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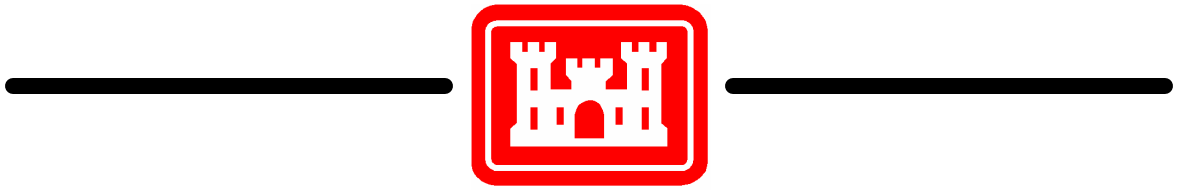
GUIDANCE FOR ADDRESSING CHLORDANE CONTAMINATION AT DEPARTMENT OF DEFENSE SITES



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GUIDANCE FOR ADDRESSING CHLORDANE CONTAMINATION AT DEPARTMENT OF DEFENSE (DoD) SITES

1. Purpose. This Public Works Technical Bulletin (PWTB) transmits information regarding management of chlordane contaminated soil on DoD property. It explains the difference in management requirements for chlordane which was intentionally applied as a pesticide as opposed to chlordane which was improperly disposed or released into the environment.

2. Applicability. This PWTB applies to chlordane contaminated soil at Army facilities.

3. References.

a. FIFRA, Federal Insecticide, Fungicide, and Rodenticide Act, 7 U.S.C. 136-136y.

b. CERCLA, Comprehensive Environmental Response Compensation and Liability Act, 42 U.S.C. 9601-9657.

c. RCRA, Resource Conservation and Recovery Act, 42 U.S.C. 6901-6992.

d. 40 CFR 300, National Oil and Hazardous Substances Pollution Contingency Plan.

e. 40 CFR 302, Designation, Reportable Quantities and Notification.

f. 40 CFR 260, Hazardous Waste Management System: General.

g. 40 CFR 261, Identification and Listing of Hazardous Waste.

h. 40 CFR 268, Land Disposal Restrictions.

i. 49 CFR 172, Hazardous Materials Table.

4. Discussion.

a. When used for its intended purpose, the pesticide chlordane was commonly applied to the soil to control termites. This resulted in soil contamination. Appendix A of this PWTB provides guidance for determining environmental regulations applicable to chlordane contaminated soil and assists in determining the need for a response action.

b. Not all chlordane in the environment is required to be remediated under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) or Resource Conservation and Recovery Act (RCRA). The requirements for managing chlordane contaminated soil will depend upon whether it was legally applied or whether it was illegally disposed or "released" into the environment.

5. Points of Contact. HQUSACE is the proponent for this document. The POC at HQUSACE is Mr. Malcolm E. McLeod, CEMP-II, 202-761-0632, or e-mail: malcolm.e.mcleod@usace.army.mil.

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Appendix A

Executive Summary

Not all chlordane in the environment is required to be remediated under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) or Resource Conservation and Recovery Act (RCRA). The requirements for managing chlordane contaminated soil will depend upon whether it was legally applied or whether it was illegally disposed or "released" into the environment.

Concentrations of chlordane detected should not be used as the basis for concluding whether a spill occurred. It was DoD practice to periodically reapply pesticide, thus chlordane may have accumulated without being indicative of a spill. The location of the chlordane, rather than its concentration, should be used as the basis for determining whether it is reasonably present due to intentional use. For example, chlordane found around foundations of buildings is likely present because it was intentionally applied for termite control.

Chlordane present due to spills or improper disposal may require remediation under either the National Contingency Plan (NCP) (also known as CERCLA process) or RCRA corrective action requirements. Both the CERCLA and RCRA remediation processes provide methodical approaches to delineating contamination, evaluating alternatives for addressing the contamination, involving the public in the decision making process, and documenting the decision.

Legally applied chlordane is not required to be remediated under either CERCLA or RCRA. Soil contaminated with pesticide used for its intended purpose can be managed in place. Remediation of these soils and/or actions to prevent or minimize exposure would be on a voluntary basis. However, when undertaking voluntary actions, there may be situations where it might be preferable to follow the CERCLA process as outlined by the NCP. Office of Counsel should be able to provide advice regarding site-specific situations.

GUIDANCE FOR ADDRESSING CHLORDANE CONTAMINATION AT DEPARTMENT OF DEFENSE SITES

1. Purpose. There has been much confusion regarding when it is necessary and appropriate to remediate chlordane contamination found at DoD installations. The purpose of this document is to clarify when cleanup action is required under Federal environmental statute and when it is not. This document also addresses the environmental requirements that may apply when managing chlordane contaminated wastes.

2. This document is divided into three parts. Part I contains general information on chlordane. It addresses issues such as how chlordane was used, health effects, and current status. Part II, entitled "Remediation Status", addresses three general categories of response - (1) no action required, (2) action required, and (3) voluntary actions. In addition, this section also discusses chlordane encountered during demolition and construction activities and during property transfer. Part III addresses transportation, treatment, and disposal of chlordane. This section addresses items such as determining whether the chlordane is regulated as a hazardous waste, complying with land disposal restrictions, and shipping chlordane waste under hazardous material regulations.

PART I - GENERAL INFORMATION

1. Background

a. What is Chlordane? Chlordane was a registered use pesticide applied from around 1948 until 1988. Its primary use was for termite control, but other known uses include application to prevent nesting of fire ants around power transformers; as a herbicide to control weeds in turf; and to control insects on lawns, gardens, and food crops (such as corn). So there are potentially many areas on DoD property, including family housing units, where chlordane may be found as a result of lawful application.

b. How Was Chlordane Used? High concentrations of chlordane may be found around military housing as a result of lawful application for termite control. To control termites, the chlordane was initially applied to soil prior to construction beneath building foundations. Then it was

DoD's pest management practice to routinely reapply chlordane every three to five years thereafter by methods such as treating the perimeter of the foundation by spraying with a rod inserted into the soil, by applying via a small trench dug along the foundation, or by injecting the chlordane through holes drilled in flooring at the periphery of walls. Thus relatively high concentrations of chlordane may have accumulated in these areas over time.

c. Legal Status. Application of chlordane at DoD installations and the rest of the United States ceased well over a decade ago. Under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), chlordane was registered for use and could be legally applied from around 1948 until 1988. During this timeframe, uses of chlordane were gradually restricted due to mounting concern over its toxicity and persistence in the environment. In 1978 its use on food crops was cancelled. In 1980, DoD self-imposed restrictions on application at DoD housing units where below ground air ducts could allow chlordane to enter homes through heating and cooling systems. In 1983, EPA banned all uses of chlordane except for termite control. Ultimately in 1988 all uses of chlordane, including termite control, were prohibited by EPA.

d. Health Effects of Chlordane. Currently chlordane is classified by EPA as a B2; probable human carcinogen. This classification is based upon studies of liver tumors occurring in many species of mice given chlordane in the diet, and human epidemiology studies of people exposed to chlordane through dermal contact and/or inhalation showing excess non-Hodgkin's lymphoma in farmers exposed to chlordane, and case reports of aplastic anemia. Short-term exposures to high levels of chlordane causes neurological effects such as tremors and convulsions in humans and in animals. Long-term exposure to chlordane, by ingestion and inhalation, have been documented to produce liver toxicity in animals; long-term effects on humans are not so clear. There is no evidence that chlordane affects the liver in humans, but some studies suggest that chlordane may cause neurophysiological and neuropsychological effects in humans. Other studies contradict this report. There is also limited evidence which suggests the potential for reproductive effects in animals. (ATSDR, 1994, EPA 1998)

e. Chlordane as a Persistent, Bioaccumulative and Toxic Chemical.

(1) There continues to be much concern regarding chlordane in the environment. Though intentional releases of chlordane have been effectively controlled by banning use, halting production, and collecting much of the remaining supply of chlordane for disposal, it continues to persist in the environment. It has been found to stick to surface soil and to persist for over 20 years. Chlordane can volatilize to the air and thus can enter housing units through subsurface ventilation systems.

(2) In an August 2000 draft document entitled, *The Persistent, Bioaccumulative, and Toxic (PBT) National Action Plan for Level 1 Pesticides*, EPA identifies chlordane as a level 1 priority PBT chemical and states that a strategy will be developed to identify and reduce risks posed by chlordane remaining in the environment.

PART II - REMEDIATION STATUS

1. Relevant Laws, Regulations, and Guidance

a. There are several key environmental laws and corresponding regulations that relate to chlordane in the environment. The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) controls distribution, sale, and use of pesticides in commerce. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) establishes the process for responding to hazardous substances, pollutants, or contaminants released or disposed into the environment. The Resource Conservation and Recovery Act (RCRA) addresses management of chlordane contamination constituting hazardous wastes. It also imposes corrective action requirements at RCRA permitted facilities. Each is discussed below.

b. The Federal Insecticide, Fungicide, and Rodenticide Act. FIFRA controls the sale, distribution, and use of pesticides. Under FIFRA, pesticides must be registered. In general, it is unlawful to sell or distribute a pesticide which is not registered or for which the registration has been cancelled or suspended. Chlordane was a registered pesticide under FIFRA. As of 1988, all registrations for chlordane were cancelled.

c. The Comprehensive Environmental Response, Compensation, and Liability Act.

(1) The CERCLA response process is outlined in the National Contingency Plan, 40 CFR 300. It establishes a systematic approach to addressing hazardous substances released or improperly disposed into the environment. Because chlordane is a CERCLA hazardous substance (40 CFR 302.4), a CERCLA response can be initiated for chlordane which was spilled or improperly disposed into the environment.

(2) It is not appropriate to undertake a CERCLA response for legally applied chlordane. This is because courts have found that normal application of pesticide does not constitute a release or disposal under CERCLA. Section 107(i) of CERCLA specifically addresses application of a registered pesticide product by stating, "No person may recover under the authority of this section for any response costs or damages resulting from the application of a pesticide product registered under FIFRA…". This has been found to mean that contamination caused by the application of a pesticide product registered under FIFRA, such as chlordane, is explicitly exempted from CERCLA liability. So not only is a CERCLA response not required for legally applied chlordane, but because there is no liability, there is no ability to expend environmental restoration funds under CERCLA for legally applied chlordane.

d. The Resource Conservation and Recovery Act.

(1) Cleanup Action Under RCRA. Under RCRA, installations with hazardous waste treatment, storage, or disposal facility (TSDF) permits are required to conduct corrective action at solid waste management units (SWMUs) throughout their facility. Chlordane disposal areas would qualify as SWMUs requiring investigation, but chlordane application and storage areas would not. This is because legally applied pesticide and pesticide product are not solid waste and thus are not subject to RCRA.

(2) Hazardous waste. RCRA also regulates management of hazardous waste. If a decision is made to dig up chlordane contamination, regardless of whether or not it was legally applied, it is potentially regulated as

hazardous waste under RCRA. This is discussed in detail in Part III of this document.

2. No Action Required

a. As explained above, no cleanup action is required under CERCLA or RCRA for chlordane used for its intended purpose.

b. Here are some recommendations for evaluating whether chlordane is likely to be present as a result of application as opposed to spill or disposal.

(1) Check maintenance records and contract specifications to determine probable application areas.

(2) Attempt to interview employees and residents that were present during the 1948 to1988 time frame. Document their recollection of pest control practices for the area in question.

(3) Justification for determining whether chlordane was legally applied is best done on the basis of location rather than concentration. In the absence of records or knowledgeable individuals, evaluate the location of the chlordane with respect to areas where chlordane was known to be commonly applied. For example, it is reasonable to assume that chlordane found near building foundations, as well as in and below footings, was intentionally applied. Do not assume chlordane was spilled or improperly disposed on the basis of concentration alone. Recurrent maintenance applications may have led to significant accumulations of chlordane and does not necessarily indicate improper disposal.

3. Action Required

a. Only in those rare, limited situations where it is determined that chlordane was spilled, improperly stored, or improperly disposed, is an action under CERCLA or RCRA warranted. Even then, the chlordane may not necessarily need to be cleaned up. Both the CERCLA and RCRA corrective action processes use a methodical approach for assessing risk, evaluating response alternatives, and deciding what action, if any, should be taken to address the contamination. It may be possible to manage waste in place if risk is within acceptable limits.

b. Generally speaking the major components of response processes can be summarized as described below.

(1) The suspected chlordane release is discovered. Notification occurs consistent with regulatory requirements.

(2) An assessment is made to confirm whether a chlordane release has indeed occurred and whether additional action may be required. This is called a CERCLA Preliminary Assessment or RCRA Facility Assessment. If risk is considered acceptable, no further response action is taken. For example, if there is no pathway for chlordane exposure, further action may not be needed. If further action is necessary, the investigation proceeds to the next stage.

(3) A CERCLA Remedial Investigation/Feasibility Study or RCRA Facility Investigation is conducted to define the extent of the contamination, evaluate risk, and assess alternatives for minimizing risk. Various alternatives for protecting human health and the environment from the chlordane are identified. Alternatives, for example may be (1) conduct no action; (2) remove exposure pathways by providing barriers to chlordane exposure; (3) impose land use restrictions to prevent exposure of sensitive receptors; or (4) excavation and disposal of areas elevated above cleanup levels to minimize overall concentrations. Each alternative is evaluated to determine whether it will be protective of human health and the environment and whether it will comply with regulatory requirements. Those alternatives that meet these threshold criteria are then screened based on implementability, cost, and effectiveness. Further detailed evaluation of retained alternatives eventually lead to a "preferred remedy".

(4) A "Proposed Plan" or "Statement of Basis" is prepared and made available to the public which explains the proposed action.

(5) Responses to public comments are prepared and a formal decision document is signed.

(6) The remedy is designed and implemented.

c. So the cleanup process under CERCLA or RCRA can be a lengthy, expensive endeavor. Thus, it should not be

undertaken unless there is authority to do so as required by law.

4. Voluntary Actions

a. Even though chlordane was legally applied and does not require remediation under CERCLA or RCRA, there may be situations where an installation may want to take voluntary actions to ensure exposures are controlled and hazards, if present, are mitigated.

b. Airborne Exposures in Residential Housing.

(1) Chlordane is a semi-volatile compound, but volatilization is not expected to be significant after it has been applied to the soil. In the extraordinary circumstances where a hazard is suspected to be present inside a building, an air sampling effort could be undertaken under the direction of a qualified chemist to determine whether chlordane exposure is occurring. The air sampling scheme should insure that samples are analyzed for not only volatilized chlordane, but also for chlordane associated with any dust in the air (attached to dust particles). If significant levels of chlordane are present in the interior air, mitigation measures should be considered that are appropriate to the source and migration pathway into the house. Such measures could include repairing or sealing ductwork and sealing openings between the house and subslab soils.

(2) Establishing whether chlordane levels are significant requires a site specific evaluation. There is no pre-established reference concentration considered safe. The National Research Council's (NRC) Committee on Toxicology was asked to review toxicity data on chlordane and to suggest an airborne concentration guideline. The NRC could not determine a level of exposure which did not produce a biological effect under prolonged exposure conditions, but they recommended 5 $\mu g/m^3$ as an interim guideline for exposures not exceeding three years. (NRC, 1979).

c. Actions That Can Be Taken To Minimize Risk. There are several common sense measures that can be taken to minimize exposure to legally applied chlordane.

(1) Reduce or limit exposures to soils within one foot of building foundations.

(2) Exterior play areas should be placed away from housing foundations.

(3) Growing fruit and vegetable crops in soils adjacent to foundations should be discouraged, as there is evidence that some types of plants may take up chlordane from the soil and translocate it to edible portions (Incorvia Mattina et al., 2000).

(4) Plant bushes and other cover around perimeter of buildings to keep human activities more distant from chlordane.

(5) If surface soil is contaminated, cover with clean fill to prevent contact.

5. Non-Remediation Related Demolition and Construction

a. Managing Chlordane During Demolition/Renovation Activities.

(1) During normal construction activities, chlordane contamination can be moved and replaced onsite. Just because it is disturbed does not mean that it must be remediated nor does it mean that it must be characterized to determine whether it is hazardous waste under the Resource Conservation and Recovery Act (RCRA). EPA has gone on record via a June 11, 1992 memo regarding contamination encountered during normal construction activities. It states as follows:

> "… The particular situation which you presented in your letter involved excavation of soils, such as trenching operations for pipeline installation, where the soils may be hazardous by characteristic, or may contain listed hazardous waste. We understand that your questions specifically relate to the excavations being conducted on public roadways or at other similar locations that are not associated with or are part of a RCRA regulated treatment, storage, or disposal facility.
>
> In the example which you cite in your letter, the soils from the excavation or construction activities are temporarily moved within the area of contamination, and

> subsequently redeposited into the same excavated area. In these situations we agree that such activity does not constitute treatment, storage, or disposal of a hazardous waste under RCRA. The activity of placing waste in the ground would not normally meet the regulatory definitions of "treatment" or "storage" (40 CFR 260.10). In addition, as you noted in your letter, movement of wastes within an area of contamination does not constitutes "land disposal" and thus does not trigger RCRA hazardous waste disposal requirements (55 FR 8666, March 8, 1990). Thus RCRA requirements such as land disposal restrictions would not apply.
>
> With respect to generator requirements, as you indicated, a hazardous waste "generator" is one, by site, who produces a hazardous waste or first causes the waste to be regulated as hazardous (40 CFR 260.10). In the circumstances you described, the excavation does not "produce" the hazardous waste, nor does it subject the waste to hazardous waste regulation since, as discussed above, the activity you described is not "treatment", "storage", or "land disposal" of hazardous waste. Therefore, we agree that the activity is not subject to any generator requirements."

(2) In extraordinary circumstances, if a known endangerment is posed by legally applied chlordane, contractor personnel and other persons in the area should be notified that a chlordane hazard is present so that necessary worker protection may be implemented. Government specifications should require that the construction site be kept moist to minimize fugitive dust, in these circumstances. Include in contract specifications that contractors are to comply with the requirements in 29 CFR 1926 Safety and Health Regulations for Construction, except for 29 CFR 1926.65, Hazardous Waste Operations and Emergency Response (HAZWOPER). Because the chlordane was used for its intended purpose, the site is not considered an uncontrolled hazardous waste site and as such, HAZWOPER does not apply to demolition and construction activities impacting chlordane, and no extraordinary measures are required.

b. Post-Construction Management of Chlordane. At project completion, exposed contaminated soil should be covered with clean soil to prevent direct contact. Steps

should be taken to prevent erosion of the cover such as seeding with grass.

6. Property Transfer Issues. Another factor that should be evaluated when deciding whether to undertake cleanup of chlordane is whether the property is going to be transferred.

a. Notification of Hazardous Substance Activity.

(1) When transferring Federal property, CERCLA 120(h) may require notification regarding chlordane because it is a CERCLA hazardous substance. The notification applies where a complete search of agency files indicates chlordane was stored on the property for one year or more in amounts greater than or equal to 1,000 kilograms (see implementing regulations in 40 CFR 373.2) or when chlordane is known to have been released or disposed on the property. However, lawfully applied chlordane alone does not constitute a release or disposal for purposes of the CERCLA 120(h) notification.

(2) Where the CERCLA 120(h) notification applies, it also requires the deed entered into for the property transfer to contain a covenant warranting that all remedial action necessary to protect human health and the environment with respect to any such substance remaining on the property has been taken before the date of such transfer. It also requires a commitment to conduct additional remedial action if found necessary after the date of transfer. Therefore, if remedial action is anticipated, it may be preferable to undertake such action prior to transferring the property. Also, if levels of chlordane are acceptable for certain types of property use, but not all uses, deed restrictions may be needed to ensure changes in future use will not trigger a need to remediate. For example, if concentrations are acceptable for industrial use, but unacceptable for residential use, then placing a deed restriction prohibiting residential use may be sufficient to prevent having to remediate to residential levels in the future.

b. Notification of Uncontaminated Property. Another property transfer notification requirement in CERCLA 120(h)(4) requires identification of uncontaminated property. The head of the department, agency, or instrumentality of the United States with jurisdiction over

the property is required to identify the real property on which no hazardous substances and no petroleum products or their derivatives were known to have been released or disposed of. Because legally applied chlordane is not considered to be released or disposed, the presence of legally applied chlordane does not disqualify a property from being considered "uncontaminated" under CERCLA 120(h)(4).

PART III - TRANSPORTATION, TREATMENT, AND DISPOSAL OF CHLORDANE CONTAMINATED WASTE

1. Regardless of whether chlordane was legally applied or spilled, if removed for offsite disposal, there may be transportation, treatment, and disposal regulations applicable to the management of that waste. For example, the chlordane may or may not be regulated as hazardous waste or it may or may not require treatment prior to disposal because of land disposal restrictions (LDRs). Because impacts of these regulations can be significant, it is important to understand these factors when making management decisions. This section explains these technical requirements.

2. There are several key environmental regulations to be aware of. They are referenced in the matrix below.

Description	**Value**	**Reference**
Threshold Characteristic Hazardous Waste Value for Chlordane	0.03 mg/L by TCLP (D020)	40 CFR 261.23
Listed Waste Code for Chlordane	U036 - Not applicable to applied pesticides. Applies to spills of commercial chemical product.	40 CFR 261.33
LDR Treatment Standard for Non-Wastewaters	0.26 mg/kg chlordane and meet 268.48, Universal Treatment Standards (UTS)	40 CFR 268.40
LDR Treatment Standard for Wastewater	0.0033 mg/L chlordane and meet 268.48	40 CFR 268.40
UTS Value for Chlordane, Non-Wastewater	0.26 mg/kg	40 CFR 268.48
UTS Value for Chlordane, Wastewater	0.0033 mg/L	40 CFR 268.48
Alternative Treatment Standard for Soil	10 x UTS or 90% reduction	40 CFR 268.49

3. Determining if Chlordane is Regulated as Hazardous Waste.

a. Listed Hazardous Waste.

(1) The disposal of commercial chemical product chlordane is regulated as hazardous waste with the listed waste code U036. However, this designation only applies to unused product in which chlordane is the sole active ingredient and to spill residues of such product. The U036 listed waste code does not apply to chlordane that has been applied for its intended purpose. 40 CFR 261.2(c)(1)(B)(ii) specifically states that commercial chemical products listed in Section 261.33 are not solid wastes (and thus not hazardous wastes) if they are applied to the land and that is their ordinary manner of use. Therefore, soil and debris intentionally treated with chlordane should not be classified as U036 listed hazardous waste.

(2) U036 hazardous waste at military installations is expected to be rare. The U036 classification would apply to waste generated from spilled commercial chemical product. Conceivably it could also be generated if old abandoned drums of product are discovered and require disposal. Otherwise, it is highly unlikely that chlordane waste from a military installation will be listed waste. It is more likely to be regulated as characteristic hazardous waste.

b. Characteristic Hazardous Waste.

(1) The threshold value at which EPA regulates chlordane as hazardous waste is 0.03 mg/L by the Toxicity Characteristic Leaching Procedure (TCLP) per 40 CFR 261.23. When an extract of a representative sample of the waste contains this level of chlordane, it is said to exhibit a hazardous characteristic for chlordane and is given the waste code D020.

Example: Two waste streams are generated during building demolition. A representative sample of the building foundation is determined to contain 0.005 mg/L chlordane by TCLP and contaminated soil under the foundation is determined to contain 0.04 mg/L by TCLP. Are either of these hazardous waste?

Answer: Yes, the soil is hazardous waste because it is above the threshold concentration of 0.03 mg/L. The concrete foundation is not hazardous waste because it is below the threshold value. Note however, that the soil is only hazardous waste if it is to be discarded. If it is remains onsite, in other words not generated, then it would not be subject to RCRA regulation and would not be hazardous waste.

(2) For solids, the TCLP analytical method involves an extraction step with a solvent to waste ratio of 20:1. This in effect dilutes the total concentration by a factor of 20. To save time and money, sometimes total concentration data is used to calculate whether it is theoretically possible to exhibit a hazardous characteristic. Then if needed, the actual TCLP analysis is performed. This is because the TCLP test is typically much more expensive than analysis for total concentration.

Example: Chlordane in soil is tested and determined to contain a total of 0.5 mg/kg chlordane. Can this soil exhibit a hazardous characteristic due to the chlordane concentration?

Answer: No. Because of the dilution factor in the extraction procedure, even if 100% of the chlordane extracted out of the soil, the resultant TCLP analysis would only be 0.5/20 = 0.025 mg/L. This is below the threshold hazardous waste value of 0.03 mg/L TCLP for chlordane.

(3) Because of the dilution factor in the TCLP method, solids containing less than 0.6 mg/kg total chlordane will not meet defining criteria for D020. On the other hand, merely having a total concentration above at or above 0.6 mg/kg does not mean the waste is hazardous waste. It will depend upon the amount of chlordane which actually leaches into the extract when performing the TCLP analysis.

Example: Soil is determined to contain a total of 0.8 mg/kg total chlordane. Is this hazardous waste?

Answer: This is not enough information to make a determination. Theoretically, this may be hazardous waste because 0.8 /20 = 0.04 mg/L which is greater than the threshold value of 0.03 mg/L, but it will depend upon the amount of chlordane which actually leaches out of the waste during the TCLP test. If only 50% of the chlordane is leachable, the resultant TCLP test would only indicate [0.5 x 0.8]/20 = 0.02 mg/L TCLP and it would not be hazardous waste. So TCLP analysis data is needed in order to determine if this is hazardous waste.

(4) The above calculation only applies to solids. Liquids do not have a dilution factor. When classifying waste streams such as ground water, the TCLP method requires the liquid to be filtered and analyzed directly to obtain the TCLP result. When the waste is a mixture of liquids and solids, a more complicated calculation can be performed to determine whether total concentration of chlordane present is sufficient to potentially fail TCLP.

(5) Chlordane may meet other characteristic waste criteria besides D020. Though pure chlordane is a powder, it was often mixed into solutions with flash points sufficiently low to be considered ignitable waste (D001).

4. Characterizing Hazardous Debris. Depending upon the manner in which debris is generated, it may or may not be regulated as hazardous waste. For example, if chlordane is present on a building foundation, but the entire building is being demolished along with the foundation, the "representative sample" used for waste classification purposes would be based on collection of debris from each component of the waste in the same proportions as will be in the actual waste going for disposal. The representative sample could conceivably be below the TCLP threshold regulatory value because the "representative sample" would include proportional amounts of uncontaminated debris. This could effectively and legitimately lower the overall TCLP concentration of the waste stream to below the regulatory threshold. On the other hand, if the foundation and building are separated for disposal, such that these are separate waste streams, then they would be analyzed independent of one another. If a representative sample of the entire waste stream is expected to fail TCLP, it may be preferable to segregate uncontaminated debris from contaminated debris to minimize the volume of waste that must be managed as hazardous.

5. Looking for Underlying Hazardous Constituents. When waste exhibits a hazardous characteristic due to chlordane, underlying hazardous constituents (UHCs) must also be evaluated. This is because RCRA LDRs restrict disposal until not only the chlordane meets LDR treatment standards, but also UHCs. UHCs are defined in 40 CFR 268.2 as "any constituent listed in 40 CFR 268.48, Table UTS - Universal Treatment Standards, except fluoride, selenium, sulfides, vanadium, and zinc, which can reasonably be expected to be present at the point of generation of the hazardous waste at a concentration above the constituent - specific UTS treatment standards." This is a list of over 200 constituents. If any of these contaminants are in the waste, though they did not cause the waste to be classified as hazardous waste, they must still be below UTS values before land disposal.

6. Treatment of Chlordane Contaminated Waste

a. Land Disposal Restrictions. Some chlordane contaminated hazardous wastes will be required to be treated prior to land disposal because of LDRs which prohibit waste from being placed into or on the land until certain standards have been met. There are options for satisfying LDRs. The first is to meet the general standards specified in 40 CFR 268.40. Another option, known as the alternative treatment standard for soil, is available in some states and allows levels an order of magnitude higher at the point of land disposal. And finally, for hazardous debris, there is yet another standard. Another approach to dealing with LDRs is to avoid actions which trigger LDRs treatment requirements. Each of these options are discussed below.

(1) General LDR Treatment Standards.

(a) General LDR treatment standards are in 40 CFR 268.40 and are listed for wastewaters and non-wastewaters. To be a wastewater, the waste must contain less than 1% total suspended solids and less than 1% total organic carbon. Thus, most chlordane wastes encountered are typically classified as non-wastewaters.

Example: Chlordane contaminated soil contains 1.0 mg/kg total chlordane and 0.04 mg/L by TCLP analysis. Is this a hazardous waste? If so, to what level must the chlordane be treated prior to land disposal?

Answer: Yes this is hazardous waste because it is above the 0.03 mg/L TCLP threshold. LDRs in 40 CFR 268.40 requires this "non-wastewater" to be treated to 0.26 mg/kg total chlordane before land disposal. (In addition, UHCs must also be meet standards in 40 CFR 268.48.)

Example: Chlordane contaminated soil contains 1.0 mg/kg total chlordane and 0.02 mg/L by TCLP analysis. Is this a hazardous waste? Must it meet LDRs prior to land disposal?

Answer: No this is not hazardous waste because it is below the TCLP threshold of 0.03 mg/L. The 0.26 mg/kg treatment standard does NOT apply because LDRs are only applicable to hazardous waste. This waste qualifies for disposal without treatment.

(b) It is very important to understand that chlordane hazardous waste must not only meet treatment standards for chlordane, but must also meet treatment standards for underlying hazardous constituents. This is because the LDR standard listed in 40 CFR 268.40 refers to "… and meet 268.48". This means that any of the contaminants listed in 40 CFR 268.48 that are reasonably expected to be present in the waste, must also meet corresponding treatment requirements prior to land disposal.

Example: Soil fails TCLP for chlordane and the soil also contains naturally occurring arsenic. What criteria must be met to satisfy LDRs?

Answer: Because the soil fails TCLP for chlordane, it is hazardous waste and LDRs apply. The LDR treatment standard for non-waste water in 40 CFR 268.40 is "0.26mg/kg and meet 268.48". This means treat the chlordane to 0.26 mg/kg and treat the arsenic (the UHC) to 5.0 mg/L TCLP as specified in 40 CFR 268.48 before land disposal.

(2) Alternative Land Disposal Restriction Treatment Standards for Soil.

(a) EPA has decided that soil should not be required to meet the same LDR treatment standard as process waste, and they provide alternative treatment standards for soil in 40 CFR 268.49. Because this is a less stringent

standard, it is not available in an authorized state unless that state has chosen to adopt this less stringent standard.

(b) The alternative LDR treatment standard for soil can be satisfied by either reducing all hazardous constituent concentrations:

- to 90% of their original concentration or
- to 10 times their corresponding UTS values.

(c) Note, either of these criteria satisfy the treatment requirement, it is not necessary to meet both. Therefore if 90% reduction results in numbers exceeding 10 times UTS, then LDRs have been satisfied. Similarly, if 10 x UTS is met, but resultant concentrations have not been decreased 90%, that too meets LDRs.

Example: Soils fails TCLP for chlordane and contains arsenic as an underlying hazardous constituent. What concentrations must be attained under the alternative treatment standard to satisfy LDRs?

Answer: Using the 10 x UTS option, chlordane must be 2.6 mg/kg (10 x 0.26) and arsenic must be 50 mg/L TCLP (10 x 0.5). Note, however, that though this then qualifies for land disposal, the levels of arsenic would be sufficiently high that it would have to be disposed as hazardous waste.

(3) Alternative Treatment Standards for Debris.

(a) Because contaminated debris is sometime non-homogeneous, EPA realized that determining a concentration of a "representative" sample may sometimes be difficult. To provide relief, they provided alternative treatment standards for debris in 40 CFR 268.45 which are based on applying specific types of treatment technologies rather than attaining specific concentrations.

(b) Debris is defined as solid material exceeding a 60 mm particle size (2.5 inches) that is intended for disposal. It includes items such as concrete, wood, and personal protective equipment. Alternative treatment standards specified consist of extraction, destruction, and immobilization technologies. These can be used in lieu of meeting general standards in 40 CFR 268.40 to satisfy LDRs.

Example: Maintenance applications of chlordane were periodically injected under a building through holes drilled into perimeter wood flooring. Discrete areas of the wood have elevated chlordane concentrations which may cause the flooring to be regulated as hazardous waste if removed for disposal during building renovation. The contaminated portions of the wood are segregated for disposal. Can an alternative treatment standard for debris be used to manage the chlordane contaminated wood?

Answer: Yes. 40 CFR 268.45 lists several types of technologies that could be used to treat wood debris. For example, an immobilization technology could be used to prevent leaching. This would be in lieu of attaining the concentration based standard that would otherwise be applicable.

(c) When determining whether to utilize an alternative treatment standard for debris, consideration should be given to potential permit requirements. When actions are conducted onsite under CERCLA, there is a permit exemption that allows hazardous debris to be treated without obtaining a RCRA permit. Under other circumstances, a permit is required if the treatment occurs after the point of generation of the hazardous waste. With proper planning, it may be possible to remove the contaminant from the debris prior to the point of generation to avoid a RCRA permit requirement.

Example 1: Chlordane was injected into a building foundation via a hole drilled in the concrete. The surrounding concrete is known to be contaminated. The foundation is not going to be demolished, but the contaminated portion will be cut out and then patched with new concrete. Because the foundation is not a "solid waste", it is not hazardous debris. The contaminated portion could legitimately be removed without a RCRA treatment permit. This activity would be viewed as generating a hazardous waste, not as treatment of hazardous debris.

[Note: This is a hypothetical scenario to illustrate a point. There is no requirement that mandates removal of legally applied chlordane.]

Example 2: Same scenario as above but the foundation will be demolished. Now it is considered a solid waste and if concentrations are sufficiently high, it can be hazardous debris. Removal of the contaminated portion would be viewed as treatment of hazardous debris and would be subject to applicable permit requirements.

b. Actions Which Do Not Require Treatment.

(1) There are several options for managing chlordane contaminated waste which will avoid triggering LDR treatment requirements.

(a) LDRs do not apply unless hazardous waste is "generated." By managing chlordane hazardous waste in place, such as by capping contaminated soil in place or treating it in situ, LDR treatment standards do not apply.

(b) Chlordane contaminated waste could be managed under the "area of contamination" concept. EPA has taken the position that when waste is moved around solely within a single AOC and is not placed into a RCRA regulated unit, then LDRs do not apply to that waste. This would facilitate relocating chlordane contamination to minimize exposures without triggering LDRs.

7. Disposal of Chlordane Contaminated Waste.

a. Disposal as Non-Hazardous Waste. Waste can be disposed of as non-hazardous under the following circumstances.

(1) When excluded from hazardous waste regulation. Potential exclusions are in 40 CFR 261.4 for household waste, in 40 CFR 261.5 for conditionally exempt small quantity generator waste, and in 40 CFR 268.45 for debris which has been treated via an extraction or destruction technology.

(2) When at the point of generation, the waste exhibits no hazardous characteristic and is not listed waste. In other words, assuming chlordane is the only hazardous constituent of concern and it is less than 0.03 mg/L TCLP, then it is not hazardous waste and can be directly disposed in a non-hazardous waste landfill without treatment.

(3) At the point of generation, chlordane exceeds the regulatory threshold of 0.03 mg/L TCLP, but has been subsequently treated such that it meets all applicable LDR treatment standards and does not exhibit any hazardous characteristic and does not contain listed hazardous waste.

(4) Concurrence has been obtained from the overseeing regulatory agency that soil that once contained U036 listed chlordane no longer contains listed waste.

(5) Contaminated debris which has been treated by an extraction or destruction method per 40 CFR 268.45 and thus rendered the debris non-hazardous.

b. Disposal as Hazardous Waste. Offsite disposal of chlordane contaminated waste must be at a hazardous waste landfill for the following.

(1) Waste exhibits a hazardous characteristic at the point of generations, has been treated to meet LDRs, but still exhibits a characteristic of hazardous waste. For example, if the alternative treatment standard for soil is used and resultant levels of UHCs are still above regulatory threshold for hazardous waste.

(2) Chlordane contaminated hazardous debris has been immobilized to meet LDRs, but still contains the hazardous waste.

(3) Chlordane contaminated waste classified as listed waste and has not been determined to no longer contain the chlordane.

8. Treatment of Chlordane

Chlordane is classified by EPA as a persistent, bioaccumulative, and toxic (PBT) chemical. Incineration is the most effective means of destroying it. Landfilling is a common method of containing it. Low temperature thermal desorption can be used to recover reduce concentrations in treated soil and debris.

9. Managing Containerized Chlordane Hazardous Waste. If hazardous waste is containerized for offsite disposal, the generator of the chlordane waste must comply with the following RCRA requirements:

- Obtain an EPA ID number
- Use a hazardous waste manifest to track the shipment
- Provide LDR notification
- Keep containers closed unless adding or removing the waste
- Mark the containers with a statement "Hazardous waste - Federal Law Prohibits Improper Disposal. If found, contact the nearest police or public safety authority or the U.S. EPA."
- Mark the container with the generators name and address
- Mark the container with the Manifest document number prior to transporting offsite.
- Mark the containers with the accumulation start date
- Transfer the waste to a permitted TSDF within 90 days (if a large quantity generator)
- Inspect the containers weekly
- Provide hazardous waste training for employees
- Prepare and distribute a contingency plan
- Make arrangements with local emergency response authorities
- Keep records of training, manifests, LDR notifications, waste analysis, exception reports, and biennial reports.

10. Transportation. Chlordane contaminated waste may be regulated by the Department of Transportation under hazardous materials regulations as well as by EPA under hazardous waste regulations.

a. Transporting Chlordane Hazardous Waste. When chlordane is regulated as a hazardous waste, it must be shipped using a hazardous waste manifest. In addition to tracking the hazardous waste as required by EPA, the manifest serves as the Department of Transportation (DOT) shipping paper. A proper shipping name from the hazardous materials table in 49 CFR 172.101 must be used to describe the shipment. Depending upon specific characteristics of the waste, there are several potential shipping names which could apply. Chlordane has the potential to meet defining criteria for a poisonous material, hazard class 6.1 or for a flammable liquid, hazard class 3. When present in soil and debris such that it does not have a flash point and does not exhibit a 6.1 hazard class, but is still hazardous waste, then chlordane waste would be regulated as a Class 9 miscellaneous hazardous material.

b. Transporting Chlordane as a Non-Hazardous Waste But as a Hazardous Material. When not a hazardous waste, there are still situations under which DOT will continue to regulate chlordane as a DOT hazardous material. This includes:

(1) When a reportable quantity (1 lb of chlordane) is present in a single container;

(2) When chlordane is regulated as a marine pollutant (1% in bulk shipments in any mode or in non-bulk packaging by vessel)

(3) When it meets defining criteria for a DOT hazardous class (class 6.1 poisonous material or class 3 flammable liquid)

11. Summary and Conclusion.

a. In summary, the manner in which chlordane is addressed will depend upon whether it was legally applied or whether it was illegally disposed or "released" into the environment. The determination as to whether it was spilled should not be based on concentration. Rather, it should be based on location of the chlordane and whether it is reasonable that it is present due to intentional use.

b. Legally applied chlordane is not required to be remediated under either CERCLA or RCRA.

c. Where action is required because of improper disposal or accidental release, the methodical approach required by CERCLA or RCRA should be undertaken to identify and evaluate alternative approaches. This also ensures the decision is properly documented.

d. Voluntary actions can be taken to minimize exposures to legally applied chlordane. Depending upon site specific circumstances, it may be prudent to follow the CERCLA process to document and implement cleanup or land use restrictions, but it may not always be necessary. Office of Counsel should be able to advise regarding these concerns.