evacuation Routes and Procedures: Onsite evacuation routes will be designated. Personnel will exit the site exclusion zone/contamination reduction zone and assemble at the onsite assembly point in the support zone. The SSC will account for personnel at the onsite assembly point and notify local emergency responders. The SSC will assess the need for site evacuation based on the degree of hazard posed to site personnel remaining in the support zone. Offsite evacuation routes and assembly points will also be designated. A person designated by the SSC will account for personnel at the offsite assembly point. The SSC and an assistant will remain onsite in the event of site evacuation (if feasible) to assist local responders and advise them on the nature and location of the incident.

Onsite and offsite evacuation routes/assembly points will be designated on the site map and posted. They will be based on site topography and layout; anticipated safe distances for places of refuge; prevailing weather conditions; and anticipated location magnitude of site emergencies. Wind flags will be installed in the exclusion and support zones to assist personnel in determining upwind evacuation routes.

Evacuation Routes (Onsite and Offsite): Evacuation routes will be dependent on the type of accident and wind direction. MAFB has first and second responders to handle evacuations (see Section II, A).

Assembly Points (Onsite and Offsite): Assembly points vary by building and areas. Therefore, it will be the responsibility of the SSC to determine the assembly point for each location from the appropriate base representative.

M. Critique of Response and Follow-up: The SSC will evaluate the effectiveness of the emergency response and recommend procedures for improving emergency response to the SSP approver. Follow-up activities include notification of the injured person's personnel office within 24 hours of the injury. Incidents of suspected overexposures will require the notification of CH2M HILL's medical consultant and the injured's occupational physician so that they may provide assistance and relevant information to the local hospital's emergency room physician.

VI. EMERGENCY CONTACTS

- CH2M HILL Medical Consultant

  Name: Dr. Kenneth Chase, Washington Occupational Health Associates, Inc.
  Phone: 202/463-6698 (8-5 EST)
  202/463-6440 (after hours answering service; physician will return call within 30 minutes)

- CH2M HILL Health and Safety Manager

  Name: David Lincoln/SEA
  Phone: 206/453-5005

- District Health and Safety Officer (HSO)

  Name: Lynn Laszewski/SEA
  Phone: 206/453-5005

- Radiation Health Officer

  Name:
  Phone:

- Occupational Physician

Name: Dr. Allen Krohn
Phone: 916/246-7464
Address: Redding Industrial Occupational health Center
1920 California Street
Redding, California 96001

Team members under his care: John Castleberry, John Spitzley, Chris Corley

- Occupational Physician

Name: Health Check
Ralph K. Davis Medical Center
Phone: 415/565-6000
Address: Castro and Duboce Street
San Francisco, California 94114

Team members under his care: Yusaf Baxausa/SFO

- Occupational Physician

Name: Drs. Robinson, Webb, Strong, Yates
Phone: 205/262-0342; 205/262-0390
Address: 1722 Pine Street, Suite 309
Montgomery, Alabama 36194-2701

Team member under their care: Bill Morgan/MGM

- CH2M HILL Project Manager

Name: Wayne Pearce/SAC
Phone: 916/920-0300

- Client Contact

Name: Larry Button/Charlie Thorpe
Phone: 916/643-1250

- CH2M HILL Regional Manager

Name: Steve DeCou
Phone: 916/920-0300

- Personnel Office

  Name: Scott Olsen
  Phone: 916/920-0300

If an injury occurs, notify the injured person's personnel office as soon as possible after obtaining medical attention for the injured. Notification MUST be made within 24 hours of the injury.

- CH2M HILL Director of Health and Safety for Waste Management and Industrial Processes

  Name: David Lincoln
  Phone: 206/453-5005
  Address:

- CH2M HILL Corporate Personnel Office

  Name: Marie Haezenbrouck/DEN
  Phone: 303/771-0900 (O)
  Address: CH2M HILL
  6060 South Willow
  Englewood, CO 80111

VIII. PLAN APPROVAL

This site safety plan has been written for the use of CH2M HILL's employees and subcontractors. CH2M HILL claims no responsibility for its use by others. The plan is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if these conditions change.

PLAN PREPARED BY: Robert Evangelista (name/office/home phone) Date: 4/24/90

APPROVED BY: Jane Stansfield (name/office/home phone) Date: 4/27/90

APPROVED BY: ____________ (name/office/home phone) Date: ____________

(Note to Preparer: SSPs for sites where the potential exists for exposure to ionizing radiation require the approval of the Radiation Health Officer.)

MODIFIED BY: ______________________ Date: ____________
(name/office/home phone)

MODIFICATIONS
APPROVED BY: ______________________ Date: ____________
(name/office/home phone)

Attachments:

- Site Map
- Form 311, Emergency Phone Numbers
- Form 533, Record of Hazardous Waste Field Activity
- MSDS where applicable
- Attachment A--Descriptions of Planned Activities
- Attachment B--Heat Stress/Cold Stress Hazards
- Attachment C--Health and Safety Site Meeting
- Site Safety Plan Addendum

Distribution of approved plan:

Project Manager (responsible for distribution to team members and client)
Health and Safety Manager

FORM 311
EMERGENCY TELEPHONE NUMBERS

Police Department	Address:	Phone: Contact:
Fire Department	Address:	Phone: Contact:
Paramedic	Address:	Phone: Contact:
Fire Report	Address:	Phone: Contact:
Ambulance Service	Address:	Phone: Contact:
Water Department	Address:	Phone: Contact:
Gas Utility	Address:	Phone: Contact:
Electric Utility	Address:	Phone: Contact:
Telephone Utility	Address:	Phone: Contact:
Hospital	Address:	Phone: Contact:
Owner	Address:	Phone: Contact:

This notice is located at : ________________________________

FORM 533

RECORD OF HAZARDOUS WASTE FIELD ACTIVITY

SITE NAME:
SITE SAFETY COORDINATOR:
PROJECT NUMBER:
RECORD OF ACTIVITIES FOR (DATES):

Employee Number	Employee Name	Total Days Onsite	Days at the Site in			or	Number of Days as SSC			Activities Employees Performed While Onsite
			Level B	Level C	Level D		Level B	Level C	Level D	

Signature of SSC:______________________

SAC/T111/083.51

Attachment A
DESCRIPTION OF PLANNED ACTIVITIES

This Description of Planned Activities encompasses a broad range of possible tasks to be issued as task orders against contract No. F04699-90-D-0035. This section defines the range of tasks CH2M HILL shall be responsible to perform as per Section 4.0 (Technical Requirements) of the above contract.

•Conduct field sampling of drums, spill sites, tanks (above and underground), monitoring wells, past waste disposal sites, etc., and perform sample characterization studies to include analysis of a wide variety of contaminants in complex matrices, including up to 297 compounds listed as hazardous by EPA.

•Perform laboratory and field tests of environmental monitoring and testing equipment, to include validation of manual/instrumental methods, continuous monitors, analytical support and Mathematical models using EPA, ASTM, NR, and/or equivalent procedures specified by the Air Force.

•Perform photogrammetric analyses of environmental and infrared photographs.

•Perform geophysical studies to include, but not be limited to, studies involving magnetometer, metal detection, earth resistivity, terrain conductivity, seismic, gravity, ground penetrating radar and shallow (less than 400 feet, in most cases) borehole logging.

•Perform hydrogeological investigations to determine the magnitude and extent of groundwater contamination.

•Determine the direction and rate of movement of contaminants and estimate the degree of risk associated with contaminant migration.

•Develop methods to mitigate the adverse environmental effects of pollutant migration.

•Develop leachate monitoring and analysis programs to comply with state or EPA regulations required for landfills and other hazardous waste treatment and disposal sites which are currently operated or have been operated in the past by the U.S. Air Force.

•Perform onsite geological/hydrological investigations required to assist the Air Force in selecting proper locations for new solid/hazardous waste treatment, storage, or disposal sites or other facilities.

•Perform sampling of soil and water in the unsaturated (vadose) zone above the water table using techniques recommended by the National Water Well Association (NWWA).

•Perform aquifer tests to determine the porosity, permeability, specific yield, drawdown and extent of cones of depression developed in aquifers in which contamination has been found or is suspected.

•Conduct comprehensive water supply and water distribution studies.

•Perform evaluations of domestic water, industrial wastewater, domestic wastewater, and groundwater treatment plants.

•Perform water and wastewater characterization, to include ambient short-term and continues water monitoring.

•Conduct inflow/infiltration studies into industrial, reclamation and groundwater extract/treatment systems at McClellan AFB and its Satellite Locations.

•Perform treatability studies, pilot plant investigations, and toxicity and bioassay determinations.

•Prepare evaluations and analyses providing sufficient detail to allow development of National Pollutant Discharge Elimination Systems (NPDES) permit applications, certifications and discharge monitoring reports.

•Conduct instream biological monitoring and fish-kill investigations.

•Perform laboratory analyses of potable water, groundwater, wastewater, soil, sludges, biologicals, fuels or commercial products and other environmental samples.

•Perform studies to ensure personnel safety, including the use of explosimeters, gas detectors, and survey meters and other equipment necessary to monitor air quality during site operations.

•Prepare evaluations and analyses, providing sufficient details to aid development of state or EPA-mandated permit applications, certifications, discharge monitoring reports and groundwater monitoring reports.

•Perform necessary analyses and reduction of any physical/chemical samples or data acquired under activities outlined herein.

•Provide analytical results in both hard copy and other formats suitable for archiving, including computer format.

•When required and specified in the delivery order, prepare sites for sampling/ monitoring and restore sites upon completion of work.

•Identify, evaluate, design and prototype processes, equipment, and facilities which minimize the generation of hazardous wastes or improve environmental quality.

•Develop permits and various applications as required by the guidance documents.

•Conduct Community Relations Program requirements in accordance with SARA.

•Prepare Site-Specific Spill Plans, maintain and reviewed annually in accordance with Air Force policy, guidance and directives.

•Develop Base Spill Prevention and Response Plans.

•Conduct quarterly review of regulatory requirements regarding the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the Superfund amendments and on-going RCRA and CERCLA/SARA Programs and other background documents as required.

•Prepare Statements of Work.

•Perform waste minimization assessments and recommend process modifications that eliminate or reduce the use, generation, and disposal of hazardous materials within production process. The assessments shall include:

- Analyze the results of waste audits to identify the most promising areas for waste minimization.

- Identify, devise, and prototype new approaches to reduce and minimize hazardous wastes through process modification of emission/effluent control.

- Investigate process technology and develop conceptual system designs to prevent and reduce industrial pollution and hazardous waste generation.
- Determine the environmental consequences of present and proposed environmental regulations of any recommended process or equipment changes.

- Recommend control technology for toxics and pollutants to address recovery/recycle and reduction, optimization treatment (chemical and biological), onsite treatment, and substitution with less toxic/hazardous materials.

- Prepare detailed drawing packages, plans, and designs for waste minimization pilot projects relative to equipment design and modifications including charts, graphs, return on investments, and cost estimates.

- Document, evaluate, and integrate the results of pilot projects in ongoing industrial processes operations through process modifications or prototype development.

•Conduct and administer the Hazardous Waste Training Program to Base employees including requirements under 29 CFR 1910.120.

•Conduct Underground Storage Tank Annual Precision Leak Testing.

•Conduct Environmental Audit Assessment of base facilities and operation in accordance with Air Force and SM-ALC/EM policy, guidance, and directives.

•Perform Inspection Services and Construction Management for Environmental Investigations, construction Project or Remedial Action Implementation.

•Develop and maintain a computer data base for tracking hazardous waste generator/management data and all delivery order project information.

•Maintain an inventory of McClellan Air permits. Develop tracking system to monitor environmental compliance. This inventory and tracking system will be maintained in a microcomputer within the Directorate of Environmental Management.

•Provide engineering and services to operate and maintain interim Remedial Measures and Remedial Actions implemented by McClellan AFB in accordance with CERCLA/SARA. This includes the McClellan Groundwater and Treatment Plant and existing and future groundwater extractor systems. Operation and maintenance shall be conducted in accordance with existing procedures.

•Prepare Environmental Assessments for proposed Air Force activities in water usage, wastewater discharge, solid waste disposal, hazardous waste cleanup, and contaminated groundwater cleanup.

•Document performance of existing and future McClellan water, wastewater, solid waste, and groundwater treatment facilities (including groundwater extraction systems) to include performance evaluations of individual unit processes within a treatment facility.

•Prepare comprehensive studies to determine potable water supply, storage and distribution requirements for McClellan AFB and its Satellite Locations.

Attachment B
HEAT STRESS/COLD STRESS HAZARDS

Heat Stress

Wearing PPE puts a hazardous waste worker at considerable risk of developing heat stress. This can result in health effects ranging from transient heat fatigue to serious illness or death. Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses at hazardous waste sites, regular monitoring and other preventive precautions are vital.

Monitoring Heat Stress. Because the incidence of heat stress depends on a variety of factors, all workers, even those not wearing protective equipment, should be monitored.

Workers wearing semipermeable or impermeable protective clothing should be monitored when the temperature in the work area is above 70°F (21°C).

To monitor the worker, measure:

- Heart Rate--Count the radial pulse during a 30-second period as early as possible in the rest period.
  - If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same.
  - If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following work cycle by one-third.
- Oral temperature--Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking).
  - If oral temperature exceeds 99.6°F (37°C), shorten the next work cycle by one-third without changing the rest period.
  - If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following work cycle by one-third.
  - Do not permit a worker to wear a semipermeable or impermeable garment when his/her oral temperature exceeds 100.6°F (38.1°C).

- Body water loss, if possible. Measure weight on a scale accurate to ±0.25 lb at the beginning and end of each work day to see if enough fluids are being taken to prevent dehydration. Weights should be taken while the employee wears similar clothing or, ideally, is nude. The body water loss should not exceed 1.5 percent total body weight loss in a work day.

Initially, the frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work (see Table 1). The length of the work cycle will be governed by the frequency of the required physiological monitoring.

Table 1
SUGGESTED FREQUENCY OF PHYSIOLOGICAL MONITORING FOR FIT AND ACCLIMATIZED WORKERS[a]

Adjusted Temperature[b]	Normal Work Ensemble[c]	Impermeable Ensemble
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5°-90°F (30.8°C-32.2°C)	After each 60 minutes of work	After each 30 minutes of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5°-77.5°F (22.5°-25.3°C)	After each 150 minutes of work	After each 120 minutes of work

[a]For work levels of 250 kilocalories/hour.
[b]Calculate the adjusted air temperature (ta adj) by using this equation: ta adj °F = ta °F + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)
[c]A normal working ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

Prevention of Heat Stress. Proper training and preventive measures will help avert serious illness and loss of work productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat injuries. To avoid heat stress, management should take the following steps:

- Adjust work schedules:
  - Modify work/rest schedules according to monitoring requirements
  - Mandate work slowdowns as needed

- Rotate personnel: alternate job functions to minimize overstress or overexertion at one task

- Add additional personnel to work teams.

- Perform work during coolers hours of the day if possible or at night if adequate lighting can be provided.

- Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.

- Maintain workers' body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat, i.e., 8 fluid ounces (0.23 liters) of water must be ingested for approximately every 8 ounces (0.32 kg) of weight lost. The normal third mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs, encourage the worker to drink more. The following strategies may be useful:

  - Maintain water temperature at 50° to 60°F (10° to 15.6°C).

  - Provide small disposable cups that hold about 4 ounces (0.1 liter).

  - Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work.

  - Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight.

  - Weigh workers before and after work to determine if fluid replacement is adequate.

- Encourage workers to maintain an optimal level of physical fitness:

  - Where indicated, acclimatize workers to site work conditions: temperatures, protective clothing, and workload.

  - Urge workers to maintain normal weight levels.

- Provide cooling devices to aid natural body heat exchange during prolonged work or severe heat exposure. Cooling devices include:

- Field showers or hose-down areas to reduce body temperature and/or to cool off protective clothing.

- Cooling jackets, vests, or suits.

- Train workers to recognize and treat heat stress. As part of training, identify the signs and symptoms of heat stress (see Table 2).

Table 2 SIGNS AND SYMPTOMS OF HEAT STRESS
• Heat rash may result from continuous exposure to heat or humid air
• Heat cramps are caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include: - Muscle spasms - Pain in the hands, feet, and abdomen
• Heat exhaustion occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include: - Pale, cool, moist skin - Heavy sweating - Dizziness - Nausea - Fainting
• Heat stroke is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occur. Competent medical help must be obtained. Signs and symptoms are: - Red, hot, usually dry skin - Lack of or reduced perspiration - Nausea - Dizziness and confusion - Strong, rapid pulse - Coma

Cold Stress

Although northern California is not prone to bitter-cold temperatures, cold stress may still be a potential problem. Cold stress is possible when work performed over water is at temperatures of 50°F or less. The ultimate effects of cold stress is hypothermia, which is a decrease in the deep core body temperature. At temperatures of 35°F, workers in water, or whose clothing becomes wet, should be provided with an immediate change of clothing. They may need to be treated for hypothermia. Workers who wear impermeable protective clothing are susceptible to chilling because their cotton underclothing may become wet with perspiration.

Windchill index. The windchill factor is the cooling effect of any combination of temperature and wind velocity of air movement. The windchill index is shown in Table 3. The windchill index does not take into account that part of the body which is exposed to cold, the level of activity and its effect on body heat production, and the amount of clothing being worn.

Table 3
WINDCHILL INDEX

	ACTUAL THERMOMETER READING (F)									
Wind speed in mph	50	40	30	20	10	0	-10	-20	-30	-40
	EQUIVALENT TEMPERATURE (F)									
calm	50	40	30	20	10	0	-10	-20	-30	-40
5	48	37	27	16	6	-5	-15	-26	-36	-47
10	40	28	16	4	-9	-21	-33	-46	-58	-70
15	36	22	9	-5	-18	-36	-45	-58	-72	-85
20	32	18	4	-10	-25	-39	-53	-67	-82	-96
25	30	16	0	-15	-29	-44	-59	-74	-88	-104
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109
35	27	11	-4	-20	-35	-49	-67	-82	-98	-113
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116
Over 40 mph (little added effect)	LITTLE DANGER (for properly clothed person)				INCREASING DANGER (danger from freezing of exposed flesh)			GREAT DANGER (Danger from freezing of exposed flesh)		

Note: The human body senses "cold" as a result of both the air temperature and the wind velocity. Cooling of exposed flesh increases rapidly as the wind velocity goes up. Frostbite can occur at relatively mind temperatures if wind penetrates the body insulation. For example, when the actual air temperature of the wind is 40°F (4.4°C) and its velocity is 30 mph (48 km/h), the exposed skin would perceive this situation as an equivalent still air temperature of 13°F (-11°C).

Attachment C
HEALTH AND SAFETY SITE MEETING

We the undersigned have read this Site Safety Plan and fully understand its contents and will adhere to procedures set forth in this document.

Name	Affiliation	Title	Date

CH2M HILL Site Safety Plan
Addendum No. 02 - Task 5005
Addendum for field activities and site personnel
Addendum should be accompanied by the MAFB base health and safety plan

McClellan Air Force Base
California

Client: McClellan Air Force Base
Project No.: SAC28722.05
Task Manager: Wayne Pearce
Site Name: McClellan Air Force Base
Dates of Field Visit: May 30, 1990 - July 2-6, 1990

Purpose of Field Visit: To collect wipe, sweep, and chip samples within Building 252 to determine extent of Mercury contamination and to assess possible cleanup scenarios.

Hazard Evaluation: Elemental mercury was detected in surface wipe tests taken at air ducts vents within Building 252. Wipe tests ranged from 0.2 ug per swipe (area wipe = 100 sq. om.). See attached.

McClellan personnel reported 0.6 mg/M3 detected within the air duct system.

Elemental mercury is readily absorbed into the respiratory system, gastrointestinal tract, and intact skin. Spilled and heated elemental mercury is particularly hazardous. Chronic industrial mercury poisoning results in central nervous system damage, and inflammation of the gums and mouth. The cardinal symptome of mercury poisoning are tremors, psychic disturbances, excessive salivation and pain on chewing. Subacute exposures may result in coughing, vomiting, diarrhea, gum pain and mouth ulcers, and protein in the urine.

The biological half life of mercury in the bodyis around 60 days. The brain and kidney are the sites of deposition following exposure to elemental mercury.

NOISH recommends the use of dermal protection and to promptly remove non-impervious clothing which may be contaminated. OSHA states that the ceiling limit is 1 mg/10M3 and the PEL for an 8 hour TWA is 0.05 mg/M3.

Site Personnel:

Team Member	Responsibility
Susan Keydel/SFO	Technician
Robert Evangelista/SAC	Team Leader/Level C SSC
William Torres/LAO	Sampler
Mike Ladeau/LAO	Sampler
Kimberly Ries/SFO	Sampler
Stacey Brown/SFO	Sampler

Level of Protection:

A: ___ B: ___ C: X D: ___

Team members must wear tyvek coveralls with a hood, doubled latex gloves, latex booties over steel toe neoprene boots, hard hat when there is an overhead hazard, MSA Comfo half face mask air purifying respirator with MSA Mersorb cartridges. Important: You must observe the mersorb indicator to detect when the Mersorb cartridge is exhausted. Each team member is to check his buddy's indicator every 5 minutes for cartridge exhaustion.

Each team member is to fit test the other and record the results of the test on the attached form.

Monitoring Equipment:
Jerome Mercury Analyzer Calibrate daily according to manufacturer's instructions and record calibration results in the logbook. Monitor continuously and record results every 30 minutes or when there is a change or positive detection of Hg. Action levels: zero to 0.25 mg/cubic meter - Level C Greater than 0.25 mg/cubic meter - Evacuate. Must wear Level B to work at concentrations greater than 0.25 mg/cubic meter. Biological monitoring - obtain a urine sample prior to going on site. Refrigerate the urine. Have AML analyze for elemental mercury, specific gravity, and correct for creatinine. Obtain a 24-hour collection bottle from the local physician and collect a 24-hour urine sample upon leaving the site. Submit to local physician to send to AML for mercury analysis. Repeat biological monitoring in 2 weeks, and every 2 weeks or until results indicate monitoring is not needed. Any mercury level greater than 50 ug mercury/gram of creatinine will be cause for removing that person from the site. All urineanalysis results will be sent to the local physician and to Dr. Swotinski at Washington Occupational Health Associates.
Addendum Written By: Wayne Pearce/SAC **Date**: 6/19/90
Addendum Approved By: Jane Stansfield/DEN **Date**: 6/26/90