USAEHA

U.S. Army Environmental Hygiene Agency

INTERIM FINAL REPORT
LEAD-BASED PAINT CONTAMINATED DEBRIS
WASTE CHARACTERIZATION STUDY NO. 37-26-JK44-92
MAY 1992 - MAY 1993

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REPLY TO
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DAIM-ED-C (200-1a) 29 MAR 1994

MEMORANDUM FOR SEE DISTRIBUTION

Subject: Lead-Based Paint Contaminated Debris - AEHA Guidance

1. Reference: Interim Final Report, USAEHA, Lead-Based Paint Contaminated Debris - Waste Characterization Study No. 37-26-JK44-92, May 92 - May 93.

2. Background:

a. The enclosed report discusses the issue of lead-based paint (LBP) as it relates to building demolition and debris disposal. The Army Environmental Hygiene Agency (USAEHA) suggests that, in general, whole building demolition debris is a non-hazardous waste stream. Other "small scale" debris (e.g., paint chips, blast grit, and individual structural components) are more likely to be classified as hazardous waste. The basis for these decisions as well as discussion of other associated environmental issues is contained within the report.

b. This study was prompted by the number of WWII wood buildings being demolished and the effects of LBP compliance on maintenance operations. This is even more of a concern since the passage of the Residential Lead-Based Paint Hazard Reduction Act of 1992 (P.L. 102-550, 28 Oct 92).

3. Following these guidelines will result in:

- legally defensible waste classification consistent with 40 CFR 262.11(c);
- Avoiding unnecessary expense by ensuring that hazardous waste disposal is used only when necessary;
- preventing violations from improper disposal of lead-based paint contaminated debris;
- reducing exposure to lead hazards for maintenance workers, residents and others during maintenance activities.

4. Applicability: These procedures can be applied in most situations, however more stringent state or local regulations are applicable to Army operations, and must be considered in conjunction with this guidance. 15 USC 53, Toxic Substance

Control, Lead Exposure Reduction, §2688 " Control of Lead-Based Paint Hazards at Federal Facilities" specifically waives sovereign immunity from State and local lead-based paint regulations.

5. Availability: Copies of this report are available on the DENIX computer bulletin board system under the file "LEAD-HW" or in hardcopy from the Commander, U.S. Army Environmental Hygiene Agency, Attn: HSHB-ME-SH, Bldg E-1677, Aberdeen Proving Ground, MD 21010-5422. Technical questions should be addressed to USAEHA, Hazardous and Medical Waste Branch at (410) 671-3652 or DSN 584-3652.

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HSHB-ME-SH (40)

3 AUG 1993

MEMORANDUM FOR Commander, U.S. Army Environmental Center, ATTN: SFIM-AEC-EC, Bldg E4435, Aberdeen Proving Ground, MD 21010-5401

SUBJECT: Interim Final Report, Lead-Based Paint Contaminated Debris - Waste Characterization Study No. 37-26-JK44-92, May 1992 - May 1993

Three copies of this report are enclosed. Questions regarding this report may be directed to Ms. Veronique Hauschild or Mr. John Resta, Chief, Hazardous and Medical Waste Branch. Additional comments or concerns may be directed to me. We can be contacted at DSN 584-3652 or commercial (410) 671-3652.

FOR THE COMMANDER:

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EXECUTIVE SUMMARY
INTERIM FINAL REPORT
LEAD-BASED PAINT CONTAMINATED DEBRIS
WASTE CHARACTERIZATION STUDY NO. 27-26-JK44-92
MAY 1992 - MAY 1993

1. PURPOSE. This study was performed to assess the waste characteristics of debris that is contaminated with lead-based paint (LBP). The study focused on the debris generated from the demolition of Army WWII structures but also addresses other waste items such as those resulting from abatement and renovation activities.

2. CONCLUSIONS.

a. Characterization: Whole-Building Demolition Debris. The findings showed that (statistically) whole-building demolition debris (e.g., Army WWII-era structures) can be characterized as nonhazardous waste so long as certain assumptions/assertions are made:

(1) Other hazardous components such as asbestos or PCBs (from light ballasts and roofing tars) are not present/or are removed and disposed separately.

(2) Metals components such as ductwork, furnace/boilers, piping, or siding are removed to the extent feasible as scrap materials for reuse/recycling.

(3) All remaining material (i.e., all those materials that were included in the sampling process such as both painted and unpainted wood components, brick, concrete/foundation material) must comprise a single wastestream at the point of generation (when the building is demolished). This wastestream must be handled as a single, discrete wastestream and disposed of all together.

b. Characterization: Small-Scale Debris. Debris that is generated during renovation, maintenance, or abatement activities such as paint chips, blast grit/media, or personal protective equipment is more likely to be characterized as "hazardous" due to the concentrated mass of LBP. For these types of wastes, hazardous waste generation can be minimized through waste segregation techniques. For some wastes, cost savings can be achieved through minimizing sampling and analyses.

c. Disposal.

(1) Nonhazardous Waste. While disposal in a construction/demolition (C/D) debris landfill may be appropriate and relatively inexpensive at this time, generators should consider other options that offer more than an "out-of-sight, out-of-mind" solution. In fact,

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3. BACKGROUND.

a. General. Lead-based paint has been a growing concern both within DOD and in the private sector for well over the past year. Most of the focus has been on the prevention of childhood lead-poisoning. The increasing alarm over lead hazards has, however, resulted in a host of related quandaries. One of these problems involves the disposal of waste/debris (such as paint chips and painted building components, that contains LBP.

b. Regulatory Basis. New environmental regulations specifically addressing wastes managed under the Resource Conservation and Recovery Act (RCRA) also prompted the assessment and waste characterization of building debris. Specifically, debris that was "inherently" hazardous due to metals constituents (e.g., the lead in certain paints) was addressed. Details are provided in the Background section of the USAEHA Sampling Protocol for Building Demolition Debris and Buildings Painted with Lead-Based Paint (Appendix B).

c. Initial Argument. The USAEHA has identified several reasons why using the standard hazardous waste identification technique [i.e., the Toxicity Characteristic Leaching Procedure (TCLP)] to characterize demolition debris may be inappropriate and unnecessary. While these reasons do not qualify as an exemption from the regulatory requirements, they are presented below for consideration during the discussions and conclusions presented later in this report.

(1) Sample Preparation. The TCLP requires particle size reduction for a sample if the solid particles are smaller than 1 cm in their narrowest dimension and are capable of passing through a 9.5 mm (0.375 inch) standard sieve (reference 1). The grinding, shredding, or other processes used on painted debris to meet this requirement change the physical properties of the waste to the degree that the leaching characteristics themselves are greatly enhanced/exaggerated. As the surface area of the sample particles increases, so does

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new/impending restrictions on C/D debris landfills may force the cost of this disposal option to greatly increase. Other options may be less expensive and/or more environmentally acceptable. State and/or local regulatory involvement will be necessary when assessing the feasibility of such alternatives.

(2) Hazardous Waste. The volume of LBP-related hazardous waste should be minimized to the extent most feasibly and economically possible. This can be done through careful assessment of operations and segregation of wastestreams as well as separation of contaminated items or removal of LBP.

(3) Recycling. Many items such as metal duct work, piping, and siding can be salvaged from buildings that are to be demolished for recycling/reuse. Recycling can provide economic gains in addition to the environmental benefits associated with a reduced wastestream.

3. RECOMMENDATIONS.

a. Identify whole-building demolition debris wastestream populations that meet the descriptions discussed in this report.

b. Characterize such waste as nonhazardous, pending concurrence from state and local agencies.

c. Identify other sources of lead-paint containing waste and debris. Determine appropriate waste segregation and management procedures based on cost-analyses and findings discussed above.

d. Evaluate the potential for environmental media (e.g., soil) contamination at demolition sites, specifically with regards to future-use scenarios and human health-risk.

e. Develop SOPs for demolition site operations to minimize environmental contamination and health hazards.

f. Assess current disposal procedures for demolition debris. Correct deficiencies/make amendments to contracts and/or SOPs with regard to final destination, liabilities, and control.

g. Evaluate disposal options and alternatives with regards to environmental and other regulatory requirements, cost, and other benefits/disadvantages.

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the likelihood that more lead (or other constituent) will leach. Since the TCLP extracts toxic constituents of a solid waste "in a manner EPA believes stimulates the leaching action that occurs in landfills" (reference 2), it is inappropriate that the waste itself is first altered to a point that is atypical of a real landfill scenario.

(2) Mobility of Lead. The TCLP was designed to reflect the "leachability" of contaminants into and through soil (presumably to ground water). However, some evidence (references 3-8) has suggested that the low solubility of lead and its tendency to be trapped by organic matter in soil results in much less migration than is assumed by the TCLP. While lead concentrations exceeding the Safe Drinking Water Act's Maximum Contaminant Level (MCL) of 0.05 mg/L have been identified in leachate from some construction/ demolition (C/D) debris landfills, the lead is always diluted or attenuated to below drinking water standards before reaching drinking water wells (reference 8).

(3) Current Landfills. As a "newly identified" potentially hazardous wastestream, the appropriateness of past disposal practices must be addressed. If such a wastestream was deemed to be hazardous, many current C/D debris landfills could be faced with clean-up problems. Without ground-water monitoring requirements for such landfills it is difficult to "prove" that lead leachate and migration problems do not actually exist.

(a) One such landfill (Army owned and operated) with an in-place ground-water monitoring system has been identified and evaluated; 2 years-worth of analytical data indicated that no lead was observed above background residual concentrations (reference 9). However, as stated above, there are cases of elevated lead in the leachate from some C/D debris landfills. Still, no evidence linking such leachate to ground-water contamination has been identified.

(b) Of course, the rate/degree of lead transport through the soil and to ground water is dependent on such factors as soil type, pH, and depth to the water table. Low pH (acidic) environments with a high water table are more prone to ground-water contamination than where soils are neutral or alkaline and the ground water is at a significant depth. In fact, it is because there are potential adverse environmental effects on ground water and adjacent surface water that many states are now implementing C/D landfill requirements (reference 8). Some of these requirements are similar to those for municipal solid waste (MSW) landfills; others include liner and leachate collection systems, ground-water testing, and surface water monitoring. In addition, some states are banning disposal of C/D debris in MSW landfills. With these added controls to C/D landfills, there should be less concern for potential environmental threats.

(4) Buildings. The buildings as they currently stand expose more painted surface area to the elements (e.g., rain and snow) than they would if demolished and placed in a (debris) landfill. If leaching lead were a significant problem, the buildings (present since WWII) would have, presumably, created a more obvious "contamination" problem. While "contaminated" soil has been identified adjacent to some residential structures painted with LBP during childhood lead-poisoning prevention risk assessments, stratified sampling has indicated highest concentrations in the surface soil with little or no contamination deeper than 1 to 2 feet (reference 10).

(5) Other. Other considerations are perhaps more socio-political and/or economic in basis. For instance, the option of disposing such debris as hazardous is not only extremely costly, but -- due to the large volume of waste involved -- it would take up a large amount of hazardous waste (HW) landfill space which could be used for wastes which pose more significant or proven health threats. In addition, disposal of LBP debris as HW increases the costs associated with abatement activities. The prioritization/completion of many abatement operations may be dependent on funding which in part will be designated for disposal costs.

d. Impact on Army. The Army was able to assess a direct and significant impact (reference 11) on various activities to include the Buildings Reduction Program which involves the demolition of WWII-era structures at a majority of Army installations. As originally established, the project plans for this program did not include funds or plans to sample and characterize the waste. More importantly, funds had not been allocated for hazardous waste disposal. In addition, potential hazardous waste disposal requirements have also created several obstacles during the implementation of the Army's childhood lead-poisoning prevention program.

e. Army Initiative. At the request of the Office of the Director of Environmental Programs and the U.S. Army Environmental Center (reference 12), the USAEHA developed the Sampling Protocol included as Appendix B and performed several pilot projects to establish a baseline waste characterization of demolition debris from Army WWII structures. During the course of the pilot studies, the Sampling Protocol was occasionally modified to address problems/issues identified during field and/or laboratory operations.

f. Regulatory Concurrence. The finalized Sampling Protocol was officially provided to the Technical Assessment Branch and the Waste Treatment Branch of the Office of Solid Waste, EPA Headquarters for comment (reference 13). The EPA response letter stated "Overall, we like [the] protocol" (reference 14). Specific comments made by the EPA are addressed in the discussion section below.

4. APPROACH AND METHODOLOGY. The procedures described in the Sampling Protocol were used to obtain samples from eight installations. The Table below identifies these installations. The following points of discussion address the various procedures outlined in the protocol and specific problems encountered.

TABLE. PILOT PROJECT INSTALLATIONS

(1)	Fort Knox, KY
(2)	Aberdeen Proving Ground, MD
(3)	Fort Meade, MD
(4)	Fort McClellan, AL
(5)	Fort Devens, MA
(6)	Fort Riley, KS
(7)	Fort Gordon, GA
(8)	Fort Jackson, SC (incomplete)

a. Establishing the Waste Population. We defined the waste population as all debris generated from a specified demolition action (such as at a given installation, within a given timeframe, by a specified contractor) and to include all building components that are to be disposed of together (in a landfill). This definition of wastestream population has perhaps been the most controversial issue of the overall problem. However, we believe this to be comparable to a specific industrial operation which generates a given wastestream and must use representative samples for characterization. Therefore, our pilot projects used the installations' Building Reduction Program Plans for the current fiscal year (FY) to determine the next group of buildings to be demolished. Some specific problems that had to be addressed are detailed below.

(1) While most of the structures (e.g., the standard, two-story WWII barracks) sampled were very similar in structure, design, and paint color for a given installation, invariably there were several "oddball" structures or perhaps two distinct types of structures that made up some of the installation's "waste population." The actual similarity between structures was not considered a requirement in defining the population since the buildings comprise one single overall wastestream -- each building contributing its own portion of lead. It was noted, however, that the EPA had suggested that buildings/structures that have had LBP removed should not be included in a population of buildings with lead-paint remaining, as this "may be considered "impermissible dilution" (reference 14). The buildings sampled during this study had not undergone paint-removal; furthermore, all were either known or presumed to be painted with LBP.

(2) It was important to identify what portions of the buildings were to be recycled or disposed of separately from the general building debris. For instance, asbestos (transite) siding identified on some structures was to be removed and disposed of separately. Metal ductwork, furnaces, piping, and siding was also to be removed as reusable/recyclable scrap metal. It was also established whether the concrete foundations of several buildings were to be demolished as well. The components that were not to be included in the overall debris (such as the metal constituents and asbestos siding) were not considered part of the wastestream population. Appendix C identifies the typical components that were established as part of the wastestream populations.

b. Establishing the Sample Group. Once the population was established, a percentage of the total number of buildings was randomly selected as the sample group. The actual number of buildings to be sampled was established using a statistical approach based on EPA guidance (reference 15). To account for the differences in some of the buildings (such as in structure or paint color) a somewhat stratified random selection process was used to select the buildings to be sampled. The protocol indicates that buildings selected for the sampling group should make up an "appropriate proportion." This meant that if 50 percent of the wastestream population was comprised of white buildings and 50 percent were yellow, then this same ratio was reflected in the sample group.

c. Composite Sampling.

(1) Each building in the sample group represented one sample. The samples were each comprised of subsamples taken from the various components that make up the individual buildings. In total, each sample weighed approximately 100 grams, as required for the TCLP. An electric drill was used to collect these subsamples from components such as wood, plaster, drywall, and foam. Hammerdrills were used to obtain samples from materials such as brick, concrete, and cinderblock. The sample material was collected onto large sheets of paper during the drilling process and was then transferred to a sample bag. The number of subsamples taken from each area was based on the proportion of component material to the material comprising the entire building (taking into account the required total mass of 100 grams). Due to the particularly high lead concentrations found on components such as windows, door frames, and doors, these items were all included in the sampling process to ensure a conservative (high) estimate of lead from the overall structure.

(2) The protocol describes how ratios between the surface areas of the different components were used to establish these proportions. As a result of drilling completely through the components, the ratios were presumed to reflect volume-based proportions. A volume-based ratio was used in the majority of the pilot projects. (Appendix C provides three examples of subsample distribution lists.) Since this approach focused on "visible" surface areas -- the majority of which were painted -- there was a high degree of

conservatism (i.e., the samples were expected to reflect higher values of lead). However, this approach was believed to be relatively cost-effective and sufficient for the purposes of the study. A similar approach (volume-ratio) for sampling buildings to be demolished was established by a contractor for use at the Rocky Mountain Arsenal (reference 16).

(3) While the EPA agreed with our approach, it was inferred that the approach might be too conservative and that a greater sampling effort would be justified if analytical results were just above the regulatory threshold (RT) (reference 14). The EPA also indicated that ratio by mass would probably be more appropriate since the TCLP is based on the mass of a sample rather than surface area or volume.

(4) We assumed that the mass-ratio approach would result in lower lead concentrations than the volume-ratio approach due to the heavier densities of materials such as concrete and brick. This hypothesis was shown to be true when six buildings at Fort McClellan were re-assessed after initial sampling results revealed lead TCLP values of 6.2 mg/L to 15.8 mg/L. Mass-ratios were determined using building schematics and standard densities (reference 17). The resulting samples were less in volume, and contained a higher percentage of concrete and brick than the original samples. Analytical results were substantially lower than before, with the highest concentration equal to 2.0 mg/L. Appendix D contains the correspondence between the USAEHA and the Alabama Department of Environmental Management regarding this issue.

d. Laboratory Analyses and Quality Assurance/Quality Control (QA/QC). Samples for all the pilot projects were analyzed by two different USAEHA laboratories. Duplicates were randomly provided to alternate laboratories for QA/QC purposes. The samples were comprised of wood shavings, saw dust, pulverized brick and concrete, and drywall "powder;" therefore, particle size reduction was not necessary. After preparation, the samples were analyzed in accordance with the procedures specified for the TCLP (reference 1). These procedures included digestion of the TCLP extract in accordance with EPA Methods 3010, 3015, or 3020 and analysis of the extract in accordance with either EPA Method 6010A or EPA Method 7421 (reference 18).

(1) The laboratories were instructed to "carefully mix and homogenize each sample" before weighing out the exact 100 grams required by the TCLP. This mixing, along with the minimization of excess sample while in the field, reduced the problems associated with the settling of materials in the sampling bag and provided better sample homogeneity.

(2) Duplicate samples were obtained by sampling randomly chosen buildings twice. All duplicate samples indicated acceptable levels of comparison. The arithmetic means of duplicate samples were established as the data point values.

e. Data Evaluation. The analytical results for the individual pilot projects were statistically evaluated using EPA guidance (reference 19). This guidance indicates that the upper 80 percent confidence interval (CI) should be established and compared to the RT. Since the statistical analysis is based on the assumption of a normally distributed population, the guidance also discusses procedures to "transform" the raw data if the data does not show a normal distribution. The guidance states that the mean for a normal distribution should be greater than the squared standard deviation. This 'test' was applied to the individual data sets to establish normality. By this definition, none of the individual data sets had a normal distribution. (This would indicate that the presence and/or concentration of LBP is not consistent across the entire population of buildings and was in fact "skewed" by occasional "hotspots.") As per the EPA guidance, logarithmic or Poisson (square-root) transformations were applied to the data sets to obtain normal distributions. The transformed data presumably fits the distribution pattern theorized by EPA in its guidelines for waste characterizations (reference 19). The most appropriate transformation (usually the Poisson) found for the data sets was similarly applied to the RT of 5 mg/L. The upper 80 percent CI of the transformed data was then compared to the similarly transformed RT. Since none of the (transformed) upper 80 percent CI's exceeded the (transformed) RT, the debris was consistently characterized as nonhazardous. Based on recent comments from the EPA (reference 14) and an independent evaluation of the EPA statistical guidance, however, several problems have been identified. While it does not appear that these issues will have a significant impact on the conclusions of this study, they are important in that they may impact future sampling efforts. These issues are discussed below.

(1) The 'test' for normality as stated above is not accurate. A normally-distributed data set may have a squared standard deviation greater than the mean. However, through graphing techniques we were able to show that the data sets were in fact not normally distributed and that a more normal distribution could be obtained through either a logarithmic or Poisson transformation. Appendix E contains an example of this graphical comparison.

(2) While transformations can be employed to yield a more normal distribution model and therefore meet the model assumptions, they do not necessarily do a better job of "predicting" actual data distribution (or in this case, the 80 percent CI) (reference 20). In fact, the EPA has revealed (reference 14) that they are working on a revisement of their guidance and are now no longer recommending transforming data. Though it is believed appropriate to follow published guidance, data from the individual pilot projects has been evaluated and it has been determined that the upper 80 percent CI calculated from the raw (untransformed) data for the completed studies each also falls below the RT of 5 mg/L.

(3) The normality of these individual data sets was skewed by occasional "high" lead levels. These data points could feasibly have been evaluated as "statistical outliers." As outliers, they would have had to either be resampled or evaluated separately. Due to the

nature of this non-homogenous, highly variable waste, however, all data points were retained for statistical evaluation. By leaving these high values in the data sets, the results are further biased to the conservative side.

5. FINDINGS AND DISCUSSION. These findings address the specific details of our study on Army WWII-era structures as well as information regarding various other related issues. It should be noted that these discussions assume that lead is the only contaminant of concern. Several samples obtained for the pilot projects were analyzed for other metals to include arsenic, barium, cadmium, chromium, mercury, silver, and selenium. The levels of these metal constituents was always found to be below the associated RT. Other than these metal constituents no additional parameters were evaluated.

a. Army WWII-Era Demolition Debris -- Pilot Projects. All but one of the individual pilot studies has been completed. Each of the completed studies has concluded that the debris should be characterized as nonhazardous wastes (references 21-28).

b. Army WWII-Era Demolition Debris -- Overall. The data accumulated during the pilot projects was combined and statistically evaluated to assess the overall characteristics of WWII-era demolition debris within the Army. The data from the 187 buildings is presented in Appendix F. Individually, the majority of the buildings indicate TCLP lead concentrations well below the regulatory threshold (RT) of 5 mg/L. Some of the buildings showed TCLP values relatively close to the RT, while a small few revealed comparatively high results (the highest being 16 mg/L). A statistical evaluation of these data points (also included in Appendix F) indicates that the overall upper 80 percent CI is 3.5 mg/L. Since this is below the RT of 5 mg/L, the waste can be classified as a nonhazardous waste. Though transformations of the data set are no longer being recommended by the EPA (reference 14), a Poisson transformation was performed in accordance with current published guidance (reference 19). The resulting statistical evaluations also revealed an upper 80 percent CI that was below the comparable RT value.

c. Building Demolition Debris -- General. This aspect of the study concentrated on structures that contained highly-leaded paints, often on both exterior and interior surfaces. Due to their age, several buildings had visible layers of paint. (On a few buildings the layers were so thick they could be individually peeled away). Presumably, these buildings represent "worst case scenarios" with regards to lead concentrations. Newer buildings will most likely contain less -- if any -- LBP. Also, the buildings evaluated in the pilot projects were primarily constructed of wood and drywall with some concrete foundation. It may be assumed that buildings constructed primarily from concrete or brick would contain a smaller proportion of paint by mass to the mass of the overall structure, resulting in lower lead concentrations. Therefore, the findings of this study may be appropriate for all building demolition debris. In fact, several states have independently classified such debris as either nonhazardous waste or as a "special" waste (reference 8).

d. Waste Generated by Abatement, Renovation, Maintenance. Several other LBP containing wastes were identified during this study. These wastes are referred to as "small-scale debris" to signify the differences with whole-scale building demolition debris. The nature of these wastes results in a higher proportion of paint to the overall wastestream; therefore, these wastes are more likely to contain higher lead concentrations -- potentially exceeding the regulatory RT. Several different types of small-scale debris are described in Appendix G along with associated generating activities and suggested waste management practices.

(1) The EPA has concluded (reference 29) that several types of LBP abatement wastes are potentially hazardous wastes and may need to be tested with the TCLP. Discussions with "experts" to include paint removal contractors, paints and coatings engineers, environmental coordinators, and facility engineers (reference 30) have indicated that, in fact, the majority of small-scale debris -- specifically where the paint has been identified to contain appreciable amounts of lead -- exceeds the TCLP RT for lead and therefore must be classified as hazardous waste. This information should be considered before expending resources on sampling and analyses. For certain wastestreams it may be more economical to classify the waste as hazardous without performing the TCLP (see Appendix G).

(2) Sampling methods for small scale debris should follow the same principle used to sample entire buildings: samples should be representative of the wastestream. Defining the wastestream may involve preplanning and assessment to determine appropriate segregation and handling procedures. Additional information regarding sampling and wastestream identification is contained in Appendix G.

(3) Preplanning and assessment may entail a documentation of the task/operations to be performed and identification of the presence and/or location of LBP as well as identification of other potentially hazardous constituents such as solvents/chemical strippers. If LBP is identified, the TCLP can be performed to verify whether the waste is hazardous or the waste can be immediately be assumed to be a HW. Waste characterization information of chemical compounds may be obtained through manufacturers [e.g., Material Safety Data Sheets (MSDSs)] or through limited sampling.

(a) A variety of techniques can be employed to identify LBP to include: (1) background/historical check (paints used before 1978 are very likely to contain significant quantities of lead), (2) chemical "spot" checks (inexpensive, commercially available kits which provide a quick screen for the presence of lead), (3) x-ray fluorescence (XRF) devices (an expensive yet quantitative field screening method of identifying lead in paint), and (4) Atomic Absorption Spectroscopy (AAS) laboratory analysis (while more time consuming, costly and destructive than other techniques, laboratory analysis will provide the most accurate data). The method to use will depend on the type/scope of the project. However, actual quantitative results (such as from the XRF or AAS methods) will not necessarily correlate to TCLP results for the wastestream (reference 31). A qualitative result may, therefore, be more efficient for assessing where LBP is present. For items where LBP is not present, the waste from those items can be presumed to be nonhazardous. Where LBP is expected (based on historical records) or detected, the waste may be hazardous. Either this waste can be disposed of as HW or a representative sample can be tested with the TCLP. Testing with the TCLP in this case would only be recommended if large quantities of waste were involved.

(b) In cases where certain components of a project's wastestream may individually be hazardous (such as painted wood siding) while others are nonhazardous (drywall, wood framework, and concrete), a waste management scheme can be documented to ensure proper segregation, HW minimization, and waste handling/storage/transport/and disposal. When segregation of the components is not feasible given the scope of the project, all waste must be characterized (with the TCLP) together, resulting in either a single nonhazardous wastestream or a single hazardous wastestream.

e. Environmental Concerns and Best Management Practices (BMPs). Characterizing demolition debris as nonhazardous waste does not mean that the operations generating such debris should disregard other environmental issues. Though these activities are not always regulated, imprudent procedures could result in future liabilities. The planning, contracts, and SOPs associated with demolition actions should address the following issues.

(1) Soil Contamination and Future Use. After removal of debris from a demolition site, it may be necessary to sample and analyze soil to assess potential health hazards associated with the future use of the site. This is especially a concern if the future use of the site exposes children to the soil (e.g., a playground). Current EPA guidance (reference 32) indicates that levels between 500 and 1,000 ppm are protective of human health. Other soil lead levels have been established by various states. Appendix H lists current regulatory soil-lead cleanup levels. Levels exceeding these concentrations may have to be removed, characterized, and properly disposed or treated.

(2) Storm Water Runoff. While demolition actions are not typically regulated under the EPA's Storm Water Program, some of the Best Management Practices (BMPs) described in EPA Storm Water Management guidance (reference 33) have direct application to such activities. Following some of these suggested practices could help minimize environmental impacts and potential safety hazards associated with demolition actions. Excerpts from the EPA guidance are contained in Appendix I.

(3) Dust Control. Dust control is primarily a concern for worker safety and the exposed public. Currently, there are no Federal regulations requiring emissions controls for demolition activities. However, as a BMP, activities that occur in areas that have public access should ensure to the extent possible that dust is minimized or controlled. The BMPs discussed above provide some methods of dust control. Also, air-monitoring for lead concentrations may be useful to evaluate the extent of exposure to workers. New lead action limits (50 μg/cubic meter) have been set for specific construction industry tasks (e.g., manual demolition) (reference 34). Workers at demolition sites or other dust-generating activities (particularly those who are continuously employed in these operations) may be advised to wear dust masks or other protective gear if LBP is present/suspected.

f. <u>Disposal Options and Alternatives</u>.

(1) Nonhazardous Waste. During this study, it was determined that -- once characterized as a nonhazardous waste -- the debris from the individual pilot project studies would be disposed of in C/D debris landfills. While this is an appropriate form of disposal, other options may prove to be more beneficial/environmentally acceptable. The burden of this large volume of waste on the diminishing supply of available landfill space cannot be over-emphasized (reference 8). Due to new requirements for C/D debris landfills (e.g., location restrictions, monitoring requirements) generators may find it increasingly difficult/expensive to choose this method of disposal. Appendix J contains a table of alternatives/options to landfilling along with the associated benefits and disadvantages of each. Installations should consider these options and assess the applicability of each based on site-specific conditions.

(2) Hazardous Waste.

(a) Waste identified as hazardous (e.g., small-scale debris) must be treated and disposed of in accordance with RCRA. Current regulations (references 35 and 36) require that lead-contaminated waste must be treated before land disposal in a hazardous waste landfill. The treatment methods identified for this type of waste include microencapsulation, microencapsulation, and stabilization. A common treatment technology involves grinding and mixing into a cement slurry. Other than land-disposal, hazardous waste may be incinerated in an appropriate RCRA-permitted facility.

(b) Debris characterized as hazardous can also be reassessed for purposes of segregation and separation/removal. For example, waste from a renovation project (to include drywall, wood, concrete, and brick) may (overall) be classified as an HW. However, if only drywall and small quantities of wood are painted, these components could be separated out for HW disposal while the remaining waste (wood, concrete, and brick) could be disposed of as a nonhazardous waste. Similarly, paint-removal procedures (such as abrasive blasting) could be employed to render the substrate (e.g., wood) nonhazardous therefore greatly reducing the volume of HW. The cost benefits of reducing the volume of HW must be balanced with the costs associated with waste segregation, separation, and/or removal.

(3) Recycling. As mentioned early in this report, metal items such as duct work, piping, aluminum siding, and furnaces were designated as recyclable materials (scrap metal) and not included in the composite samples. Other materials such as porcelain (bathroom fixtures) and glass (windows and mirrors) were other commonly found items that were identified as recyclable/reusable and therefore not sampled. Items such as these for which there are available markets and which can feasibly be retrieved with minimal cost should be segregated to the extent possible. Recycling opportunities may also exist for other items such as wood flooring, concrete, or brick. However, while recycling these materials will reduce the overall volume of waste and may even result in financial returns, it may also mean that a previously nonhazardous wastestream is now hazardous. Recycling may prove beneficial only when the returns outweigh the costs associated segregation and disposal of the remaining (hazardous) waste.

6. CONCLUSIONS.

a. Building Demolition Debris. Whole-building demolition debris -- specifically WWII Army structures -- can be characterized as a nonhazardous waste based on the findings of this study. Since this study focused on the characteristics of Army WWII structures which are known to be heavily painted with LBP, it may be construed that other structures undergoing demolition are also nonhazardous. It is important to note, however, that these conclusions are in accordance with FEDERAL regulations and the assumption that such waste must be tested in accordance with RCRA (TCLP) requirements. Some states and EPA regions have independently classified such debris as nonhazardous waste or as "special waste;" other states have more stringent approaches. However, even though such debris may not be regulated as a hazardous waste, certain handling/management procedures are recommended.

(1) As discussed previously, the definition of wastestream population and whole-building demolition debris that was applied during this study included the majority of the building structural components, to include wood floors and cement foundations/footers. For

demolition projects that involve recycling/reuse of a significant structural component (such as the concrete foundations), a limited sampling effort may be used to determine whether the debris still meets the criteria of a nonhazardous waste. The procedures described in the protocol -- with the exception of statistical transformations -- are currently recommended.

(2) For certain structures, additional parameters or contaminants of concern may be identified. Lead and other metal constituents contained in paints and pigments were the only identified contaminants in this study. The conclusions of this study, therefore, are not necessarily valid for buildings which contain contamination from other sources. The sampling procedures used in this study, however, may be an appropriate approach to assess other parameters.

b. Other LBP-Contaminated Waste Items. The larger the proportion of lead-paint to the overall wastestream, the greater the likelihood that the waste will be hazardous. Sampling and analysis costs can be minimized by using generator knowledge to characterize many of these wastes.

(1) Generator-knowledge can often be used to determine if a waste is hazardous. Knowledge obtained from previous sampling, XRF readings, MSDSs or other manufacturers information, or the information contained within this report may be used to minimize or eliminate sampling when characterizing a waste as hazardous. While using generator knowledge to characterize wastes as non-hazardous is also permissible, limited sampling is advised since small-scale debris is most frequently hazardous.

(2) Small-scale debris wastes should be identified and/or characterized before generating activities occur to ensure that proper segregation, handling, packaging, transport, and disposal procedures are followed. Also, early assessment will provide necessary funding information and contract arrangements.

c. Environmental Concerns and BMPs. Environmental concerns relating to the demolition of buildings containing LBP or management of debris containing LBP involve potential contamination of soil, surface water, and air. Though there are few regulations currently governing the control of lead-releases from these operations, certain precautions and BMPs (as described in paragraph 5e) are advised to minimize potential environmental and health threats.

d. Disposal Options and Alternatives.

(1) Nonhazardous Waste. While disposal in a C/D debris landfill may be appropriate and relatively inexpensive at this time, generators should consider other options that offer more than an "out-of-sight, out-of-mind" solution. Each of these options, as discussed above, has both benefits and disadvantages. State and/or local regulatory involvement will be necessary when assessing the feasibility of such alternatives.

(2) Hazardous Waste. The volume of LBP-related HW should be minimized to the extent most feasibly and economically possible. This can be done through careful assessment of operations and segregation of wastestreams as well as separation of contaminated items or removal of LBP.

(3) Recycling. Many items such as metal duct work, piping, and siding can be salvaged from buildings that are to be demolished for recycling/reuse. Recycling can provide economic gains in addition to the environmental benefits associated with a reduced wastestream.

7. RECOMMENDATIONS.

a. Identify whole-building demolition debris wastestream populations that meet the descriptions discussed in this report.

b. Characterize such waste as nonhazardous, pending concurrence from state and local agencies.

c. Identify other sources of lead-paint containing waste and debris. Determine appropriate waste segregation and management procedures based on cost-analyses and findings discussed above.

d. Evaluate the potential for environmental media (e.g., soil) contamination at demolition sites, specifically with regards to future-use scenarios and human health-risk.

e. Develop SOPs for demolition site operations to minimize environmental contamination and health hazards.

f. Assess current disposal procedures for demolition debris. Correct deficiencies/make amendments to contracts and/or SOPs with regard to final destination, liabilities, and control.

g. Evaluate disposal options and alternatives with regards to environmental and other regulatory requirements, cost, and other benefits/disadvantages as discussed above.

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APPENDIX A

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APPENDIX B

USAEHA SAMPLING PROTOCOL

USAEHA

U.S. Army Environmental Hygiene Agency

CONSERVARE SALUTEM

SAMPLING PROTOCOL

BUILDING DEMOLITION DEBRIS

AND

BUILDINGS PAINTED WITH LEAD-BASED PAINT

U.S. Army Environmental Hygiene Agency
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SAMPLING PROTOCOL
FOR
BUILDING DEMOLITION DEBRIS
AND
BUILDINGS PAINTED WITH LEAD-BASED PAINT

1. REFERENCES. Appendix A contains a list of the materials referenced in this document.

2. PURPOSE. The procedures outlined in this protocol provide a method of characterization for the solid waste generated during demolition operations through sampling and Toxicity Characteristic Leaching Procedure (TCLP) analyses.

3. BACKGROUND.

a. Since May 1991 (reference 1), problems associated with disposal of construction debris have surfaced at various Army installations. More specifically, these concerns have focused on problems associated with lead-based paint "contaminated" debris from the demolition of World War II era-buildings and other structures known to be contaminated with lead paint. Appropriate sampling and analytical techniques have not been easily defined due to the lack of specific regulatory guidance.

b. A proposed rule, published in the 17 January 1992 Federal Register (FR) (reference 2), cited requirements to test building debris for suspected metal constituents using the TCLP. The proposed rule indicated that a "homogenous" sample, representative of the building, should be obtained from any building scheduled to be demolished. The proposed rule explained that representative proportions of the various building materials (to include glass, wood, cement, brick, roofing material, and any metal piping, utilities, or equipment that will remain in the building at the time of demolition) should be included in the homogenized sample.

c. The final rule, published in the 18 August 1992 FR (reference 3), cited no significant changes. In addition, certain states and even regional U.S. Environmental Protection Agency (EPA) offices have requested that this type of solid waste (i.e., demolition debris) be adequately characterized (references 4-6). Due to the increasing number of installations requesting characterization assistance and the initial feedback from EPA officials (references 7 and 8), a decision was made between various Army agencies (reference 9) to establish a feasible, standardized plan for demolition debris characterization. The plan would outline the appropriate sampling and analytical procedures to be used by Army installations/activities whenever a demolition debris characterization is needed.

d. The U.S. Army Environmental Hygiene Agency (USAEHA) has developed this generic sampling protocol to assist Army installations/activities in efficiently satisfying the requirements of the new EPA rule in accordance with existing EPA methodologies and guidelines (references 10 and 11). The general approach of this protocol has been verbally approved by the EPA (reference 12). By consistently using this approach, the USAEHA hopes to establish an Army-wide hazardous waste characterization baseline for various types of buildings and structures. The baseline may eventually be used to minimize or eliminate the need for additional sampling and analyses.

e. The USAEHA has been promoting this plan through initial sampling studies (pilot projects) at selected installations. These installations were selected based on the need for immediate waste characterization, the quantity of projected (FY 92) demolition debris, geographic location, and major Army command (MACOM). Appendix B contains brief descriptions of the selected installations and initial findings.

4. SCOPE.

a. Before characterizing the waste, it is necessary to define the wastestream. This protocol defines the wastestream or "population" that is being characterized as the debris generated during a given demolition project at a given site/installation. Demolition projects are typically designated by a given FY; therefore, an installation should have one demolition wastestream generated each year. While all buildings/structures being demolished in a given year constitute the population, only a percentage of these buildings should be sampled. More details on how to determine the appropriate number of buildings to sample are presented in the "PROCEDURE" section below.

b. This protocol and the associated pilot projects are designed to characterize demolition debris from entire buildings. A previous study (reference 13) has shown that certain constituents may appear in more concentrated forms when individual components of buildings are tested. "Small-scale" demolition/construction debris that is generated during maintenance, removal, or other structural modification projects should be individually tested and characterized. In general, this "small-scale" debris should include any demolition/construction debris that does not involve the entire building. Appendix C contains a brief discussion on disposal procedures for "small-scale" debris.

5. PROCEDURE. During a demolition debris waste characterization study, several site-specific determinations will need to be made. The following steps are detailed to the extent possible.

a. Defining Individual Wastestreams/Populations. As defined above, the wastestream/population will consist of all the debris generated during a specified demolition project. A list of the buildings should include notations of buildings that are identical. Information should also be gathered regarding the demolition and disposal procedures. For instance, if the structures are set on cement foundations it would be necessary to determine whether the cement is to be demolished and disposed of with the rest of the debris. If such foundations were to be left in place they would not be considered as debris; otherwise, they would be included in the wastestream and would be sampled in accordance with the procedures discussed below.

b. Determining the Number of Samples. Based on EPA guidance (reference 10), a statistical approach will be used to determine the number of buildings that need to be sampled. This approach is based on the assumption that the buildings are all of a relatively unique population and that the analytical results of the study will be normally distributed. The EPA manual SW-846 -- Test Methods for Evaluating Solid Wastes (reference 11), requires that the number of samples and statistical parameters used to characterize a 'population' ensure an 80 percent confidence level in the resulting determination (in this case, hazardous or nonhazardous). The Table is based on these guidelines and should be used to determine the number of buildings to be sampled in a given population:

c. Sample Buildings Selection. Once the number of buildings to be sampled has been determined, the specific buildings to be sampled need to be identified. A somewhat random approach should be used in the selection process. Buildings may be randomly selected using building numbers or placement on maps. However, when one or more groups of identical buildings (e.g., a set of WWII barracks, all painted the same, maintained the same, etc.) constitutes a portion of the population, an appropriate percentage of buildings should be selected from the individual group(s).

d. Sampling Strategy. The objective is to obtain one composite sample from each selected sample building. The composite sample should include appropriate proportions of all materials constituted within the structure. The Figure depicts various areas of a building that may be constructed of different materials and should be sampled.

(1) Building components, such as glass, screen, or wiring, that are difficult to sample and comprise a very small percentage of the overall structure, will not be sampled. Also, materials such as aluminum siding, large metal ductwork, light ballasts, utility equipment, and asbestos insulation should not be sampled as these materials should be separated from the

TABLE. STATISTICAL DETERMINATION OF THE NUMBER OF BUILDINGS TO BE SAMPLED

NO. OF TOTAL BUILDINGS	NO. OF BUILDINGS TO SAMPLE*
1 - 9	ALL
11 - 15	10
16 - 20	13
21 - 30	16
31 - 40	21
41 - 100	26
> 100	32

* These numbers are designed to meet or exceed the statistical requirements set by EPA. Both the power and the confidence intervals (CI's) were set at or above 90 percent and 80 percent, respectively, and the precision was established as 20 percent. The coefficient of variance (CV) is assumed to be 35 percent. The actual CV will vary from case to case and should be determined when the analytical results are available. A complete statistical evaluation of the analytical data will involve a calculation of the actual CV and potentially include data transformations and/or adjustments to the other statistical parameters (see the "DATA ANALYSES" section below).

demolition debris and disposed of separately or recycled/reused (e.g., scrap metal). In general, the most commonly sampled components will be wood, brick, cement and plaster/wallboard.

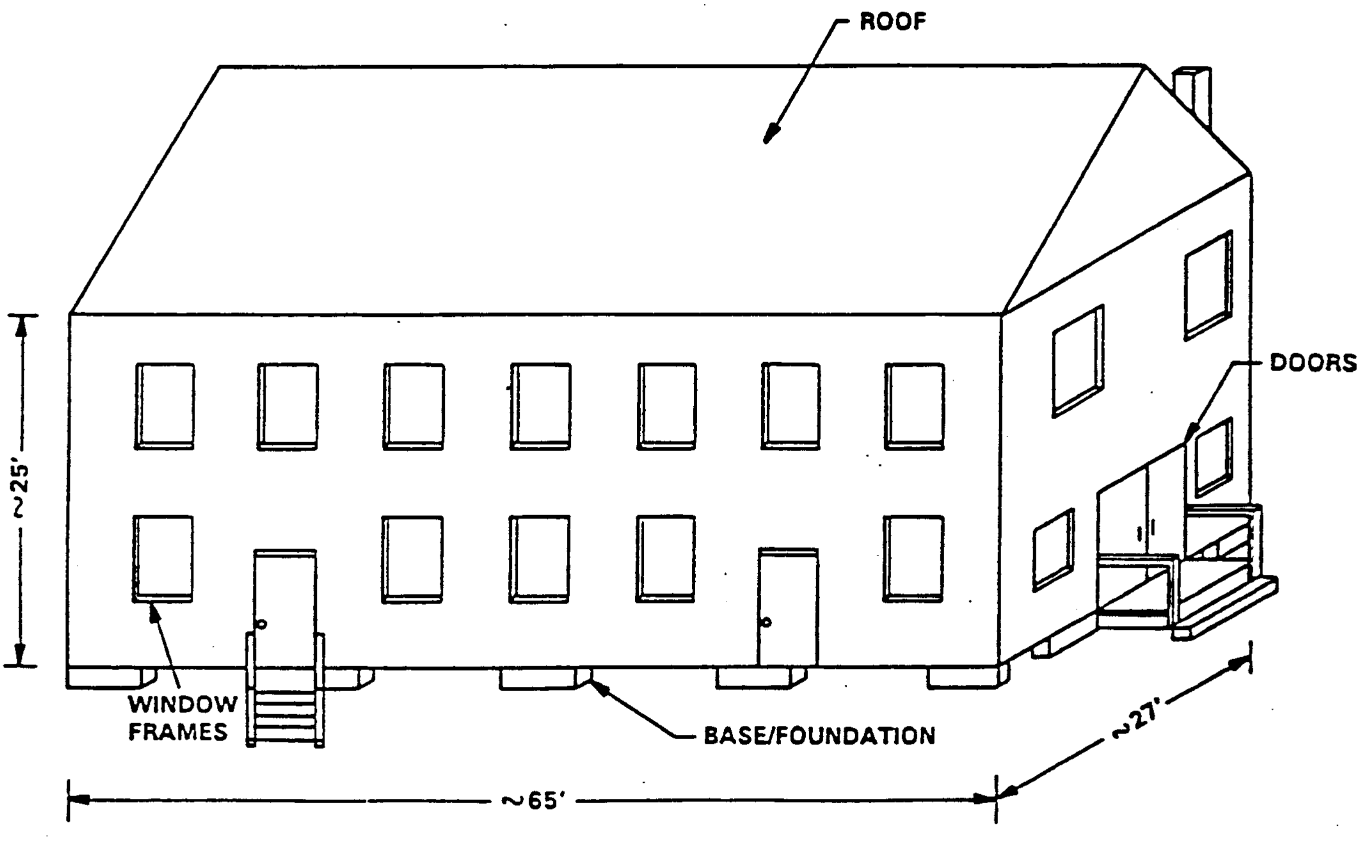
(2) The proportional size of the various building areas based on (estimated) square footage must be determined. For instance, a building may be 70 feet long, 40 feet wide and 12 feet high; if all four of the exterior walls are made of the same material, there is 2,640 ft^2 of that material/component. Window and door space should be subtracted out from the exterior-interior walls and considered as separate areas. The total estimated areas of the individual areas (e.g., exterior wall, interior plaster board wall, interior plywood/panelling wall, floor, cinder block supports, etc.) should be compared to one another in order to establish ratios. The ratios will determine the number of subsamples to obtain from each individual area.

Figure
Example Diagram of a Building
(WWII Temporary Barracks Slated for Demolition)

Inside: Partition Walls
Ceiling
Floor

Inner Structure: "Studs"
Support Beams

Areas to Consider: "Between Floor" Space
"Attic" Area



Generally, 20 to 30 subsamples are necessary to makeup one 110-gram sample. This number will vary based on the types of materials in the building.

e. Sampling Methodology.

(1) Using a 1-inch bit drill or similar device, a "core" subsample should be obtained from the selected areas of the building. The subsample material should be collected into a disposable container (such as large sheets of paper) as the drilling is done. The sampling crew should -- to the extent feasibly possible -- drill through the entire substrate. For building components such as cinder block or cement a hammer drill should be used. The number of drill holes obtained from each type of surface/area should be recorded. If the amount of overall sample material is not enough (i.e., less than 110 grams) for the TCLP, additional subsamples should be obtained from each of the specific areas. [NOTE: For at least 5 percent of the samples (and a minimum of 1 sample), approximately 300 grams should be obtained for adequate split laboratory analyses.]

(2) Field duplicates, equaling 5 percent of the number of actual samples (at a minimum of one), should be obtained to check the sampling practice. The duplicate(s) should be obtained by simultaneously filling two sample containers during the sample process (i.e., for each subsample within a sample building, two adjacent cores should be obtained and placed into two separate containers).

f. Collection and Labelling. The sample material from each building should be collected onto a (disposable) container (such as sheets of unused paper, paper plates, etc.). From this collection container, the materials should be emptied into clean (new) plastic baggies and labelled with the project/installation name and or identification number, sample (building) number, sample date, and sampling personnel's name.

g. Decontamination. Nondedicated sampling equipment such as the drill bit should be decontaminated between sampling of individual buildings. The sampling crew should first brush excess material from the equipment and then wash using tap water and soap. This should be followed by a final rinse with distilled, deionized, filtered (DDIF) water. To ensure the equipment was properly decontaminated, a used rinse water sample should be taken and analyzed.

6. LABORATORY ANALYSES.

a. Packaging and Transportation. All samples should be properly packaged before transporting them to the certified analytical laboratory.

b. Laboratory Preparation. To ensure thorough mixing of the material, the laboratory should be requested to thoroughly mix/homogenize the sample material before preparing it for analyses. This will minimize the 'settling' that may occur during transportation. This procedure is extremely important when excess sample has been obtained and the laboratory will only be using a portion of the overall sample.

c. Analytical Methodology. All solid (wood/plaster/paintchip, etc.) samples should be extracted using EPA Method 1311 (TCLP). The samples should be analyzed using either EPA Method 6010A [Inductively Coupled Plasma (ICP)-Atomic Emission Spectroscopy] or EPA Method 7421, the Atomic Absorption, Furnace Technique for lead. The ICP procedure is recommended due to lower cost, but either method will satisfy EPA requirements (reference 14). The rinsate sample should also be analyzed using one of these methods.

7. DATA ANALYSES.

a. The TCLP laboratory results should be statistically analyzed to assess the variability among the structures and overall normality of the lead distribution. If the analytical results do not indicate a normal distribution (i.e., the arithmetic mean is not greater than the variance), the raw data should be transformed (reference 11). After normality has been achieved through an appropriate transformation, the 80 percent CI should be calculated and compared to the (similarly transformed) regulatory threshold (RT) of 5.0 mg/L of lead (reference 11).

b. Additional procedures may be necessary to address potential "statistical outliers," or buildings that yield unusually high TCLP lead concentrations that dramatically skew the 80 percent CI. If necessary, such buildings may be addressed as a separate population.

8. QUALITY ASSURANCE/QUALITY CONTROL (QA/QC). The QA/QC measures for this sampling effort includes the field duplicate(s), rinsate sample, and laboratory duplicate(s). These measures are all in accordance with EPA guidance (reference 10).

9. SITE SAFETY PROCEDURES. A Site Safety and Health Plan (SSHP) must be established to ensure safe working conditions for personnel performing the procedures outlined in this protocol. An SSHP summarizes the potential hazards and safety procedures during sample collection at the subject buildings. Appendix D includes an example of an SSHP.

10. COORDINATION AND MONITORING. Analytical results obtained using this protocol or a similar approach are being requested for placement in a database. Future sampling of building demolition debris may be minimized or even eliminated based on such results.

Personnel using this protocol may direct any questions, comments, or results to Ms. Veronique Hauschild of the Waste Disposal Engineering Division, USAEHA, at DSN 584-2953, commercial (410) 671-2953, or forward same to the address below:

COMMANDER
USAEHA
ATTN: HSHB-ME-SH (V.Hauschild)
BLDG 1677
APG - EA, MD 21010-5422

APPENDIX A

REFERENCES

1. Memorandum, FORSCOM, FCEN-CED-E, 17 May 1991, subject: Disposal of Waste Construction Debris Containing Lead-Contaminated Paint.

2. Proposed Rule, Land Disposal Restrictions for Newly Listed Wastes and Contaminated Debris, 57 Federal Register 958, 9 January 1992.

3. Final Rule, Land Disposal Restrictions for Newly Listed Wastes and Hazardous Debris, 57 Federal Register 37194, 18 August 1992.

4. Memorandum, AFZD-DEQ, 10 May 1991, subject: Lead Paint Compliance Strategy [re: State of Massachusetts and EPA Region Stance on Waste Characterization.

5. Letter, State of Maryland Department of the Environment, 23 December 1991, re: Characterization of Lead-Based Paint Debris (at Aberdeen Proving Ground).

6. Letter, Alabama Department of Environmental Management, 8 May 1992, re: Demolition of Buildings Painted with Lead-Based Paint (at Fort McClellan).

7. Telephone conversation between Ms. Elaine Ebeye, Treatment and Technologies Branch - Office of Solid Waste (OSW), EPA, and Ms. V. Hauschild, U.S. Army Environmental Hygiene Agency (USAEHA), January 1992.

8. Telephone conversation between Mr. Jim Thompson, Enforcement Division, EPA, and Ms. V. Hauschild, USAEHA, January 1992.

9. Memorandum, ENVR-EH, 22 May 1992, subject: Analysis and Disposal of Construction Debris (Army Environmental Office requesting assistance from USATHAMA and USAEHA).

10. EPA/600/8-89/046, March 1989, Soil Sampling Quality Assurance User's Guide, 2nd Edition.

11. EPA Manual SW-846, November 1986, Test Methods for Evaluating Solid Waste (Volume II), 3rd Edition.

12. Telephone conversation between Mr. Dave Topping, OSW, and Ms. V. Hauschild, USAEHA, 28 August 1992.

13. Mêmorandum, USAEHA, HSHB-ME-SH, 27 March 1992, subject: Hazardous Waste Study No. 37-26-J105-91, Characterization of Demolition Debris Containing Lead-Based Paint.

14. EPA Manual SW-846, Revision 1 November 1990, Test Methods for Evaluating Solid Waste, (Volume I, Part A), 3rd Edition.

APPENDIX B

PILOT STUDIES

The following installations make up the current list (September 1992) of USAEHA pilot studies for demolition debris waste characterization. A brief summary of the status of the individual cases is provided. The associated reports/memorandums that are referenced where available. Copies of these documents can be obtained through the Waste Disposal Engineering Division of USAEHA.

Fort Devens, Massachusetts

With over 200 WWII barracks to demolish and stringent state requirements, Fort Devens was the first installation to identify the problem. A study performed by USAEHA (see reference 13 in Appendix A of this protocol) revealed concentrations of lead statistically higher than the regulatory threshold (RT). However, the report indicated that a more appropriate sampling procedure was necessary, as the actual wastestream incorporated the entire building and not just the painted portions. The installation has obtained a contractor and is recharacterizing the buildings using the USAEHA recommended approach.

Aberdeen Proving Ground (APG), Maryland

After receiving conflicting statements from two different state regulatory officials, APG determined that a conservative approach was necessary and opted to test the buildings. The APG requested USAEHA to assist with sampling and analysis. Initial results have revealed that the majority of the buildings pass the TCLP test (i.e., contain less than 5 mg/L lead). A memorandum to the installation is expected to be finalized in September 1992.

Fort Knox, Kentucky

After receiving the USAEHA Draft Protocol for Sampling Demolition Debris, installation personnel collected and had samples analyzed accordingly. The raw data was sent to USAEHA for statistical evaluation. Out of approximately 100 buildings that were to be demolished, 54 were sampled. Six samples failed the TCLP analysis (i.e., results exceeded 5 mg/L lead) but the statistical evaluation indicated that the actual wastestream (i.e., demolition debris as a whole) did not exhibit the hazardous characteristic for lead. The resulting memorandum is provided in the Annex.

Fort McClellan, Alabama

Laboratory results indicating high levels of lead and cadmium in paint samples were provided to the State of Alabama in a request for disposal options for demolition debris. The state denied the request to dispose of such waste in a sanitary landfill (reference 6, Appendix A of this protocol). The initial results of a USAEHA sampling study indicate that representative samples of the buildings do not contain significant concentrations of cadmium. Lead was present in most samples, but exceeded the RT in only a few samples. A memorandum documenting the findings is expected to be completed in October 1992.

Fort Meade, Maryland

Though in the same state as APG, this installation was able to get clearance from the state to dispose of building debris in a Subtitle D (nonhazardous waste) landfill. However, due to the convenient location and ready supply of buildings, USAEHA personnel were able to obtain several samples. These samples are currently being analyzed by the USAEHA laboratory. The findings will be documented in a final report expected to be released in early 1993.

Fort Riley, Kansas

Timelines for this project are being developed. Sampling activities are expected to take place in October 1992.

Fort Jackson, South Carolina

Timelines for this project are being developed. Sampling activities are expected to be completed within the first quarter of FY 93.

Fort McCoy, Wisconsin

Timelines for this project are being developed. No sampling dates are available at this time.

DEPARTMENT OF THE ARMY
U. S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND, MARYLAND 21010-5422

REPLY TO ATTENTION OF

HSHB-ME-SH (40)

Annex

-9 SEP 1992

MEMORANDUM FOR Commander, U.S. Army Armor Center and School and Fort Knox, Directorate of Engineering and Housing (ATTN: Mr. Louis Barnhart), Fort Knox, KY 40121

SUBJECT: Lead Testing of Demolition Buildings

1. REFERENCES.

a. Telephone conversation between Mr. L. Barnhart, Fort Knox, and Ms. V. Hauschild, this Agency, 25 August 1992, SAB.

b. AEHA (Draft) Protocol: Sampling of Buildings to Be Demolished.

c. EPA Manual SW-846, November 1986, Test Methods for Evaluating Solid Waste (Volume II), 3rd Edition.

d. Ott, Lyman; An Introduction to Statistical Methods and Data Analysis (page 418), PWS-Kent Publishing Company, 1992.

e. EPA 600/8-89-046, March 1989, Soil Sampling Quality Assurance User's Guide, 2nd Edition.

2. This memorandum is in response to your request (reference 1a) that our Agency review the lead Toxicity Characteristic Leaching Procedure (TCLP) data obtained from 54 buildings that are to be demolished. At the time of the request, details of the sampling and analytical procedures were confirmed to be appropriate and in accordance with the basic draft protocol being used by our Agency (reference 1b). This protocol has been verbally accepted by the Office of Solid Waste, Headquarters U.S. Environmental Protection Agency.

3. The raw data was analyzed using appropriate statistical procedures in accordance with EPA guidance (reference 1c). Where duplicate samples were analyzed, the arithmetic mean was used instead of the two samples. The results of this statistical evaluation are enclosed.

4. The goal of the statistical calculations was to determine the 80% confidence interval (CI). The upper limit of the 80% CI is to be compared with the applicable regulatory threshold (RT) to determine if the solid waste contains the contaminant of concern

at a hazardous level (reference 1c). Since this statistical evaluation is based on the assumption of a normal distribution, the data was first transformed in accordance with proper statistical procedures (reference 1c and 1d). A normal distribution was achieved through a Poisson (square-root) transformation.

5. The transformed upper 80% CI for this wastestream falls below the (transformed) RT for TCLP lead, resulting in a non-hazardous waste. The wastestream can be defined as all demolition debris being generated during a given FY demolition action. This would include the other 45 buildings at Fort Knox that have not been sampled. In accordance with EPA guidance (reference 1e), an adequate number of samples (i.e., buildings) has been sampled to characterize the wastestream population.

6. Future sampling of building demolition debris may be minimized or even eliminated based on these results and similar studies being performed at other Army installations. Questions concerning this matter should be directed to Ms. Veronique Hauschild at DSN 584-3651 or commercial (410) 671-3651.

FOR THE COMMANDER:

Encl

JOHN J. RESTA, P.E.
Program Manager
Hazardous and Medical Waste
Waste Disposal Engineering Division

FT KNOX RESULTS: LEAD TESTING OF DEMOLITION BUILDINGS

	Pb TCLP (mg/L)	log Pb	SQRT Pb
1	3.07	0.487138	1.752141
2	2.34	0.369215	1.529705
3	4.29	0.632457	2.071231
4	0.71	-0.14874	0.842614
5	6.86	0.836324	2.619160
6	4.62	0.664641	2.149418
7	3.26	0.513217	1.805547
8	1.44	0.158362	1.2
9	1.91	0.281033	1.382027
10	0.09	-1.04575	0.3
11	4.76	0.677606	2.181742
12	4.13	0.615950	2.032240
13	1.18	0.071882	1.086278
14	4.58	0.660865	2.140093
15	7.6	0.880813	2.756809
16	4.16	0.619093	2.039607
17	9.55	0.980003	3.090307
18	3.24	0.510545	1.8
19	3.03	0.481442	1.740689
20	4.02	0.604226	2.004993
21	2.64	0.421603	1.624807
22	1.84	0.264817	1.356465
23	5.36	0.729164	2.315167
24	1.99	0.298853	1.410673
25	16.8	1.225309	4.098780
26	0.15	-0.82390	0.387298
27	3.92	0.593286	1.979898
28	0.17	-0.76955	0.412310
29	0.11	-0.95860	0.331662
30	1.78	0.250420	1.334166
31	7.42	0.870403	2.723967
32	3.03	0.481442	1.740689
33	0.7	-0.15490	0.836660
34	0.71	-0.14874	0.842614
35	3.58	0.553883	1.892088
36	3.13	0.495544	1.769180
37	2.92	0.465382	1.708800
38	1.24	0.093421	1.113552
39	2.79	0.445604	1.670329
40	2.74	0.437750	1.655294
41	1.96	0.292256	1.4
42	1.8	0.255272	1.341640
43	0.43	-0.36653	0.655743
44	0.9	-0.04575	0.948683
45	3.97	0.598790	1.992485
46	0.23	-0.63827	0.479583
47	3.29	0.517195	1.813835
48	0.92	-0.03621	0.959166
49	1.71	0.232996	1.307669
50	2.28	0.357934	1.509966
51	0.47	-0.32790	0.685565
52	0.55	-0.25963	0.741619
53	13.47	1.129367	3.670149
54	4.61	0.663700	2.147091

STATISTICAL EVALUATIONS

3.231 Mean
3.112 STD — Mean < STD^2
0.057 Std Error

3.305 80% CI

5.0 RT — 80% CI < RT

Trnsfrmd (LOG) Statistics

0.296 Mean
0.500 STD — Mean < STD^2
0.068 Std Error

0.384 80% CI

0.699 RT — 80% CI < RT

Trnsfrmd (SQRT) Statistics

1.589 Mean
0.805 STD — Mean > STD^2 ***
0.110 Std Error

1.731 80% CI

2.236 RT — 80% CI < RT

Enclosure

APPENDIX C

SMALL SCALE
LEAD-BASED PAINT DEBRIS

SUGGESTED GUIDELINES FOR
WASTE CHARACTERIZATION AND DISPOSAL

DEFINITION: "Small scale" lead-based paint debris includes building/structural debris generated during renovation, maintenance, or abatement of structures that are painted with lead-based paint. This debris may be comprised of a variety of materials such as wood, plasterboard, drywall, brick and/or cement, or may only involve a specific item such as wood doors or window frames/sills.

SCOPE: This document does not address safety and health requirements for personnel or building inhabitants nor does it describe abatement/encapsulation procedures and/or requirements. These are generic guidelines to assist installations when determining the most efficient means for characterizing and disposing of the waste debris.

OTHER REFERENCES: Several other documents, guides, and even policies that address the other aspects of the lead-based paint issue (assessment of housing, abatement, blood-level monitoring, worker protection, etc.) are being formulated at this time (e.g., DOD Commander's Guide to Lead-Based Paint Issues and the DOD Technical Guide to Lead-Based Paint Issues). The HUD Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing is also a good source for additional information. Unfortunately, these sources do not address waste characterization with adequate detail.

PROCEDURES: The following procedures are written as a set of "suggested steps" that installation personnel should use to most efficiently identify, characterize, and dispose of small scale lead-based paint debris.

1. The first step is the identification process. Installations need to determine if and where lead-based paint exists. While many installations are currently faced with immediate identification problems, an installation assessment may eventually facilitate proper handling and disposal actions, thus reducing costs and improving efficiency.

a. In the meantime, all buildings undergoing maintenance, renovation or abatement should be assessed for the possibility for containing lead-based paint. This initial "assessment" can be performed without the use of any equipment such as x-ray fluorescence (XRF) analyzers or chemical analysis.

Knowledge of the approximate age of the building (buildings built prior to 1978 are more likely to contain lead-based paint), which areas are going to actually be removed and disposed (exterior painted surfaces, window frames and doors are areas that often contain the most concentrated forms of lead-based paint), and the results of any previously sampled debris, should provide an assessor with enough information to determine whether lead may be present.

b. While many "lead kits" and XRF analyzers are now available for assessing lead presence in paint, these technologies were designed to evaluate the total amount of lead in the paint, rather than the amount of leachable lead. It is this leachable concentration [achievable through the Toxicity Characteristic Leachate Procedure (TCLP)] which must be used to characterize the waste. A comparison of the results from a spectrum XRF analyzer and the associated TCLP values revealed no correlation (see reference 13, Appendix A of this protocol). The evaluation concluded that such devices are only useful when screening buildings for the presence of lead. In addition, these devices cost a considerable amount of money and are not as accurate as laboratory analysis. In most cases, basic knowledge of the building will allow for a reasonably conservative determination of the presence of lead.

2. Once projects on lead-paint 'contaminated' buildings have been identified, the approximate quantity and types of materials that will make up the waste debris should be estimated. The cost of disposing this waste as a hazardous waste (HW) should then be established. In most cases, the Defense Reutilization and Marketing Office (DRMO) or HW disposal contractor will be able to provide cost estimates.

3. The cost of disposing of the waste as HW should then be compared to analytical costs for performing the TCLP for lead. Generally, it would be cheaper to dispose of one or two doors or a 5-gallon can of paint chips as an HW rather than taking a sample for analysis (especially since there is over a 50 percent chance of the waste turning out to be hazardous).

4. Larger scale renovation may involve a significant amount of waste, however, to the extent that it may be beneficial to obtain samples and analyze them. The number of samples to obtain will depend on the types and amounts of materials being tested. Compositing of different materials is advised (refer to the Sampling Protocol for Buildings to be Demolished). A minimum of two samples is recommended to check for compositing and or laboratory error. A greater number of samples may be obtained for larger amounts and more variable wastestreams.

APPENDIX D

SITE SAFETY AND HEALTH PLAN (SSHP)

1. PROJECT DESCRIPTION.

a. **Background.** Refer to the Sampling Protocol for Demolition Debris for details and general background information.

b. **Study Objectives.** The purpose of this project is to determine if the subject buildings contain lead-based paint (LBP) and establish the appropriate waste classification (solid waste or hazardous waste) for the debris.

c. **Anticipated Activities.** The activities which are to be conducted as part of this study will chiefly involve drilling into structural materials of the subject buildings. Since electrical power is not available at the site a portable generator will be used.

d. **Number of Personnel Required Onsite.** At least two persons will be onsite during all sampling activities.

2. TRAINING AND INFORMATION. Personnel performing these tasks will be properly trained to use the equipment, informed of the potential dangers, and provided with the necessary tools to adequately protect themselves.

3. HAZARD ANALYSIS.

a. **Hazardous Substances.** Since it has been confirmed that lead-based paint is present on the buildings, lead is considered to be a potential chemical hazard. Where asbestos has been removed from the buildings, there is still a possibility of asbestos fibers in some of the transite boarding and insulation. Care will be taken to minimize any disturbance of these items.

b. **Exposure Routes.** The potential routes of exposure include the ingestion, dermal, and inhalation pathways. Ingestion exposures will be minimized by prohibiting eating, gum chewing, drinking, and smoking while onsite. Dermal contact will be prevented by personnel wearing protective gloves (and in some cases coveralls). Inhalation exposure is a potential problem since the drilling operations create a lot of dust. While the exposure concentrations may intermittently exceed the safe work levels set by the Occupational Safety and Health Act (see Annex), the workers' overall exposure is only a one-time, short term event. At a minimum, particulate masks will be worn by the sampling crew. If extreme dust and poor ventilation is encountered, half-face respirator masks will be worn. Air monitoring is not required.

c. **Additional Hazards**. Additional hazards include the possible physical hazards associated with using the drilling equipment. Only trained personnel will be permitted to use such equipment. Also, sampling personnel will ensure that both electrical and water systems are turned off before sampling.

4. PERSONAL PROTECTIVE EQUIPMENT. The level of personal protective equipment (PPE) necessary for field work on this project is categorized as a modified EPA Level D and includes safety goggles, gloves, steel-toed shoes, and street clothes (long sleeve shirts and pants) with optional tyvek protective cover-alls. Particulate/half face respirator masks will also be worn.

5. SITE CONTROL. Site control will be exercised during sampling for this project to protect worker health and safety, and to prevent the spread of potential contamination (lead dust) offsite. Emergency communications with offsite personnel will be by installation telephones located near each site or by messenger. The following site procedures will also be used:

a. The buddy system will be used. Each worker will act as a safety backup to his partner. Offsite personnel will be available for emergency assistance. All personnel will be aware of dangerous situations that may develop.

b. Contact lenses will not be worn during drilling operations.

c. Eating will not be allowed at the site.

d. Alcoholic beverages are prohibited during the workday.

6. DECONTAMINATION. Personnel and equipment contact with potentially contaminated materials will be kept to a minimum. Only gloves and potentially tyvek suits will require disposal. Dusty clothing will be brushed off at the sampling site and workers will be instructed to wash hands and face directly after leaving the site. The drill bit used to extract the sample will be decontaminated with brushing and double rinsing with tap and then distilled water.

7. EMERGENCY PROCEDURES. All sampling personnel will be informed of the appropriate procedures to follow in case of an accident. Telephone numbers and/or directions to emergency personnel will be provided prior to sampling operations.

ANNEX

LEAD STANDARD

WORKER REQUIREMENTS IN ACCORDANCE WITH 29 CFR 1910.1025

Action level: 30 ug/m3 8 hr TWA (p 156)

Permissible Exposure Limit: 50 ug/m3 8 hr TWA (p 156)

Engineering Controls (p 158-9)

- if exposure more than 30 days per year, then reduce to 50 ug/m3
- if exposure 30 days per year or less, then reduce to 200 ug/m3

Administrative Controls (p 160)

Job rotation schedule acceptable provided these areas covered:

- name and identification number of affected employee (s)
- duration and exposure levels at each job or work station
- any other pertinent information

Personal Protective Equipment (p 161)

Include as a minimum: 1) coveralls; 2) gloves, hats and shoes; 3) face shields, vented goggles.

Training (p 167-8)

- required before initial job assignment and annually thereafter
- cover specific topics as listed in Appendices A and B

Medical Surveillance (p 162-3)

- Appendix C- Medical Surveillance guidelines (p 180-190)
- required for all employees exposed above the action level for more than 30 days; biological monitoring for blood lead at least every 6 mos

Respiratory Protection and Respiratory Protection Program (p 160-1)

- respiratory protection program in accordance with 29 CFR 1910.134

TABLE II—RESPIRATORY PROTECTION FOR LEAD AEROSOLS

Airborne concentration of lead or condition of use	Required respirator [1]
Not in excess of 0.5 mg/m^3 (10X PEL).	Half-mask, air-purifying respirator equipped with high efficiency filters.[2,3]
Not in excess of 2.5 mg/m^3 (50X PEL).	Full facepiece, air-purifying respirator with high efficiency filters.[3]
Not in excess of 50 mg/m^3 (1000X PEL)	(1) Any powered, air-purifying respirator with high efficiency filters;[3] or (2) Half-mask supplied-air respirator operated in positive-pressure mode.[2]
Not in excess of 100 mg/m^3 (2000X PEL)	Supplied-air respirators with full facepiece, hood, helmet, or suit, operated in positive pressure mode.
Greater than 100 mg/m^3, unknown concentration or fire fighting.	Full facepiece, self-contained breathing apparatus operated in positive-pressure mode.

[1] Respirators specified for high concentrations can be used at lower concentrations of lead.
[2] Full facepiece is required if the lead aerosols cause eye or skin irritation at the use concentrations.
[3] A high efficiency particulate filter means 99.97 percent efficient against 0.3 micron size particles.

Appendices

A Substance Data Sheet (p 170-2)
B Employee Standard Summary (p 173-180)
C Medical Surveillance Guidelines (p 180-190)
D Qualitative Fit Test Protocol (p 190-4)

Research Completed By: 1LT Lisa Simmons-Dailey

APPENDIX C

BUILDING COMPONENTS: SAMPLING LOCATIONS
(excerpts from field sampling logs)

EXAMPLE I

No. Sub-Samples	Location
6	exterior walls
1	outside windows
1	(concrete) foundation
1	trim - outside
4	interior floor
4	ceiling
2	interior wood components (door frames/window sills)
5	drywall
3	plywood (interior)
27	TOTAL

EXAMPLE II

No. Sub-Samples	Location
5	exterior walls
4	ceiling
3	floor
2	concrete flooring
2	sheetrock
2	interior wood components (doorframe, window)
2	exterior wood trim (door, window frames)
4	drywall
4	plywood
24	TOTAL

EXAMPLE III

No. Sub-Samples	Location
5	exterior walls
3	floors
3	ceiling
1	concrete footers
4	drywall
2	plywood
4	int. wood components (doorframe,windows,wall,pillar)
2	exterior wood trim (door, window frames)
1	chimney (brick)
25	TOTAL

APPENDIX D

CORRESPONDENCE: STATE OF ALABAMA

ADEM

ALABAMA
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

GREAT SEAL

ɔh Pegues, Director

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271-7950
270-5612

d Offices:

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941-1603

Box 953
ıtur, AL
ı2
) 353-1713
340-9359

Perimeter Road
ile, AL
5
) 479-2336
475-2593

Guy Hunt
Governor

May 8, 1992

Commander
U. S. Army Chemical School and Military Police Center
ATTN: ATZN - FEE (R. Levy)
Fort McClellan, AL 36205-5000

Dear Mr. Levy:

RE: Demolition of buildings painted with lead base paint

Personnel with the Alabama Department of Environmental Management (ADEM) have received your request to dispose of a total of 29 buildings that have been painted with lead base paint. After reviewing the supplied analytical information, it has been determined that the buildings in question would be a hazardous waste subject to Division 14, Hazardous Waste Regulations, if the buildings in question were demolished and a solid waste was created. According to the TCLP analysis the exterior walls are characteristically hazardous for lead (D008) and Cadmium (D006) with results of 365 ppm and 9.25 ppm respectively. It should be noted that if the outer walls are removed and handled as a hazardous waste the remaining structure may not exhibit the characteristic for lead and cadmium and thus not be subject to Division 14, Hazardous Waste Program. Also, additional testing should be conducted to determine the scope and extent of lead and cadmium contamination.

Enclosed you will find a copy of the November 13, 1984 Federal Register, pp 44978-44980. This Final Rule specifically addresses the household exclusion with regard to bunkhouses, crew quarters, ranger stations etc.

At this time the Solid Waste Branch is denying your request to dispose of 29 buildings at your on-site sanitary landfill, permit number 08-02R. Management and or disposal of this waste stream should be coordinated through the RCRA Compliance Branch of this Department.

You may contact Mr. Steve Jenkins at (205) 271-7726 for further information regarding this matter.

Sincerely,

Russell A. Kelly

Russell A. Kelly, Chief
Solid Waste Branch
Land Division

RAK/MBJ/kap#1966
Enclosure
C: Steve Jenkins, with attachments
File: I/W - Fort McClellan

DEPARTMENT OF THE ARMY
U.S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND, MARYLAND 21010-5422

REPLY TO ATTENTION OF

December 8, 1992

Waste Disposal Engineering
Division

Mr. Steve Jenkins
Alabama Department of the Environment
Land Division - Solid Waste Branch
1751 Cong. W.L.
Dickenson Drive
Montgomery, Alabama 36130

Dear Mr Jenkins:

This Agency has recently been involved with a study of the waste characteristics of building demolition debris at various Army installations. A copy of the Sampling Protocol that was designed for this study is at Enclosure 1. This protocol was used to obtain representative waste stream samples from several sites, including Fort McClellan.

As lead-based paint was cited as the potential contaminant in this type of waste stream, our study has focused primarily on the lead constituents in this debris. However, other metals associated with paints and pigments were also investigated.

To date, levels of metal constituents in the samples have generally been well below the associated regulatory thresholds (RT). Arsenic, barium, cadmium, chromium, mercury, silver, and selenium are typically non-detectable in the samples. Lead is consistently detected, yet usually at concentrations below the RT of 5 mg/L.

A number of the samples obtained from Fort McClellan, however, exhibited a lead concentration slightly higher than the RT of 5 mg/L. The 80% confidence interval (CI) for these samples was 6.51 mg/L (see Enclosure 2). While we understand that there is no existing variance or exemption from classifying this waste as a hazardous waste, we urge you to allow the disposal of these buildings at Fort McClellan as non-hazardous waste for the following reasons:

a. When data is properly transformed (IAW EPA guidance SW-846), the transformed 80% confidence interval is 2.25. For comparison, the transformed RT is 2.24. The difference between these two units (0.01) is relatively small.

b. Our sampling protocol was designed to reflect a conservative estimate (i.e., higher than the true value) of lead leachate that would be released from the debris. While ensuring that any error would be on the conservative side, we also maintained safer and less time consuming sampling efforts by following the procedures outlined in the protocol.

c. Sampling results from other Army installations have typically exhibited non-hazardous characteristics. These results and their evaluations will be published by this Agency. A final report will suggest that, based on these findings, general demolition debris from Army installations be classified as a non-hazardous waste.

d. The remaining options are costly, time-consuming and/or may incur unneccesary health hazards to personnel:

(1) One such option involves resampling. Resampling the buildings will involve additional time and money. In addition, the difficulties involved with this process may preclude us from obtaining more accurate results.

(2) The removal of the paint from the buildings is an option that would greatly reduce the volume of hazardous waste. New abatement technologies are being invented every day. However, these methods are extremely expensive and generally only used when the structure is to remain for reuse/reoccupancy. In addition, there is the risk of occupational exposure and/or release to the environment during removal operations.

(3) Finally, there is the option of disposing of the buildings (or at least those exhibiting the highest lead concentrations) as a hazardous waste. Not only is this option very costly, but -- due to the large volume of waste -- it would take up a large amount of HW landfill space which could undoubtedly be used for waste that pose more significant or proven health threats.

This Agency requests that your office consider these options and provide us with an opinion with regards to the proposed classification of the buildings at Fort McClellan as a non-hazardous waste. Questions concerning this matter should be addressed to Ms. Veronique Hauschild or Mr. John Resta at (410) 671-3652. Please contact Mr. Ron Levy at Fort McClellan for any additional questions. He can be reached at (205) 848-3758.

Sincerely,

John J. Resta, P.E.
Program Manager
Hazardous and Medical Waste
Waste Disposal Engineering Division

Enclosures

Building Debris Samples -- Ft. McClellan, September, 1992

	Pb	log Pb	sqrt Pb
1121	6.2	0.792	2.490
956	0.5	-0.301	0.707
963	2.8	0.447	1.673
862	0.2	-0.699	0.447
1123	10.6	1.025	3.256
1125	12.7	1.104	3.564
1124	15.2	1.182	3.899
796	0.1	-1.000	0.316
221	2.4	0.380	1.549
962	4.4	0.643	2.098
970	0.5	-0.301	0.707
883	0.8	-0.097	0.894
1394	0.1	-1.000	0.316
2266	6.2	0.792	2.490
2264	11.9	1.076	3.450
1692	3.0	0.477	1.732
mean	4.850	0.283	1.849
std	4.937	0.727	1.196
std err	1.234	0.182	0.299
normal?	N	N	Y
80% CI	6.51	0.53	2.250
trsfmd RT	5.00	0.699	2.236

* 80% Confidence Interval = mean + (t * std err); where t = 1.341 for df = 15 (df=n-1)

The data shows a normal distribution (i.e., the mean > the STD squared) ONLY when the data is subjected to a square root transformation.

The appropriately transformed data results in an 80% CI that exceeds the regulatory threshold by 0.014. However, since the sampling methodolgies were designed to present a conservative estimate of the lead concentrations in each building, one can assume that the statistical results (e.g., 80% CI) are also high.

(reference: Test Methods for Evaluating Solid Waste, EPA Manual SW-846, Vol. II, Chapter 9, November 1986.)

ADEM

ALABAMA
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

Pegues, Director

Guy Hunt
Governor

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479-2336
79-2593

January 14, 1993

Mr. John J. Resta, P.E.
Program Manager
Hazardous and Medical Waste
Waste Disposal Engineering
Division
Aberdeen Proving Ground, MD 21010

Dear Mr. Resta:

Re: **Building Demolition Debris**
Fort McClellan/Calhoun County, Alabama
USEPA Identification Number AL4 210 020 562

The Department has reviewed the Department of the Army's submittal dated December 8, 1992, requesting the Alabama Department of Environmental Management's (ADEM) opinion in regard to the classification of the waste generated upon demolition of buildings at Fort McClellan. The Department of the Army urges that ADEM allow the disposal of the demolition wastes as non-hazardous.

Rule 335-14-3-.01(2) of the afore-mentioned Code requires the generator to make a hazardous waste determination on each solid waste generated. Representative samples of wastes generated during the demolition process at Fort McClellan should be analyzed using the Toxicity Characteristic Leaching Procedure (TCLP) for metals. Those wastes which are determined to contain hazardous constituents at regulated levels must be managed as a hazardous waste, until such time as a variance or exemption is issued.

Should you have any questions regarding this matter, please contact Mr. Philip Woods of the RCRA Compliance Branch at (205) 271-7758.

Sincerely,

Steven O. Jenkins, Chief
RCRA Compliance Branch
Land Division

SOJ/PSW/sdm:#1795-110

c: Mr. John Dickinson, Chief
Waste Compliance Section
USEPA Region IV

Mr. Lindsay Mothershed
Solid Waste
Land Division

Major General Robert D. Orton
Commander, USA-CML & MPCEN & FM
Fort McClellan, AL

DEPARTMENT OF THE ARMY
U. S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND, MARYLAND 21010-5422

REPLY TO
ATTENTION OF

Waste Disposal Engineering
Division

22 FEB 1993

SUBJECT: Building Demolition Debris, Fort McClellan/Calhoun County, Alabama, EPA Identification Number AL4 210 020 562

Alabama Department of the Environment
Land Division - Solid Waste Branch
ATTN: Mr. Steve Jenkins
1751 Cong. W.L.
Dickenson Drive
Montgomery, Alabama 36130

Dear Mr. Jenkins:

This Agency has received your response to our submittal dated December 8, 1992, requesting the Alabama Department of Environmental Management's (ADEM) opinion on the classification of demolition debris to be generated from Fort McClellan. We agree that wastes that contain hazardous constituents at or above the regulatory thresholds (RTs) must be managed as hazardous waste (without exception). However, in our previous submittal we pointed out the numerous problems involved with obtaining an accurate representation of this particular wastestream. We hypothesized that our sampling techniques had resulted in overly conservative (i.e., high) estimates of lead.

In light of your response, we have chosen to re-evaluate (i.e., re-sample) the six buildings that originally yielded over 5 mg/L of lead. The results are enclosed. Please note that all 6 buildings fell well below the RT. The sampling strategy used during the second phase involved more time and effort on part of the sampling team but has apparently 'proven' our hypothesis. The main difference in approach was that subsamples were selected on the basis of mass ratio as opposed to surface area. The survey team also used building schematics more consistently and identified 'hidden' components such as wood studs and rafters which were then included in the sampling process. These additional procedures are consistent with the comments received from Headquarters EPA in regards to the USAEHA Sampling Protocol:

" ... The real trick in sampling is to accurately determine hazard potential while balancing costs of sample collection and analysis. To this end your protocol seems well

Nationally Recognized as the Center of Matrixed Occupational and Environmental Health Excellence designed. Always keep the data quality objectives in mind so that the cost of sampling is balance with the precision needed. A greater sampling effort is only justified when analysis shows we are near the regulatory threshold (RT)...."

Based on our re-sampling, we would recommend that Fort McClellan proceed with demolition and dispose of the debris as (nonhazardous) rubble/debris, in accordance with the appropriate ADEM regulations. This Agency requests your concurrence with this recommendation. Questions concerning this matter should be addressed to Ms. Veronique Hauschild or Mr. John Resta at (410) 671-3651. Please contact Mr. Ron Levy at Fort McClellan for any additional questions. He can be reached at (205) 848-3758.

Sincerely,

John J. Resta, P.E.
Program Manager
Hazardous and Medical Waste
Waste Disposal Engineering Division

Enclosure

Copies Furnished:

CDR, Fort McClellan, ATTN: ATZN-FEE (Mr. R. Levy)
CDR, HQ TRADOC ATTN: Environmental Office (Ms. S. Stotz)

REPORT OF ANALYSES

The proponent of this form is ESHB-LO

RETURN ADDRESS: T. Custer, EHED

PROJECT NUMBER: 37-62-JK44-93

DATE SAMPLES REC'D: 5 Feb 93

PROJECT OFFICER: Terry Custer

SAMPLED INSTALLATION: Ft. McClellan

LAB NUMBER	SAMPLE NUMBER	SAMPLE RESULTS (PARAMETER AND UNITS)						
		TCLP lead						
2738	2266	0.1 mg/L						
2739	2264	0.1 "						
2740	1125	0.2 "						
2741	1124	2.0 "						
2742	1123	0.1 "						
2743	1121	0.8 "						
2744	1121D	0.9 "						

Building #1 5

PROCEDURES PERFORMED: EPA

ANALYST(s) (initial): AS /RA /PH

REVIEWED BY (initial): TW

DATE RESULTS REPORTED: 16 FEB 93

AEHA Form 14, 1 Sep 82

Pegues, Director

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450-3400
79-2593

Guy Hunt
Governor

March 18, 1993

Commander
USA-CML & MPCEN & FM
Directoric of Engineering & Housing
Building 215
15th Street
Fort McClellan
Fort McClellan, Alabama 36205-5000

Dear Commander:

Re: **Demolition Debris**
Fort McClellan
USEPA Identification Number AL4 210 020 562

The Department has completed review of the U.S. Army Environmental Hygiene Agency's submittal documenting the sampling protocol and sample analysis results for the buildings to be demolished at Fort McClellan in the 1993 Fiscal Year. Based on the results of this study it appears that the wastes generated in the FY 1993 building demolition process may be managed as non-hazardous solid wastes.

In order to dispose this waste stream in Fort McClellan's on-site solid waste landfill, please complete the enclosed Solid/Hazardous Waste Determination packet and return it to this Department.

Should questions arise regarding this matter, please contact Mr. Philip Woods of the RCRA Compliance Branch at (205) 271-7758.

Sincerely,

Steven O. Jenkins, Chief
RCRA Compliance Branch
Land Division

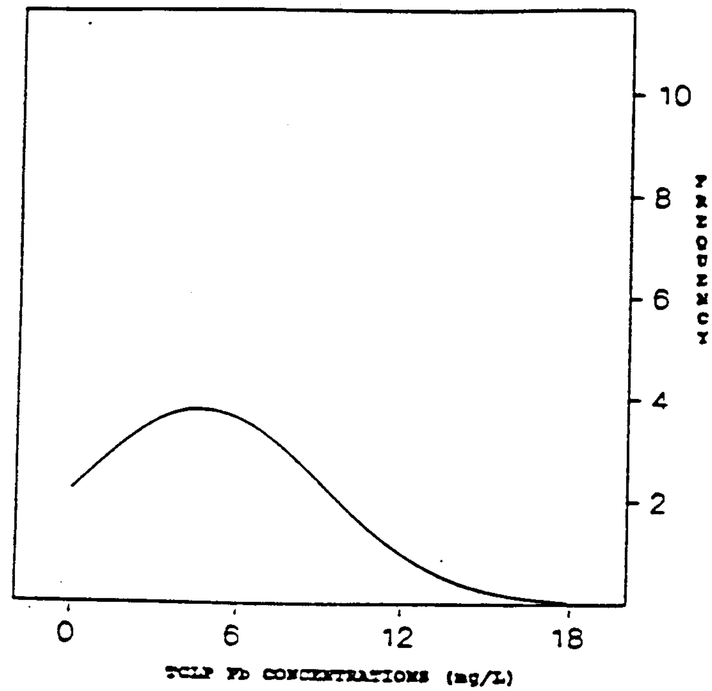
SOJ/PSW/sdm:#1795/201
Enclosure(s)
c: Ms. Veronique Hauschild
Aberdeen Proving Ground, MD

Mr. Lindsey Mothershed
Solid Waste

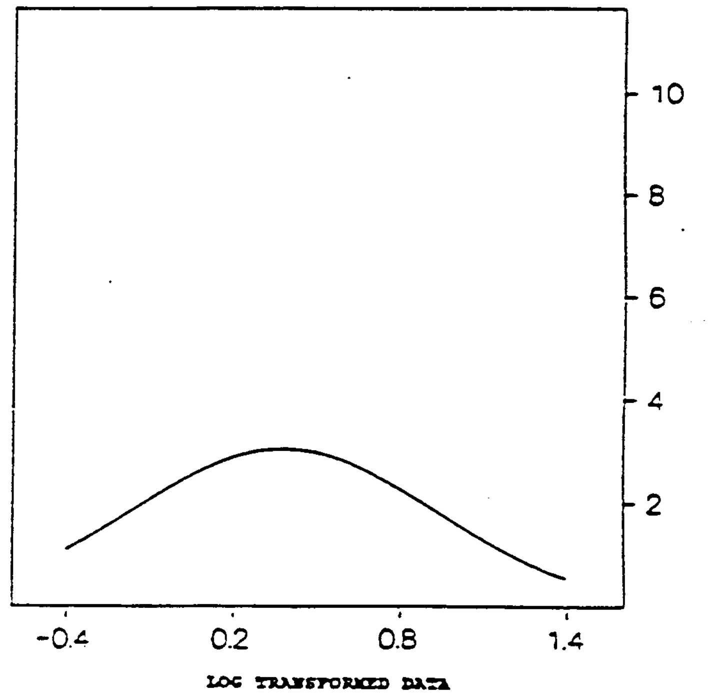
APPENDIX E

GRAPHICAL DISPLAY OF DATA NORMALITY

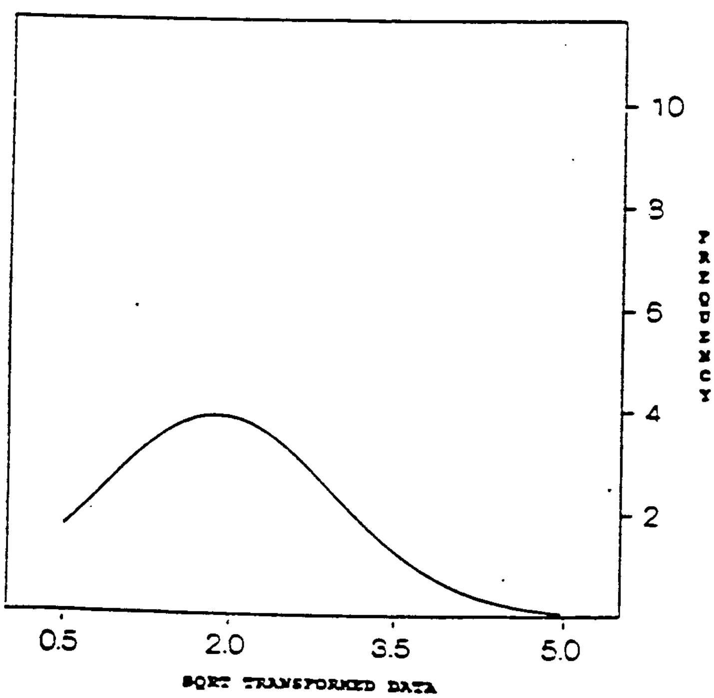
FT. JACKSON
BUILDING DEMOLITION DEBRIS CHARACTERIZATION
Distribution Curve of Raw Data



FT. JACKSON
BUILDING DEMOLITION DEBRIS CHARACTERIZATION
Distribution Curve of LOG Transformed Data



FT. JACKSON
BUILDING DEMOLITION DEBRIS CHARACTERIZATION
Distribution Curve of SQRT Transformed Data



APPENDIX F

COMBINED DATA:
PILOT STUDIES

Pb RESULTS -- ALL

	mean	3.17
	std	3.07
	stderr	0.21
	00% CI *	3.45
	RT	5.00

* 00% Confidence Interval = mean + (t * stderr); for which t = 1.289

Pb RESULTS -- ALL

SQRT Transformation

1.66	mean
0.84	std
0.06	stderr
1.73	00% CI
2.24	RT

		Pb mg/L		SQRT Transformation
Ft Knox	1	3.07		1.75
	2	2.34		1.53
	3	4.29		2.07
	4	0.71		0.84
	5	6.86		2.62
	6	4.62		2.15
	7	3.26		1.81
	8	1.44		1.20
	9	1.91		1.38
	10	0.09		0.30
	11	4.76		2.18
	12	4.13		2.03
	13	1.18		1.09
	14	4.58		2.14
	15	7.60		2.76
	16	4.16		2.04
	17	9.55		3.09
	18	3.24		1.80
	19	3.03		1.74
	20	4.02		2.00
	21	2.64		1.62
	22	1.84		1.36
	23	5.38		2.32
	24	1.99		1.41
	25	16.80		4.10
	26	0.15		0.39
	27	3.92		1.98
	28	0.17		0.41
	29	0.11		0.33
	30	1.78		1.33
	31	7.42		2.72
	32	3.03		1.74
	33	0.70		0.84
	34	0.71		0.84
	35	3.58		1.89
	36	3.13		1.77
	37	2.92		1.71
	38	1.24		1.11
	39	2.79		1.67
	40	2.74		1.66
	41	1.96		1.40
	42	1.80		1.34
	43	0.43		0.66
	44	0.90		0.95
	45	3.97		1.99
	46	0.23		0.48
	47	3.29		1.81
	48	0.92		0.96
	49	1.71		1.31
	50	2.28		1.51
	51	0.47		0.69
	52	0.55		0.74
	53	13.47		3.67
	54	4.61		2.15
Ft Meade	55	1.40		1.18
	56	2.26		1.50
	57	1.97		1.40
	58	0.75		0.86
	59	0.72		0.85
	60	1.10		1.05
	61	3.88		1.97
Ft McClel	62	0.85	6.20	2.49
	63	0.50		0.71
	64	2.80		1.67
	65	0.20		0.45
	66	0.10	10.60	3.26
	67	0.20	12.70	3.56
	68	2.00	15.20	3.90
	69	0.10		0.32
	70	2.40		1.55
	71	4.40		2.10
	72	0.50		0.71
	73	0.00		0.09
	74	0.10		0.32
	75	0.10	6.20	2.49
	76	0.10	11.90	3.45
	77	3.00		1.73
APG	78	1.00		1.04
	79	1.11		1.05
	80	14.70		3.83
	81	10.00		3.16
	82	1.35		1.16
	83	3.11		1.76
	[illegible]	[illegible]		[illegible]

	86	1.53	1.24
	87	1.76	1.35
	88	1.30	1.17
	89	0.50	0.71
	90	0.51	0.71
	91	1.06	1.03
	92	0.91	0.95
	93	0.82	0.91
	94	2.56	1.60
	95	0.50	0.71
Ft Devens	96	4.10	2.02
	97	7.20	2.68
	98	0.53	0.73
	99	1.20	1.10
	100	1.50	1.22
	101	6.00	2.45
	102	8.40	2.90
	103	5.90	2.43
	104	3.50	1.87
	105	0.44	0.66
	106	0.02	0.14
Ft Riley	107	0.66	0.81
	108	2.80	1.67
	109	0.58	0.76
	110	2.80	1.67
	111	1.10	1.05
	112	0.66	0.81
	113	3.90	1.97
	114	2.70	1.64
	115	4.10	2.02
	116	0.96	0.98
	117	5.00	2.24
	118	7.40	2.72
	119	6.60	2.57
	120	6.70	2.59
	121	5.30	2.30
	122	8.50	2.92
	123	7.50	2.74
	124	7.55	2.75
	125	3.90	1.97
	126	1.80	1.34
	127	4.70	2.17
	128	6.75	2.60
	129	3.00	1.73
	130	1.40	1.10
	131	6.20	2.49
	132	6.00	2.45
Ft Jackso	133	0.50	0.71
	134	15.20	3.90
	135	0.50	2.55
	136	8.80	2.97
	137	8.90	2.98
	138	12.85	3.58
	139	3.20	1.79
	140	0.00	0.09
	141	0.60	0.77
	142	0.80	0.89
	143	2.10	1.45
	144	0.70	0.84
	145	0.75	0.87
	146	6.80	2.61
	147	6.00	2.45
	148	0.60	0.77
	149	0.60	0.77
	150	0.40	0.63
	151	6.60	2.57
	152	7.70	2.77
	153	7.00	2.65
	154	1.40	1.18
	155	3.10	1.76
	156	2.60	1.61
	157	6.60	2.57
	158	2.90	1.70
	159	3.70	1.92
	160	0.20	0.45
	161	9.30	3.05
	162	0.50	0.71
	163	3.80	1.95
	164	9.70	3.11
	165	1.20	1.10
	166	3.50	1.87
	167	5.00	2.24

	168	5.50	2.35
	169	1.50	1.22
	170	3.20	1.79
	171	1.00	1.00
	172	1.30	1.14
	173	0.30	0.55
	174	0.20	0.45
	175	2.60	1.61
	176	3.00	1.73
	177	3.60	1.90
	178	0.40	0.63
	179	1.30	1.14
Ft Gordon	180	1.40	1.18
	181	3.10	1.76
	182	2.60	1.61
	183	6.60	2.57
	184	2.90	1.70
	185	3.70	1.92
	186	0.20	0.45
	187	9.30	3.05
	188	0.50	0.71
	189	3.00	1.95
	190	9.70	3.11
	191	1.20	1.10
	192	3.50	1.87
	193	5.00	2.24
	194	5.50	2.35
	195	1.50	1.22
	196	3.20	1.79
	197	1.00	1.00
	198	1.30	1.14
	199	0.30	0.55
	200	0.20	0.45
	201	2.60	1.61
	202	3.00	1.73
	203	3.60	1.90
	204	0.40	0.63
	205	1.30	1.14

APPENDIX G

SUGGESTED GUIDELINES FOR CHARACTERIZATION OF SMALL SCALE DEBRIS CONTAINING LEAD-BASED PAINT

The following discussion describes various "types" of debris that are commonly "contaminated" with lead-based paint. The discussion assumes that lead-containing paint has been previously identified (either through laboratory analyses, XRF testing, spot-tests, or historic knowledge. If NO information is available regarding the existence of lead in the painted surfaces, screening with one of these methods (i.e., lab analyses, XRF, etc.) is recommended in that it will provide information for worker protection and may reduce analytical costs for waste characterization.

After each "category" of waste, a waste characterization is provided: HW = hazardous waste (as per RCRA 40 CFR 261);
SW = non-hazardous waste. These waste characterizations are provided as a tool to assess your operation's wastestream and determine when analyses may be warranted or when enough information is available to characterize your waste based on "generator knowledge." There may be exceptions to the waste characterizations listed, the information is based on general industry-based findings.

Keep in mind that when waste is deemed to be SW (i.e, non-hazardous) some limited sampling may be warranted for "liability's sake." Classifying waste as HW without sampling and analyses, on the other hand, may be over conservative and result in classifying some non-hazardous wastes as HW. While HW disposal is more expensive than regular SW disposal, the costs of sampling and analytical analyses (specifically the Toxicity Characteristic Leachate Procedure (TCLP) for lead) do add up. A cost analyses may be beneficial to determine the most practical approach for your individual needs.

Finally, keep in mind that these suggested guidelines are all based on FEDERAL regulations. Individual States and localities may have more stringent requirements and therefore should be consulted when determining waste disposal practices.

WASTE TYPES AND TYPICAL CHARACTERIZATIONS

4 CATEGORIES OF DEBRIS	WASTE CHAR
(1) Whole Building Demolition Debris. Consists of all building components (painted and non-painted) to include wood, brick, cement (foundations), plaster, drywall, etc. that are torn down during demolition and hauled off site for disposal. Waste characterization is based on analyses of samples that are "representative" of the waste. Therefore, proportionate quantities of the various structural components should be obtained (e.g., by coring or drilling through the materials) and combined for analyses in accordance with the TCLP requirements.	**SW**
(2) Partial Demolition (Building Renovation). This waste stream consists of a mixture of components (painted and non-painted) such as those in whole building demolition debris, but the mixture is less than the entire structure. The volume of hazardous waste may be through careful characterization and segregation of individual components. Where segregation is not practical for a particular operation the overall "representative" sample approach used for whole building demolition should be used. A cost analyses may be beneficial to determine waste management practices.	**SW/ HW/ both**
(3) Components. This waste stream includes lead painted or varnished components removed for remodelling, abatement or maintenance purposes. Such components include baseboards, window frames, doors, trim, etc. Usually, the proportion of paint to the overall mass of the waste is sufficient to result in a relatively "high" TCLP concentration, therefore resulting in a hazardous waste. Some minimal sampling may be beneficial.	**HW**
(4) Contaminated Media/Items. This category encompasses everything from the paints chips/scrapings to solvents to personal protective clothing and other items that are "contaminated" with dust or paint chips/residues. Some of items are listed below with associated discussion and waste characterizations.	
- **Paint chips/scrapings**. Contain and collect. Should be handled, packaged, and disposed as a HW.	**HW**
- **Blast grit**. Since there are different types of grit material and degree of contamination will vary, limited sampling is recommended.	**HW/ SW**

- **Solvents**. These may be hazardous for constituents other than lead, specifically for RCRA "listed" compounds. The Material Safety Data Sheets (MSDSs) or other product information should be referred to for more information. "Listed" compounds are HWs regardless of lead concentrations. For otherwise nonhazardous solvents, the concentrations of lead must be established after use for ultimate waste characterization. Some solvents may be able to be distilled/recycled. While the "cleaned" solvent would not be a HW, any sludge or filters used for recycling purposes are probably HWs (see below.) **HW**

- **Caustic Pastes**. Due to different compounds and different paints, minimal sampling and analyses is suggested. **HW/SW**

- **Water**. Water may be used during blasting, decontamination, rinsing, etc. Due to the different uses, minimal sampling is recommended. Whenever possible, recycling of water is recommended; filters used in recycling may be HW (see below).

- **Filters, sludges, etc**. From air filters, water filters/recycling, or solvent reclamation operations, these items are usually very "concentrated" wastes that are high in lead and therefore a HW. **HW**

- **Plastics, tarps, PPE**. To the degree possible, these items should be reused. At the end of an operation or when disposal of these items is otherwise necessary, best management practices include proper containment (i.e., drumming) handling and disposal. In general, it may be most cost efficient to classify these wastes as a HW without sampling. **HW**

- **Soil**. Soil that is "contaminated" with lead may [based on a health risk assessment and/or EPA Office of Solid Waste and Emergency Response (OSWER) Lead Clean-up levels of 500-1000 ppm] have to removed from a site and properly disposed. Similar to other materials previously discussed, the waste characterization of this removed soil will depend on a TCLP analyses for lead. Limited sampling is recommended to characterize the waste soil. **HW**

APPENDIX H

SOIL LEAD CLEAN-UP LEVELS

Currently Available Lead Clean-up Levels/Allowable Concentrations

Source	Level	Basis & Comments
CDC (1985)[1] EPA (1989)[2]	500-1000mg/kg	Soil levels that are unlikely to cause increased blood lead levels in children; used as interim criteria by EPA.
EPA (1991)[3]	250-500 mg/kg	Allowable soil levels to protect children based on the EPA Biouptake Model.
Washington State Dept. of Ecology (1991)[4]	250 mg/kg and 1000 mg/kg	Allowable soil lead levels for residential and industrial areas, respectively.
New Jersey Dept. of Env. Protection and Energy (proposed)[5]	100 mg/kg and 600 mg/kg	Allowable soil lead levels for residential and industrial areas, respectively.
New York Dept. of Environ. Conservation (proposed)[6]	250 mg/kg	
Minnesota Pollution [7] Control Agency	300 mg/kg	Allowable soil levels in residential areas and playgrounds.

[1] CDC, "Preventing Lead Poisoning in Young Children," Public Health Service, Chronic Disease Division, Atlanta, GA, July 85.

[2] EPA Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites, OSWER Directive 9355.4-02, Sept 89

[3] EPA "User's Guide for Lead: A PC/Software Application of the Uptake/Biokinetic Model 0.50;" Env. Criteria & Assessment Office, Cincinnati, OH; ECAO-CIN; January 1991.

[4] Washington Dept of Ecology, "The Model Toxics Control Act Cleanup Regulation: Chapter 173-340 WAC;" 1991.

[5] New Jersey DEPE; Proposed Rule: Surface Standards for Contaminated Sites; Site Remediation Program; Trenton, NJ, 1992.

[6] New York State DEC; Draft Cleanup Policy and Guidelines; Cleanup Standards Task Force; Albany, NY; October 1991.

[7] Journal of Protective Coatings & Linings, April 1993, "Research News;" page 24.

APPENDIX I

EPA BEST MANAGEMENT PRACTICES (BMPs) FOR STORMWATER RUNOFF & DUST CONTROL

United States Environmental Protection Agency

Office Of Water (WH-547)

EPA 832-R-92-006
September 1992

EPA

Storm Water Management For Industrial Activities

Developing Pollution Prevention Plans And Best Management Practices

Recycled/Recyclable
Printed on paper that contains at least 50% recycled fiber

FOREWORD

This manual provides industrial facilities with comprehensive guidance on the development of storm water pollution prevention plans and identification of appropriate Best Management Practices (BMPs). It provides technical assistance and support to all facilities subject to pollution prevention requirements established under National Pollutant Discharge Elimination System (NPDES) permits for storm water point source discharges.

EPA's storm water program significantly expands the scope and application of the existing NPDES permit system for municipal and industrial process wastewater discharges. It emphasizes pollution prevention and reflects a heavy reliance on BMPs to reduce pollutant loadings and improve water quality. This manual provides essential guidance in both of these areas.

This document was issued in support of EPA regulations and policy initiatives involving the development and implementation of a National storm water program. This document is Agency guidance only. It does not establish or affect legal rights or obligations. Agency decisions in any particular case will be made applying the laws and regulations on the basis of specific facts when permits are issued or regulations promulgated.

This document will be revised and expanded periodically to reflect additional pollution prevention information and data on treatment effectiveness of BMPs. Comments from users will be welcomed. Send comments to U.S. EPA, Office of Wastewater Enforcement and Compliance, 401 M Street, SW, Mail Code EN-336, Washington, DC 20460.

3.3 BMPs FOR PAINTING OPERATIONS

Many painting operations use materials or create wastes that are harmful to humans and the environment. Storm water runoff from areas where these activities occur can become polluted by a variety of contaminants such as solvents and dusts from sanding and grinding that contain toxic metals like cadmium and mercury. These and other potentially harmful substances in storm water can enter water bodies directly through storm drains where they can harm fish and wildlife.

The following questions will help you identify potential sources of storm water contamination from painting operations on your site and BMPs that can reduce or eliminate these sources. Reading this section can help you eliminate, reduce, or recycle pollutants that may otherwise contaminate storm water.

Q. Is care taken to prevent paint wastes from contaminating storm water runoff?

Use tarps and vacuums to collect solid wastes produced by sanding or painting. Tarps, drip pans, or other spill collection devices should be used to collect spills of paints, solvents, or other liquid materials. These wastes should be disposed of properly to keep them from contaminating storm water.

PAINTING ACTIVITIES THAT CAN CONTAMINATE STORM WATER:

- Painting and paint removal
- Sanding or paint stripping
- Spilled paint or paint thinner

Q. Are wastes from sanding contained?

Prevent paint chips from coming into contact with storm water. Paint chips may contain hazardous metallic pigments or biocides. You can reduce contamination of storm water with paint dust and chips from sanding by the following practices:

- Avoid sanding in windy weather when possible.
- Enclose outdoor sanding areas with tarps or plastic sheeting. Be sure to provide adequate ventilation and personal safety equipment. After sanding is complete, collect the waste and dispose of it properly.
- Keep workshops clean of debris and grit so that the wind will not carry any waste into areas where it can contaminate storm water.
- Move the activity indoors if you can do so safely.

Q. Are parts inspected before painting?

Inspect the part or vehicle to be painted to ensure that it is dry, clean, and rust free. Paint sticks to dry, clean surfaces, which in turn means a better, longer-lasting paint job.

Q. Are you using painting equipment that creates little waste?

As little as 30 percent of the paint may reach the target from conventional airless spray guns; the rest is lost as overspray. Paint solids from overspray are deposited on the ground where they can contaminate storm water. Other spray equipment that delivers more paint to the target and less overspray should be used:

- Electrostatic spray equipment
- Air-atomized spray guns
- High-volume/low-pressure spray guns
- Gravity-feed guns.

Q. Are employees trained to use spray equipment correctly?

Operator training can reduce overspray and minimize the amount of paint solids that can contaminate storm water. Correct spraying techniques also reduce the amount of paint needed per job. If possible, avoid spraying on windy days. When spraying outdoors, use a drop cloth or ground cloth to collect and dispose of overspray.

Q. Do you recycle paint, paint thinner, or solvents?

These materials can either be recycled at the facility or sent offsite for recycling. Some recycling options ranked by the level of effort required follow.

Least Effort:
• Dirty solvent can be reused for cleaning dirty spray equipment and parts before equipment is cleaned in fresh solvent. • Give small amounts of left-over paint to the customer for touchup.
Moderate Effort:
• Arrange for collection and transportation of paints, paint thinner, or spent solvents to a commercial recycling facility.
Most Effort:
• Install an onsite solvent recovery unit. If your facility creates large volumes of used solvents, paint, or paint thinner, you may consider buying or leasing an onsite still to recover used solvent for reuse. Contact your State hazardous waste management agency for more information about onsite recycling of used solvents.

CHAPTER 4

SITE-SPECIFIC INDUSTRIAL STORM WATER BMPs

This chapter describes some of the possible Best Management Practices (BMPs) that you might include in your Storm Water Pollution Prevention Plan so that pollutants from your site do not mix with storm water.

Table 4.1 provides an easy index of the BMP descriptions that follow. The BMPs are grouped by section into six categories: Flow Diversion Practices; Exposure Minimization Practices; Mitigative Practices; Other Preventive Practices; Sediment and Erosion Prevention Practices; and Infiltration Practices.

The following information is provided for each BMP: (1) description of the BMP; (2) when and where the BMP can be used; (3) factors that should be considered when using the BMP; and (4) advantages and disadvantages of the BMP. More detailed fact sheets for a limited number of the Sediment and Erosion Prevention Practices are included as Appendix E. When designing these structural controls, EPA recommends that you refer to any State or local storm water management design standards.

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Covering

What Is It

Covering is the partial or total physical enclosure of materials, equipment, process operations, or activities. Covering certain areas or activities prevents storm water from coming into contact with potential pollutants and reduces material loss from wind blowing. Tarpaulins, plastic sheeting, roofs, buildings, and other enclosures are examples of covering that are effective in preventing storm water contamination. Covering can be temporary or permanent.

When and Where to Use It

Covering is appropriate for outdoor material storage piles (e.g., stockpiles of dry materials, gravel, sand, compost, sawdust, wood chips, de-icing salt, and building materials) and areas where liquids and solids in containers are stored or transferred. Although it may be too expensive to cover or enclose all industrial activities, cover high-risk areas (identified during the storm water pollutant source identification). For example, cover chemical preparation areas, vehicle maintenance areas, areas where chemically treated products are stored, and areas where salts are stored.

If covering or enclosing the entire activity is not possible, the high-risk part of the activity can often be separated from other processes and covered. Another option that reduces the cost of building a complete enclosure is to build a roof over the activity. A roof may also eliminate the need for ventilation and lighting systems (Washington State, 1992).

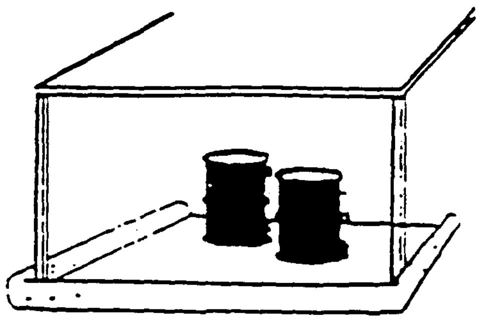
What to Consider

Evaluate the strength and longevity of the covering, as well as its compatibility with the material or activity being enclosed. When designing an enclosure, consider access to materials, their handling, and transfer. Materials that pose environmental and safety dangers because they are radioactive, biological, flammable, explosive, or reactive require special ventilation and temperature considerations.

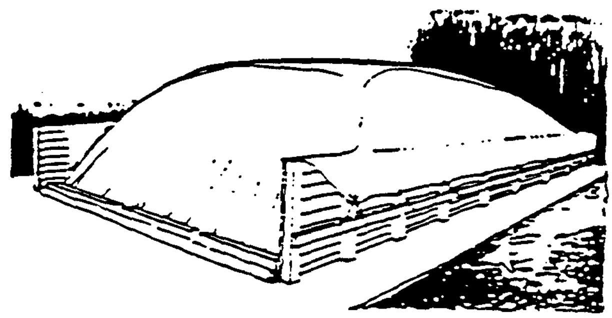
Covering alone may not protect exposed materials from storm water contact. Place the material on an elevated, impermeable surface or build curbing around the outside of the materials to prevent problems from runon of uncontaminated storm water from adjacent areas.

Frequently inspect covering, such as tarpaulins, for rips, holes, and general wear. Anchor the covering with stakes, tie-down ropes, large rocks, tires, or other easily available heavy objects.

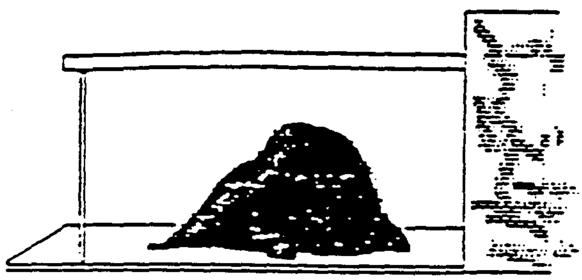
Practicing proper materials management within an enclosure or underneath a covered area is essential. For example, floor drainage within an enclosure should be properly designed and connected to the wastewater sewer where appropriate and allowed. If connection to an offsite wastewater sewer is considered, the local Publicly Owned Treatment Works (POTW) should be consulted to find out if there are any pretreatment requirements or restrictions that must be followed.



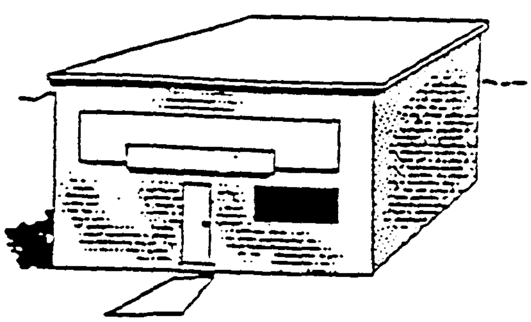
Small Chemical Storage Area with Curbing and Cover



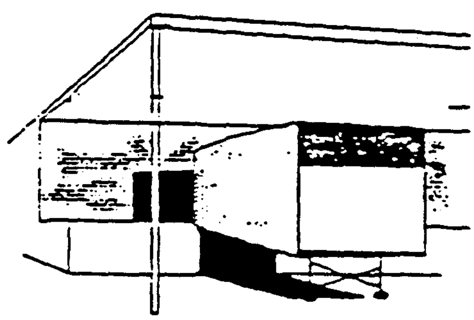
Raw Material Storage Covered with Tarpaulin



Covered Area for Raw Materials



Enclosed Area for Storage of Raw Materials or Chemicals



Covered Area for Loading and Unloading

FIGURE 4.7 EXAMPLE COVERING FOR INDUSTRIAL ACTIVITIES
(Modified from Washington State, 1992; Salt Institute, 1987)

Advantages of Covering
• Is simple and effective • Is commonly inexpensive
Disadvantages of Covering
• Requires frequent inspection • May pose health or safety problems if enclosure is built over certain activities

4.3 MITIGATIVE PRACTICES

Mitigation involves cleaning up or recovering a substance after it has been released or spilled to reduce the potential impact of a spill before it reaches the environment. Therefore, pollution mitigation is a second line of defense where pollution prevention practices have failed or are impractical. Because spills cannot always be avoided at industrial sites, it is necessary to plan for these events and to design proper response procedures. This section discusses mitigative BMPs to avoid contamination of storm water. Most of the mitigative practices discussed are simple and should be incorporated in your facility's good housekeeping and spill response plans. The mitigation practices discussed include manual cleanup methods, such as sweeping and shoveling, mechanical cleanup by excavation or vacuuming, and cleanup with sorbents and gels.

Facilities are cautioned that spills of certain toxic and hazardous substances and their cleanup may be covered under regulations, including those imposed under the Superfund Amendments and Reauthorization Act (SARA), the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA), and the Resource Conservation and Recovery Act (RCRA).

4.4 OTHER PREVENTIVE PRACTICES

A number of preventive measures can be taken at industrial sites to limit or prevent the exposure of storm water runoff to contaminants. This section describes a few of the most easily implemented measures:

- Preventive Monitoring Practices
- Dust Control (Land Disturbance and Demolition Areas)
- Dust Control (Industrial)
- Signs and Labels
- Security
- Area Control Procedures
- Vehicle Washing.

Preventive Monitoring Practices

What Are They

Preventive monitoring practices include the routine observation of a process or piece of equipment to ensure its safe performance. It may also include the chemical analysis of storm water before discharge to the environment.

When and Where to Use Them

Automatic Monitoring System—In areas where overflows, spills, and catastrophic leaks are possible, an automatic monitoring system is recommended. Some Federal, State, and local laws require such systems to be present if threats exist to the health and safety of personnel and the environment. For material management areas, monitoring may include liquid level detectors, pressure and temperature gauges, and pressure-relief devices. In material transfer, process, and material handling areas, automatic monitoring systems can include pressure drop shutoff devices, flow meters, thermal probes, valve position indicators, and operation lights. Loading and unloading operations might use these devices for measuring the volume of tanks before loading, for weighing vehicles or containers, and for determining rates of flow during loading and unloading.

Automatic Chemical Monitoring—Measures the quality of plant runoff to determine whether discharge is appropriate or whether diversion to a treatment system is warranted. Such systems might monitor pH, turbidity, or conductivity. These parameters might be monitored in diked areas, sewers, drainage ditches, or holding ponds. Systems can also be designed to signal automatic diversion of contaminated storm water runoff to a holding pond (e.g., a valve or a gate could be triggered by a certain pollutant in the storm water runoff).

Manned Operations—In material transfer areas and process areas, personnel can be stationed to watch over the operations so that any spills or mismanagement of materials can be corrected immediately. This is particularly useful at loading and unloading areas where vehicles or equipment must be maneuvered into the proper position to unload (see Vehicle Positioning BMP).

Nondestructive Testing—Some situations require that a storage tank or a pipeline system be tested without being physically moved or disassembled. The structural integrity of tanks, valves, pipes, joints, welds, and other equipment can be tested using nondestructive methods. Acoustic emission tests use high frequency sound waves to draw a picture of the structure to reveal cracks, malformations, or other structural damage. Another type of testing is hydrostatic pressure testing. During pressure testing, the tank or pipe is subjected to pressures several times the normal pressure. A loss in pressure during the testing may indicate a leak or some other structural damage. Tanks and containers should be pressure tested as required by Federal, State, or local regulations.

What to Consider

Automated monitoring systems should be placed in an area where plant personnel can easily observe the measurements. Alarms can be used in conjunction with the measurement display to warn personnel. Manned operations should have communication systems available for getting help in case spills or leaks occur. Especially sensitive or spill-prone areas may require back-up instrumentation in case the primary instruments malfunction.

Mechanical and electronic equipment should be operated and maintained according to the manufacturers' recommendations. Equipment should be inspected regularly to ensure proper and accurate operation.

The pollution prevention team, in consultation with a certified safety inspector, should evaluate system monitoring requirements to decide which systems are appropriate based on hazard potential.

Advantages of Preventive Monitoring Practices
• Pressure and vacuum testing can locate potential leaks or damage to vessels early. The primary benefit of such testing is in ensuring the safety of personnel, but it also has secondary benefits including prevention of storm water contamination. • Automatic system monitors allow for early warnings if a leak, overflow, or catastrophic incident is imminent. • Manning operations, especially during loading and unloading activities, is effective and generally inexpensive. • The primary benefit of nondestructive testing is in ensuring the safety of personnel, but it also has secondary benefits including early detection of the potential for contaminating storm water runoff.
Disadvantages of Preventive Monitoring Practices
• Plant personnel often do not have the expertise to maintain automatic equipment. • Automatic equipment can fail without warning. • Automated process control and monitoring equipment may be expensive to purchase and operate

Dust Control (Land Disturbance and Demolition Areas)

What Is It

Dust controls for land disturbance and demolition areas are any controls that reduce the potential for particles being carried through air or water. Types of dust control are:

- Irrigation – Irrigation is a temporary measure involving a light application of water to moisten the soil surface. The process should be repeated as necessary.

- Minimization of Denuded Areas – Minimizing soil exposure reduces the amount of soil available for transport and erosion. Soil exposure can be lessened by temporary or permanent soil stabilization controls, such as seeding, mulching, topsoiling, crushed stone or coarse gravel spreading, or tree planting. Maintaining existing vegetation on a site will also help control dust.

- Wind Breaks – Wind breaks are temporary or permanent barriers that reduce airborne particles by slowing wind velocities (slower winds do not suspend particles). Leaving existing trees and large shrubs in place will create effective wind breaks. More temporary types of wind breaks are solid board fences, snow fences, tarp curtains, bales of hay, crate walls, and sediment walls.
- Tillage – Deep plowing will roughen the soil surface to bring up to the surface cohesive clods of soil, which in turn rest on top of dusts, protecting them from wind and water erosion. This practice is commonly practiced in arid regions where establishing vegetation may take time.

- Chemical Soil Treatments (palliatives) – These are temporary controls that are applied to soil surfaces in the form of spray-on adhesives, such as anionic asphalt emulsion, latex emulsion, resin-water emulsions, or calcium chloride. The palliative is the chemical used. These should be used with caution as they may create pollution if not used correctly.

When and Where to Use It

Dust controls can be used on any site where dust may be generated and where the dust may cause onsite and offsite damage. Dust controls are especially critical in arid areas, where reduced rainfall levels expose soil particles for transport by air and runoff. This control should be used in conjunction with other sedimentation controls such as sediment traps.

What to Consider

To control dust during land disturbance and at demolition areas, exposure of soil should be limited as much as possible. When possible, work that causes soil disturbance or involves demolition should be done in phases and should be accompanied by temporary stabilization measures. These precautions will minimize the amount of soil that is disturbed at any one time and, therefore, control dust.

Oil should not be used to control dust because of its high potential for polluting storm water discharges.

Irrigation will be most effective if site drainage systems are checked to ensure that the right amount of water is used. Too much water can cause runoff problems.

Chemical treatment is only effective on mineral soils, as opposed to muck soils, because the chemicals bond better to mineral soils. Therefore, it should be used only in arid regions. Vehicular traffic should be routed around chemically treated areas to avoid tracking of the chemicals. Certain chemicals may be inappropriate for some types of soils or application areas. For example, spraying chemicals on the soil of an industrial site adjacent to a school may be dangerous. Local governments usually have information about restrictions on the types of palliatives that may be used. Special consideration must be given to preserving ground water quality whenever chemicals are applied to the land.

Since most of these techniques are temporary controls, sites should be inspected often and materials should be reapplied when needed. The frequency for these inspections depends on site-specific conditions, weather conditions, and the type of technique used.

Advantages of Dust Control (Land Disturbance and Demolition Areas)
• Can help prevent wind-and-water based erosion of disturbed areas and will reduce respiratory problems in employees • Some types can be implemented quickly at low cost and effort (except wind breaks) • Helps preserve the aesthetics of the site and screens certain activities from view (wind breaks) • Vegetative wind breaks are permanent and an excellent alternative to chemical use
Disadvantages of Dust Control (Land Disturbance and Demolition Areas)
• Some types are temporary and must be reapplied or replenished regularly • Some types are expensive (irrigation and chemical treatment) and may be ineffective under certain conditions • May result in health and/or environmental hazards, e.g., if overapplication of the chemicals leaves large amounts exposed to wind and rain erosion or ground water contamination • May create excess runoff that the site was not designed to control (irrigation) • May cause increased offsite tracking of mud (irrigation) • Is not as effective as chemical treatment or mulching and seeding; requires land space that may not be available at all locations (wind breaks)

Dust Control (Industrial)

What Is It

Dust controls for material handling areas are controls that prevent pollutants from entering storm water discharges by reducing the surface and air transport of dust caused by industrial activities. Consider the following types of controls:

- Water spraying
- Negative pressure systems (vacuum systems)
- Collector systems (bag and cyclone)
- Filter systems
- Street sweeping.

The purpose of industrial dust control is to collect or contain dusts to prevent storm water runoff from carrying the dusts to the sewer collection system or to surface waters.

When and Where to Use It

Dust control is useful in any process area, loading and unloading area, material handling areas, and transfer areas where dust is generated. Street sweeping is limited to areas that are paved.

What to Consider

Mechanical dust collection systems are designed according to the size of dust particles and the amount of air to be processed. Manufacturers' recommendations should be followed for installation (as well as the design of the equipment).

If water sprayers are used, dust-contaminated waters should be collected and taken for treatment. Areas will probably need to be resprayed to keep dust from spreading.

Two kinds of street sweepers are common: brush and vacuum. Vacuum sweepers are more efficient and work best when the area is dry.

Mechanical equipment should be operated according to the manufacturers' recommendations and should be inspected regularly.

Advantages of Dust Control (Industrial)
• May cause ~~a~~ decrease of respiratory problems in employees around the site • May cause less material to be lost and may therefore save money • Provides efficient collection of larger dust particles (street sweepers)
Disadvantages of Dust Control (Industrial)
• Is generally more expensive than manual systems • May be impossible to maintain by plant personnel (the more elaborate equipment) • Is labor and equipment intensive and may not be effective for all pollutants (street sweepers)

APPENDIX J

DISPOSAL ALTERNATIVES

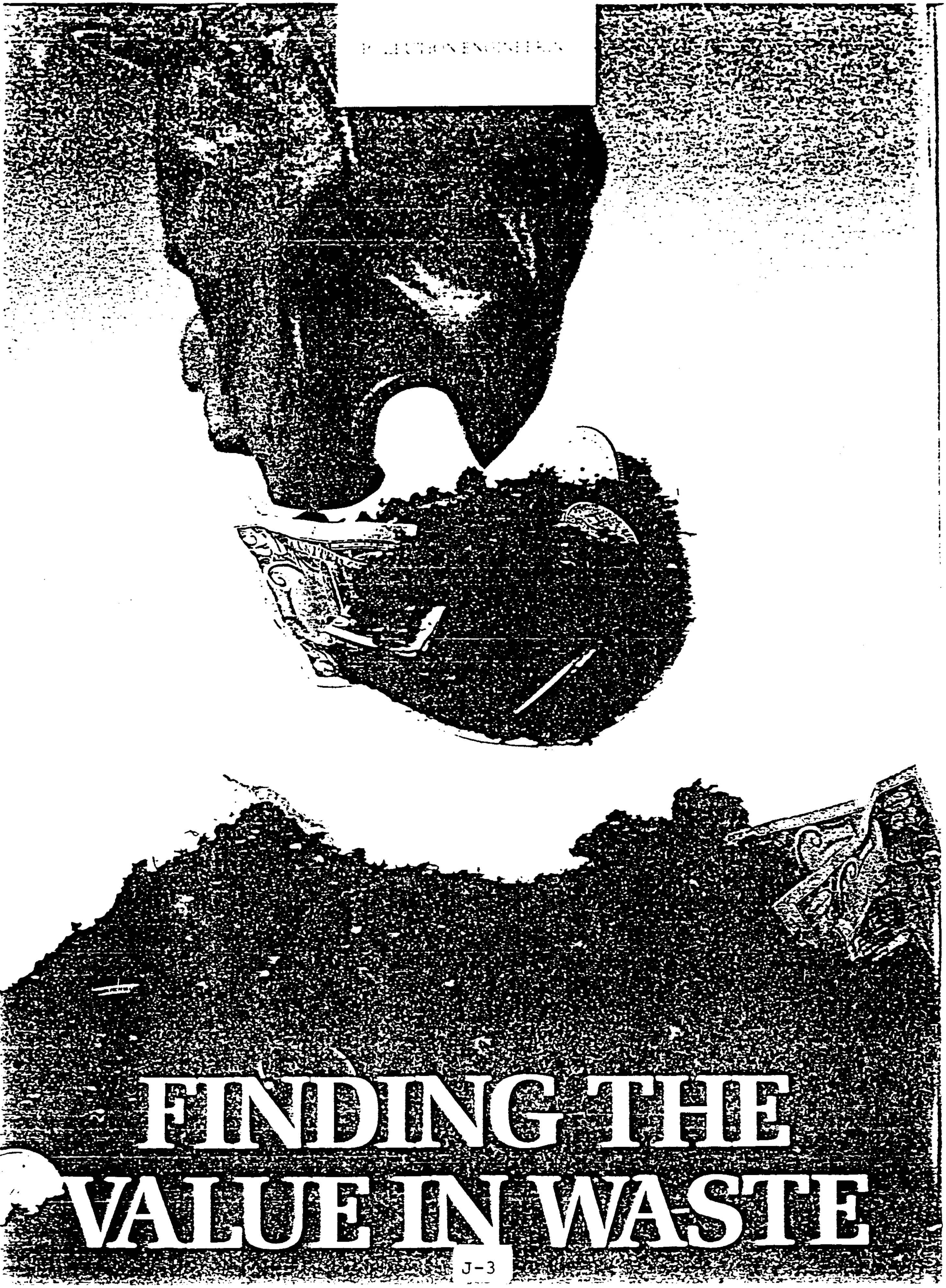
APPENDIX F

DISPOSAL OPTIONS AND ALTERNATIVES: BUILDING DEMOLITION DEBRIS

METHOD	BENEFITS	PROBLEMS/DISADVANTAGES
Land Disposal	Provides generally acceptable environmental and health controls; "quick and easy"; relatively inexpensive; waste available for potential future use (see "Fuel/Energy" method below	Limited landspace; potential liabilities (over real or perceived problems); "out-of-sight" but not "out-of-mind"
Fuel/Energy	"Waste to energy" process can be cost-effective and greatly reduce amount of overall waste; may be a method for extending life of existing landfills or "rejuvinating" old ones*	May require new technologies; may concentrate constituents in the waste resulting in a HW ash; air emission standards may be exceeded -- may require new emission control systems
Incineration	Reduces volume of waste; extends life of landfills	May be expensive; does not provide the direct benefits as burning for fuel (above); may require permits and/or specific emissions controls; may not be as "publically acceptable" as burning for fuel recovery
Fire Training	Acceptable "use" of structure results in reduced wastestream	Requires a "permit" from the State Fire Marshall; potential problems worker exposure to LBP or asbestos; should include collection and analysis of ash for lead -- potentially a HW
Property Resale/ Donation **	Cost-effective; community appreciation; waste reduction	Potential liability concerning LBP, asbestos; no market

* The enclosed article (Annex A) discusses new efforts to retreive material from landfills for use in energy and resource recovery operations.
(SOURCE: Pollution Engineering, 1 Oct 1992, "Finding the Value in Waste," (p 38), by F. Cross, Jr., P.E.)

** The Federal Surplus Property Program is designed to facilitate the transfer of Federal properties to homeless or needy families or assistance organizations. Under this program, the Department of Housing and Urban Development (HUD) reviews identified properties for suitability and lists suitable/available in the Federal Register
(SEE Annex B for example)



FINDING THE VALUE IN WASTE

Communities find that excavating their old landfills and reclaiming the usable components can be profitable.

by *Frank L. Cross Jr., PE, and Joseph Howell*

The basic premise for landfill mining or sanitary landfill reclamation is to excavate an old landfill, reclaim the available cover material, and then separate and sell or reuse other valuable materials such as ferrous metal and aluminum. The remaining fraction is replaced in the landfill or converted to energy.

Landfill mining and reclamation has many advantages, including:

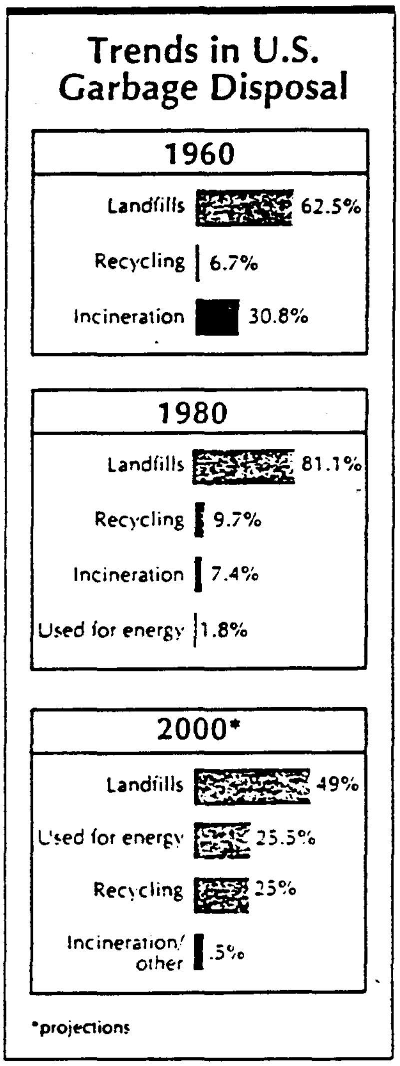
- Ability to remove leaching landfills and reduce or eliminate groundwater contamination.
- Provide space for depositing new solid waste.
- Excavated landfills can be redesigned to include new technologies, such as liners, leachate collection/treatment and monitoring systems.
- Soil from the reclamation process can be used as cover material for the new landfill.
- Energy can be generated from the combustibles using incinerators or resource recovery systems.
- Additional waste materials, such as wood chips and shredded tires, can be used as fuel supplements.
- Salvage materials including white goods can be sold as scrap.
- Separated and reclaimed materials (ferrous metals, aluminum, etc.) can be sold or stored and brokered.
- Pockets of hazardous waste can be removed and destroyed by an onsite mobile hazardous waste incinerator. Energy from this process can be used to generate electricity.
- Excavation and reclamation will reduce the cost of buying new land for sanitary landfills and reduce siting and permitting problems.

Several landfill mining projects, both pilot and full-scale, are operating currently and many more are in the planning stages.

Edinburg, N.Y., has a one-acre landfill reclamation pilot demonstration at a five-acre landfill. The $630,000 project is sponsored by the Energy Authority. Its goal is to reclaim the landfill so the property can be used for park land. The soil can be used to upgrade the facility into a state-of-the-art landfill.

Collier County, Fla., also has a pilot project. An economic evaluation showed that cover material, currently purchased for $4 per ton delivered, can be replaced with dirt recovered from the mining operation for about $3 per ton. Plans for a full-scale system project a savings of up to $200,000 per year on the cost of cover material.

Lancaster County, Pa., has a full-scale operation to excavate and process waste from the Frey Farm Landfill and generate electricity at their resource recovery facility. The Lancaster County Solid Waste Authority and Ogden Martin Systems of Lancaster Inc., the operator of the resource recovery facility, have worked together on the project since 1991.



- Changes in garbage disposal practices are projected. (Source: Solid Wastes Management Assoc.)

Energy from reclaimed refuse

Waste-to-energy systems generally handle waste as it is generated or received. With reclaimed refuse, the composition of the waste is likely to be quite different from when it was originally landfilled. Municipal solid waste (MSW) generally degrades slowly under anaerobic conditions in a landfill. The time required to reach stabilization varies as a function of several factors, including climate and moisture. A site-specific analysis, including a coring into the individual cells to be excavated, is needed to determine actual energy content.

The three sites referred to in this article have analyzed the energy content of their reclaimed refuse. Different values were arrived at for each site. Much of this can be attributed to different conditions at the sites, including the length of time the waste has been digesting.

Calorimetric analyses of the Edinburg reclaimed refuse yielded Btu values around 1000 per pound. While this value was unexpectedly low, it was attributed to both the age of the material (20 years) and a high percentage of soil and rock included in the material.

Lancaster County found values ranging from 2600 to 4000 Btu/lb, with an average of 3000 Btu/lb. The excavated material was two to four years old.

Collier County tested several locations in three different cells (4, 8 and 11 years old) to determine the energy content of the reclaimed refuse. The results ranged from

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Typical waste-to-energy systems operate with refuse having an energy content around 5000 Btu/lb.

Collier County

Collier County, Fla., currently has a landfill reclamation pilot unit (see drawing). Continuous operation of the unit, processing 50 tons per hour of mined material, has produced 33 tons of dirt per hour and 17 tons of plastics and oversized material per hour.

The cover material is immediately usable on the existing landfill at significant savings over the cost of purchased cover material. Collier County is planning a full-scale system estimated to save up to $200,000 per year on the cost of cover material.

The mined material (Table 1) is moved to the separation and screening plant. This equipment includes a tipping reject grid (grizzly) and a feed hopper for the conveyor transport to the two-staged vibrating screen where the mined material is separated into: dirt cover material; ferrous metal; plastic, wood, rubber; and oversized reject material. The reject material is recycled to the plant. The dirt material is transported to the landfill and used as cover material. Currently, the plastic, wood and rubber (primarily plastic) portion of the matrix is placed back into an active landfill. The ferrous metal is stockpiled for future sale. Future plans include additional recycling or thermal resource recovery.

Table 1
Estimated Material Fractions

Cover dirt	70%
Iron materials	3.9%
Aluminum materials	0.45%
Plastic materials	2.4%
Other metals	0.05%
Glass	0.5%
Rubber tires	0.44%
Wood	2%
Rock/concrete	14.66%
Misc. organic materials	1.1%

Source: Collier County Solid Waste Management Department

2170 to 8180 Btu/lb, with an average value of 5616 Btu/lb. This is higher than the Btu content of the refuse originally placed in the landfill. Energy values for different samples taken from the same cell varied by as much as 5840 Btu/lb.

Typical waste-to-energy systems are designed to operate with refuse having an energy content of about 5000 Btu/lb. Two of the previous cases required supplemental fuel to achieve this level. Edinburg mixed reclaimed refuse with MSW at a 1:1 ratio. Lancaster County, during 18 months of operation, has experimented with various methods to raise the energy content of their fuel. Currently, they add chipped tires and chipped wood to the reclaimed refuse and then mix 3 parts MSW to 1 part reclaimed refuse.

When the Lancaster County waste-to-energy facility can get 8.5 cents per kilowatt hour for the electricity generated, they further supplement the waste matrix with propane to increase the Btu content. With the increased energy output from the generator, the gross revenues from energy sales is $45,000 per week. After operating expenses, the facility nets $15,000 a week, not including the value of the reclaimed landfill space estimated at $12.50 per cubic yard.

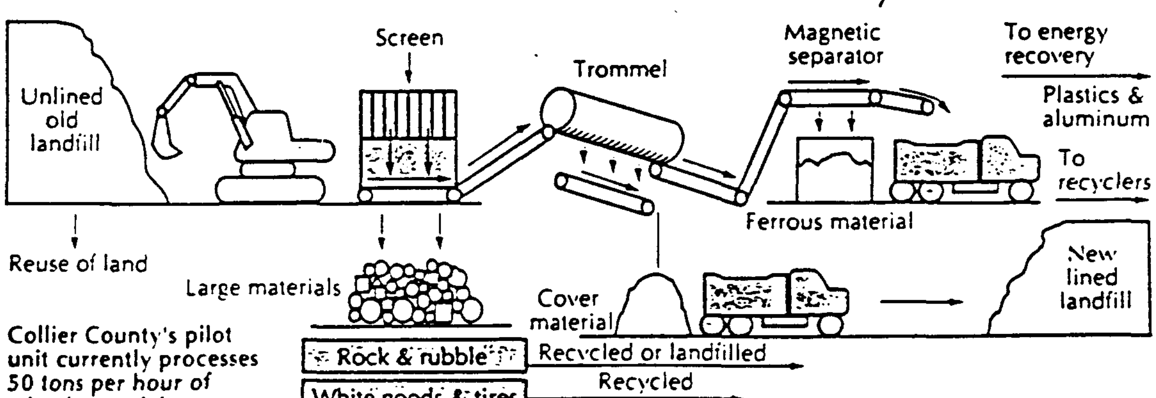
After redepositing the oversized and non-combustible material that was sorted out and the ash from the resource recovery facility, the reclaimed space is valued at $41,650 per week. This is a calculated reclamation rate of 83 percent.

Collier County has not pursued the waste-to-energy option largely due to the low cost they currently can receive for the energy they could produce. After the separation process, the combustible organic fraction is returned to the active landfill.

Obviously the expected returns from energy sales help determine the feasibility of waste-to-energy projects. Electricity need not be the only product, however; depending on location, steam can be sold to a variety of industries.

Due to the anaerobic digestion, the combustible organic fraction of the reclaimed refuse is more highly concentrated than when originally placed in the landfill. One would expect the energy content of the

Landfill Reclamation in Collier County



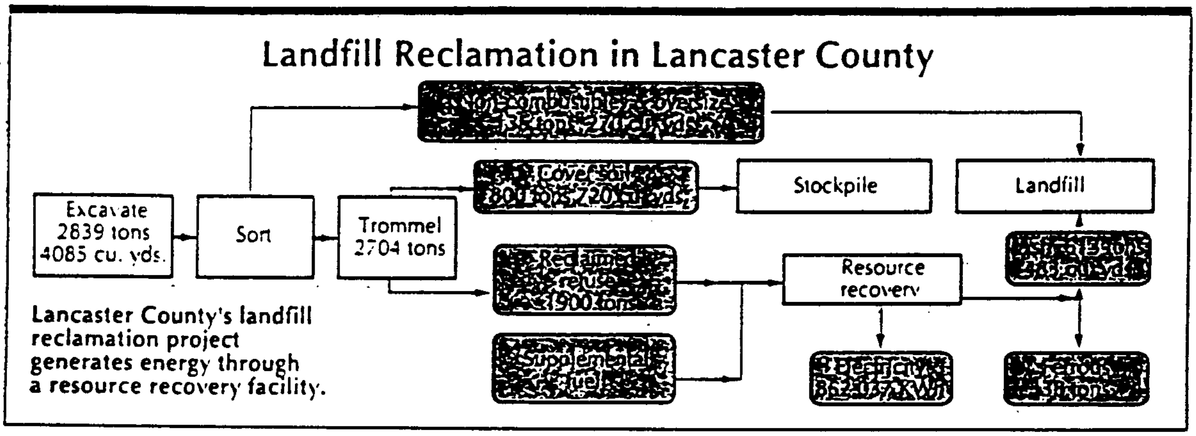
Collier County's pilot unit currently processes 50 tons per hour of mined material

Lancaster County

Lancaster County, Pa., has a full-scale operating system that generates electricity from its resource recovery facility. The Lancaster County Solid Waste Authority and Ogden Martin Systems of Lancaster Inc., the operator of the resource recovery facility, have worked together since 1991 to excavate and process waste from the Frey Farm Landfill.

Lancaster's system is handling 2839 tons/week, of which 1900 tons/week pass through the trommel. This portion of the excavated waste is the reclaimed refuse, which goes to the waste-to-energy system. Lancaster County estimates the energy content of the refuse at 3000 Btu/lb. Since the resource recovery plant is designed to operate at 5000 Btu/lb, tire chips, virgin MSW and wood chips are added to supplement the system. The energy content of this mixture is estimated to be 3700 Btu/lb. During peak hours, the fuel is supplemented with propane to provide an energy content of 5000 Btu/lb.

The combustible organic fraction basically consists of plastics, with other materials such as rubber, leather, textiles and wood. There also may be some paper and other organic material that has not degraded. Other materials mixed with the combustible organic fraction include aluminum cans, ferrous metals and some glass. The ferrous metal is separated.



Lancaster County's landfill reclamation project generates energy through a resource recovery facility.

reclaimed material to be higher, but as we have seen, this may not necessarily be the case. Individual analysis is needed to determine the actual energy content. Fuel supplementation likely will be required.

Environmental considerations

From the perspective of recycling, landfill mining can be profitable. The materials likely to be available for recovery are ferrous metals, aluminum and plastics. Glass may not be worth segregating since it is likely to be broken and mixed.

Ferrous metals are the easiest to separate. Number one scrap metal may sell for up to $65 per ton. Aluminum, while more difficult to separate, has an approximate value of $700 per ton and may be worth recovering. The current market for recycled plastics is not very profitable. The problem is finding the market and competing with curbside recycling. Removing plastics from the reclaimed refuse also will remove the portion with the highest Btu content and would affect the energy that can be reclaimed for use in a waste-to-energy facility. The profit from recycled materials will vary widely depending on quality and quantity of materials, as well as location.

Waste-to-energy systems will require permits, such as a solid waste permit for reclamation and a new sanitary landfill; an air permit for fugitive emissions (roadways, handling/excavation/storage, pile control, etc.); and an air permit for incinerator/boiler or resource recovery facility emissions.

Hazardous waste situations

Some landfills have pockets of hazardous wastes, in which case, the waste either must be sent to an off-site hazardous waste incinerator, left unexcavated, or excavated and treated in an on-site portable incineration unit. Obtaining permits for hazardous waste situations can be very difficult.

Conclusions

There are between 4000 and 10,000 municipal landfills in the U.S., not including industrial or private facilities. The remaining landfill capacity in existing permitted sites ranges from 2 to 40 years, but most sites will be filled to capacity within 5 to 10 years. Although the number of poorly designed and managed landfills will decrease, responsibly operated landfills will continue to function, and the number of recycling and waste-to-energy facilities is expected to increase.

Landfill mining may be the wave of the future for solid waste management because it:

- Provides cover for new sites.
- Can generate energy for sale.
- Upgrades landfills.
- Provides for recycling.
- Can be a profitable venture.

Each site will need to be investigated to determine:

- The use of salable materials.
- Proximate analysis from core samples and how to locate pockets of toxic or hazardous materials/waste.
- Feasibility of the proposed operation.

Frank L. Cross Jr., PE, is president and Joseph Howell is a project engineer with Cross/Tessitore & Associates, Orlando, Fla.

Reader Interest Review

Please circle the appropriate number on the Reader Service Card to indicate the level of interest in the article.

High 468 Medium 469 Low 470

information collections should be sent within 30 days of this notice directly to the OMB Desk Officer designated above at the following address:

Human Resources and Housing Branch, New Executive Office Building, room 3002, Washington, DC 20503.

Dated: July 6, 1992.

Lorraine Fishback,

Acting Director, Office of Health Planning and Evaluation.

[FR Doc. 92-16235 Filed 7-9-92; 8:45 am]

BILLING CODE 4160-17-M

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

Office of the Assistant Secretary for Community Planning and Development

[Docket No. N-92-1917; FR-2934-N-86]

Federal Property Suitable as Facilities To Assist the Homeless

AGENCY: Office of the Assistant Secretary for Community Planning and Development, HUD.

ACTION: Notice.

SUMMARY: This Notice identifies unutilized, underutilized, excess, and surplus Federal property reviewed by HUD for suitability for possible use to assist the homeless.

ADDRESSES: For further information, contact James N. Forsberg, room 7262, Department of Housing and Urban Development, 451 Seventh Street SW., Washington, DC 20410; telephone (202) 708-4300; TDD number for the hearing- and speech-impaired (202) 708-2565 (these telephone numbers are not toll-free), or call the toll-free title V information line at 1-800-927-7588.

SUPPLEMENTARY INFORMATION: In accordance with 56 FR 23789 (May 24, 1991) and section 501 of the Stewart B. McKinney Homeless Assistance Act (42 U.S.C. 11411), as amended, HUD is publishing this Notice to identify Federal buildings and other real property that HUD has reviewed for suitability for use to assist the homeless. The properties were reviewed using information provided to HUD by Federal landholding agencies regarding unutilized and underutilized buildings and real property controlled by such agencies or by GSA regarding its inventory of excess or surplus Federal property. This Notice is also published in order to comply with the December 12, 1988 Court Order in *National Coalition for the Homeless* v. *Veterans Administration*, No. 88-2503-OG (D.D.C.).

Properties reviewed are listed in this Notice according to the following categories: Suitable/available, suitable/unavailable, suitable/to be excess, and unsuitable. The properties listed in the three suitable categories have been reviewed by the landholding agencies, and each agency has transmitted to HUD: (1) Its intention to make the property available for use to assist the homeless, (2) its intention to declare the property excess to the agency's needs, or (3) a statement of the reasons that the property cannot be declared excess or made available for use as facilities to assist the homeless.

Properties listed as suitable/available will be available exclusively for homeless use for a period of 60 days from the date of this Notice. Homeless assistance providers interested in any such property should send a written expression of interest to HHS, addressed to Judy Breitman, Division of Health Facilities Planning, U.S. Public Health Service, HHS, room 17A-10, 5600 Fishers Lane, Rockville, MD 20857; (301) 443-2265. (This is not a toll-free number.) HHS will mail to the interested provider an application packet, which will include instructions for completing the application. In order to maximize the opportunity to utilize a suitable property, providers should submit their written expressions of interest as soon as possible. For complete details concerning the processing of applications, the reader is encouraged to refer to the interim rule governing this program, 56 FR 23789 (May 24, 1991).

For properties listed as suitable/to be excess, that property may, if subsequently accepted as excess by GSA, be made available for use by the homeless in accordance with applicable law, subject to screening for other Federal use. At the appropriate time, HUD will publish the property in a Notice showing it as either suitable/available or suitable/unavailable.

For properties listed as suitable/unavailable, the landholding agency has decided that the property cannot be declared excess or made available for use to assist the homeless, and the property will not be available.

Properties listed as unsuitable will not be made available for any other purpose for 20 days from the date of this Notice. Homeless assistance providers interested in a review by HUD of the determination of unsuitability should call the toll free information line at 1-800-927-7588 for detailed instructions or write a letter to James N. Forsberg at the address listed at the beginning of this Notice. Included in the request for review should be the property address (including zip code), the date of publication in the Federal Register, the landholding agency, and the property number.

For more information regarding particular properties identified in this Notice (*i.e.*, acreage, floor plan, existing sanitary facilities, exact street address), providers should contact the appropriate landholding agencies at the following addresses: U.S. Army: Robert Conte, Dept. of Army, Military Facilities, DAEN-ZCI-P; Rm. 1E671, Pentagon, Washington, DC 20310-2600; (703) 693-4583; GSA: Ronald Rice, Federal Property Resources Services, GSA, 18th and F Streets NW, Washington, DC 20405; (202) 501-0057; Dept. of Energy: Tom Knox, Realty Specialist, AD223.1, 1000 Independence Ave. SW., Washington, DC 20585; (202) 586-1191; (these are not toll-free numbers).

Dated: July 2, 1992.

Randall H. Erben,

Acting Assistant Secretary.

TITLE V, FEDERAL SURPLUS PROPERTY PROGRAM FEDERAL REGISTER REPORT FOR 07/10/92

Suitable/Available Properties

Buildings (by State)

Missouri

Bldg. T200
Fort Leonard Wood
Ft. Leonard Wood, Co: Pulaski, MO 65473-5000
Landholding Agency: Army
Property Number: 219220525
Status: Underutilized
Comment: 2284 sq. ft., wood frame, 1 story, presence of asbestos, off-site removal only, most recent use—general storehouse, not handicapped accessible.

Bldg. T455
Fort Leonard Wood
Ft. Leonard Wood, Co: Pulaski, MO 65473-5000
Landholding Agency: Army
Property Number: 219220526
Status: Underutilized
Comment: 6736 sq. ft., wood frame, 2 story, presence of asbestos, off-site removal only, most recent use—general storehouse, not handicapped accessible, scheduled to be vacated 9/30/92.

Bldg. T532
Fort Leonard Wood
Ft. Leonard Wood, Co: Pulaski, MO 65473-5000
Landholding Agency: Army
Property Number: 219220527
Status: Underutilized
Comment: 1296 sq. ft., wood frame, 1 story, presence of asbestos, off-site removal only, most recent use—general storehouse, not handicapped accessible, scheduled to be vacated 7/31/92.

Bldg. T546
Fort Leonard Wood
Ft. Leonard Wood, Co: Pulaski, MO 65473-5000