Revised Management Plan for
Lead-Based Paint and
Soil-Metals Survey
Camp Bonneville, Washington

Prepared for
U.S. Army Corps of Engineers
Seattle District

Contract DACA67-93-D-1004
Delivery Order No. 49

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REVISED MANAGEMENT PLAN
LEAD-BASED PAINT (LBP) AND SOIL-METALS SURVEY
CAMP BONNEVILLE, WASHINGTON

1.0 INTRODUCTION

The Seattle District of the U.S. Army Corps of Engineers has been charged with overseeing contracts relating to the remediation of Camp Bonneville, Washington, as part of the Base Realignment and Closure (BRAC) process. Existing land and structures at Camp Bonneville (BNVL) will eventually be released by the U. S. Army to an as yet to be determined second party. Tasks to be completed by Hart Crowser as part of this contract include:

- Lead-based paint survey of 48 buildings and their associated structures;
- Soil lead survey of the surface soil in the vicinity of the 48 buildings; and
- Soil-metals (lead, zinc, and copper) survey of the surface soil adjacent to buildings with metal roofs.

We are submitting this Revised Management Plan for LBP and soil-metals survey under U.S. Army Corps of Engineers (Corps) Contract No. DACA67-93-D-1004, Delivery Order No. 49.

1.1 Organization of this Management Plan

Section 1.0 introduces the issues and regulations relating to surveying LBP, and metals in soil associated with the BRAC process.

Section 2.0 addresses the overall work and sampling procedures Hart Crowser will use in conducting its LBP survey at BNVL. The section also includes information on sample collection protocol, condition assessments, and survey documentation.

Section 3.0 addresses the work procedures Hart Crowser will use in conducting its soil-metal survey at BNVL. The section also includes information on sample collection protocol and survey documentation.

Section 4.0 addresses survey team health and safety considerations in the form of a site-specific safety and health plan (SSSHP).

Appendix A contains instructions for operation of the Niton x-ray fluorescence (XRF) Spectrum Analyzer and the Lead In Soil Analyzer (LISA).

Appendix B contains example illustrations of building components which will be used during our LBP survey.

Appendix C contains Lead Inspector certificates for the LBP survey.

1.2 Applicable Regulations

The work to be performed at the BNVL site will follow all federal, state, and local policies and regulations. Specific applicable policies and regulations include:

- Asbestos, lead paint, and radon policies at BRAC properties (31 October and 15 December, 1994); and

- Public Law 102-550 (Residential Lead-Based Paint Hazard Reduction Act of 1992 [Title 10]).

2.0 LEAD-BASED PAINT SURVEY WORK PLAN

2.1 Purpose of the Survey

Transfer of existing buildings at BNVL will require completing a survey to determine the location and approximate quantity of LBP. The results of this survey will assist the Army to determine the appropriate method for handling building materials that contain regulated quantities of lead. This section of the Management Plan describes the procedures Hart Crowser will follow in conducting the LBP survey at BNVL.

2.2 Historical Background

Buildings that were built in the United States and painted prior to 1960 today represent potential sources of LBP. Buildings constructed after 1960 are not necessarily free of LBP because the voluntary standard for limiting lead content in interior paint to less than 1 percent was only adopted in 1966; and, until very recently, exterior paint contained significant amounts of lead. Although current (1977) federal regulations have limited the lead content of most paints to 0.06 percent, it is still important to consider most painted surfaces (e.g., walls, windows, trim, floors, swing sets, eaves, banisters, etc.) as potential sources of lead.

2.3 General Responsibilities of the LBP Inspection Team

It is the responsibility of the LBP inspector/operator to:

- Utilize appropriate personal protective equipment and measures to avoid potential exposure to lead, radiation, and other building-specific health and safety problems (refer to Section 4.0 for additional health and safety procedures);

- Obtain and assess relevant blueprints, renovation histories, and other applicable information for each building to be surveyed, if available;

- Collect samples of suspect LBP and maintain complete and accurate sample documentation as described in this work plan; and

- Provide an accurate characterization of suspect LBP, i.e., to accurately interpret the sample results for the portable XRF device and to ensure that the survey report accurately describes the paint sampled and other relevant building information.

It is the responsibility of the Project Manager to:

- Ensure that sampling personnel comply with this work plan;

- Ensure that the work is conducted in a safe, thorough, and cost-effective fashion; and

- Ensure that project schedules are met.

2.4 Training Requirements

All LBP inspectors/operators conducting visual inspections of LBP, operating the portable XRF, and collecting bulk paint samples will have completed a lead inspector program sponsored or accepted by the EPA. Certificates of trained inspectors are in Appendix C.

2.5 Documentation Review

Prior to conducting the LBP survey, pertinent information on the buildings will be reviewed, if available. The types of information to be reviewed include:

- Date(s) of original construction;
- Dates and locations of all known renovations;
- Painting history and paint specifications; and
- Prior LBP survey/sampling and abatement information.

This information will assist the inspector/operator in formulating the overall sampling strategy for each building and will help in verifying sample results.

2.6 Lead-Based Paint Sample Collection Procedures

The lead content in paint will generally be determined with a Niton XL 309 Spectrum Analyzer (Niton), a portable device which uses x-ray fluorescence. This method is a non-destructive test and can be completed quickly with almost immediate results. Tests that prove to be inconclusive with the XRF device may require collecting bulk samples for confirmatory laboratory analysis.

Identification of Suspect LBP for Testing/Sampling

A thorough visual inspection will be conducted of the entire building prior to any sampling or testing activities. A site plan provided by the Corps will be used to assist the inspector in determining sample locations. Codes will be used to identify LBP sample information in the data logger of the XRF device. Appendix A lists specific instructions for operation of the Niton XL and the codes of building components and painted surfaces that will be used. Appendix B presents illustrations of the typical painted surfaces that will be measured in each building.

When approaching a building, the inspector/operator will use consistent techniques, described below, to lay out all testing activities. These procedures will allow any follow-up investigation to be performed simply by following the survey report.

Sampling Sequence. The survey will be performed using the "Clockwise Direction" method. The inspector will first identify by sight the main entry point of the building and mark this entry point on the floor plan. When standing directly in front of the building main entry point, he/she will be looking at the Exterior Wall A. The left exterior side wall will be Wall B, the wall opposite the main entry will be Wall C, and the right side wall will be Wall D. Individual room/areas inside the building will have their walls similarly identified based on the main entry to each room/area. If there is more than one entry, the one from the common space or hallway will be used. Entry points upon which wall numbering is based will be indicated on the floor plans by an arrow.

Test Identification Number. Each surface to be tested will be identified by a unique 8-digit "Test Identification Number" derived as follows:

- Room/Area Type: 2-digit number from Table A-3;
- Room/Area Number: 1-digit number indicating the sequential occurrence of the room type;
- Wall: 1-digit number from Table A-4;
- Component: 2-digit number from Table A-5 or A-6;
- Substrate: 1-digit number from Table A-7; and
- Condition: 1-digit number from Table A-8.

Survey Procedure. Each surface will be tested in a clockwise rotation, beginning with the first room/area inside the main entry. The inspector will test at least one of each painted component in each room/area. After completing the first room/area, the inspector will walk through the building in a clockwise rotation (i.e., will next enter the room/area to the left of the entry room/area).

Each time the inspector enters a new area of the building which is defined by a door, or an obvious break in the room/r area, a new "Test Identification Number" will be entered into the XRF device. A room/area will always be entered from a main hallway or main access area. For example, if the inspector is in Bedroom No. 1 and there is a door inside the bedroom leading into a bathroom, the inspector will determine if there is another entrance to the bathroom by way of the main hallway. If so, the bathroom will be entered from the main hallway.

Interior Structures. Closets, stairways, and landings will be identified as individual rooms/areas and will be assigned an individual room/area number if not already listed on the floor plan. Shelves in closets will be assigned to the wall on which the longest dimension of the shelving is mounted.

If there are two or more doors or windows on a single wall, the door or window measured will be recorded according to the wall designation and its location as referenced by the clockwise direction numbering system. This system will aid in future identification of surfaces tested. Surfaces covered with wallpaper surfaces will be tested if painted surfaces are beneath the wallpaper.

If a surface area should be tested, but is otherwise inaccessible, every effort will be made to access this area. However, areas where access is clearly not possible will be recorded on the Niton Problem Log (Figure A-2). Surfaces or areas that may be inaccessible include locked rooms that could not be opened and entered during the inspection and the interior of above-ground storage tanks (ASTs).

Exterior Structures. After all interior areas of the specified building have been inspected, the exterior surfaces (e.g., siding, window trim, and eaves) associated with the specified building will be inspected. Miscellaneous surfaces/areas usually found outside of the building that are also to be inspected include sheds, garages, fences, and playground equipment.

Exterior surfaces will be inspected starting in the upper left hand corner of Exterior Wall A and proceeding from left to right and from top to bottom. The inspector will look for all surfaces that require testing. Each exterior surface will be sequentially inspected in a clockwise sequence around the building. All specific testing locations will be randomly selected so as to avoid bias.

Condition Assessment

Inspectors will assign an overall condition assessment for each painted surface tested according to the degree of damage as estimated by the inspector. The ranking scheme presented in Table A-8 will be used for coding the assessments.

Measurements Using the XRF Device

The XRF device utilized on this project will be the Niton Corporation XL Model 309 Spectrum Analyzer (Niton XL). The Niton XL device is a portable hand-held detector designed to make fast and accurate non-destructive measurements of lead concentrations in painted surfaces. The Niton XL was designed to find very low levels of lead in paint.

The Niton XL device contains a sealed radioactive source that emits gamma radiation, which excites electrons from the inner (K or L) shells in the material within its field of view. These excited electrons enter outer shells. Other electrons in the outer atomic shells then take the place of the excited electrons. As the electrons move to the inner shells, they give off x-rays. These x-rays are specific for each element. The device and associated electronics measure the amount of energy from the x-rays. Lead levels are calculated by the instrument and clearly presented on the liquid crystal display (LCD) screen in mg/cm^2.

The Niton XL uses a 10 millicurie (mCi) $Cadmium^{109}$ (Cd^{109}) source, exempt from case labeling, shipping labeling, or notification of bridges and tunnels. Exempt notifications and wipe test paperwork accompany the Niton XL. It has virtually no radiation exposure above background to the operator's hand, with the shutter open. Residents and workers do not have to leave the room/area being tested or adjacent areas.

The half-life of Cd^{109} is 15 months, so that a 5-second test will take 1/3 second longer each month until, at 15 months, it will take 10 seconds. The current "read time" is noted on a display screen, enabling the operator to best gage the time required to complete the work.

The Niton XL measures both the L x-ray and K x-rays of lead. The triple L x-rays are independent of the substrate, are shown on the screen separately, have no read-through, are fast, highly accurate and precise at low levels, and can penetrate up to 0.5 mm of paint (0.7 mm of varnish). The K x-rays resolve ambiguities and provide measurements for thicker paint.

The LCD displays the lead levels, L and K x-ray readings, provides a Depth Index, shows the time in source seconds and clock (live-time) seconds, and has other features to assist the operator, such as battery life and temperature indicators. The detection range of the L x-rays is from 0.1 to 5.0 mg/cm^2. Concentrations above 5 mg/cm^2 are displayed as ">>5 mg/cm^2."

The Niton XL screen shows a continuous readout of each item indicated while the sample is being taken, allowing the operator the opportunity to continue the measurement until the desired accuracy and precision have been achieved. This can vary from a few seconds to, in some cases, a few minutes.

The window of the Niton XL is 1 cm x 2 cm, close to its front edge, making it possible to test relatively inaccessible surfaces. These include jambs, window wells and stops, plus fancy woodwork, pipes, balusters, radiators, wrought iron, and I-beams.

Spectra. After 3 source seconds the Niton XL shows a graphic display, an extremely crisp auto-scaled spectra from 0 to 25 KeV. The triple L x-ray lines clearly show the presence or absence of lead, and do not include the Compton scatter of the substrate. Thus, the Niton XL L x-ray lines are virtually independent of substrate.

The middle L-Beta peak (along with the associated L-Alpha and L-Gamma) at 12.6 KeV is a confirming sign of the presence of lead.

Taking a Measurement. After 3 source seconds, the Niton XL displays a numerical reading in the L mode if there is 95 percent confidence in the result.

Examples: L >> 5 mg/cm^2
L 3.0 ± 0.5 mg/cm^2

At any time after 3 source seconds, K readings will also appear when the Niton XL has reached 95 percent confidence that the K measurement is above the action level.

By 20 source seconds, 90 percent of all readings are conclusive. At 20 source seconds (if no reading is displayed at the 95 percent confidence level) the L mode will begin to display numerical values that the operator will use to determine the length of the test, or whether it is inconclusive and thus an alternate technique (e.g., bulk sample) is called for.

After 30 source seconds (if no L reading at the 95 percent confidence level is displayed), the K mode will make a numerical statement about the amount of lead in the paint. Both L and K modes can be compared at this time to determine which alternative techniques will be helpful in achieving 95 percent confidence, and which techniques can avoid collecting bulk samples for lab analysis.

The Niton XL's report prints out both the L and K spectra of each measurement, each with test number, locations, etc. This spectral data, together with other measurement data, will be downloaded and stored off-line for examination at a later time, if required.

Alternate Techniques—Measurements at the Site. In a small number of cases, when 95 percent confidence data do not appear on the screen, the operator, using numerical and spectral information, can opt to use other data collection methods. These are also used to resolve uncertainties when the operator is in doubt because of ambiguous spectra, high levels of zinc mixed with arsenic, failing to find the amount of lead that might be expected in an old structure, and so forth. Alternate techniques include:

- Holding the Niton XL longer to get a K reading with good precision;
- Checking the area for painted-over thin spots and measuring at those locations to achieve 95 percent confidence;
- Removing only a small area of the top layers of paint to allow the small 1 x 2 cm window to cover that area and test at a low Depth Index; and/or
- Removing a small, inconspicuous paint chip, a bit larger than the 1 x 2 cm window, and reading the reverse side, which are the oldest layers. This method almost invariably gives conclusive results and may eliminate the need for Atomic Absorption (AA) analysis of bulk samples.

In a small number of cases, typically with concentrations closest to the 1.0 mg/cm^2 compliance level, none of these techniques can improve an inconclusive measurement. It is then necessary to collect a bulk sample to get a conclusive measurement. To confirm that all layers of lead paint are removed, use the Niton XL on the bare spot of the substrate to determine that all lead paint has been removed.

Transferring Data. The data stored in the Niton XL will be downloaded to a personal computer on a daily basis.

Bulk Sample Collection and Analysis

Painted Surface Sampling and Analysis. Bulk sampling of suspect LBP may be required when an unusual building material is encountered in which the XRF measurements are suspect, when the XRF results are inconclusive, and as part of Hart Crowser's quality control/quality assurance program to confirm XRF results. One bulk sample for approximately every 60 XRF readings, not to exceed 16 bulk samples (per negotiations), will be collected.

For metal or concrete surfaces, samples will be collected from a 2-inch by 2-inch surface area. The sample should contain all layers of paint down to the substrate. Care will be exercised during sample collection to minimize the amount of substrate that adheres to the paint film.

For wood, wallboard, and plaster surfaces, collect a sample from a 2-inch by 2-inch surface area. Substrate may be included in the sample if the paint is difficult to remove from the wood, wallboard, or plaster.

A piece of adhesive tape slightly larger than the sample area will be firmly secured over the entire sample area. The sample square will be outlined using a template or making pen. A sharp knife will be used to cut through all layers of paint following the square outline. The paint will be removed using a sharp chisel, and placed in a Ziploc™-type plastic sample bag. Extreme care will be exercised during sample collection to minimize suspect LBP residue and debris beneath the sampling area.

The excess tape will be removed from the wall and the sample area and the surface immediately surrounding and below the sample area will be wet wiped using baby wipes. A clean piece of tape for carpeted areas (or baby wipes for hard, non-porous surfaces) will be used to remove any residue or debris beneath the sample area, as necessary. Tape and baby wipes used during this cleaning process will be placed in a Ziploc™-type bag for later disposal.

Bulk paint samples will be analyzed for lead by an approved chemical laboratory using EPA SW-846 Method 7420 (Flame Atomic Absorption Spectroscopy [FAAS]). All sample results will be reported on a dry weight basis as mg/cm^2 based on the surface area of the analyzed portion of the sample. Results can also be provided, upon request, in mg/kg or percent lead, but these results are subject to misinterpretation because of the substrate included in the sample.

Wipe Samples

When a category 4 condition is identified (the painted surface has deteriorated with large areas of peeling, cracking, flaking, discoloration, buckling, etc.), the lead inspector will collect wipe samples on the nearest applicable surface (floor, window sill, or window well). No more than two wipe samples will be collected, per negotiations. Sample ID numbers will follow the format below:

[Building Number] -W- [Unique Sequential Number]

Sample Labeling

All sample bags will be labeled using indelible ink at the time of sample collection. The following information will be recorded directly on the sample bag:

- Sample ID number;
- Date of collection; and
- Inspector's initials.

The labeled sample bag will then be placed in a larger Ziploc™-type bag and sealed for additional protection during handling and shipment.

Sample Chain of Custody

The Hart Crowser Sample Custody Record form (Figure 2-1) will be completed for all samples collected and transported to the laboratory. A custody seal will be wrapped around each sampling container for shipment. Chain of custody records will include complete information for each sample. The inspector is responsible for providing a legible signature.

If the samples are shipped via commercial express carrier or other public transportation, the custody record will be signed to relinquish custody of the samples. The inspector, handling sample shipment, will relinquish custody only when directly transmitting the sample container to a receiving party or when handing the container to a shipper for subsequent transmittal to the analytical laboratory. A copy of the custody record should be retained by the inspector handling shipment and placed in the project file with other field notes. The inspector will place the original and remaining copies of the custody record into the shipping container.

The inspector will obtain custody seal(s) (Figure 2-2), and will sign and date them. The custody seal(s) will be used to seal the sample shipping container lid and will be covered with transparent packaging tape.

Upon receipt of the samples, the analytical laboratory will break the custody seal(s), open the shipping container, and sign "Received by" line on the sample chain of custody form. The laboratory will verify that the custody seal was intact at the time of opening. The analytical laboratory will then forward the original sample chain of custody form to Hart Crowser to indicate that sample transmittal is complete. A copy of the sample chain of custody form will to be kept on file by the laboratory.

These chain of custody procedures must be followed for each shipment of samples.

Decontamination of Sampling Equipment

The sampling equipment (e.g., template, knife, and chisel) will be decontaminated by thoroughly wiping them with baby wipes prior to collecting another sample. Baby wipes used during decontamination will be placed in a Ziploc™-type bag for later disposal.

2.7 Survey Report

A draft and final report (incorporating Corps comments) will be produced at the conclusion of field work and laboratory analysis. The report will include an overall summary of conclusions and recommendations, and raw and supporting data, including methods used, sources of information, drawings, and selected color photographs. All information requested in the Statement of Work dated 22 April 1996, will be included.

2.8 Quality Control

Quality control (QC) procedures implemented on this project are detailed in this section for field sampling and analysis and subsequent confirmation analysis by the designated primary and quality assurance laboratories.

Field Quality Control Procedures

Field quality control will be checked by confirming the calibration of the XRF device and collecting and analyzing paint chip samples to confirm XRF results.

Field Calibration Check. The Niton XL calibrates itself every time it is turned on. QA/QC calls for turning the XL on and off a minimum of once every four hours of use and logging the results. As an additional quality control measure, a field calibration check using NIST standards will be taken every 4 hours during the field survey.

A standard ID code will be assigned to calibration checks of the XRF device. The standard code will be "111" for calibration checks. Results from the various QC tests will be compared on a regular basis to identify any trends that may be developing during the testing program.

XRF and Bulk Sample Comparison. As part of the quality assurance program, bulk samples of suspect LBP will be collected. A single bulk sample will be collected for approximately every 60 samples measured using the XRF device (up to a total of 16 lead paint QC samples). The bulk lead paint QC samples will be collected as described above. Results of the XRF and corresponding AAS measurements will be compared. Trends indicating that the XRF is not producing results comparable to those of AAS measurements will be investigated and resolved with either the Niton Corporation or the laboratory.

Laboratory Quality Control

The laboratory will create one quality control (QC) suspect LBP bulk split sample for approximately 6 percent of the bulk samples analyzed. QC samples will be created by splitting a bulk sample in the laboratory. Care will be taken to help ensure that all layers of suspect LBP are equal in amount on the main and QC sample. The QC sample will be analyzed by an alternative accredited chemical laboratory and compared with the main sample to confirm the results of the primary laboratory.

3.0 SOIL-METALS SURVEY WORK PLAN

3.1 Purpose of the Survey

The soils surrounding Camp Bonneville structures may be contaminated with lead caused by deteriorating and flaking painted surfaces. In addition, the vegetation appears stressed or is altogether absent in the vicinity of the drip-lines of some structures with corrugated metal roofing. This section of the Management Plan describes the procedures Hart Crowser will follow in conducting the soil-metals survey at BNVL.

3.2 General Responsibilities of the LBP Inspection Team

The general responsibilities of the soil-metals inspector/operator and the Project Manager are described in Section 2.3.

3.3 Training Requirements

All soil-metal operators will be trained to operate the Niton Lead-In-Soil Analyzer (LISA). The LISA is an enhanced Niton XL that has the capability of detecting lead, arsenic, zinc, and copper in the soil.

3.4 Soil-Metal Sample Collection Procedures

To provide the Camp Bonneville with data concerning the extent of soil contamination, around structures having exterior LBP, we will test the soils surrounding these structures for the presence of lead using the LISA. We will also test the soil in areas with sparse or no vegetation near buildings with corrugated metal roofing for the presence of lead, zinc, and copper with the LISA. This method is a non-destructive test and can be completed quickly with almost immediate results. Appendix A lists specific instructions for operation of the LISA.

The LISA has two operating modes; "direct" and "indirect". For the direct soil testing method, the analyzer is placed directly on the ground surface and the readings taken on in-situ soil. This measurement can be completed quickly with almost immediate results. The indirect soil testing method is more accurate, but requires some sample preparation. For the indirect soil testing method, a sample of the soil is collected by the operator, ground and homogenized, and then placed in a testing platform for analysis.

<u>Identification of Suspect Metal-Contaminated Soil for Testing/Sampling</u>

The test procedures for the soil in the vicinity of each building surveyed for LBP is described below. These procedures will allow any follow-up investigation to be performed simply by following the survey report.

Lead in Soil Survey Method. Grouped structures at BNVL are generally aligned in an organized pattern of rows. The soil surrounding every other building in groupings of four or more structures will be tested for lead contamination. In the first row to be surveyed; the soil surrounding the first, third, fifth, and so on, buildings will be tested. In the second row to be surveyed; the soil surrounding the second, fourth, sixth, and so on, buildings will be tested. All odd numbered rows will follow the sequence of survey described for the first row. All even numbered rows will follow the sequence of survey described for the second row. Row numbering shall be assigned by the surveyors at their discretion. Selection of sample locations to sample for metals in soils will be also based on field observations of areas of vegetative stress or visible paint chips.

Isolated structures in groupings of three or less will be surveyed for surrounding soil lead contamination based on the results of the LBP surveys on the exteriors of the structures. The soil surrounding the single structure having the highest lead levels in exterior paints will be surveyed. Should all the buildings in the group have similar LBP levels, the largest of the structures based on floor area will be surveyed for soil lead contamination. The soil surrounding isolated single buildings will be surveyed for soil lead contamination if exterior paints tested either "inconclusive" or "positive" for LBP.

Soil Sample Collection. Subsurface soil samples will be collected and prepared using a decontaminated shovel, stainless steel spoon, and stainless steel bowl. With the shovel, make a vertical slice of the soil 2 to 3 inches deep. Place approximately 50 to 100 grams of soil in the stainless steel bowl and mix thoroughly with the stainless steel spoon. The sample is either placed in a plastic Ziploc™ bag labeled with indelible ink for later XRF analysis or prepared for immediate XRF analysis.

Soil Sample Preparation. Ideally, the sample should be dry and well homogenized. The entire sample should be dried to constant weight, sieved to remove gravel and debris, and ground or milled to a fine powder.

The sample can be dried in any of several ways:

- Oven dry the sample for approximately 2 hours at 150° C., until the sample reaches a constant weight;
- Air dry the sample in the direct sun in a shallow pan; or
- Gently stir and warm the sample in a pan over a hot plate or burner.

After drying, break up any clods and paint chips by grinding the sample in a mortar and pestle. Sieve with the No. 10 (2 mm) mesh and separate out the larger pieces (stones, organic matter, metallic objects, and the like). Grind the sample so its particles are fine and homogenous. Use mortar and pestle, or an electrically powered grinding mill. Sieve at least 10 grams of the sample through No. 60 (250 μm) and No. 120 (125 μm) mesh. Regrind the unpassed material until the required fraction is able to pass. Mix the resulting sample.

Place a circle of mylar film on top of the XRF sample cup. Secure the film with the collar. The flange inside the collar faces down and snaps into the indented ring of the cup. Inspect the installed film window for continuity and smooth, taut appearance. Set the cup, window-side down, on a flat surface. Fill it with a least 3 grams of the prepared sample (no more than half-full). Take care that there are no voids or layering.

Supporting the film window on a flat surface, tamp the loose sample into the cup. The end of the pestle makes a convenient tamper. Fill the cup with polyester fiber stuffing to prevent sample movement. Fasten the cap on the cup. Using indelible ink write an identifying number on the cup. Keep a record of that number, the site and location, and any other relevant comments.

Soil Sample Testing. Set the XL test platform on a flat, solid surface. Place the sample cup on the receptacle of the sampler. Hold the XL in one hand along the rubber gripping bands. Push the safety slide out from under the shutter release. Holding the XL in your right hand, place it on the test platform so that the sample cup is under the window of the XL. Squeeze the shutter release, pull back the latch on the platform with your left hand, and firmly press the XL flat against the platform surface.

Listen for the XL's beep (and watch for indications of lead on the screen) as you decide when the test has reached the desired level of accuracy. A typical test for the quantitative measurement of lead takes 60 source seconds. After the desired interval, pull back on the platform latch to release the XL and lift the XL off the platform to end the test.

Lead in Soil Testing Method. Before testing for the presence of lead, we will determine the predominant upwind and downwind direction in relation to the structure to be surveyed.

Two test locations will be selected in the upwind direction of the buildings to be surveyed. The locations will be generally equally spaced along the building side (at 33 and at 66 percent of the building's length) unless other conditions exist which would suggest soil lead contamination in other areas along the structure on the upwind side. At each test location selected, we will take direct readings of the surface soils 5 feet from the exterior wall. If the building is surrounded by asphalt or concrete pavement, the measured distances to the test location will be 5 feet from the edge of the pavement. We will also take a direct reading at a depth of 3 inches below the surface at the same locations.

Four test locations will be selected in the downwind direction of buildings to be surveyed. One test each will be performed at the corner of each building. The remaining two tests will be equally spaced along the building side (at 33 and 66 percent of the building's length) unless other conditions exist which would suggest soil lead contamination in other areas along the structure on the downwind side. The number of tests at each location selected will be as described for the upwind test procedure.

One of each downwind test shall be performed in the indirect mode after completing the direct mode test. The location of the indirect mode test and the depth of the test will be at the surveyor's discretion. The purpose of the indirect mode test is to provide a general correlation between the two test modes.

Ten soil samples from locations tested in the indirect mode will be collected and submitted to a laboratory for confirmation of total lead content. The purpose is to provide a general correlation between the XRF survey results with laboratory results. The sample collection locations shall be at the surveyor's discretion. Sample ID numbers will follow the following format:

[Building Number]-[Distance from Building in Feet]-[Depth Code]S

LBP surveyors shall describe each site, whether tested using direct or indirect XRF modes or sampled for laboratory testing, and include the following information:

- Soil gradation;
- Soil classification based on the Unified Soil Classification System; and
- General description of the visible presence of paint chips/flakes.

Metals in Soil Testing Method. Test locations will be modified from those described above in that the initial test at each survey location selected will be located directly along the roof drip-line. The second test at each survey location will be 10 feet away from the outside wall of the structure.

Sample Labeling, Chain of Custody, and Sampling Equipment Decontamination

These procedures will be as described in Section 2.6.

3.5 Survey Report

Reporting procedures will be as described in Section 2.7.

3.6 Quality Control

Quality control procedures will generally be as described in Section 2.8. Four soil samples from locations tested in the indirect mode will be collected and submitted to a laboratory for total metals (lead, arsenic, zinc, and copper content) analysis. The purpose is to provide a general correlation between the XRF survey results with laboratory results. The sample collection locations shall be at the surveyor's discretion. Soil sample ID numbers will be as described above.

4.0 SITE-SPECIFIC SAFETY AND HEALTH PLAN (SSSHP)
ASBESTOS, LEAD-BASED PAINT AND SOIL-METALS SURVEYS AND CS GAS CHAMBER BUILDING SURVEY
CAMP BONNEVILLE, WASHINGTON
DATE REVISED: May 22, 1996

4.1 Introduction

SSSHP Review

Hart Crowser Review:

______________________________	____________________
David E. Chawes, CIH Certified Industrial Hygienist Project Health and Safety Officer	Date
______________________________	____________________
Chad Armour Project Manager	Date

U. S. Army Corps of Engineers Review:

______________________________	____________________
Signature	Date
______________________________	
Name (print)	

Personnel Acknowledgement

The following personnel have reviewed a copy of this SSSHP. By signing below, these personnel indicate that they have read the plan, including all referenced information, and that they understand the requirements which are detailed for this project.

PRINTED NAME	SIGNATURE	PROJECT DUTIES	DATE

Table 4-1 - Emergency Contingency Information

SITE LOCATION	Camp Bonneville Camp Bonneville, Washington
EMERGENCY INFORMATION	Police....911 Fire....911 Ambulance....911 Hospital (Southwest Washington Medical Center)....256-2064
EMERGENCY CONTACTS	David Chawes, Hart Crowser .... (206) 324-9530 Jerry Cummings .... (360) 892-6179 Tim Grube, Corps Health & Safety Office .... (206) 764-3503 Bill Graney, Corps of Engineers .... (206) 764-3494
IN EMERGENCY, CALL FOR HELP AS SOON AS POSSIBLE	Give the following information: _ **Where you are** (cross streets or landmarks) ☎ **Phone number** you are calling from ☹ **What happened** - type of injury, accident # **How many persons** need help _ **What is being done** for the victim(s) ! **You hang up last** - let whomever you called hang up first

Plan Distribution

This SSSHP is for use by all Hart Crowser personnel working on the asbestos, lead-based paint, and soil-metals surveys, and the pre-demolition survey for the CS Gas Chamber Building at Camp Bonneville, Washington. A revised SSSHPA will be necessary and developed for the future building decontamination activities. copy of this plan shall be readily available at all times that Hart Crowser employees are present. All employees assigned to site work shall read, sign, and abide by this SSSHP. Table 4-1 lists emergency contacts for the site. This SSSHP was prepared on June 19, 1996, by David E. Chawes, CIH, for Hart Crowser activities relating to the referenced site.

Brief Description of the Site

Camp Bonneville is located approximately 20 miles east of Vancouver, Washington. It is used by the Army as a training facility. In addition to CS gas training, soldiers also use the site to fire small arms and larger weapons such as tanks and artillery. As such, unused ammunition and unexploded ordinance are likely present over most of the Camp Bonneville Military Reservation.

Brief Description of Planned Field Activities

This SSSHP pertains to the following field activities:

- Collect representative samples of asbestos.
- Collect representative samples of suspect LBP and soil;
- Use portable XRF device to measure lead content of painted surfaces;
- Use portable XRF device to measure metal content of the soil; and
- Collect representative samples of CS gas-impregnated building materials.

Contamination Characterization

Potentially hazardous materials, other than asbestos, LBP, metals in the soil, and CS gas residue expected to be on the BNVL site, include:

- Unexploded ordinance; and
- Fuel.

It is not anticipated that asbestos, lead, metal in soil, and CS gas survey activities will typically involve substantial disturbance of these materials. None of the other hazardous materials will be sampled or handled, and thus pose no health concern to the survey workers.

Regulatory Compliance

Hart Crowser ensures that all personnel comply with the basic provisions of the following as applicable to the specific project tasks:

- Washington State General Safety and Health Standards Chapter 296-24 WAC, and General Occupational Health Standards Chapter 296-62 WAC;
- Occupational Safety and Health Administration (OSHA) Regulations (29 CFR 1910); and
- US Army Corps of Engineers Health and Safety Requirements Manual, EM 385-1-1 Oct. 1992.

4.2 Hazard Assessment and Risk Analysis

Chemical Hazards

Descriptions of the principal health hazards of the potential contaminants affecting this survey include:

Asbestos. Asbestos fibers are usually mixed with various binder materials or resinous matrices. Collecting bulk samples of building materials may release extremely low concentrations of asbestos fibers. Asbestos occurs as bundles of fibers that, when disturbed, are easily separated into smaller and smaller sizes. Micron-size fibers tend to remain airborne and, because of their small size, can be inhaled down to the alveolar surface (smallest ends of air passageways) of the lungs.

Exposure to elevated levels of airborne asbestos fibers is known to cause a number of asbestos-related diseases, including asbestosis (fibrosis of the lung), mesothelioma (cancer of the lining of the lung), and other cancers of the lung, esophagus, stomach, and colon. Although the risk of developing asbestos-related diseases is greatest for individuals who are regularly exposed to relatively high airborne asbestos fiber concentrations (e.g., industrial asbestos workers), it is apparent that some degree of elevated risk exists for individuals chronically exposed to low airborne asbestos fiber concentrations, which may be present in a building that contains friable ACM. The actual degree of risk associated with prolonged exposure to asbestos levels in this range is still unknown at this time; however, it is prudent to take steps to limit asbestos exposure to the lowest extent possible.

OSHA has established standards for limiting the exposure of personnel working with asbestos. As described in the OSHA Standard (29 CFR 1910.1001), the current permissible exposure limit (PEL) for asbestos, as an 8-hour time weighted average (TWA), is 0.1 fiber per cubic centimeter of air (f/cc). The OSHA 8-hour TWA action limit is 0.05 f/cc. There is no OSHA standard regarding asbestos exposure for the general public.

Inorganic Lead. Inorganic lead exposure can occur via inhalation or ingestion of lead-containing dusts. Skin and eye contact are not considered routes of entry of lead dust into the body. The principal target organs of lead toxicity include the nervous system, kidneys, blood, gastrointestinal, and reproductive systems. Generalized symptoms of lead exposure include decreased physical fitness, fatigue, sleep disturbances, headaches, bone and muscle pain, constipation, abdominal pain, and decreased appetite. More severe exposure can result in anemia, severe gastrointestinal disturbance, a "lead-line" on the gums, neurological symptoms, convulsions, and death.

Neurological effects are among the most severe of inorganic lead's toxic effects and vary depending on the age of individual exposed. Effects observed in adults occur primarily in the peripheral nervous system, resulting in nerve destruction and degeneration. Wrist-drop and foot-drop are two characteristic manifestations of this toxicity.

The EPA also currently lists inorganic lead as a Group B2 probable human carcinogen via the oral route. This conclusion is based on feeding studies conducted in laboratory animals. The current PEL-TWA for inorganic lead is 0.05 mg/m^3. Occupational exposure to lead is also specifically regulated under WAC 296-62-07521, with an action level established at 0.03 mg/m^3 that triggers monitoring and other requirements. It is not anticipated that any sampling activities involving potential exposure to lead will trigger monitoring requirements for lead, because of the extremely low concentrations released to the air during paint sampling activities.

CS Gas. CS "gas" (actually fume) causes lacrimation and irritant effects at concentrations between 12 to 20 mg/m^3. The Permissible Exposure Limit (PEL) for occupational settings is 0.4 mg/m^3. the American Conference of Governmental Industrial Hygienists (ACGIH) recommends in the 1995-1996 Threshold Limit Values (TLV) that the maximum exposure to CS be 0.05 mg/m^3 as a ceiling value, with a Skin notation, indicates potential significant contribution to the overall exposure by the cutaneous route, including mucous membranes and the eyes, either by contact with the vapors or direct skin contact. Only residue from expended CS is expected on the site. No actual airborne CS "gas" will be encountered.

Radiation Hazards

Ionizing radiation is emitted by the portable XRF device. This will only be an issue when the analyzer is physically used in the survey of LBP.

Radiation hazards are dependent on the activity (in mCi) of the source, as well as the types and energy of the ionizing radiation emitted. The risk of exposure to radiation is related to three factors: time, distance, and shielding. The longer one is exposed to radioactivity, the more radioactive energy strikes the body and the greater the risk to health.

The allowable exposure limit for occupational exposure is 5,000 mrem/year while the allowable exposure limit for the public is 100 mrem/year. Exposure to the XRF device will not result in any appreciable radiation dose, and total exposure over the duration of the project is estimated to be well below 100 mrem/year.

The farther you stand from a radioactive source, the fewer x-rays will hit you. The damage caused by radiation drops off by the square of the distance. Thus, standing 10 feet from a source of radiation is 100 times less hazardous than standing 1 foot away.

Cadmium^{109} (Cd^{109}), the radiation source in the Niton XL and LISA XRF devices, is effectively and easily shielded, since it is at the low end of the energy spectrum, 4 keV to 25 keV, and less than 3 percent of 88 keV.

It is not anticipated that any sampling activities involving potential exposure to x-rays will trigger monitoring requirements because of the anticipated extremely low x-ray emissions.

Potential Exposure Routes

Inhalation. Exposure via this route could occur if large amounts of asbestos or lead dusts, or fugitive CS gas fumes are encountered during sampling activities.

Skin Contact. Skin contact with asbestos and lead are not considered significant routes of entry of those materials.

The Niton XL analyzer uses a Cd^{109} source to fluoresce LBP. Cd^{109} is the safest radioactive source used for x-ray fluorescence of lead paint. With its Cd^{109} source, the Niton XL analyzer has virtually no radiation leakage when its shutter is closed. With the shutter open (while taking a test) it gives off only a minute amount of extraneous radiation. Properly used, the radiation exposure to the skin and body from the Niton XL analyzer should be minimal.

Ingestion. Exposure via this route could occur if individuals eat, drink or perform other hand-to-mouth contact while conducting sampling. This should not occur, as inspectors will be instructed not to do these practices.

Physical and Other Hazards

Physical hazards associated with transportation to and from the site, and site activities include those listed in the Activity Hazard Analysis, Table 4-2. No other physical, radiological, biological, or safety hazards are indicated for the work at this site.

4.3 Accident Prevention

The Activity Hazard Analysis is presented in Table 4-2.

Table 4-2 - Activity Hazard Analysis Sheet 1 of 2

ACTIVITY	HAZARD	CONTROL(S)
Driving to, on, and from the site	Striking pedestrians, runaway vehicles, striking structures, overturning vehicles	Wear seat belts at all times while vehicles are in motion. Use licensed drivers. Define vehicle routes of travel. Obey Washington State driving regulations. Do not drive over holes or down sides of improperly sloped depressions.
General site activities	Stinging insects (bees, wasps, spiders)	Use care when sampling near dense vegetation. Be sure individuals allergic to insect bites (if any) have obtained prescription for insect-bite kit.
	Unexploded Ordinance	Stay on roads, paths, and maintained areas. Do not walk or drive in non-maintained portions of the site.
	Inhalation of asbestos or lead from debris piles and from damaged insulation.	Wear protective clothing, and air-purifying respirators as appropriate. Do not walk on or disturb debris, if possible.
	Inhalation of CS from impregnated building materials.	Wear protective clothing, and air-purifying respirators if irritation occurs, as necessary.
	Slipping on wet or oily surfaces	Wear appropriate slip-resistant boots

Table 4-2 - Activity Hazard Analysis (Continued) Sheet 2 of 2

ACTIVITY	HAZARD	CONTROL(S)
Use of portable XRF device	Radiation exposure	Do not point XRF device at anyone while device is ON. Keep in carrying case when not in use. Never leave device unattended or in unlocked vehicle.
Collecting bulk material samples for CS analysis	Skin contact with or inhalation of CS	Use care while cutting bulk materials not to dislodge residue, and wear appropriate personal protection, including Tyvek suit, gloves, and full-face respirators, as necessary to avoid eye, respiratory, or skin irritation.
Collecting bulk suspect asbestos samples	Inhalation of asbestos in dusts	Use wet methods to collect samples. Spray areas damaged by sampling with adhesive or encapsulant to hold down fibers.
Collecting bulk suspect LBP samples	Inhalation of lead in dusts	Use wet methods or adhesive tape as necessary to avoid generating any dusts. Repair areas damaged during sampling immediately.
Using sharp tools	Cuts and punctures	Use extreme care when cutting or chipping samples with sharp instruments. Retract blades into containers, or hold blades and sharp tools away from body when walking.
Working at heights on ladders	Falls from heights, ladders slipping, dropping items	All ladders will be placed at a proper angle equal to 1 length of run for every 4 lengths of rise. Ladders will be tied off before work at heights will be attempted. Only Class I ladders with 300 lb. weight limits will be used. Weight limits on ladders will not be exceeded. Ladder footings will be level and on non-slippery surfaces before climbing. Individuals working under ladders will wear hard hats to protect against dropped objects. Requirements for working at heights listed by WISHA and in Corps of Engineers Safety Manual will be followed.

4.4 Staff Organization, Qualifications, and Responsibilities

Project Managers - Chad Armour/David Chawes

The Project Managers have overall responsibility for the fulfillment of the contract requirements. Duties include management of the technical and administrative project activities. The Project Manager works under the direction of the Health and Safety Officer (HSO) for continued safety and health surveillance. The Project Manager has authority to act on all health and safety measures and to establish new controls as needed.

Health and Safety Officer - David Chawes, Certified Industrial Hygienist (CIH)

Mr. Chawes will be responsible for Health and Safety issues associated with the projects. He is a CIH and has over 10 years of working experience on environmental projects. As the Hart Crowser HSO, Mr. Chawes developed the SSSHP, ensures training of employees, and provides overall management of the health and safety requirements covered in the SSSHP. The HSO is Hart Crowser's representative, with overall responsibility for the preparation, implementation, and enforcement of the SSSHP. The HSO has a broad working knowledge of state and federal occupational safety and health regulations and formal training in occupational safety and health. In addition, the HSO has demonstrable expertise in air monitoring techniques and in the development of respiratory protection programs. The HSO will also serve as the Radiation Safety Officer's representative for this project.

Periodic Inspections by HSO. The HSO shall conduct periodic inspections as necessary to determine the overall effectiveness of the SSSHP. Any deficiencies shall be submitted to the Contracting Officer (CO) in writing and the SSSHP shall be modified accordingly. Should deficiencies at any time be of a nature that presents an immediate danger, the HSO or Site Safety Coordinator (SSC) shall stop all work in the area and initiate changes as required immediately.

Site Safety Coordinator - Brian Christianson

The SSC will be assigned to the site on a full-time basis for the duration of the field work with functional responsibility for implementation and enforcement of the SSSHP. This individual will be responsible for implementing this SSSHP in the field.

4.5 Training

Asbestos and LBP inspectors are required to be in an annual medical surveillance program and to have completed and asbestos and a lead building inspection course. Recertification for asbestos is annual; however, there is no recertification process for lead inspectors.

At least one individual on the site will be first aid/CPR trained. Army representatives present at the same time as the survey team may be included as "on-site" workers.

4.6 Personal Protective Equipment

Sampling personnel will be required to wear the appropriate personal protective equipment. The selection of equipment will be based on the structure walk-through prior to beginning the survey, observing personnel working in the building, and identifying and adhering to all safety signs posted for each area of a building inspected.

Persons collecting bulk samples of materials suspected of containing CS gas, or asbestos, at BNVL may be protected, at the direction of the SSC, by wearing a half-face, air-purifying respirator. All respirators will be equipped with combination organic vapor/HEPA filter cartridges. A higher level of respiratory protection (e.g., full-face respirator) may be chosen at the inspector's discretion. Additional protective equipment, such as a hard hat, Tyvek coveralls, gloves, etc. will be required when sampling in or under the CS Gas Chamber Building.

Employees expected to wear air-purifying respiratory protection must be fit tested for the brand and model respirator they will be wearing during sampling. Fit tests are required to be performed in accordance with the OSHA standard every 6 months.

Levels of Protection

Levels of protection specified by 29 CFR 1910.120, Appendix B, Parts A and B, are not applicable to work on this project. Protective equipment to be worn is described in the following section.

Protective Equipment

Respiratory Protection. It is not anticipated that respiratory protection will be necessary during routine sampling activities, except when CS residue causes irritation, or if damaged asbestos or LBP paint are present. A half-mask respirator with HEPA cartridges will be worn by the inspectors whenever undue risk of exposure to lead or asbestos exists. Such situations could arise if sampling in areas with a large amount of suspect asbestos or lead dust or debris. A full-face respirator with organic vapor/HEPA combination cartridges will be used if irritation is noted while sampling CS-affected materials.

Respirators, if used, shall be NIOSH/MSHA-approved. Cartridges shall be changed whenever breathing resistance increases noticeably. Cartridge changes shall be made only in areas outside the area in which respiratory protection is being used.

All respiratory protection will follow OSHA Safety and Health Standards 29 CFR 1910.134 and the Hart Crowser Respiratory Protection Program, found in the Hart Crowser Health and Safety Manual.

Chemical-Resistant Clothing. In general, protective clothing will not be necessary while conducting routine sampling. However, when sampling CS-affected materials, or sampling for lead or asbestos in areas with large amounts of dust or debris, then regular Tyvek, or equivalent, garments will be used.

Gloves. Work gloves (Scorpio or equivalent) will be worn as necessary to avoid skin contact with sharp objects or rough edges on equipment.

Other Protective Equipment. Safety glasses will be used while sampling LBP, soils, and in the CS Gas Chamber Building. For individuals who require prescription glasses for their work tasks, prescription safety glasses will be made available at no extra cost to the individual.

4.7 Medical Surveillance

Persons working on this project must be current in an annual medical surveillance program.

This program includes a pulmonary function test performed by trained personnel to record Forced Vital Capacity (FCC) and Forced Expiratory Volume in One Second (FEV_1). As directed by the physician, an audiogram and visual acuity measurement, including color perception, and a resting EKG with 12 lead ECG and PA and lateral chest X-ray, is also provided. Furthermore, the physician must certify in writing if a person can or cannot wear a respirator. Hart Crowser personnel routinely get exit medical exams upon completion of employment.

A written medical opinion signed by a physician for each employee on site will be available upon request.

Hart Crowser routinely provides results of the employee's medical exam to that employee. Any employee who develops a work-related time loss illness or injury during the period of the Contract shall be evaluated by the Hart Crowser physician prior to allowing the employee to re-enter the work site.

4.8 Exposure Monitoring/Air Sampling

Individuals using the XRF will wear film badges measuring whole body radiation. They will be analyzed once per quarter by Troxler, Inc., with results reported to David Chawes, CIH, for review.

4.9 Heat/Cold Stress Monitoring

Use of impermeable clothing reduces the cooling ability of the body because of evaporation reduction. This may lead to heat stress. Cold stress, or hypothermia, can result from abnormal cooling of the core body temperature.

Heat Stress

Signs of Heat Stress. "Heat stress" is a term that is used to describe progressively more serious symptoms, as follows:

- An initial rise in skin temperature from increased blood flow to the skin (skin redness);
- Increase in heart rate, to more than 30 beats/minute above the resting level;
- Collapse, or heat exhaustion, due to inadequate blood flow to the brain;
- Dehydration, from excessive sweating;
- Hyperventilation, resulting in a reduction of the normal blood carbon dioxide concentrations;
- Tingling around the lips, dizziness, cramping of muscles of hands and feet, and blackout; and
- "Heat stroke," characterized by unconsciousness, hot dry skin, and absence of sweating.

Control of Heat Stress. On hot, sunny days (high radiant heat load), if using impermeable work clothing, maintain appropriate work-rest cycles (progressively longer rest breaks in a cool location or the shade as temperature and work tasks increase) and drink water or electrolyte-rich fluids (Gatorade or equivalent) to minimize heat stress effects. Impermeable clothing will only be worn when absolutely necessary for control of hazardous chemicals.

Also, when ambient temperatures exceed 70° F, employees will conduct monitoring of their heart (pulse) rates, as follows:

- Each employee will check his or her own pulse rate at the beginning of each break period;
- Take the pulse at the wrist for 6 seconds, and multiply by 10; and
- If the pulse rate exceeds 110 beats per minute, then reduce the length of the next work period by one-third.

Example: After a one-hour work period at 80 degrees, a worker has a pulse rate of 120 beats per minute. The worker must therefore shorten the next work period by one-third, resulting in a work period of 40 minutes until the next break.

Treatment of Heat Stress. Individuals affected by mild forms of heat stress (heat exhaustion, dehydration, or cramping) should take a break in a cool or shaded location, drink liquids, and sit or lay down until feeling better. Shorter work periods should be used until temperature cools off.

Individuals affected by heat stroke are in critical condition. Summon emergency aid immediately, remove clothing, and bathe individual in cool water continually to bring down body temperature.

Hypothermia

Hypothermia can result from abnormal cooling of the core body temperature. It is caused by exposure to a cold environment, and wind-chill as well as wetness or water immersion can play a significant role. The following discusses signs and symptoms as well as treatment for hypothermia.

Signs of Hypothermia. Typical warning signs of hypothermia include fatigue, weakness, incoordination, apathy, and drowsiness. A confused state is a key symptom of hypothermia. Shivering and pallor are usually absent, and the face may appear puffy and pink. Body temperatures below 90° F require immediate treatment to restore temperature to normal.

Treatment of Hypothermia. Current medical practice recommends slow rewarming as treatment for hypothermia, followed by professional medical care. This can be accomplished by moving the person into a sheltered area and wrapping with blankets in a warm room. In emergency situations where body temperature falls below 90° F and heated shelter is not available, use a sleeping bag, blankets and/or body heat from another individual to help restore normal body temperature.

4.10 Standard Operating Safety Procedures

Equipment

Portable XRF Device. All employees who may operate portable XRF equipment will be trained by a trainer approved by the manufacturer prior to its use.

The Niton XL and LISA were designed to be safe. The Cd^{109} source inside the Niton emits low energy gamma radiation. The location of the source and the direction of its beam are both clearly marked on the case of the machine.

There is no measurable radiation from an XRF when its shutter is closed. The maximum dosage to which you are exposed when properly operating the XRF is 0.1 mR/hr on the fingers of the hand holding the XRF with the shutter open. The dosage you would receive on the fingers **while holding the shutter open** for 8 hours a day, 200 days a year is 160 mrem.

The operator's hand and any other body part should be kept as far away as practicable from the beam.

Never point the XRF at someone or yourself.

XRF equipment will be blocked and braced in vehicle so that it cannot move around inside vehicle. Carry permit for use of radioactive source in Niton case at all times.

Motor Vehicle Operation (General). All employees who may operate motor vehicle equipment at or during transportation to the job site must hold a valid driver's license. Seat belts must be worn at all times when the vehicle is in motion. Vehicles must be operated in compliance with applicable state and federal laws as well as the provisions of WAC 296-155-600 through 296-155-630. Vehicles shall also be inspected in a regularly scheduled maintenance program.

Hand and Power Tools. Hand tools would include chisels, knives, and other devices used to collect building material samples. Care will be taken to avoid injury from routine use of tools.

Electrical Hazards

Electrical Circuits. No samples of electrical cords will be taken. Care will be maintained to avoid damage to existing building electrical circuits during all sampling activities.

Lockout/Tagout Procedures. It is not anticipated that work procedures requiring lockout/tagout will be performed during this project by Hart Crowser personnel, as no confined spaces with energized parts or equipment will be entered.

Working around Power Lines. If sampling on roofs, care will be taken to avoid power lines to buildings.

Working at Heights/Fall Protection

Sampling on ceilings or roofs will generally be from ladders. Care will be taken to use ladders properly, using the following guidelines:

Ladders will be set up so that a ratio of 1:4 (distance from base of building to height of ladder against building) is maintained at all times. An individual will remain on the ground to steady the ladder while another individual is climbing or descending. Items will not be passed up or down from ladders. No items will be intentionally dropped from ladders.

Individuals sampling on roofs will wear slip-resistant shoes or boots, and will not take any risks in collecting samples.

Trenching and Excavation

No excavation or trenching will be conducted for this project.

Fuels, Cleaning Solutions, and Chemical Handling

On-site fuels or chemicals have been reported to be stored in an appropriate manner. Work around areas that may have been affected by historical fuel and/or chemical spills is not anticipated for this project. Cleaning solutions will be limited to amended water for cleaning asbestos-sampling tools, or deionized water for cleaning LBP sampling tools.

Hot Work

No hot work on site is anticipated for this project, as no welding, cutting, or burning is planned.

Slip and Fall Prevention

Suitable slip-resistant boots will be worn whenever conditions dictate. Site conditions are such that tripping over debris presents a real risk.

Compressed Gases

No compressed gases are anticipated for this project.

Confined Space Entry

No confined space entry is anticipated for this project. If any confined spaces are found that do require entry, this SSSHP would require modification.

Housekeeping and Maintenance

Housekeeping

- Responsibility for good housekeeping rests with each employee and shall be enforced by the SSC.
- Keep all work areas clear (including all inside and outside areas).
- Clean up all liquid spills immediately to prevent slipping, or other hazards.
- Clean up the area after each job. Remove tools and surplus material, to their proper places. No job is complete until this has been done.

Maintenance. No maintenance of equipment will be performed for this project.

Drum Handling. No drums will be moved, handled, or sampled in this project.

Guarding of Machinery and Equipment. No machinery will be used for this project.

Illumination. All exterior work will be conducted during daylight hours only. Interior spaces will not have electrical power and illumination. If necessary, flashlights will be used to illuminate dark areas for better visibility.

Sanitation. On-site sanitary facilities will be used.

Engineering Controls. Spraying a fine mist of deionized water on dry surfaces will be used to control dust release.

Hazard Communication. It is not anticipated that any chemicals requiring special hazard communication training will be brought on site during this project.

Process Safety Management. There are no industrial processes to be sampled during this project, so this item is not relevant to this project.

Signs and Labels. Labeling of all samples is discussed in the work plan sections of this document. Warning signs will not be necessary for this project, as it consists of short-term sampling as discrete locations for very brief periods.

4.11 Site Control Measures

No hazardous waste operations are anticipated to require sampling for this project, so site control requirements are not needed.

4.12 Personnel Hygiene and Decontamination

Respirators

All respirators, if used, shall be provided and maintained by the individual employer (Hart Crowser and subcontractors) for their own employees and shall be cleaned per WISHA requirements and inspected daily (if used) by the individual user.

Disposable Materials

All disposable clothing, gloves, expendable protective wear, used respirator cartridges, and other disposable material generated during site activities shall be placed in suitable plastic bags and disposed of at the appropriate on-site waste disposal receptacle. If protective equipment is significantly contaminated with asbestos, it will be bagged into special yellow Asbestos Waste bags.

Personal Hygiene

All site workers will thoroughly wash hands and face before eating, drinking, or performing other actions with a hand-to-mouth component.

Minimization of Contamination

Do not kneel on contaminated ground, stir up unnecessary dust, or perform any practice that increases the probability of hand-to-mouth transfer of contaminated materials. Use plastic drop cloths and equipment covers where appropriate. Eating, drinking, chewing gum, smoking or using smokeless tobacco are forbidden while collecting samples. Coordination with other site workers will be accomplished, as necessary, to avoid cross-contamination.

4.13 Equipment Decontamination

Decontamination of equipment used in sampling is discussed in the ***Decontamination of Sampling Equipment*** sections above.

4.14 Emergency Equipment and First Aid Requirements

This section covers the emergency equipment to be utilized in the performance of the work.

Emergency Equipment

The following emergency equipment must be available on site at all times:

- First aid kit complying with 29 CFR 1926.50(d)(1);
- A 10:ABC fire extinguisher;
- Spill Control materials; and
- A portable emergency eyewash bottle.

First Aid and CPR

An individual who is first aid/CPR trained shall be on site at all times when active work for this project is being conducted.

4.15 Emergency Response Plan

The Hart Crowser Emergency Response Plan (ERP) outlines the steps necessary for appropriate response to emergency situations. This ERP addresses the following:

- Pre-Emergency Planning;
- Personnel Roles;
- Emergency Contacts;

- Emergency Recognition and Prevention;
- Site Characteristics;
- Site Evacuation;
- Medical Emergencies;
- Route to Hospital;
- Community Alert; and
- Critique of Emergency Response.

Pre-Emergency Planning

Although emergencies are unanticipated for the nature of work to be conducted for this project, field personnel shall always exercise caution and look for signs of potentially hazardous situations that could impact them or the project, including:

- Visible or odorous chemical contaminants;
- Live electrical wires or equipment;
- Underground pipelines or cables; and
- Poisonous plants or dangerous animals.

The ERP shall be reviewed, as necessary, during project-specific training.

Personnel Roles

The SSC shall act as the lead individual in the event of an emergency situation and evaluate the situation. He/she will determine the need to implement the emergency procedures, in concert with other resource personnel including client representatives, the Project Manager, and the HSO. Other on-site field personnel will assist the SSC, as required, during the emergency.

In the event that the ERP is implemented, the SSC or designee is responsible for alerting all personnel at the affected area by use of visual or verbal instructions, as appropriate. Cease all work immediately. Offer whatever assistance is required, but do not enter work areas without proper protective equipment. Workers not needed for immediate assistance will leave the work area, pending approval by the SSC for re-start of work.

Emergency Contacts

Site personnel must notify Jerry Cummings in the event of ERP implementation. Table 4-1 will be readily available in each project vehicle's glove compartment. Refer to Table 4-1 for the following information:

- Emergency Contacts and Telephone Numbers; and
- Nearest Hospital.

Emergency Recognition and Prevention

Fires. Hart Crowser personnel will attempt to control only very small fires. If an explosion appears likely, evacuate the area immediately. If a fire occurs which cannot be controlled with the 10-pound ABC fire extinguisher located in the field equipment, then immediate intervention by the Camp Bonneville Fire Department is necessary. Use these steps:

- Evacuate the area to a previously agreed upon, upwind location;
- Contact Jerry Cummings; and
- Inform Project Manager of the situation, as soon as practicable.

Uncontrolled Contaminant Release. In the unlikely event of a tank rupture or other material spill, attempt to stop and contain the flow of material using absorbents, booms, dirt, or other appropriate material. Prevent migration of liquids into streams or other bodies of water by building trenches, dikes, etc. Drum recovered material for proper disposal, or contact a spill removal firm for material cleanup and disposal, as required. Observe all fire and explosion precautions while dealing with spills.

Potentially High Chemical Exposure Situations. In some emergency situations, workers may encounter localized work areas where exposure to previously unidentified chemicals could occur. A similar hazard includes the situation where chemicals are unexpectedly present above permissible exposure levels and/or above the levels suitable for the personnel protective equipment at hand on site. If these situations occur, immediately stop work and evacuate the work area. Do not reenter the area until appropriate help is available and/or appropriate personnel protective equipment is obtained and donned. Do not attempt to rescue a downed worker from such areas without employing appropriate rescue procedures. Professional emergency response assistance (fire department, HAZMAT team, etc.) may be necessary to deal with this type of situation.

Site Characteristics

Prevailing weather conditions are rainy and cool during the fall and winter, mild during the spring, and warm during the summer.

Site Evacuation

In the unlikely event of an unforeseen release of a hazardous chemical, evacuate the sampling area to an upwind location. Be sure to remove the Niton XRF device during evacuation. Since all individuals sampling will be within shouting distance, no special alarm system is anticipated as necessary. Contact appropriate emergency authorities. No other situation calling for site evacuation is reasonably anticipated.

Medical Emergencies

Contact the emergency responders if a life-threatening medical emergency occurs. If any worker leaves the site to seek medical attention, another worker must accompany the patient to the hospital. When in doubt about the severity of an accident or exposure, always seek medical attention as a conservative approach. Notify the Project Manager of the outcome of the medical evaluation as soon as possible. For minor cuts and bruises, an on-site first aid kit will be available.

- If a worker is seriously injured or becomes ill or unconscious, immediately request assistance from the local emergency response agency (911). Do not attempt to assist an unconscious worker in an untested or known dangerous area without following appropriate rescue procedures.

- In the event that a seriously injured person is also heavily contaminated, use clean plastic sheeting to prevent contamination of the inside of the emergency vehicle. Less severely injured individuals may also have their protective clothing carefully removed or cut off before transport to the hospital.

If appropriate equipment or resources are not available on site, emergency removal will require professional assistance (fire department, rescue squad, etc.).

Route to Hospital

The nearest hospital is depicted on Figure 4-1 on page 4-3.

Community Alert Procedures

It is not anticipated that any Hart Crowser site emergency would require the need to notify the local community, beyond that of calling the police or fire department. All accidents and unusual events shall be dealt with in a manner which minimizes continued health risk to site workers and the general public.

Critique of Emergency Response

The SSC will notify the Project Manager as soon as possible after the emergency situation has been stabilized. The Project Manager will notify the HSO, appropriate client contacts, and regulatory agencies, if applicable. If any individual is injured in conjunction with this project, the SSC will file a detailed Accident Report with the HSO within 24 hours. The Contracting Officer's Representative (COR) will receive a copy of the Report from the HSO.

The Project Manager, SSC, and the HSO will critique the emergency response action following the event. The results of the critique will be used in follow-up training exercises to improve the ERP.

4.16 Logs, Reports, and Recordkeeping

Site-specific health and safety records to be retained for this project include:

- Training records;
- Medical surveillance records;
- Daily safety inspection records;
- Results of film badge dosimetry;
- Accidents, incidents, or unexpected events; and
- Other records as appropriate (see ER 385-1-92 Appendix B, Section 17b.)

These site safety records will be retained for 30 years.

bnvl2.fr

APPENDIX A
INSTRUCTIONS FOR OPERATION OF NITON XL XRF

APPENDIX A
INSTRUCTIONS FOR OPERATION OF NITON XL XRF

Equipment Operation for Lead-in-Paint Analysis

IMPORTANT: The following instructions must be followed exactly—changing the order of procedures may result in problems.

1. Be sure Niton batteries are fully charged (charge overnight or in van on way to site).

2. Remove lock from Niton case and store lock inside case. With Niton off, insert light pen into device (red dot UP).

3. On building/structure floor plan diagram, write building/structure number and mark drawing (all sheets) in all caps as "LEAD." Establish location of main entry, and mark sides A-B-C-D for exterior walls and all room/areas. Be sure to indicate with an arrow the entry point of each room/area with more than one entry. Name all rooms/areas.

4. Turn on Niton XL. Be sure that previous data have been downloaded successfully. If not sure DO NOT ERASE and SKIP THE REST OF THIS STEP (The Niton XL can hold up to 500 measurements). Scroll arrow to "Zero Memory". Press Enter and then Scroll to ERASE ALL READINGS. Press Enter. When erasure is complete, press ENTER to exit.

5. Scroll arrow to SET TIME. Press enter and verify that date and time are correct. If not correct, reset as necessary.

6. Go to location where first building/structure measurement will be taken (calibration must be done at same temperature as subsequent measurements). With arrow on CALIBRATE AND TEST, press Enter. When calibration is done (approx 2 minutes), machine will beep. Press Enter twice.

7. Record screen info on upper portion of Niton Spectrum Analyzer Calibration form (Figure A-2). Use appropriate code from Table A-1 for Inspector Number.

8. Unlock Niton XL device and place instrument lock inside case.

9. Take out Lead Paint Standards card and place on closed surface of Niton XL case.

10. Attach the Niton XL wrist strap to the wrist of the hand which will most likely be holding the Niton XL against the walls (probably your right

hand).

11. Place the cord from the light pen around your neck, so that the pen hangs on the side that will most likely use the pen (most likely left hand). If possible, place light pen in shirt pocket. **BE ESPECIALLY CAREFUL NOT TO DROP OR BANG THE INSTRUMENT OR LIGHT PEN. SEVERE DAMAGE MAY RESULT.**

12. Get out Niton XL bar code cards.

13. **CHECK FOR ENTRY OF PROPER INFORMATION BEFORE EVERY MEASUREMENT. YOU CAN NEVER CHANGE THE INFORMATION IN THE Niton XL AFTER THE MEASUREMENT HAS BEGUN.**

14. With light pen, scan the following items on the card:

    - *Inspector:* Your pre-assigned inspector number, the same as that entered on Calibration form.
    - *Site:* The Sub-Building Code number (Table A-2, possible values are 1 through 9).
    - *Floor:* 111 [this is the special code for "calibration"]
    - *Side:* "Delete"
    - *Room:* "Calibrate", then scan in 4-digit building number.

15. Using red paint standard (1.0 +- 0.1 mg/m^2), make measurement of the standard. Record **Niton XL measurement number,** L-value, and Depth Index on Calibration form on appropriate line under "Surface" (Figure A-2).

16. Turn paint standard card over, and make reading of same standard from rear. Record L-value and Depth Index on appropriate line under "Buried" (Figure A-2).

17. Compare established values against your readings. If any discrepancy, call Hart Crowser Project Manager.

18. Prepare to make first actual building measurement. Enter "Room" followed by 4-digit building/structure number. Do not enter sub-building letter here.

19. Enter "Floor", followed by proper 3-digit "room" code (Table A-3).

20. Enter Wall, Component, Substrate and Condition of the painted surface (Tables A-4 through A-8, respectively).

21. Make measurement of painted surface. Stop when reading is conclusive, or when continued measurement does not seem to change an inconclusive reading. Measurements are considered conclusive when the spectrum gives the characteristic appearance of lead in paint, and when:

- L < 0.8 after at least 5 seconds (use precision [±] to determine if outside inconclusive range); or
- L > 1.2 after at least 5 seconds (use precision [±] to determine if outside inconclusive range); or
- K (Lo) > 1.0 after 30 seconds.

21. If the measurement appears to be inconclusive, and lead is deeply buried (Depth Index > 4), try to find an area on the same component where perhaps less paint has been applied and try again. If there is no such area, or if measurement is still inconclusive, carefully remove surface paint and measure the "buried" layers.

If measurement is still inconclusive, remove all paint as a chip and check back surface of lowest layer on the chip. Enter a "1" into the Note field of the Niton XL before making such a measurement. After measurement, remember to delete the "1" in the Note field (scan "Note", followed by "Delete").

Confirm that you have removed all lead from the bare surface. Enter a "2" into the Note field of the Niton XL before making that measurement. After measurement, remember to delete the "2" in the Note field (Scan "Note", followed by "Delete").

If you are collecting a paint chip sample for lab AAS analysis, remove the entire chip as a single piece using adhesive tape, and label the sample as Sample # [Bldg#][SubBuilding]-[Reading Number]-Q. For example, if you collect a chip from the location of reading number 97 in Building 999, then the sample is numbered "999-97Q." Make an entry (i.e., "QC sample taken") in the Action column of the Niton XL Problem Log.

22. If you make an error (wrong information entered, incomplete measurement, etc.) record the Niton XL reading number, "floor" code, problem description, and action to be taken on the Niton XL Problem Log (Figure A-1). Typically, the action to be taken will be "Delete," as it is quicker to make a new measurement with the correct information than to change the database later. However, if you realize you have made an error after a large number of measurements have already been

made, (i.e., wrong side, etc.) the action may be to "Change Side A to Side B." All such data changes must be made after the data has been downloaded from the Niton XL to a PC.

23. Every time the Niton XL is turned on or off, and every time the temperature changes by more than 15° F., the Niton XL must be recalibrated. In any event, recalibrate after lunch. Don't worry about when to recalibrate because of temperature changes, as the instrument will automatically let you know. Follow exactly the instructions 6 through 17 every time you recalibrate. Record multiple calibration data for the same building on the same form for each day in the field (i.e., one form per building per day).

24. If a room or area can not be entered to survey for LBP, record on the Niton Problem Log the room number or area number, and the reason why entry could not be obtained.

Entry of LBP Survey Information into the Niton XL

Building Number

Enter 4-digit building number into the Niton XL "Room" field, as 0999.

Subbuilding

Enter 1-character code for subbuilding into the Niton XL "Site" field, using the Niton "Site" codes as listed in Table A-1.

Table A-1 - Subbuilding Codes

Niton "Site"	Subbuilding
1	A
2	B
3	C
4	D
5	E
6	F
7	G
8	H
9	X [or no subbuilding]

Inspector Identification

Enter a 1-digit code "Niton Inspector Code" into the Niton XL Inspector field, corresponding to the inspectors name in Table A-2.

Table A-2 - Inspector Codes

Niton "Inspector" Code	Inspector Code	Name
1	HCAIDEC	David E. Chawes
2	HCAICDA	Chad D. Armour
3	HCAIWHD	William H. Damon
4	HCAICWW	Carl W. Wolfe
5	HCAIBEC	Brian E. Christianson
6	HCAILAH	Lisa A. Hammerle
7	HCAIHSS	Holly S. Sawin
8	HCAIAGF	Anne G. Fitzpatrick
9	HCAISC	Stacy Callison

Room

The room is designated by a two subfields in the Niton: Room Type and Room Number. Enter Room information as follows:

- **Room Type:** Enter room type (using appropriate code in Table A-3 below) into the first 2 digits of the Niton XL "Floor" field.

- **Room Number:** This number denotes multiple designations of same room, e.g., Bedroom-1, Bedroom-2. Enter room number into the third digit of the Niton XL "Floor" field. The default Room Number is always 1.

Example: If two offices are present, enter 601 into the "floor" field on the Niton XL for Office-1, and 602 for Office-2.

Table A-3 - Room Descriptions List Sheet 1 of 2

Room Code **Description**

00	Not Specified
01	Hallway
02	Living
03	Kitchen
04	Bedroom
05	Bathroom
06	Dining
07	Stairway
08	Pantry
09	Laundry
10	Basement
11	Calibrate
12	Lobby
13	Conference
14	Maintenance
15	Mechanical
16	Storage
17	Classroom
18	Locker
19	Exercise
20	Shower
21	Vestibule
22	Laboratory

Table A-3 - Room Descriptions List

Room Code	Description
23	Maintenance Bay
24	Closet
25	Shed
26	Porch
27	Elevator
28	Garage/Carport
29	Exterior
30	Playground
31	Attic
32	Deck
33	Boiler
34	Library
35	Coat
36	Vest
37	Electrical
38	Office (11-19)
39	Safe (vault)
40	Store
41	Game
42	Freezer
43	Barber Shop
44	Surgical
45	Landing
46	Balcony
47	Cafeteria
48	Dressing Room
49	Patio
50	Furnace Room
51	Cell
52	Overhead Cover
53	Entry/Foyer
54	Utility
55	Linen Closet
57	Studio
58	Workshop
59	Solarium
60	Office (1-9)
61	Office (10-19)
62	Office (20-29)
63	Office (30-39)
64	Loading Dock
65	Tank
66	Ramp
67	Mail Room

Wall Codes

Using the Niton "Side" Codes in Table A-4, enter a letter into the Niton XL "Side" field, from the perspective of someone entering the room from its main entry point and looking into the room from that doorway. Be sure to mark the entry point you are using on the floor plan with an arrow, if any ambiguity is possible.

Table A-4 - Wall Codes

Niton Code	Wall Identification
[Blank]	Not Specified
A	Wall Behind (Wall 1)
B	Wall /Left (Wall 2)
C	Wall Ahead (Wall 3)
D	Wall Right (Wall 4)

Component Codes

Use a combination of the Niton XL Structure and Feature fields, as indicated in Tables A-5 and A-6, to designate the Component being measured.

Table A-5 - Component by 2-Digit Code Sheet 1 of 4

Component	Description
00	Not Specified
01	Door
02	Door Jamb
03	Door Molding
04	Wall
05	Baseboard
06	Window Jamb
07	Window Sill
08	Window Molding
09	Window Mullion
10	Closet Shelf
11	Closet Shelf Support
12	Cabinet Door,outside

Table A-5 - Component by 2-Digit Code (Continued)

Component	Description
13	Stair Tread
14	Stair Riser
15	Stair Stringer
16	Stair Baluster
17	Stair Handrail
18	Radiator
19	Pipe
20	Beam
21	Shelf
22	Stall
23	Counter
24	Clothes Hanger Pole
25	Electrical Box
26	HVAC
27	Conduit
28	Column
29	Boiler
30	Tank
31	Locker
32	Pool
33	Cage
34	Floor
35	Ceiling
36	Eave
37	Facia
38	Rain Gutter
39	Siding
40	Trim, Upper (ext)
41	Trim, Lower (ext)
42	Corner Board
43	Soffit
44	Lattice
45	Joist
46	Electrical Fixture
47	Kickboard
48	Foundation
49	Crown Molding
50	Sliding Door Track
51	Chair Railing
52	A.C. Unit
53	Stair Newel Post
54	Fireplace Molding
55	Fireplace Mantel

Table A-5 - Component by 2-Digit Code (Continued) Sheet 3 of 4

56	L-Brace
57	Board
58	Ladder
59	Rafter
60	Skirting
61	Exhaust Hood
62	Elevator
63	Chimney
64	Flashing
65	Support Stringer
66	Roof Decking
67	Escape Platform
68	Window Guard
69	Roof
70	Shelf, Cabinet
71	Door Header
72	Door Plinth
73	Door Threshold
74	Downspout
75	Fence
76	Porch Baluster
77	Porch or Patio Floor
78	Porch Rail, lower
79	Porch Rail, cap
80	Porch Trim
81	Stair Rail Cap
82	Trim, Upper (int)
83	Window Apron
84	Window Header
85	Window Sash (ext)
86	Window Sash (int)
87	Window Stool
88	Bookcase
89	Dripboard
90	Ceiling Tile (glue-on)
91	Ceiling Tile (drop)
92	Ceiling Grid (drop)
93	Diffuser (ceiling/wall)
94	Furnace
95	Light Fixture
96	Register (Floor)

Table A-5 - Component by 2-Digit Code (Continued) Sheet 4 of 4

97	Register (Wall)
98	Water Heater
99	Window Parting Bead
AA	Bulkhead
AB	Loading Dock Bumper
AC	Paint On Glass
AD	Ceiling Beam

Table A-6 - Components by Niton Code Sheet 1 of 5

Niton "Structure" (and Structure #)	Niton "Feature"	Feat #	Compo-nent Code	Component Description
Unlisted-0	[any]		52	Air Conditioner Unit
Wall	Baseboard		05	Baseboard
			20	Beam [see Ceiling Beam or Support Beam]
			29	Boiler
Cabinet	Door	Out	12	Cabinet Door (outside). Note in Comments if it is "Medicine Cabinet."
Wall	Ceiling		35	Ceiling
Wall	Ceiling		35	Ceiling Beam. Note in Comments that it is "Ceiling Beam"
Wall	Chair Rail		51	Chair Railing
Unlisted-1	[any]		63	Chimney
Closet	Wall		11	Closet Shelf Support
			10	Closet Shelf [see Shelf]
Unlisted-6	[any]		24	Clothes Hanger Pole (i.e., in closet)
Porch	Columns		28	Column
			27	Conduit
Ext Wall	Corner brd		42	Corner Board
Cabinet	Outside		23	Counter
Door	Door		01	Door
Door	Crown Mold		49	Door Crown Molding
Door	Header		71	Door Header
Door	Jamb		02	Door Jamb
Door	Casing		03	Door Molding

Table A-6 - Components by Niton Code Sheet 2 of 5

Niton "Structure" (and Structure #)	**Niton "Feature"**	**Feat #**	**Compo-nent Code**	**Component Description**
Door	Plinth		72	Door Plinth
Door	Threshold		73	Door Threshold
Unlisted-9	[any]		74	Downspout
Ext Wall	Trim	Upr	36	Eave
			25	Electrical Box
			46	Electrical Fixture
			62	Elevator
			67	Escape Platform
			61	Exhaust Hood [see HVAC Duct and Equipment]
			37	Facia
Grounds	Fence		75	Fence
Fireplace	Mantle		55	Fireplace Mantel
Fireplace	Trim		54	Fireplace Molding
			64	Flashing
Wall	Floor		34	Floor
Ext Wall	Foundation		48	Foundation
Porch	Trim	Upr	80	Gutter Board (on porch). Note in Comments that it is "Gutter board on porch."
Ext Wall	Trim	Upr	40	Gutter Board (other than on porch). Note in Comments that it is "Gutter board on________[fill in: main structure, garage, etc...]."

Table A-6 - Components by Niton Code Sheet 3 of 5

Niton "Structure" (and Structure #)	Niton "Feature"	Feat #	Compo-nent Code	Component Description
Unlisted-7	[any]		26	HVAC Duct or Equipment
Porch	Joist		45	Joist
			47	Kickboard [see Baseboard]
			58	Ladder
Unlisted-4	[any]		44	Lattice
			31	Locker [see Cabinet]
Unlisted	[Blank]		00	Not Specified [record component on Problem Log]
Wall	Wall		04	Partition. Note in Comments that it is "Partition."
Unlisted-5	[any]		19	Pipe
			24	Poles [see Clothes Hanger Pole]
			32	Pool
Porch	Baluster		76	Porch Baluster
Porch	Floor		77	Porch or Patio Floor
Porch	Rail	Lwr	78	Porch Rail (lower rail)
Porch	Rail cap		79	Porch Rail Cap
Porch	Trim	Upr	80	Porch Trim
Unlisted-8	[any]		18	Radiator
			59	Rafter
			38	Rain Gutter [see Downspout]
Porch	Ceiling		69	Roof
			66	Roof Decking
Cabinet	Shelf		70	Shelf, Cabinet

Table A-6 - Components by Niton Code Sheet 4 of 5

Niton "Structure" (and Structure #)	Niton "Feature"	Feat #	Compo-nent Code	Component Description
Closet	Shelf		21	Shelf, other than in cabinet. Note in Comments if it is "Shelf built up from floor".
Ext Wall	Siding		39	Siding
Ext Wall	Skirt		60	Skirting
			50	Sliding Door Track
			43	Soffit
Stairway	Baluster		16	Stair Baluster
Stairs	Handrail		17	Stair Handrail
Stairs	Newel Post		53	Stair Newel Post
Stairs	Rail cap		81	Stair Rail Cap
Stairs	Riser		14	Stair Riser
Stairs	Stringer		15	Stair Stringer
Stairs	Tread		13	Stair Tread
Wall	Ceiling		35	Support beam. Note in Comments that it is "Support Beam"
			30	Tank
Ext Wall	Trim	Lwr	41	Trim, Lower (exterior)
Ext Wall	Trim	Upr	40	Trim, Upper (exterior)
Unlisted-2	[any]		82	Trim, Upper (interior wall)
Wall	Wall	Upr	04	Wall
Window	Apron		83	Window Apron
			68	Window Guard

Table A-6 - Components by Niton Code Sheet 5 of 5

Niton "Structure" (and Structure #)	Niton "Feature"	Feat #	Compo-nent Code	Component Description
Window	Header		84	Window Header
Window	Stops		06	Window Jamb
Window	Casing		08	Window Molding
Window	Part.Bead		09	Window Mullion
Window	Sash	Ext	85	Window Sash (exterior)
Window	Sash	Upr or Lwr	86	Window Sash (interior)
Window	Sill	Ext	07	Window Sill
Window	Stool		87	Window Stool

Substrate Code

Enter the appropriate Substrate from Table A-7 into the Niton XL Substrate field.

Table A-7 - Substrate Codes

Niton "Substrate"	Substrate Code	Substrate
[blank]	6	Other/Unknown
Wood	1	Wood
Metal	3	Metal/Steel
Plaster	5	Plaster
Drywall	4	Wallboard
Concrete	2	Masonry

Condition Code

Enter data into the Niton Condition field corresponding to the paint condition listed in Table A-8.

Table A-8 - LBP Condition Assessment

Niton "Condition"	Condition Code	Rating	Description
Solid	1	Good	The painted surface is intact. There is no peeling, flaking, cracking, chipping, discoloration, buckling. The substrate is in good condition.
Peeling	2	Satisfactory	The painted surface is intact; however, it is worn with minor chips from wear and tear with no adhesion or substrate problems. However, extremely minor damage in isolated areas does exist.
Cracked	3	Poor	The painted surface has isolated areas of peeling, flaking, cracking, or buckling paint. The substrate is in generally good condition.
Comply	4	Unsatisfactory	The painted surface is deteriorating with large areas peeling, flaking, cracking, or buckling. The substrate may also be deteriorating.
Comply	5	Stained/ Varnished	The surface is stained or varnished.

HART CROWSER INC.
NITON XL PROBLEM LOG

Date: ________________

Building: __________________ SubBuilding: _______________

Inspector Name: ______________________________________

Niton Reading #	"Floor"	Problem Description	Action to Be Taken

List rooms not surveyed, and reason why.

HART CROWSER INC.
NITON XL SPECTRUM ANALYZER CALIBRATION

Use a new form for every building. Record the following after every calibration:

Building Number:	Subbuilding:			
Date:	Operator Name:			
Niton XL Serial No.: XL309-U390NS106	Operator No.:			
Days since last cal:				
Hours Used:				
Resolution **(1)**:				
Source Date:				
Reading Speed:				

STANDARD SAMPLE CHECK
Use Red Paint Standard (1.0 ± 0.1 mg/cm^2)

Check No.	Niton Measure-ment Number[5]	Time	Standard Sample (Surface)		Standard Sample (Buried)	
			Value [2]	Depth Index [3]	Value [2]	Depth Index [4]
1						
2						
3						
4						
Final[6]						

Notes:
[1] **Value should be less than 1,200 eV. If greater, DO NOT USE the machine and alert the Hart Crowser Project Manager.**
[2] Value should be between 0.9 and 1.1 mg/cm^2. If outside this range, alert Hart Crowser Project Manager.
[3] Depth Index should be about 1. If not, contact Hart Crowser Project Manager.
[4] Depth Index should be between 2.1 to 2.3. If not, contact Hart Crowser Project Manager.
[5] Record internal XRF reading number.
[6] Record internal XRF reading number of final measurement taken in unit that day.

Direct Analysis of In-Place Soil with the LISA

Before you take your first measurement, you must decide whether to test the soil in-place, as bagged samples, or in XRF cups after careful preparation. The preparation, which consists of drying, milling, and sieving, yields far more accuracy. The drier, finer, and more homogenous the particles, the higher the accuracy.

If you are primarily interested in determining whether lead is present (rather than in accurately measuring how much is present), direct measurement is the quickest, simplest way to proceed. Even if you will take samples, direct measurement will help you to survey the site. The analysis of bagged samples is another screening technique that may be more convenient than direct analysis.

Warning: When taking samples from sites where toxic chemicals may be present, use gloves and respiration equipment for your own protection.

1. Select a measurement site. Lead from paint will be concentrated within a few feet of the painted structure. Valid results depend on a sufficient and appropriate selection of sites to sample. Sampling design is a study in itself and beyond the scope of this manual.

2. Clear surface debris and vegetation. You need a flat area so the XL will be contacting the soil. The finer and more homogenous the soil, the more accurate the measurement. Two other ways to raise accuracy: loosen the soil, let it dry in the sun.

3. Place the XL test guard on ground. Keep the top of the XL test guard clean.

4. Hold the XL in one hand along the rubber gripping bands. There is virtually no radiation above background when the XL is on, even on the hand holding the XL.

Warning: Although the exposure there is only 1 mR per hour, a tiny fraction of OSHA's permissible average annual radiation dosage standard on the hand, always treat radiation with respect.

Do not put the other hand along the top plate of the XL while measuring. You don't need it there where it would be exposed to some radiation. Do not attempt to defeat the safety purpose of the springloaded plunger. The procedure set forth in this section gives you positive simultaneous control over radiation exposure and test time.

5. Push the safety slide (that locks the shutter release) out from under the

shutter release. If the slide is still tucked in, you cannot press in the release nor will the XL fit on the XL test guard correctly.

6. Place the XL on the test guard so that the rectangular opening on the test guard is under the window of the XL, squeeze the shutter release, and firmly press the XL flat against the surface of the test guard. If you don't squeeze the shutter release, the plunger will not depress. If the plunger is not fully depressed, the window is not fully open and the XL cannot measure accurately. The back of the unit (specifically, the window opening) must be flush with the XL test guard and soil to get an accurate reading.

Note: During the measurement, you do not need to squeeze the shutter release continuously. Hold the XL firmly against the test guard surface and it will continue to read. Once you lift the XL, the plunger goes back out the bottom, the shutter closes, and the test is over.

7. Listen for the XL's beep (and watch for indications of lead on the screen) as you decide when the test has reached the desired level of accuracy. A typical screening test would last 20 source seconds.

Note: The light on the LCD stays on for 15 seconds from the start of each measurement. To get another 15 seconds of light at any time, press any one of the three buttons just above the screen. (Pressing the Clear/Enter button will turn on the light and reset the average.)

8. After the desired interval, lift the XL from the XL test guard to end the test. The shutter automatically closes. The plunger should clear the surface and be fully extended. Pick up the XL test guard and, if necessary, clean it. Check the mylar film window of the guard; if it is damaged, replace the window.

Warning: In the unlikely event that the plunger gets stuck in that open position, simply push it closed. Then call NITON.

Take 50-100 gram sample. The XL only requires a few grams, but, by taking 50 or 100 grams, you assure that you have a sample large enough to be representative and unbiased after mixing, grinding, and straining it.

1. Before sampling a site, evaluate it for differences in soil characteristics. Valid results depend on a sufficient and appropriate selection of sites to sample. Sampling design is a study in itself and beyond the scope of this manual. Soil test results are worthless, may even be misleading, unless the samples tested actually represent the area.

   Consider its topography, texture, drainage, color of topsoil, and past use. Lead is usually concentrated near a building with lead paint (within 4 to 6 feet).

2. If the individual samplings are taken with a spade or trowel, reduce them

by taking a vertical slice (so it is representative of the entire spadeful) about one inch wide.

Place the reduced samples in a clean pail. Then mix the soil thoroughly by hand and by rotating the pail at an angle of 45 degrees. Don't shake it (You do not want to stratify the sample by weight).

3. Take a composite sample from each predetermined area. Do not combine sample from areas with different compositions or history. A composite sample made up of samplings from two distinctly different areas is not representative of either area.

   From each predetermined soil area, prepare a composite sample by taking several samplings consisting of vertical columns of soil approximately 1 inch in diameter.

   The length of each column should be about 6 inches. Lead is usually concentrated within the top 1 to 4 inches

   Package samples from unusual areas separately: those close to painted structures, close to roads, where various types of waste have been stored, or near pressure-treated lumber.

4. Fill a clean plastic bag with the soil and close it securely (with a twist tie). Be sure to label it with the site and location where you took the sample and your name.

Analysis of Prepared Soil Samples

Preparing the Sample

The equipment you need to prepare soil samples is included in your kit. Among these are a mortar and pestle, an electrically powered grinding mill, and several accurately sized sieves.

Each piece of equipment must be kept clean. Otherwise, your samples will be contaminated and your tests will be meaningless.

The mortar, pestle, and mill can be cleaned with dry paper towels. Water will also clean the mortar, pestle, and the mill's container, but be sure each is absolutely dry before you use them on another sample. The mortar and pestle may be cleansed by grinding clean dry sand in the mortar.

A couple of short bristle brushes are included in your kit. Use these to clean the sieves.

Grinding soil will eventually erode the blade on the mill. When that happens, unbolt the worn blade and install a replacement.

Cone and Quartering. At various times while preparing a soil sample you may need to split it. Cone and quartering is a method for splitting the sample into homogenous quarters. Slowly and carefully pour the dry soil sample onto a flat sheet or pan forming a symmetrical cone. Using a flat thin-bladed tool, such as a knife or ruler, divide the cone into equal piles. Divide these in half again. Now you have four samples, each one-quarter the size of the original and more homogenous than the original.

1. If the soil is moist and cohesive, dry the sample. To best prepare a soil sample for presentation to the XRF, the sample should be dry and well-homogenized. Ideally, the entire sample should be dried to constant weight, sieved to remove gravel and debris, and ground or milled to a fine powder.

   The sample can be dried in any of several ways. Choose one of the following. Oven dry the sample for approximately 2 hours at 150° C., until the sample reaches a constant weight. Air dry the sample overnight at room temperature in a shallow pan. Gently stir and warm the sample in a pan over a hot plate or burner (Sterno works well when gas or electricity are unavailable).

   Oven drying is inappropriate when certain volatile compounds may be present in the sample. For example, lead present as tetraethyl lead would be driven off by the heat and, thus, could not be detected by later testing. Some forms of mercury and arsenic are volatile. Air drying will preserve more of these volatile substances.

2. Break up any clods and paint chips. You can grind the sample in your mortar and pestle to do this. Clean the mortar and pestle with paper towel or clean sand.

3. Sieve with the No. 10 (2 mm) mesh and separate out the larger pieces (stones, organic matter, metallic objects, and the like). Examine the larger particles by eye (Look for paint chips), but do not include in the soil sample.

4. Grind the sample so its particles will be finer and more homogenous. Use mortar and pestle, or an electrically powered grinding mill.

Warning: Grinding and sieving dried samples produces dust. Even clean soil contains silica--a hazard when airborne. Prepare all samples (and especially those from sites where toxic chemicals may be present) in a ventilated area, wear a mask, gloves, and an apron, and spread a drop cloth for your own protection.

5. Sieve at least 10 grams of the sample through No. 60 (250 μm) and No. 120 (125 μm) mesh. Regrind the unpassed material until the required fraction is able to pass.

6. Mix the resulting sample.

Placing the Sample in an XRF Sample Cup

The container holding the sample increases scattering and thus affects the accuracy of the measurement. Therefore, it makes sense to use a container with as thin-walled a window as is convenient and to use the same kind of container and window for each sample. Consistency and careful attention to detail are keys to accurate measurement.

The container should be a sample cup of a type that can be filled from the rear; that is, the side opposite the window (e.g., Chemplex No. 1330). NITON recommends using a 1/4 mil mylar film window. An initial supply of cups and windows are included in your kit.

1. Place a circle of mylar film on top of an XRF sample cup. The window goes on the end of the cup with the indented ring. Note that the window may be prepared ahead of time.

2. Secure the film with the collar. The flange inside the collar faces down and snaps into the indented ring of the cup. Inspect the installed film window for continuity and smooth, taut appearance.

3. Set the cup, window-side down, on a flat surface. Fill it with at least 3 grams of the prepared sample (no more than half-full). Take care that there are no voids or layering.

4. Supporting the film window on a flat surface, tamp the loose sample into the cup. The end of the pestle makes a convenient tamper. Optionally (especially if you expect to reuse the sample), place filter paper disk on the sample.

5. Fill the cup with polyester fiber stuffing to prevent sample movement. Use aquarium filter or pillow filling as stuffing. An initial supply comes with your kit.

6. Fasten the cap on the cup. Using an indelible pen, write an identifying number on the cup. Keep a record of that number, the site and location, and any other relevant comments.

Testing the Sample

1. Set the XL test platform on a flat, solid surface. Place the sample cup in the receptacle of the sampler. Included in your kit are some foam disks that you can put in the receptacle under the cup for firmer contact between the XL and the sample cup window.

2. Hold the XL in one hand along the rubber gripping bands. There is virtually no radiation above background when the XL is on, even on the hand holding the XL.

   Do not put the other hand along the top plate of the XL while measuring. You don't need it there where it would be exposed to some radiation. Although the exposure there is only 1 mR per hour, a tiny fraction of OSHA's permissible average annual radiation dosage standard on the hand, always treat radiation with respect.

3. Push the safety slide (that locks the shutter release) out from under the shutter release. If the slide is still tucked in, you cannot press in the release nor will the XL fit on the XL test guard correctly.

4. Holding the XL in your right hand, place it on the test platform so that the sample cup is under the window of the XL. Squeeze the shutter release, pull back the latch on the platform with your left hand, and firmly press the XL flat against the platform surface. If you don't squeeze the shutter release, the plunger will not depress. If the plunger is not fully depressed, the window is not fully open and the XL cannot measure accurately. The back of the unit (specifically, the window opening) must be flush with the XL test platform to get an accurate reading. The XL test platform latch will continue to hold the XL flush against the sample until you lift it off.

Note: During the measurement, you do not need to hold the XL or squeeze the shutter release continuously. It will continue to read until you lift the XL, the plunger goes back out the bottom and the test is over.

5. Listen for the XL's beep (and watch for indications of lead on the screen) as you decide when the test has reached the desired level of accuracy. A typical test for the quantitative measurement of lead takes 60 source seconds.

6. After the desired interval, pull back on the platform latch to release the XL and lift the XL off the platform to end the test. The shutter automatically closes. The plunger should clear the surface and be fully extended.

Warning: **In the unlikely event that the plunger gets stuck in that open position, simply push it closed. Then call NITON.**

APPENDIX B
EXAMPLE ILLUSTRATIONS OF BUILDING COMPONENTS

APPENDIX C
PROJECT PERSONNEL CERTIFICATES