

QUALITY ASSURANCE MANUAL FOR
WASTE MANAGEMENT BRANCH INVESTIGATIONS

Prepared by the Regional Quality Assurance Management Office
USEPA Region 10, in cooperation with the
Waste Management Branch

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To Users of the Quality Assurance Manual For Waste Management Branch Investigations:

The following is an initial list of errata found in the initial copies of this manual. If, in use or review of this document, additional ones are found, please notify Roy R. Jones in the Regional Quality Assurance Management Office so they may be corrected with the first revision tentatively scheduled for May or June, 1986. If major changes or new references should be noted, please give the RQAMO as much lead time as possible for inclusion and/or further errata notice. Thank you for your patience, cooperation and assistance in developing this manual.

Errata as of 2/12/86

Sect. V, pg 1, last sentence; change " Sample Management Office (SMO)" to Regional Sample Control Center (RSCC)

Sect VIII, pg 2, 1 st. paragraph; should read "...found in Section XVI."

Sect.X, pgs.4 & 5, part E.; should read "RSCC NOTIFICATION AND REPORTING", with RSCC replacing "laboratory" in subsequent 2 paragraphs. ALSO, delete SS from SSQAP in last sentence of 2 nd. paragraph.

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V. INTRODUCTION

The Environmental Protection Agency (EPA) Region 10, Waste Management Branch (WMB) administers implementation of the Resource Conservation and Recovery Act (RCRA, see Appendix B, "40 CFR Part 261) and oversees compliance monitoring of hazardous waste handling facilities. This includes on-site technical and field investigation aimed at assessing compliance with permit requirements. An effective multidisciplinary technical and field investigation program requires a definitive quality assurance (QA) program coupled with efficient scheduling of all resources. The nature of the field investigation as well as the combination of sampling and laboratory activities make QA of all collected data critical. To obtain quality data that are scientifically and legally defensible, and to have the requisite levels of precision and accuracy with minimum expenditures of resources, requires the development of a comprehensive and well-documented Quality Assurance Project Plan (QAPP).

The guidelines and procedures for quality assurance of data gathering, analysis, and reporting under the RCRA Program are covered in this Quality Assurance Manual. This manual describes those procedures which ensures the collection of data of adequate quality to meet project objectives.

Specific guidelines and activities that are addressed include: sampling procedures; sample custody; calibration procedures; analytical procedures; and data analysis/reduction, validation, and reporting. The plan also addresses internal quality control checks; performance and system audits; quality assurance reports to management; preventive maintenance; corrective actions; and assessment of data precision, accuracy, and completeness.

It will be necessary to prepare a WMB/RCRA specific QA project sampling plan for each project that includes monitoring and measuring activities that generate and process environmental data. Appendix C provides an example of format for preparing all types of QAPPs. It can be utilized by simply "filling in the blanks" for routine and screening efforts or expanded for developing a comprehensive plan for major data acquisition efforts. This model addresses all essential elements called for in national agency guidance and regulations

Each QAPP will be reviewed by appropriate Environmental Services Division (ESD) peer reviewer(s), and when concurred with by the Regional Quality Assurance Management Office (RQAMO), will serve as an authorization to assign Laboratory sample numbers and other ESD resources. It cannot be too strongly emphasized, that, except for unique emergency response situations, the QAPP must be completed prior to the initiation of sample collection. Finally, the QAPP will serve as the basic tracking document for the project managers, the RQAMO, and the Sample Management Office (SMO).

VI. PROJECT DESCRIPTION

Data generated from the samples that are analyzed using the QA procedures described in this manual will primarily be used for RCRA and solid waste permits, compliance and enforcement cases. Data generated will be used for monitoring activities related to:

- Generation
- Treatment
- Storage
- Disposal
- Closure (e.g. specific sites)
- Unregulated Discharges (e.g. spills)
- PA/SI's
- Permit Development
- Case development
- Corrective Action Development
- SWMU's

Data will also be generated from both compliance, enforcement, and routine surveillance activities covering hazardous waste facilities. These data will be used for facility plan evaluation, and information, education and technical assistance in professional development programs.

Under 40 CFR Part 261 (Appendix B) of the RCRA regulations, a listing of hazardous materials is provided. This part also requires analyses to be performed by methods provided in SW-846 "Test Methods for Evaluating Solid Waste; Physical/Chemical Methods". However, SW-846 does not provide methods of analysis for every material listed as hazardous in 40 CFR Part 261. As new procedures are added to SW-846, the laboratory will develop procedures the same as in SW-846 to perform these analyses. All groundwater sampling and analysis procedures also currently follow either SW-846, the EPA 600 series, or SW-611. This will be continued until such time as EPA promulgates groundwater monitoring in SW-846.

The specific parameters addressed by this plan are as follows:

Ignitability	Antimony	Halogenated Volatile Organics
Corrosivity	Arsenic	Nonhalogenated Volatile Organics
Reactivity	Barium	Aromatic Volatile Organics
EP Toxicity	Cadmium	Acrolein, Acrylonitrile, Acetonitrile
	Chromium	Phenols
	Lead	Phthalate Esters
Volatile Organics-	Mercury	Organochlorine Pesticides and PCBs
Semi-volatile Organics	Nickel	Nitroaromatics and Cyclic Ketones
Polynuclear Aromatic	Selenium	Polynuclear Aromatic Hydrocarbons
Hydrocarbons	Silver	Chlorinated Hydrocarbons
		Organophosphorous Pesticides
Total and Amenable Cyanide		
TOX		
Sulfides		
pH		

Other parameters may be measured as part of the overall RCRA program. These parameters include, but are not necessarily limited to: TOC, polar organics, viscosity, chlorides, specific gravity, BTU, proximate and ultimate analysis.

VII. PROJECT ORGANIZATION AND RESPONSIBILITIES

The WMB is organized under the Branch Chief into three Sections. Out of these three Sections, the compliance section and the permit section are responsible for conducting monitoring activities. The functions of this Section are described as follows:

Provides technical assistance to Federal, State, and local agencies and industry.
Conducts compliance inspections and takes enforcement actions as appropriate.
Overviews state program monitoring activities.

Project organization and individuals responsible for quality assurance are shown in Figure I. Responsibilities of these personnel are summarized in Table I

FIGURE I
PROJECT ORGANIZATION

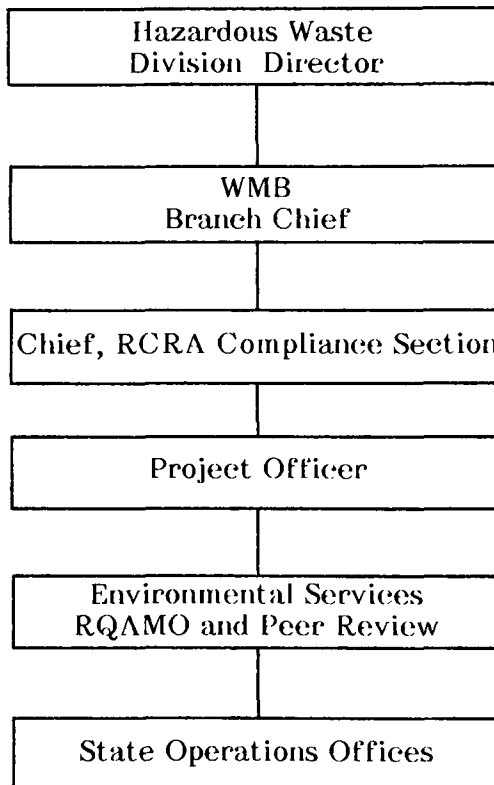


Table 1. Personnel Responsible For Quality Assurance Activities

<u>Personnel</u>	<u>Responsibilities</u>
WMB Chief	Provides oversight of all program activities; consult with section chief on policy decisions and major QA problems.
RCRA Compliance Section Chief	Reviews final-project QA needs, problems, and requests; approves appropriate QA corrective actions as needed. Sign-off responsibility for Section on QAPPs.
Project Officer	Coordinates both internal and external technical operations with appropriate State or local agencies. Liaison with RQAMO. Ensures that QAPP is prepared and adhered to: by proper handling of logs, sample receipts, custody records and all other required documentation; through careful instrument calibration and maintenance; that internal quality control measures are implemented; that corrective action is taken and RQAMO is notified when problems occur; that data, QA information, and reports are produced in a timely manner.
ESD Peer Reviewer(s)	Provides technical QA assistance to ensure compliance with approved or recommended sample collection policies and procedures.
RQAMO	Reviews and has sign-off authority for Region on all QAPPs; provides technical QA assistance and audits in relation to EPA QA policies and procedures.

VIII. OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective is to develop and implement procedures for field sampling, chain of custody, laboratory analysis and reporting that will provide sound scientific data and legally defensible results in a court of law. Specific procedures to be used for sampling, chain of custody, calibration, laboratory analysis, reporting, internal quality control, audits, preventative maintenance and corrective actions are described in other sections of this QA Manual. The purpose of this section is to define QA goals for detection limits, precision, accuracy and completeness where possible and presented in a tabular format similar to table 2. Such a table should be prepared by the project officer in consultation with the QA coordinator, laboratory director and reviewed by the RQAMO prior to initiating sampling efforts.

All measurements will be made so that results are consistent and representative of the media and conditions measured. All data will be calculated and reported in units consistent with other RCRA investigations to guarantee comparable data bases. Establishment of these goals allows the project manager to judge the adequacy of the results obtained and either use them or take corrective action if necessary.

Data quality objectives recommended by WMB for RCRA analyses are described below:

Detection Limits – The detection limits most commonly used for the purpose of RCRA analyses are presented in Table 4 in Section XII.

Accuracy – The QA accuracy objectives for quantitative analysis are expressed in terms of recovery of surrogate compounds or recovery of spiked analytes. Recovery of a surrogate compound added to a sample will be defined as follows:

$$\text{Recovery, \%} = \frac{\text{Grams of Surrogate Found in Sample}}{\text{Grams of Surrogate Added to Sample}} \times 100\%$$

The recovery of a spiked analyte is defined as follows:

$$\text{Recovery, \%} = \frac{\text{Total Analyte Found} - \text{Analyte Originally Present}}{\text{Analyte Added}} \times 100\%$$

QA objectives for these recoveries are given in Table 2.

Precision – The objective for precision where duplicates or replicate analyses have been performed are as follows:

- **Analysis of Surrogate or Analyte Spikes:** One of the QA objectives is that the standard analysis of surrogate compounds or analyte spikes in duplicate samples from a given sampling point be within the limits specified in Table 2.
- **Analysis of Duplicate Samples or Replicate Analytes :** One of the QA objectives is that the results or quantitative analysis for duplicate or replicate samples be within the limits specified in Table 2.

A more thorough discussion of, and the equations used to calculate precision are to be found in Section 15.0.

Completeness – Completeness is defined as the degree to which the number of activities initiated are actually finished. The degree of completeness is the total number of samples for which acceptable analytical data are generated divided by the total number of samples collected times 100%. As shown in Table 2, the QA data objective for the completeness of WMB projects is 95%.

Comparability – To ensure a coherent data base, all results should be reported in the same units of quantification. Measurement units most commonly used for the purpose of RCRA analyses are presented in Table 4 in Section XII.

TABLE 2

EXAMPLE OF DATA QUALITY OBJECTIVES FOR RCRA MEASUREMENT DATA

<u>Technique or Parameter</u>	<u>Matrix</u>	<u>Precision</u>	<u>Accuracy</u>	<u>Completeness</u>
<u>Characteristics</u>				
Ignitability	Solid, liquid ,sludge	±20%	97-103%	95%
Corrosivity	Liquids, sludges	±10%	90-110%	95%
EP Toxicity	Solids ±30%	70-130%	95%	
<u>Composition</u>				
GC or GC/MS	Aqueous	±20%	±3 SD	95%
Volatile	Solids			
Organics	and Biota	±50%	±3 SD	95%
Base neutrals				
Acids				
Pesticides				
Atomic Absorption	Solid, liquid, sludge	±30%	70-130% for spikes ±2 SD for QC samples	95% 95%
Cyanide	Solid, liquid, sludge	±20%	80-120%	95%
Sulfides	Solid, liquid, sludge	±20%	80-120%	95%
pH	Aqueous phase of 20% total volume			
TOX	Drinking & Groundwaters	±20%	80-120%	95%

Following is a list of documents that provide information concerning statistical procedures for measurement data:

Cochran, W.G. 1977. Sampling Techniques. 3rd edition
John Wiley & Sons, Inc. New York, NY. 428 pp.

Finney, D.J. 1964. Statistical methods in biological assay.
Hafner Publishing Co. New York, NY.

Green, R.H. 1979. Sampling design and statistical methods for environmental biologists.
John Wiley & Sons, N.Y. 257 pp.

U.S. Environmental Protection Agency, 1984.
Calculation of Precision, Bias, and Method Detection Limit for Chemical and Physical Measurements.

Keith, L, W. Crummett, J. Deegan, Jr., R. Libby, J. Talor and G. Wenther. 1983.
Principles of environmental analysis. Analytical Chemistry, Vol. 55. pp. 2210-2218.

Sokal, R.R., and F.J. Rohlf. 1969. Biometry. W.H. Freeman and Co., San Francisco, CA.
776 pp.

Tetra Tech. 1985. Bioaccumulation monitoring guidance: Selection of target species and analytical detection limits prepared for U.S. Environmental Protection Agency,
Washington D.C.

U.S. Environmental Protection Agency. 1979a. Handbook for analytical quality control in water and wastewater laboratories. EPA-600/4-79-019. Environmental Monitoring and Support Laboratory, Cincinnati, OH.

U.S. Environmental Protection Agency. 1982a. Handbook for sampling and sample preservation of water and wastewater. EPA-600/4-82-029. Environmental Monitoring and Support Laboratory, Cincinnati, OH. 402 pp.

U.S. Environmental Protection Agency. 1983b. Environmental measurement method performance data for establishing achievable data quality goals. Environmental Monitoring Systems Laboratory Research, Triangle Park, NC.

Additional references for methods and associated measurement objectives are given in Section 7 - Sampling Procedures, and Section 10 - Analytical Procedures.

IX. SAMPLING PROCEDURES

Ultimate accuracy of any data generation begins with a sampling procedure that is well conceived and implemented. Prior to sample collection, a detailed QAPP (see Appendix C for example of format) specifying sampling procedures and equipment, sample container type and preparation, sample preservation methods and holding times and shipping requirements will be prepared.

The sampling procedures to be used by the HWMB for RCRA investigation are based on those described in the following references:

- "Test Methods for Evaluating Solid Waste Physical/Chemical Methods", SW-846, 2nd Edition, U.S. Environmental Protection Agency, 1982.
- "Sampling at Hazardous Materials Incidents", U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, April 1984.
- "Field Sampling Workbook", Prepared by Region 10, U.S. Environmental Protection Agency, Nov. 1984.

Before sampling of any site is performed, the Project Officer will meet or talk with the Compliance Section Chief or the RCRA QA Coordinator. The purpose of the meeting will be to establish the sampling objectives, sampling methodology to be employed and the analytical test which will be performed on the samples. Where possible, the QA coordinator and the field sampling team will establish the sensitivity required for the analytical tests. All field activities and sampling will be documented in a stitched, bound, and numbered field logbook. Modifications to approved or recommended sample collection procedures will be described on the sample alteration checklist (Appendix C, pg 4) of the QAPP. Overall responsibility to see that field staff is properly trained in sampling procedures rests with the WMB Chief.

The type of sample container and preservation method used will vary according to the sample type and the parameters being measured. The field sampler is responsible to assure proper preservation methods are employed.

Table 3
Example Of Sample Container And Preservation Methods

<u>Parameter</u>	<u>Size and Type of Container</u>	<u>Preservative*</u>
Ignitability	500 ml glass	Iced or refrigerated
Corrosivity	1 liter plastic	Iced or refrigerated
Reactivity	1 liter plastic	Iced or refrigerated
EP Toxicity	1 quart glass	Iced or refrigerated
Metals, except Mercury and Hexavalent Cr	1 liter plastic	5 ml HNO ₃ /liter
Mercury	1 liter plastic	20 ml (2.5% K ₂ Cr ₂ O ₇ in 25% HNO ₃)/liter and iced
Hexavalent Cr	1 liter plastic	Iced or refrigerated
Volatile Organics	Purgeable vials (2 or more)	Iced or refrigerated
Semi-volatile Organics	1 gallon glass	Iced or refrigerated
Pesticides	1 gallon glass	Iced or refrigerated
Cyanide	1 liter plastic	1 ml 50% NaOH/liter and iced
TOX	Purgeable vials	Iced or refrigerated
Sulfides	1 liter plastic	2 ml (2N) Zn(C ₂ H ₃ O ₂) per liter
pH	1 liter plastic	Iced or refrigerated

* Preservation used only if sample is aqueous. Non-aqueous samples are placed in a glass bottle and iced. If the sample is strongly alkaline or acidic, a preservative should not be used. Volume of sample includes Quality Control effort.

X. SAMPLE CUSTODY AND DOCUMENTATION

The possession of samples must be traceable (i.e. their whereabouts must be determinable at all times evidenced by paper to prove it) from the time the samples are collected until they are introduced as civil or criminal evidence in enforcement proceedings, because of the potential evidentiary nature of sample collecting investigations. In addition, all information pertinent to field activities must be recorded in various forms, including logbooks, sample tags, and photographs. Such information, since it is required and used to refresh the investigators memory years later at trial will support the introduction into evidence of a particular sample, and potentially provide important or corroborative evidence relevant to the matters at issue. Therefore, each field worker must keep detailed records of inspections, investigations, photographs taken, etc., and thoroughly review all notes before leaving the site. Document control is implemented to ensure that all documents for a specific project are accounted for when the project is completed. Accountable documents include items such as logbooks, field data records, and photos. Each document should bear a serial number and should be listed, with the number, in a project document inventory assembled at the project's completion. Waterproof ink should be used in recording all data in documents bearing serial numbers.

Under Rule 803(6) of the Federal Rules of Evidence written records of regularly conducted business activities may be introduced into evidence as an exception to the "hearsay rule" without the substantive oral testimony of the person(s) who made the record, (IF the author can establish the proper foundation for admissibility (date, time, place, who was there, identify that a document was authored by him (by signature, initials, or handwriting) and be able to state that that type of document is kept in the ordinary course of business). Although it is preferable, it is not always possible for the individuals who collected, kept and analyzed samples to testify in court. In addition, if the opposing party does not intend to contest the integrity of the sample or testing evidence, admission under Rule 803(6) can save a great deal of trial time. For these reasons, it is important to standardize the procedures followed in collection and analysis of evidentiary samples to qualify for the requirement of "regularly conducted activity". Whether or not the team members anticipate that various documents will be introduced as evidence, they should make certain that all documents are as accurate and objective as possible. THE SUCCESS OR FAILURE OF A COURT PROCEEDING COULD DEPEND ON IT.

A. FIELD LOGBOOK

All information pertinent of field activities should be entered in a bound book with consecutively numbered pages. At a minimum, logbook entries must include:

- WHEN (date, time)
- WHERE (county, state, site address, sample location)
- WHO (those present directly involved)
- WHAT (sample numbers, descriptions of observations and actions)
- HOW (equipment used, or procedures followed)

Additional entries, of a WHY nature may be included, particularly if the sampler feels they could act as collateral aids in refreshing his memory at a later date. HOWEVER, caution should be exercised that these are essentially objective in nature as they too would be considered as evidence. Such entries could include:

- Name and address of field contacts (federal, state, or local representatives present but not directly involved in activity)
- Type of process producing the material
- Type of media sampled (drinking water, wastewater, sediment, etc.)
- References such as maps or photographs taken or acquired of the sampling site
- Any field measurements made such as pH, total organic vapors, or explosiveness

Because sampling situations vary widely, notes should be as descriptive and inclusive as possible. Those reading the entries should be able to reconstruct the sampling situation from the recorded information. Language must be objective, factual, and free of personal feelings or opinions or any other inappropriate terminology. If anyone other than the person to whom the logbook was assigned makes an entry, they must date and sign it. Errors should be corrected with a single line drawn through the error; the correct data filled in, and the correction entry initialed and dated.

B. PHOTOGRAPHS

Photographs can be the most accurate demonstration of the field worker's observation. They can be significant to the field team during future inspections, informal meetings, and hearings. A photograph should be documented with the entries listed as MUST listed in part A, above, if it is to be valid representation of an existing situation. It is a good idea to sign and date the final print or transparency, to aid in positive identification at a future date. Comments should be limited to an objective description. Photographs should be taken with a camera-lens system with a perspective similar to that afforded by the naked eye.

C. SAMPLE LABELS

Each sample should be labeled using waterproof ink and sealed immediately after it is collected. Labels should be filled out before collection to minimize handling of the sample container. Records should be kept of the assignment of serial sample tags to field personnel if such forms are used. Sample tags must never be discarded. Lost, voided, or damaged tags should be immediately noted in the logbook of the person to whom they were assigned.

Labels must be firmly affixed to the sample containers. Tags attached by string are acceptable when gummed labels are not available or applicable. The container must be dry enough for a gummed label to be securely attached. The label must include at the minimum the assigned sample number. If supporting information, i.e. Name of collector, date and time of collection, place of collection are not included on this label, such information MUST be recorded in the bound field logbook at the time of actually taking the sample and directly keyed to the assigned sample number and cross referenced to the appropriate Field Data Sheet and Chain of Custody Form, and Analysis Requested form.

D. CHAIN-OF-CUSTODY PROCEDURES

As in any other activity that may be used to support litigation, the sample collector must be able to provide documentation of the chain of possession and evidence of the continued custody of any samples which are offered for evidence. Written procedures must be available and followed whenever evidentiary samples are collected, transferred, stored, analyzed, or destroyed. The primary objective of these procedures is to create an accurate written record which can be used to trace the possession and handling of the sample from the moment of its collection through its analysis and to its introduction as evidence.

A sample is considered to be in someone's "custody" if:

- It is in one's actual possession, or
- It is in one's view, after being in one's physical possession, or
- It is in one physical possession and then locked up so that no one can tamper with it, or
- It is kept in a secured area, restricted to authorized and accountable personnel only.

During sampling collection and shipment, specific procedures should be followed to maintain proper chain-of-custody and accurate field inventory sheets, logbooks, and other supporting documentation. DO NOT LOSE THEM!

1. Sample Collection, Handling, and Identification

The number of persons involved in collecting and handling samples should be kept to a safe minimum. Field records should be completed at the time the sample is collected and should be signed or initialed, including the data and time, by the sample collector(s). Field records (in addition to those listed in Part A. of this section) should contain the following information:

- Unique sampling or log number
- Custody form numbers, if supplied
- Preservative used
- Name of collector(s)
- Copies of Field Data Sheets, Chain of Custody documentation, Analysis Requested, Airbill or Waybill documents if shipped by common carrier

It should be confirmed by the sampler writing in his or her field log that each sample is identified by the approved pressure-sensitive gummed label or standardized tag on the container, and if the individual container is sealed.

The sample container should then be placed in a transportation case, along with the shipping copies of chain-of-custody record form, pertinent field records, and analysis request forms as needed. The transportation case should be sealed or locked. A locked or sealed ice chest eliminates the need for close oversight of the individual samples. However, on those occasions when the use of an ice chest is inconvenient, the collector should seal the cap of the individual sample container in such a way that any tampering would be easy to detect.

When samples are composited over a period of time, unsealed samples can be transferred from one crew to the next. The transferring crew should list the samples and condition and a member of the receiving crew should verify the condition and sign the list. The receiving crew either transfers the unfinished composite samples to another crew or treats the finished composite sample as described above for samples.

It is desirable to photograph the sample location or any visible pollution to facilitate identification later. At the time the photo is taken, the photographer should record time, date, site location, and a brief description of the subject in the Field Log book. If Polaroid is used, the photographer should sign and date on the back of the photo. Film, developed negatives, transparencies, photographs and written records that may be used as evidence should be handled in such a way that chain-of-custody can be established.

2. Transfer of Custody and Shipment

When transferring the samples, the transferee must sign and record the date and time in the chain-of-custody record (Either Fig. 2 or Fig. 6). Custody transfers in the field should be documented and account for each sample, although samples may be transferred as a group (as long as each individual sample in the group is identified). Every person who takes custody must note if the individual samples or the sealed shipping container is correctly sealed and in the same condition as noted by the previous custodian; and must fill in the appropriate section of the chain-of-custody record. To minimize custody records, the number of custodians in the chain-of-possession should be minimized (if possible).

All packages sent to the laboratory should be accompanied by the chain-of-custody record and other pertinent forms. A copy of these forms should be retained by the originating person. Have the designated agent of the common carrier sign and date the field copy of the chain of custody form. Mailed packages can be registered with return receipt requested. For packages sent by common carrier, receipts, bills of lading, airbills or waybills or copies of these documents must be retained as part of the permanent chain-of-custody documentation. If the originals of such documents must be forwarded to finance for payment, be sure to keep a true copy (a true copy is one made or photocopied by an individual who signs and dates the copy to identify it as an accurate reproduction of the original: "True copy of original. Made by John Doe, February 30, 1980.") for the chain of custody documentation. Samples to be shipped must be packed so as not to break and the package should be sealed or locked so that any tampering can be readily detected. The EPA shipper and receiving personnel should both note the condition of the container seals (broken or unbroken) each time possession is exchanged. The preferred procedure includes use of a custody seal (Figure 3) wrapped across filament tape that is wrapped around the package at least twice. The custody seal is then folded over and stuck to itself so that the only access to the package is by cutting the filament tape or breaking the seal to unwrap the tape. The seal is then signed. As an alternative, tamper proof tape may be used to seal across the filament tape.

Upon receiving the sample container the laboratory will verify the integrity of the custody seals by noting in the "miscellaneous" section of the Field Data Sheet/Chain of Custody sheet "seals intact" or "seal broken", initialed and dated. If containers arrive with broken seals, the Laboratory will immediately notify the Project Officer and the RQAMO.

E. LABORATORY NOTIFICATION AND REPORTING

It is important to notify the Regional Sample Management Control Center (RSMCC) by phone and verify the shipping schedule before sampling, whenever possible. The caller should indicate that it is a high priority situation (if appropriate) and verify that the lab will be able to receive the samples. Queries about the sample arrival, position in the job stream etc., should be directed to the RSMCC.

In an emergency situation, when the EPA RSMCC or laboratory cannot be notified prior to sampling, the sampler must keep accurate records of sampling procedures and locations. The sampler may use a physical description of the sample location, provided that it is descriptive enough to differentiate between locations. As soon as possible following the emergency response, a completed QAP will be submitted to facilitate tracking and response.

All prospective samplers or Project Officers should contact the Sample Control Center prior to any sampling to obtain copies of their required forms. A list of the forms often required by laboratories include:

- Chain of Custody Record (Figure 2)
- Examples of Custody Seals (Figure 3)
- Analysis Required: X-91, Priority Pollutants - Organics (Figure 4)
- Analysis Required Sheet: X-92, Metals (Figure 5)
- Field Sample Data Sheet, with Chain of Custody (Figure 6)
- Analysis Required: X-93, Physical and General Inorganics and Ion Chromatograph (Figure 7)
- Analysis Required: X-94, Oxygen Demand, Solids & Nutrients (Figure 8)
- Contract Lab Organic Traffic Report (Figure 9)
- Contract Lab Inorganics Traffic Report (Figure 10)
- Contract Lab High Hazard Traffic Report (Figure 11)

Samplers should find out in advance which of these forms the laboratory requires.

F. CORRECTIONS TO DOCUMENTATION

If an error is made on any accountable document assigned to one individual, that individual may make corrections simply by drawing a line through the error and entering the correct information. The erroneous information should not be obliterated. Any subsequent error discovered on an accountable document should be corrected by the person who made the entry. All corrections must be initialed and dated.

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United States
Environmental Protection
Agency

Region 10
1200 Sixth Avenue
Seattle WA 98101


CHAIN OF CUSTODY RECORD

PROJECT				SAMPLERS: <i>(Signature)</i>							
LAB #	STATION	DATE	TIME	SAMPLE TYPE						NUMBER OF CONTAINERS	REMARKS
				WATER	SEDIMENT	TISSUE	AIR	OIL	OTHER		
RELINQUISHED BY: <i>(Signature)</i>				RECEIVED BY: <i>(Signature)</i>						DATE/TIME	
RELINQUISHED BY: <i>(Signature)</i>				RECEIVED BY: <i>(Signature)</i>						DATE/TIME	
RELINQUISHED BY: <i>(Signature)</i>				RECEIVED BY: <i>(Signature)</i>						DATE/TIME	
RELINQUISHED BY: <i>(Signature)</i>				REC'V'D BY MOBILE LAB FOR FIELD ANAL.: <i>(Signature)</i>						DATE/TIME	
DISPATCHED BY: <i>(Signature)</i>			DATE/TIME	RECEIVED FOR LAB BY: <i>(Signature)</i>						DATE/TIME	
METHOD OF SHIPMENT:											

Distribution. Original - Accompany Shipment
One Copy - Survey Coordinator Field Files

FIGURE 2
Chain Of Custody Record

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 UNITED STATES ENVIRONMENTAL PROTECTION AGENCY OFFICIAL SAMPLE SEAL	SAMPLE NO.	DATE	SEAL BROKEN BY	DATE
	SIGNATURE			
	PRINT NAME AND TITLE <i>(Inspector, Analyst or Technician)</i>			

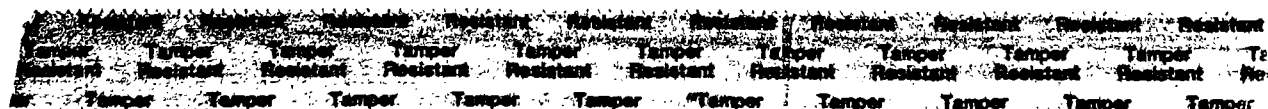


Figure 3
 Examples of Custody Seals

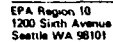
Page: 8 of 15EPA X-91 Lab Copy

FIGURE 4
Analysis Required: X-91, Priority Pollutants - Organics

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EPA X-92 Lab Copy

FIGURE 5
Analysis Required: X-92, Metals



☐ **Enforcement/Custody**

Samplers: _____

Project Code: _____ Account: _____

☐ Possible Toxic/Hazardous Notes: _____

Name/Location: _____

☐ Data Confidential

Project Officer: _____

☐ Data for Storet

Recorder: _____
(Signatures Required)

[illegible]

LAB NUMBER			DEPTH	Units	Type	COL MTD CD	QA CODE	TEMP DEG C	pH	CONDCTVTY umho/cm	MISCELLANEOUS	CHAIN OF CUSTODY RECORD			
Yr	Wk	Seq													
												RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME	
												RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME	
												RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME	
												RELINQUISHED BY: (Signature)	REC'D BY MOBILE LAB FOR FIELD ANAL.: (Signature)	DATE/TIME	
												DISPATCHED BY: (Signature)	DATE/TIME	RECEIVED FOR LAB BY: (Signature) DATE/TIME	
												METHOD OF SHIPMENT			

Laboratory Copy White	Project Officer Copy Yellow	Field or Office Copy Pink
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FIGURE 6
Field Sample Data and Chain of Custody Sheet

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EPA Region 10 Laboratory		Analyses Required	
PHYSICAL & GENERAL INORGANICS AND ION CHROMATOGRAPH			
Project Name: _____		Project Code: _____ Account Code: _____	
Matrix Codes <small>(circle one only)</small> 10 Water-Total 11 Water-Dissolved 40 Sediment/Soil 45 Semi-Solid/Sludge 46 Sediment for EP Toxicity 70 Tissue 80 Oil/Solvent 00 Other	Sample Numbers <div style="border: 1px solid black; height: 40px; width: 100%; background: linear-gradient(to top right, transparent 49%, black 49%, black 51%, transparent 51%);"></div>		
Physical & General Inorganics WG (10) Turbidity TURB pH (Lab) pH Conductivity COND Total Alkalinity T ALK Total Hardness T HARD Bicarbonate HCO3 Calcium Ca Carbonate CO3 Chloride Cl Fluoride F Sulfate SO4-TOT Sulfide S Cyanide CN Acidity Acidity Hardness CaCO3 Color Color			Analy/Comp Init/Date
Ion Chromatograph WG (80) Calcium Ca Chloride Cl Cyanide CN Fluoride F Magnesium Mg Potassium K Sodium Na Sulfate SO4 Nitrate NO3 Nitrite NO2 Ortho Phosphorous O-Phos.			
Save samples after analysis? NONE, SOME or ALL. <small>(If SOME circle sample numbers)</small>			
Special detection limits and comments: _____ _____ _____ _____ _____			
Project Officer Signature _____		Date _____	

EPA X-93 Lab Copy

FIGURE 7
Analysis Required: X-93, Physical and General Inorganics
and Ion Chromatograph

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Date

Analysis Required: X-94, Oxygen Demand, Solids and Nutrients

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U.S. ENVIRONMENTAL PROTECTION AGENCY HWI Sample Management Office P.O. Box 818, Alexandria, Virginia 22313-703 557-2490 • FTS 557-2490		Sample Number JB 102																																								
ORGANICS TRAFFIC REPORT																																										
① Case Number: Sample Site Name/Code: 	② SAMPLE CONCENTRATION (Check One) <input type="checkbox"/> Low Concentration <input type="checkbox"/> Medium Concentration ③ SAMPLE MATRIX (Check One) <input type="checkbox"/> Water <input type="checkbox"/> Soil/Sediment	④ Ship To: Attn: _____ Transfer _____ Ship To: _____																																								
⑤ Regional Office: _____ Sampling Personnel: (Name) _____ (Phone) _____ Sampling Date: (Begin) _____ (End) _____	⑥ For each sample collected specify number of containers used and mark volume level on each bottle. <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 15%; text-align: center;">Number of Containers</th> <th style="width: 15%; text-align: center;">Approximate Total Volume</th> <th style="width: 40%;"></th> </tr> </thead> <tbody> <tr> <td style="border: 1px solid black;">Water (Extractable)</td> <td style="border: 1px solid black;"></td> <td style="border: 1px solid black;"></td> <td>JB 102 - Water (Extractable)</td> </tr> <tr> <td style="border: 1px solid black;">Water (VOA)</td> <td style="border: 1px solid black;"></td> <td style="border: 1px solid black;"></td> <td>JB 102 - Water (Extractable)</td> </tr> <tr> <td style="border: 1px solid black;">Soil/Sediment (Extractable)</td> <td style="border: 1px solid black;"></td> <td style="border: 1px solid black;"></td> <td>JB 102 - Water (Extractable)</td> </tr> <tr> <td style="border: 1px solid black;">Soil/Sediment (VOA)</td> <td style="border: 1px solid black;"></td> <td style="border: 1px solid black;"></td> <td>JB 102 - Water (VOA)</td> </tr> <tr> <td style="border: 1px solid black;">Other</td> <td style="border: 1px solid black;"></td> <td style="border: 1px solid black;"></td> <td>JB 102 - Water (VOA)</td> </tr> <tr> <td style="border: 1px solid black;"></td> <td style="border: 1px solid black;"></td> <td style="border: 1px solid black;"></td> <td>JB 102 - Soil/Sediment (Extractable)</td> </tr> <tr> <td style="border: 1px solid black;"></td> <td style="border: 1px solid black;"></td> <td style="border: 1px solid black;"></td> <td>JB 102 - Soil/Sediment (Extractable)</td> </tr> <tr> <td style="border: 1px solid black;"></td> <td style="border: 1px solid black;"></td> <td style="border: 1px solid black;"></td> <td>JB 102 - Soil/Sediment (VOA)</td> </tr> <tr> <td style="border: 1px solid black;"></td> <td style="border: 1px solid black;"></td> <td style="border: 1px solid black;"></td> <td>JB 102 - Soil/Sediment (VOA)</td> </tr> </tbody> </table>			Number of Containers	Approximate Total Volume		Water (Extractable)			JB 102 - Water (Extractable)	Water (VOA)			JB 102 - Water (Extractable)	Soil/Sediment (Extractable)			JB 102 - Water (Extractable)	Soil/Sediment (VOA)			JB 102 - Water (VOA)	Other			JB 102 - Water (VOA)				JB 102 - Soil/Sediment (Extractable)				JB 102 - Soil/Sediment (Extractable)				JB 102 - Soil/Sediment (VOA)				JB 102 - Soil/Sediment (VOA)
	Number of Containers	Approximate Total Volume																																								
Water (Extractable)			JB 102 - Water (Extractable)																																							
Water (VOA)			JB 102 - Water (Extractable)																																							
Soil/Sediment (Extractable)			JB 102 - Water (Extractable)																																							
Soil/Sediment (VOA)			JB 102 - Water (VOA)																																							
Other			JB 102 - Water (VOA)																																							
			JB 102 - Soil/Sediment (Extractable)																																							
			JB 102 - Soil/Sediment (Extractable)																																							
			JB 102 - Soil/Sediment (VOA)																																							
			JB 102 - Soil/Sediment (VOA)																																							
⑦ Shipping Information Name of Carrier _____ Date Shipped: _____ Airbill Number: _____	⑧ Sample Description <input type="checkbox"/> Surface Water <input type="checkbox"/> Mixed Media <input type="checkbox"/> Ground Water <input type="checkbox"/> Solids <input type="checkbox"/> Leachate <input type="checkbox"/> Other (specify) _____																																									
⑨ Sample I 		 																																								
⑩ Special Handling Instructions: (e.g., safety precautions, hazardous nature) 																																										

SMO COPY

FIGURE 9
Contract Laboratory Organic Traffic Report

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	U.S. ENVIRONMENTAL PROTECTION AGENCY HWI Sample Management Office P.O. Box 818, Alexandria, VA 22313-703 / 557-2490 • FTS / 557-2490	Sample Number MJA 700
INORGANICS TRAFFIC REPORT		

① Case Number: _____ Sample Site Name/Code: _____ _____ _____	② SAMPLE CONCENTRATION (Check One) <input type="checkbox"/> Low Concentration <input type="checkbox"/> Medium Concentration ③ SAMPLE MATRIX (Check One) <input type="checkbox"/> Water <input type="checkbox"/> Soil/Sediment	④ Ship To: Attn: _____ Transfer Ship To: _____
⑤ Sampling Office: _____ Sampling Personnel: (Name) _____ (Phone) _____ Sampling Date: (Begin) _____ (End) _____	⑥ Shipping Information: Name Of Carrier: _____ Date Shipped: _____ Airbill Number: _____	MJ A 700 - Task 1 & 2 MJ A 700 - Task 1 & 2 MJ A 700 - Task 3 MJ A 700 - Task 3 MJ A 700 Task 3 MJ A 700 Task 3 MJ A 700 - Task 3
⑦ Sample Description: (Check One) <input type="checkbox"/> Surface Water <input type="checkbox"/> Ground Water <input type="checkbox"/> Leachate <input type="checkbox"/> Mixed Media <input type="checkbox"/> Solids <input type="checkbox"/> Other _____ (specify) MATCHES ORGANIC SAMPLE NO. _____	⑧ Mark Volume Level On Sample Bottle Check Analysis required <input type="checkbox"/> Task 1 & 2 <input type="checkbox"/> Task 3 Ammonia Sulfide Cyanide	

SMO COPY

FIGURE 10
Contract Laboratory Inorganics Traffic Report

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	U.S. ENVIRONMENTAL PROTECTION AGENCY CLP Sample Management Office PO Box 818 - Alexandria, Virginia 22313 Phone 703/557-2490 - FTS/557-2490	Sample Number: J 5152
	HIGH HAZARD TRAFFIC REPORT	

FIELD SAMPLE RECORD

① Case Number: Sample Site Name/Code: _____ _____ _____ _____	② Field Sample Description: <input type="checkbox"/> Drum <input type="checkbox"/> Aqueous Liquid <input type="checkbox"/> Sludge <input type="checkbox"/> Solid <input type="checkbox"/> Oil <input type="checkbox"/> Other _____	③ Ship To: Attn: _____
④ Sampling Office: _____ Sampling Personnel: _____ (name) _____ (phone) Sampling Date: (begin) _____ (end) _____	⑤ Known or Suspected Hazards: _____ _____ _____ _____ _____	⑥ Sample Location: J 5152 J 5152 J 5152 J 5152 J 5152
⑧ Shipping Information: _____ (name of carrier) _____ (date shipped) _____ (airbill number)	⑦ Preparations Requested: (check below) Sample Volume: _____ <input type="checkbox"/> Organics <input type="checkbox"/> Volatile Organics <input type="checkbox"/> Base/Neutral, Acid, TCDD <input type="checkbox"/> Pesticides, PCB <input type="checkbox"/> Inorganics <input type="checkbox"/> Total Metals <input type="checkbox"/> Total Mercury <input type="checkbox"/> Strong Acid Anions	

⑨ Special Handling Instructions: <p align="center">SMO Copy</p>

FIGURE 11
High Hazard Traffic Report

XI. CALIBRATION PROCEDURES, FREQUENCY; PREVENTATIVE MAINTENANCE

The calibration procedures and frequencies for laboratory analytical methods will be those specified in SW-846. If field measurements are to be taken, all equipment and the appropriate check and calibration procedures should be described by reference in the QAPP.

Maintenance of equipment is an important part of every laboratory and field operation. In the Regional Laboratory, contract laboratory, or field operations, the responsibility of routine operating care lies with the analysts using the instruments. Every manufacturer furnishes instrument maintenance manuals for their equipment. These are kept on file in each laboratory for frequent reference; adjustments or repairs which cannot be performed to satisfy these manuals are contracted to the manufacturer's service department or representative.

Preventative maintenance procedures are discussed in detail in the Regional Laboratory QA Manual.

Preventive maintenance and check procedures for field instrumentation will be described separately for each instrument identified for use in the QAPP

XII. ANALYTICAL PROCEDURES

Methods and references for most analyses are summarized in table 4.

Analysis of chemical and biological samples collected during field investigations will be performed by the Regional laboratory or contract laboratory program with established protocols and QA procedures described in SW-846 or contract requirements. When approved or recommended EPA procedures are not available, a written description of the procedure will be included as a reference to an EPA recommended method and what modification have been made. Modifications to approved or recommended methods for analytical methods will be described on the sample alteration checklist (in Appendix C, page 4) of the QAPP.

Table 4
Methods and Minimum Detection Limits for RCRA Analysis

<u>Parameter</u>	<u>SW-846 Method ..Number</u>	<u>Detection Limit ug/L</u>
Ignitability	1010	N/A
Corrosivity	9040	N/A
Reactivity	Sect.6	N/A
EP Toxicity	1310	N/A
Antimony	7040,7041	200., 3.0
Arsenic	7060	1.0
Barium	7080,7081	100., 2.0
Cadmium	7130,7131	5.0, 1.0
Chromium	7190,7191	50., 1.0
Chromium, Hexavalent	7196,7197	verification
Lead	7420,7421	100., 1.0
Mercury	7470	0.2
Nickel	7520,7521	40., 1.0
Selenium	7740	2.0
Silver	7760	10.0
Halogenated Volatile Organics	8010	0.03-0.5*
Nonhalogenated Volatile Organics	8015	1.0 ug/G sample
Aromatic Volatile Organics	8020	1.0 ug/G sample
Acrolein, Acrylonitrile, Acetonitrile	8030	1.0 ug/G sample
Phenols	8040	0.1-16.0*
Pthalate Esters	8060	0.29-3.0*
Organochlorine Pesticides and PCBs	8080	0.004-0.176*
Nitroaromatics and Cyclic Ketones	8090	0.06-5.0*
Polynuclear Aromatic Hydrocarbons	8100	1.0 ug/G sample
Chlorinated Hydrocarbons	8120	0.03-1.19*
Organophosphorus Pesticides	8140	0.1-5.0*
Chlorinated Herbicides	8150	0.1-200.0*
Volatile Organics (GC/MS)	8240	1.6-7.2
Semi-volatile Organics (GC/MS)	8270	0.9-45.0*
Polynuclear Aromatic Hydrocarbons (HPLC)	8310	0.4-2.3*
Total and Amenable Cyanide	9010	Not Defined
Total Organic Halides (TOX)	9020	" "
Sulfides	9030	" "
pH	9040	" "

* Dependent on individual compound within group.
ug/L microgram per Liter
ug/G microgram per gram

Table 4 (Cont'd)

<u>Parameter</u>	<u>SW-846 Method Number</u>
<u>Sample Preparation – Metals</u>	
Acid Digestion Procedure for Flame Atomic Absorption Spectroscopy	3010
Acid Digestion Procedure for Furnace Atomic Absorption Spectroscopy	3020
Acid Digestion of Oils, Greases, or Waxes	3030
Dissolution Procedure for Oils, Greases or Waxes	3040
Acid Digestions of Sludges	3050
Alkaline Digestion	3060
<u>Sample Preparation – Organics</u>	
Separatory Funnel Liquid – Liquid Extraction	3510
Continuous Liquid – Liquid Extraction	3520
Acid-Base Cleanup Extraction	3530
Soxhlet Extraction	3540
Sonication Extraction	3550
<u>Sample Introduction – Organics</u>	
Purge and Trap	5030

XIII. DATA REDUCTION, VALIDATION AND REPORTING

Each QAPP will identify individuals responsible for handling data, and describe the type of information to be transmitted with the data at each step. In general, laboratories will provide verified data sets to the Project Officer and/or designated QA Coordinator with adequate documentation to allow independent data validation. The Project Officer and/or QA Coordinator is responsible for conducting checks for internal consistency, transmittal errors, laboratory protocols, and finally, a check for complete adherence to the quality control elements specified in Sections 6, 9, 10, and 12 of this manual.

Data storage needs unique to the WMB operations will be specified after consultation with ESD data management staff. Such needs might include the way in which data are referenced to original documents, particular data qualifiers to be used, the level of detail with which sampling and analysis methods are to be described, and the inclusion of certain types of descriptive information or additional data. Procedures and criteria for evaluating both historical data and new data for completeness and comparability for database inclusion should be developed by the WMB QA Coordinator in conjunction with the ESD data management staff. Any other procedures or criteria used by the HWMB or their contractors for assessing data validity must be described in the QAPP. All data submitted by contractors must be in a form consistent with other WMB investigations and compatible with the Regional Data Management System.

The data analysis scheme planned for collected data, including units, and statistical tests to be used will be specified in the QAPP. While such specification may be by citation from this guidance, the Project Officer should encourage a well thought out project plan and should clearly identify additional data needs to ensure comparability with study site reference data or historical comparisons

Each project officer is responsible for the accuracy of the reduction of data to reports or final file inclusion. If precision or accuracy are outside of established acceptance limits, data analyzed with that group of QA data must either be re-analyzed or considered for corrective action. Where appropriate and defensible adjustments cannot be made, the data should not be used. The Project Officer is also responsible for further use or release of the data or derived project reports.

Standardized forms are to be used for data collection, analysis requests, reduction and reporting. While data are entered into the computer system, the forms package will be submitted to the WMB following QA acceptance.

On at least a yearly basis, WMB will cooperate with the SMO/RSCC, ESD in a review and audit of the computer system records of analysis, etc. maintained on the sample tracking and laboratory reporting systems.

XIV. INTERNAL QUALITY CONTROL CHECKS

Each measurement system shall have predetermined limits to identify when corrective action is required, before data becomes unacceptable. The QAPP will specify (from Table 4, Section XII) the analytical procedures to be used to identify that point.

The QAPP will address controls for accurate location of sampling stations, the rationale used in selecting the number and location of those stations, for sample collection, and for sample handling, and the type and frequency of QA/QC samples as set forth in Table 5:

Table 5: Level Of Effort In QA Sampling

Data Characteristic Frequency* Evaluated	Sample Type	Recommended
Field/Transport Contamination	Field Blank	One per 20 samples
Field/Transfer Contamination	Field Blank	One per 20 samples
Sampling Equipment	Field Blank	As appropriate Final Rinse
Laboratory Contamination	Lab (reagent) Blank	One per batch run
Accuracy (Field variability)	Field Spiked	One per 20 samples
Accuracy	Standard Addition (Spike) and performance evaluation samples or standard reference materials: One per 20 samples	One per 10 Samples
Precision (Field Variability)	Field replicates	One per 20 samples or One per sample event
Precision (Lab Variability)	Laboratory One per batch run	One per 10 samples or One per sample event
Container Contamination	Empty Container	One per container lot

* Where two alternatives are cited, the recommended alternative is that resulting in more frequent analysis. Where less than 20 samples are taken at a site, Transport and/or Transfer blanks shall be taken to provide QA even to the minimum sampling efforts.

XIV. INTERNAL QUALITY CONTROL CHECKS

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Laboratory Contamination	Lab (reagent) Blank	One per batch run
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Accuracy	Standard Addition (Spike) and performance evaluation samples or standard reference materials: One per 20 samples	One per 10 Samples
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Precision (Lab Variability)	Laboratory One per batch run	One per 10 samples or One per sample event
Container Contamination	Empty Container	One per container lot

* Where two alternatives are cited, the recommended alternative is that resulting in more frequent analysis. Where less than 20 samples are taken at a site, Transport and/or Transfer blanks shall be taken to provide QA even to the minimum sampling efforts.

XV. PERFORMANCE AND SYSTEM AUDITS

Each QAPP will describe the internal and external performance and system audits that will be required to monitor the capability and performance of the measurement system(s).

Performance and system audits for WMB sampling and analysis operations will consist of on-site reviews of field and laboratory quality assurance systems and equipment for sampling, calibration, and measurement. This includes review of items such as documentation of quality control data, completeness of field forms, field data storage and filing procedures, and sample custody sheets. Environmental monitoring equipment will be routinely maintained and calibrated during field use (see Preventive Maintenance).

Region 10 Laboratory and contract laboratories are required to take part in performance evaluation studies conducted by the Environmental Monitoring and Support Laboratory (EMSL) in Cincinnati, OH. and Las Vegas NV.. Results of these audits are available from the RQAMO. For internal quality control applications, analytical standards used in preparing performance evaluation samples and guidance for their use can be obtained from:

Environmental Monitoring Systems Laboratory. U.S. Environmental
Protection Agency. Las Vegas, NV 89114

Environmental Monitoring Systems Laboratory. U.S. Environmental
Protection Agency. Cincinnati, OH 45268

The RQAMO in conjunction with the WMB QAC will develop and conduct system audits based on this manual and also conduct optional site technical audits of operations detailed in the QAPPs.

The WMB QAC ensures that each aspect of a project detailed in a QAPP will have performed adequate internal audits of performance and systems before submitting quality assurance reports to the management.

XVI. SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

The assessment of data precision, accuracy, completeness, and blanks will be made by the HWMB project officer or QAC.

Assessment of Precision:

The mean, \bar{C} , of a series of replicate measurements of concentration, C_i , is calculated as:

$$\bar{C} = \frac{1}{n} \sum_{i=1}^n C_i$$

where n = number of replicate measurements; C , C_i are both on mg/L or mg/Kg

The estimate of precision of duplicate measurements is expressed as the relative percent difference (RPD):

$$RPD = \frac{C_2 - C_1}{C} \times 100$$

The RPD calculated will be compared with the respective goals identified in the QAPP.

The estimate of precision of a series of replicate measurements (primarily used in GC/MS analysis) is expressed as the relative standard deviation (RSD) where:

$$RSD = \frac{1}{\bar{C}} \sqrt{\frac{\sum_{i=1}^n (C_i - \bar{C})^2}{n-1}}$$

Assessment of Accuracy:

Accuracy is monitored by analyzing standards, samples that have been spiked with standard solutions, and control samples. Approximately 10% of all samples are analyzed as spiked samples. The accuracy of new analytical methods is verified by analyzing replicate spiked samples intermixed with routine samples.

XVII. CORRECTIVE ACTION

Corrective actions can fall into two categories:

1. Handling of sampling analysis, data processing, or equipment failures.
2. Handling of non-conformance or non-compliance with the QA requirements that have been set forth (objectives for measurement data).

Each QAPP will address the corrective measures to be taken for the method or equipment failure type of problem. It will include predetermined limits of sample and data acceptability, identification of the corrective action, and the organizational level responsible for approval of action. Routine procedures for correcting and limiting data processing errors will cover data coding, data entry, and data reporting. A formal corrective actions program is difficult to define in advance for the non-conformance or non-compliance type of problem. Each QAPP will list who is responsible for taking actions, when actions are to be taken, and who ensures that actions taken produce desired results. A special form is included with the example QAPP to facilitate such documentation.

Corrective actions will be taken by the project officer when data are found to be outside the predetermined limits of acceptability. The acceptable data range will be listed on the corrective action form, which also provides a checklist for procedures to be followed.

XVIII. QUALITY ASSURANCE REPORTS TO MANAGEMENT

Reports to the WMB Branch Chief and the Project Officer will be made periodically by the QA Coordinator. QAPPs will identify the mechanism of and the points to which the reports will be made. QA reporting should be tied to the completion of various elements of the QAPP rather than to general time periods. The reports will contain information regarding data accuracy, precision, completeness, result of system and performance audits along with any reports of corrective action, sample alteration, or other significant QA problems. Through this mechanism, effective solutions to project problems may be developed and applied.

XIX. SAFETY

RCRA inspectors must occasionally deal with the risk of incurring illness or injury while conducting investigations. They cannot anticipate every hazard, so they must take precautions to prevent illness or injury to themselves, other workers, and the public.

Since RCRA inspectors cannot eliminate risk, they must reduce it to the lowest feasible level. No set of rules can be uniformly applied to every situation. The Project Officer must judiciously apply the guidelines of the EPA Standard Operating Safety Guides (SOSG) at each site visited. The Project Officer must assess those variables peculiar to each investigation in order to establish appropriate safeguards. The EPA Region 10 Safety and Health Officer (RSHO) is available at 442-0370 for consultation on appropriate levels of protection, equipment, etc. to use for each investigation.

Generally, all RCRA site inspections requiring the collection of samples or potential exposure to toxic materials will require a site safety plan. The Project Officer is responsible for preparing the site safety plan. If the investigation is quite complex, the RSHO will prepare or assist with the preparation of the plan. The site safety plan in non-emergency situations must be written, posted, distributed and signed by all project team members, and discussed with them prior to visiting the site. Emergency situations may require verbal safety instruction and use of standard operating procedures until specific protocols can be written. The SOSG will be used as standard operating procedure in emergency situations.

Annex 9 and 10 of the SOSG are two examples of site safety plans. Examples of job functions requiring use of levels C and B are described on pages A9-2 and A9-3 of the SOSG.

All RCRA inspectors must complete training as described in the Regional Policy on Health, Safety and Proficiency Training before being allowed to participate in a RCRA inspection or investigation.

Special safety considerations may be addressed as part of the QAPP. Because a formal safety plan is already required as separate documentation on any field activity, such considerations would only address the possible effect of plan limits on achieving data quality objectives.

APPENDIX A

GLOSSARY OF TERMS

AUDIT

A systematic check to determine the quality of operation of some function or activity. Audits may be of two basic types: 1) performance audits on which quantitative data are independently obtained for comparison with routinely obtained data in a measurement system, or 2) system audits of a qualitative nature that consist of an on-site review of a laboratory's quality assurance system and physical facilities for sampling, calibrations, and measurement.

CHAIN-OF-CUSTODY

Documentation that describes the physical control of a sample, measurement or document.

DATA QUALITY

The totality of features and characteristics of data that bears on its ability to satisfy a given purpose. The characteristics of major importance are accuracy, precision, completeness, representativeness, and comparability. These characteristics are defined as follows:

- Accuracy – the degree of agreement of a measurement (or an average of measurements of the same thing), X , with accepted reference or true value, T , usually expressed as the difference between the two values, $X-T$, or the difference as a percentage of the reference or true value, $100 (X-T)/T$, and sometimes expressed as a ratio, X/T . Accuracy is a measure of the bias in the system.
- Precision – a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision is best expressed in terms of the standard deviation. Various measures of precision exist depending upon the "prescribed similar conditions."
- Defensibility – ability to document the origin, chain of custody, matrix of scientifically acceptable operations performed, reduction, and transcription of data, so that their limitations, representativeness, and applicability are known.
- Completeness – a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions.
- Representativeness – expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.
- Comparability – expresses the confidence with which one data set can be compared to another.

DATA VALIDATION

A systematic process for reviewing a body of data against a set of criteria to provide assurance that the data are adequate for their intended use. Data validation consists of data editing, screening, checking, auditing, verification, certification, and review.

ENVIRONMENTALLY RELATED MEASUREMENTS

Terms used to describe essentially all field and laboratory investigations that generate data involving 1) the measurement of chemical, physical, or biological variables in the environment, 1) the determination of the presence or absence of contaminants in waste streams, 3) assessment of health and ecological effect studies, 4) conduct of clinical and epidemiological investigations, 5) performance of engineering and process evaluations, 6) study of laboratory simulation of environmental events, and 7) study or measurement of pollutant transport and fate, including dispersion models.

PERFORMANCE AUDITS

Procedures used to determine quantitatively the accuracy of the total measurement system or component parts thereof.

QUALITY ASSURANCE

The total integrated program for assuring the reliability of monitoring and measurement data. A system for integrating the quality planning, quality assessment, and quality improvement efforts to meet user requirements.

QUALITY ASSURANCE PROGRAM PLAN

An orderly assemblage of management policies, objectives, principles, and general procedures by which an agency or laboratory outlines how it intends to produce data of known and accepted quality.

QUALITY ASSURANCE PROJECT PLAN

An orderly assembly of detailed and specific procedures which delineates how data of known and acceptable quality are produced for a specific project. (A given agency or laboratory would have only one quality assurance plan, but would have a specific Quality Assurance Project Plan(QAPP) for each of its projects.)

QUALITY CONTROL

The routine application of procedures for obtaining prescribed standards of performance in the monitoring and measurement process.

STANDARD OPERATING PROCEDURE (SOP)

A written document that details an operation, analysis, or action whose mechanisms are thoroughly prescribed and that is commonly accepted as the method for performing certain tasks.

APPENDIX B

CODE OF FEDERAL REGULATIONS

TITLE 40: PROTECTION OF THE ENVIRONMENT

Part 261: Identification and Listing of Hazardous Waste as amended through July 1, 1984

PART 261—IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

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APPENDIX X—METHOD OF ANALYSIS FOR CHLORINATED DIBENZO-P-DIOXINS AND DIBENZOFURANS

AUTHORITY: Secs. 1006, 2002(a), 3001 and 3002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended (42 U.S.C. 6905, 6912(a), 6921, and 6922).

SOURCE: 45 FR 33119, May 19, 1980, unless otherwise noted.

Subpart A—General

§ 261.1 Purpose and scope.

(a) This part identifies those solid wastes which are subject to regulation as hazardous wastes under Parts 262 through 265 and Parts 270, 271, and 124 of this chapter and which are subject to the notification requirements of section 3010 of RCRA. In this part:

(1) Subpart A defines the terms "solid waste" and "hazardous waste," identifies those wastes which are excluded from regulation under Parts 262 through 265, 270, 271 and 124 and establishes special management requirements for hazardous waste produced by small quantity generators and hazardous waste which is used, re-used, recycled or reclaimed.

(2) Subpart B sets forth the criteria used by EPA to identify characteristics of hazardous waste and to list particular hazardous wastes.

(3) Subpart C identifies characteristics of hazardous waste.

(4) Subpart D lists particular hazardous wastes.

(b)(1) The definition of solid waste contained in this part applies only to wastes that also are hazardous for purposes of the regulations implementing Subtitle C of RCRA. For example, it does not apply to materials (such as non-hazardous scrap, paper, textiles, or rubber) that are not otherwise hazardous wastes and that are recycled.

(2) This part identifies only some of the materials which are solid wastes and hazardous wastes under Sections 3007, 3013, and 7003 of RCRA. A material which is not defined as a solid waste in this part, or is not a hazardous waste identified or listed in this part, is still a solid waste and a hazard-

ous waste for purposes of these sections if:

(i) In the case of Sections 3007 and 3013, EPA has reason to believe that the material may be a solid waste within the meaning of Section 1004(27) of RCRA and a hazardous waste within the meaning of Section 1004(5) of RCRA; or

(ii) In the case of Section 7003, the statutory elements are established.

(c) For the purposes of §§ 261.2 and 261.6:

(1) A "spent material" is any material that has been used and as a result of contamination can no longer serve the purpose for which it was produced without processing;

(2) "Sludge" has the same meaning used in § 260.10 of this chapter;

(3) A "by-product" is a material that is not one of the primary products of a production process and is not solely or separately produced by the production process. Examples are process residues such as slags or distillation column bottoms. The term does not include a co-product that is produced for the general public's use and is ordinarily used in the form it is produced by the process.

(4) A material is "reclaimed" if it is processed to recover a usable product, or if it is regenerated. Examples are recovery of lead values from spent batteries and regeneration of spent solvents.

(5) A material is "used or reused" if it is either:

(i) Employed as an ingredient (including use as an intermediate) in an industrial process to make a product (for example, distillation bottoms from one process used as feedstock in another process). However, a material will not satisfy this condition if distinct components of the material are recovered as separate end products (as when metals are recovered from metal-containing secondary materials); or

(ii) Employed in a particular function or application as an effective substitute for a commercial product (for example, spent pickle liquor used as phosphorous precipitant and sludge conditioner in wastewater treatment).

(6) "Scrap metal" is bits and pieces of metal parts (e.g., bars, turnings,

rods, sheets, wire) or metal pieces that may be combined together with bolts or soldering (e.g., radiators, scrap automobiles, railroad box cars), which when worn or superfluous can be recycled.

(7) A material is "recycled" if it is used, reused, or reclaimed.

(8) A material is "accumulated speculatively" if it is accumulated before being recycled. A material is not accumulated speculatively, however, if the person accumulating it can show that the material is potentially recyclable and has a feasible means of being recycled; and that—during the calendar year (commencing on January 1)—the amount of material that is recycled, or transferred to a different site for recycling, equals at least 75 percent by weight or volume of the amount of that material accumulated at the beginning of the period. In calculating the percentage of turnover, the 75 percent requirement is to be applied to each material of the same type (e.g., slags from a single smelting process) that is recycled in the same way (i.e., from which the same material is recovered or that is used in the same way). Materials accumulating in units that would be exempt from regulation under § 261.4(c) are not be included in making the calculation. (Materials that are already defined as solid wastes also are not to be included in making the calculation.) Materials are no longer in this category once they are removed from accumulation for recycling, however.

[45 FR 33119, May 19, 1980, as amended at 48 FR 14293, Apr. 1, 1983; 50 FR 663, Jan. 4, 1985]

EFFECTIVE DATE NOTE: At 50 FR 663, Jan. 4, 1985, § 261.1(c) was added, effective July 5, 1985.

§ 261.2 Definition of solid waste.

(a)(1) A *solid waste* is any discarded material that is not excluded by § 261.4(a) or that is not excluded by variance granted under §§ 260.30 and 260.31.

(2) A *discarded material* is any material which is:

(i) Abandoned, as explained in paragraph (b) of this section; or

(II) *Recycled*, as explained in paragraph (c) of this section; or

(III) Considered *inherently waste-like*, as explained in paragraph (d) of this section.

(b) Materials are solid waste if they are abandoned by being:

(1) Disposed of; or

(2) Burned or incinerated; or

(3) Accumulated, stored, or treated (but not recycled) before or in lieu of being abandoned by being disposed of, burned, or incinerated.

(c) Materials are solid wastes if they are *recycled*—or accumulated, stored, or treated before recycling—as specified in paragraphs (c)(1) through (c)(4) of this section.

(1) *Used in a manner constituting disposal*. (I) Materials noted with a “*” in Column 1 of Table I are solid wastes when they are:

(A) Applied to or placed on the land in a manner that constitutes disposal; or

(B) Contained in products that are applied to the land (in which case the product itself remains a solid waste).

(II) However, commercial chemical products listed in § 261.33 are not solid wastes if they are applied to the land and that is their ordinary manner of use.

(2) *Burning for energy recovery*. (I) Materials noted with a “*” in column 2 of Table 1 are solid wastes when they are:

(A) Burned to recover energy;

(B) Used to produce a fuel;

(C) Contained in fuels (in which case the fuel itself remains a solid waste).

(II) However, commercial chemical products listed in § 261.33 are not solid wastes if they are themselves fuels.

(3) *Reclaimed*. Materials noted with a “*” in column 3 of Table 1 are solid wastes when reclaimed.

(4) *Accumulated speculatively*. Materials noted with a “*” in column 4 of Table 1 are solid wastes when accumulated speculatively.

TABLE 1

	Use constituting disposal (261.2(c)(1))	Energy recovery/ fuel (261.2(c)(2))	Reclaim- ation (261.2(c)(3))	Speculative accumula- tion (261.2(c)(4))
	(1)	(2)	(3)	(4)
Spent Materials.....	(*)	(*)	(*)	(*)
Sludges (listed in 40 CFR Part 261.31 or .32).....	(*)	(*)	(*)	(*)
Sludges exhibiting a characteristic of hazardous waste.....	(*)	(*)	(*)	(*)
By-products (listed in 40 CFR Part 261.31 or 261.32).....	(*)	(*)	(*)	(*)
By-products exhibiting a characteristic of hazardous waste.....	(*)	(*)	(*)	(*)
Commercial chemical products listed in 40 CFR § 261.33.....	(*)	(*)	(*)	(*)
Scrap metal.....	(*)	(*)	(*)	(*)

Note.—The terms “spent materials”, “sludges”, “by-products,” and “scrap metal” are defined in § 261.1.

(d) *Inherently waste-like materials*. The following materials are solid wastes when they are recycled in any manner:

(1) Hazardous Waste Nos. F020, F021 (unless used as an ingredient to make a product at the site of generation), F022, F023, F026, and F028.

(2) The Administrator will use the following criteria to add wastes to that list:

(I)(A) The materials are ordinarily disposed of, burned, or incinerated; or

(B) The materials contain toxic constituents listed in Appendix VIII of Part 261 and these constituents are

not ordinarily found in raw materials or products for which the materials substitute (or are found in raw materials or products in smaller concentrations) and are not used or reused during the recycling process; and

(II) The material may pose a substantial hazard to human health and the environment when recycled.

(e) *Materials that are not solid waste when recycled*. (1) Materials are not solid wastes when they can be shown to be recycled by being:

(i) Used or reused as ingredients in an industrial process to make a prod-

uct, provided the materials are not being reclaimed; or

(II) Used or reused as effective substitutes for commercial products; or

(III) Returned to the original process from which they are generated, without first being reclaimed. The material must be returned as a substitute for raw material feedstock, and the process must use raw materials as principal feedstocks.

(2) The following materials are solid wastes, even if the recycling involves use, reuse, or return to the original process (described in paragraphs (e)(1) (I)–(III) of this section):

(i) Materials used in a manner constituting disposal, or used to produce products that are applied to the land; or

(ii) Materials burned for energy recovery, used to produce a fuel, or contained in fuels; or

(iii) Materials accumulated speculatively; or

(iv) Materials listed in paragraph (d)(1) of this section.

(f) *Documentation of claims that materials are not solid wastes or are conditionally exempt from regulation*. Respondents in actions to enforce regulations implementing Subtitle C of RCRA who raise a claim that a certain material is not a solid waste, or is conditionally exempt from regulation, must demonstrate that there is a known market or disposition for the material, and that they meet the terms of the exclusion or exemption. In doing so, they must provide appropriate documentation (such as contracts showing that a second person uses the material as an ingredient in a production process) to demonstrate that the material is not a waste, or is exempt from regulation. In addition, owners or operators of facilities claiming that they actually are recycling materials must show that they have the necessary equipment to do so.

[50 FR 664, Jan. 4, 1985]

EFFECTIVE DATE NOTE: At 50 FR 664, Jan. 4, 1985, § 261.2 was revised, effective July 5, 1985 (except for paragraph (e) which was effective December 20, 1984). For the convenience of the user, the superseded text is set out below:

§ 261.2 Definition of solid waste.

(a) A solid waste is any garbage, refuse, sludge or any other waste material which is not excluded under § 261.4(a).

(b) An “other waste material” is any solid, liquid, semi-solid or contained gaseous material, resulting from industrial, commercial, mining or agricultural operations, or from community activities which:

(1) Is discarded or is being accumulated, stored or physically, chemically or biologically treated prior to being discarded; or

(2) Has served its original intended use and sometimes is discarded; or

(3) Is a manufacturing or mining by-product and sometimes is discarded.

(c) A material is “discarded” if it is abandoned (and not used, re-used, reclaimed or recycled) by being:

(1) Disposed of; or

(2) Burned or incinerated, except where the material is being burned as a fuel for the purpose of recovering usable energy; or

(3) Physically, chemically, or biologically treated (other than burned or incinerated) in lieu of or prior to being disposed of.

(d) A material is “disposed of” if it is discharged, deposited, injected, dumped, spilled, leaked or placed into or on any land or water so that such material or any constituent thereof may enter the environment or be emitted into the air or discharged into ground or surface waters.

(e) A “manufacturing or mining by-product” is a material that is not one of the primary products of a particular manufacturing or mining operation, is a secondary and incidental product of the particular operation and would not be solely and separately manufactured or mined by the particular manufacturing or mining operation. The term does not include an intermediate manufacturing or mining product which results from one of the steps in a manufacturing or mining process and is typically processed through the next step of the process within a short time.

§ 261.3 Definition of hazardous waste.

(a) A solid waste, as defined in § 261.2, is a hazardous waste if:

(1) It is not excluded from regulation as a hazardous waste under § 261.4(b); and

(2) It meets any of the following criteria:

(i) It exhibits any of the characteristics of hazardous waste identified in Subpart C.

(ii) It is listed in Subpart D and has not been excluded from the lists in Subpart D under §§ 260.20 and 260.22 of this chapter.

(iii) It is a mixture of a solid waste and a hazardous waste that is listed in Subpart D solely because it exhibits one or more of the characteristics of hazardous waste identified in Subpart C, unless the resultant mixture no longer exhibits any characteristic of hazardous waste identified in Subpart C.

(iv) It is a mixture of solid waste and one or more hazardous wastes listed in Subpart D and has not been excluded from this paragraph under §§ 260.20 and 260.22 of this chapter; however, the following mixtures of solid wastes and hazardous wastes listed in Subpart D are not hazardous wastes except by application of paragraph (c)(2) (i) or (ii) of this section if the generator can demonstrate that the mixture consists of wastewater the discharge of which is subject to regulation under either Section 402 or Section 307(b) of the Clean Water Act (including wastewater at facilities which have eliminated the discharge of wastewater) and:

(A) One or more of the following inert solvents listed in § 261.31—carbon tetrachloride, tetrachloroethylene, trichloroethylene—provided that the maximum total weekly usage of these solvents (other than the amounts that can be demonstrated not to be discharged to wastewater) divided by the average weekly flow of wastewater into the headworks of the facility's wastewater treatment or pre-treatment system does not exceed 1 part per million; or

(B) One or more of the following inert solvents listed in § 261.31—methane chloride, 1,1,1-trichloroethane, chlorobenzene, o-dichlorobenzene, creosols, cresylic acid, nitrobenzene, toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, spent chlorofluorocarbon solvents—provided that the maximum total weekly usage of these solvents (other than the amounts that can be demonstrated not to be discharged to wastewater) divided by the average weekly flow of wastewater into the headworks of the facility's wastewater treatment or pre-treatment system does not exceed 25 parts per million; or

(C) One of the following wastes listed in § 261.32—heat exchanger

bundle cleaning sludge from the petroleum refining industry (EPA Hazardous Waste No. K050); or

(D) A discarded commercial chemical product, or chemical intermediate listed in § 261.33, arising from *de minimis* losses of these materials from manufacturing operations in which these materials are used as raw materials or are produced in the manufacturing process. For purposes of this subparagraph, "*de minimis*" losses include those from normal material handling operations (e.g. spills from the unloading or transfer of materials from bins or other containers, leaks from pipes, valves or other devices used to transfer materials); minor leaks of process equipment, storage tanks or containers; leaks from well-maintained pump packings and seals; sample purgings; relief device discharges; discharges from safety showers and rinsing and cleaning of personal safety equipment; and rinsate from empty containers or from containers that are rendered empty by that rinsing; or

(E) Wastewater resulting from laboratory operations containing toxic (T) wastes listed in Subpart D, provided that the annualized average flow of laboratory wastewater does not exceed one percent of total wastewater flow into the headworks of the facility's wastewater treatment or pre-treatment system, or provided the wastes, combined annualized average concentration does not exceed one part per million in the headworks of the facility's wastewater treatment or pre-treatment facility. Toxic (T) wastes used in laboratories that are demonstrated not to be discharged to wastewater are not to be included in this calculation.

(b) A solid waste which is not excluded from regulation under paragraph (a)(1) of this section becomes a hazardous waste when any of the following events occur:

(1) In the case of a waste listed in Subpart D, when the waste first meets the listing description set forth in Subpart D.

(2) In the case of a mixture of solid waste and one or more listed hazardous wastes, when a hazardous waste listed in Subpart D is first added to the solid waste.

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(3) In the case of any other waste (including a waste mixture), when the waste exhibits any of the characteristics identified in Subpart C.

(c) Unless and until it meets the criteria of paragraph (d):

(1) A hazardous waste will remain a hazardous waste.

(2)(i) Except as otherwise provided in paragraph (c)(2)(ii) of this section, any solid waste generated from the treatment, storage, or disposal of a hazardous waste, including any sludge, spill residue, ash, emission control dust, or leachate (but not including precipitation run-off) is a hazardous waste. (However, materials that are reclaimed from solid wastes and that are used beneficially are not solid wastes and hence are not hazardous wastes under this provision unless the reclaimed material is burned for energy recovery or used in a manner constituting disposal.)

(ii) The following solid wastes are not hazardous even though they are generated from the treatment, storage, or disposal of a hazardous waste, unless they exhibit one or more of the characteristics of hazardous waste: (A) Waste pickle liquor sludge generated by lime stabilization of spent pickle liquor from the iron and steel industry (SIC Codes 331 and 332).

(d) Any solid waste described in paragraph (c) of this section is not a hazardous waste if it meets the following criteria:

(1) In the case of any solid waste, it does not exhibit any of the characteristics of hazardous waste identified in Subpart C.

(2) In the case of a waste which is a listed waste under Subpart D, contains a waste listed under Subpart D or is derived from a waste listed in Subpart D, it also has been excluded from paragraph (c) under §§ 260.20 and 260.22 of this chapter.

[45 FR 33119, May 19, 1980, as amended at 46 FR 56588, Nov. 11, 1981; 50 FR 14219, Apr. 11, 1985]

EFFECTIVE DATE NOTE: At 50 FR 664, Jan. 4, 1985, and corrected at 50 FR 14219, Apr. 11, 1985, § 261.3(c)(2) was revised, effective July 5, 1985. For the convenience of the user, the superseded text is set out below:

§ 261.3 Definition of hazardous waste.

• • • • •

(c) • • • • •
(2)(i) Except as otherwise provided in paragraph (c)(2)(ii) of this section, any solid waste generated from the treatment, storage, or disposal of a hazardous waste, including any sludge, spill residue, ash, emission control dust or leachate (but not including precipitation run-off) is a hazardous waste.

(ii) The following solid wastes are not hazardous even though they are generated from the treatment, storage, or disposal of a hazardous waste, unless they exhibit one or more of the characteristics of hazardous waste: (A) Waste pickle liquor sludge generated by lime stabilization of spent pickle liquor from the iron and steel industry (SIC codes 331 and 332).

• • • • •

§ 261.4 Exclusions.

(a) *Materials which are not solid wastes.* The following materials are not solid wastes for the purpose of this part:

(1)(i) Domestic sewage; and
(ii) Any mixture of domestic sewage and other wastes that passes through a sewer system to a publicly-owned treatment works for treatment. "Domestic sewage" means untreated sanitary wastes that pass through a sewer system.

(2) Industrial wastewater discharges that are point source discharges subject to regulation under Section 402 of the Clean Water Act, as amended.

[Comment: This exclusion applies only to the actual point source discharge. It does not exclude industrial wastewaters while they are being collected, stored or treated before discharge, nor does it exclude sludges that are generated by industrial wastewater treatment.]

(3) Irrigation return flows.

(4) Source, special nuclear or by-product material as defined by the Atomic Energy Act of 1954, as amended, 42 U.S.C. 2011 *et seq.*

(5) Materials subjected to in-situ mining techniques which are not removed from the ground as part of the extraction process.

(6) Pulping liquors (i.e., black liquor) that are reclaimed in a pulping liquor

recovery furnace and then reused in the pulping process, unless it is accumulated speculatively as defined in § 261.1(c) of this chapter.

(7) Spent sulfuric acid used to produce virgin sulfuric acid, unless it is accumulated speculatively as defined in § 261.1(c) of this chapter.

(b) *Solid wastes which are not hazardous wastes.* The following solid wastes are not hazardous wastes:

(1) Household waste, including household waste that has been collected, transported, stored, treated, disposed, recovered (e.g., refuse-derived fuel), or reused. "Household waste" means any waste material (including garbage, trash and sanitary wastes in septic tanks) derived from households (including single and multiple residences, hotels and motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds, and day-use recreation areas).

(2) Solid wastes generated by any of the following and which are returned to the soils as fertilizers:

(i) The growing and harvesting of agricultural crops.

(ii) The raising of animals, including animal manures.

(3) Mining overburden returned to the mine site.

(4) Fly ash waste, bottom ash waste, slag waste, and flue gas emission control waste generated primarily from the combustion of coal or other fossil fuels.

(5) Drilling fluids, produced waters, and other wastes associated with the exploration, development, or production of crude oil, natural gas or geothermal energy.

(6)(i) Wastes which fail the test for the characteristic of EP toxicity because chromium is present or are listed in Subpart D due to the presence of chromium, which do not fail the test for the characteristic of EP toxicity for any other constituent or are not listed due to the presence of any other constituent, and which do not fail the test for any other characteristic, if it is shown by a waste generator or by waste generators that:

(A) The chromium in the waste is exclusively (or nearly exclusively) trivalent chromium; and

(B) The waste is generated from an industrial process which uses trivalent chromium exclusively (or nearly exclusively) and the process does not generate hexavalent chromium; and

(C) The waste is typically and frequently managed in non-oxidizing environments.

(ii) Specific wastes which meet the standard in paragraphs (b)(6)(i)(A), (B) and (C) (so long as they do not fail the test for the characteristic of EP toxicity, and do not fail the test for any other characteristic) are:

(A) Chrome (blue) trimmings generated by the following subcategories of the leather tanning and finishing industry: hair pulp/chrome tan/retan/wet finish; hair save/chrome tan/retan/wet finish; retan/wet finish; no beamhouse; through-the-blue; and shearling.

(B) Chrome (blue) shavings generated by the following subcategories of the leather tanning and finishing industry: hair pulp/chrome tan/retan/wet finish; hair save/chrome tan/retan/wet finish; retan/wet finish; no beamhouse; through-the-blue; and shearling.

(C) Buffing dust generated by the following subcategories of the leather tanning and finishing industry: hair pulp/chrome tan/retan/wet finish; hair save/chrome tan/retan/wet finish; retan/wet finish; no beamhouse; through-the-blue.

(D) Sewer screenings generated by the following subcategories of the leather tanning and finishing industry: hair pulp/chrome tan/retan/wet finish; hair save/chrome tan/retan/wet finish; retan/wet finish; no beamhouse; through-the-blue; and shearling.

(E) Wastewater treatment sludges generated by the following subcategories of the leather tanning and finishing industry: hair pulp/chrome tan/retan/wet finish; hair save/chrome tan/retan/wet finish; retan/wet finish; no beamhouse; through-the-blue; and shearling.

(F) Wastewater treatment sludges generated by the following subcategories of the leather tanning and finishing industry: hair pulp/chrome tan/retan/wet finish; hair save/chrome-

tan/retan/wet finish; and through-the-blue.

(G) Waste scrap leather from the leather tanning industry, the shoe manufacturing industry, and other leather product manufacturing industries.

(H) Wastewater treatment sludges from the production of TiO₂ pigment using chromium-bearing ores by the chloride process.

(7) Solid waste from the extraction, beneficiation and processing of ores and minerals (including coal), including phosphate rock and overburden from the mining of uranium ore.

(8) Cement kiln dust waste.

(9) Solid waste which consists of discarded wood or wood products which fails the test for the characteristic of EP toxicity and which is not a hazardous waste for any other reason if the waste is generated by persons who utilize the arsenical-treated wood and wood products for these materials' intended end use.

(c) Hazardous wastes which are exempted from certain regulations. A hazardous waste which is generated in a product or raw material storage tank, a product or raw material transport vehicle or vessel, a product or raw material pipeline, or in a manufacturing process unit or an associated non-waste-treatment-manufacturing unit, is not subject to regulation under Parts 262 through 265, 270, 271 and 124 of this chapter or to the notification requirements of Section 3010 of RCRA until it exits the unit in which it was generated, unless the unit is a surface impoundment, or unless the hazardous waste remains in the unit more than 90 days after the unit ceases to be operated for manufacturing, or for storage or transportation of product or raw materials.

(d) *Samples.* (1) Except as provided in paragraph (d)(2) of this section, a sample of solid waste or a sample of water, soil, or air, which is collected for the sole purpose of testing to determine its characteristics or composition, is not subject to any requirements of this part or Parts 262 through 267 or Part 270 or Part 124 of this chapter or to the notification requirements of Section 3010 of RCRA, when:

(i) The sample is being transported to a laboratory for the purpose of testing; or

(ii) The sample is being transported back to the sample collector after testing; or

(iii) The sample is being stored by the sample collector before transport to a laboratory for testing; or

(iv) The sample is being stored in a laboratory before testing; or

(v) The sample is being stored in a laboratory after testing but before it is returned to the sample collector; or

(vi) The sample is being stored temporarily in the laboratory after testing for a specific purpose (for example, until conclusion of a court case or enforcement action where further testing of the sample may be necessary).

(2) In order to qualify for the exemption in paragraphs (d)(1) (i) and (ii) of this section, a sample collector shipping samples to a laboratory and a laboratory returning samples to a sample collector must:

(i) Comply with U.S. Department of Transportation (DOT), U.S. Postal Service (USPS), or any other applicable shipping requirements; or

(ii) Comply with the following requirements if the sample collector determines that DOT, USPS, or other shipping requirements do not apply to the shipment of the sample:

(A) Assure that the following information accompanies the sample:

(1) The sample collector's name, mailing address, and telephone number;

(2) The laboratory's name, mailing address, and telephone number;

(3) The quantity of the sample;

(4) The date of shipment; and

(5) A description of the sample.

(B) Package the sample so that it does not leak, spill, or vaporize from its packaging.

(3) This exemption does not apply if the laboratory determines that the waste is hazardous but the laboratory is no longer meeting any of the conditions stated in paragraph (d)(1) of this section.

[45 FR 33119, May 19, 1980, as amended at 45 FR 72037, Oct. 30, 1980; 45 FR 76620, Nov. 19, 1980; 45 FR 78531, Nov. 25, 1980; 45 FR 80287, Dec. 4, 1980; 46 FR 27476, May 20, 1981; 46 FR 47429, Sept. 25, 1981; 46 FR

14293, Apr. 1, 1983; 48 FR 30115, June 30, 1983; 49 FR 44980, Nov. 13, 1984; 50 FR 665, Jan. 4, 1985; 50 FR 14219, Apr. 11, 1985]

EFFECTIVE DATE NOTE: At 50 FR 665, Jan. 4, 1985, as corrected at 50 FR 14219, Apr. 11, 1985, § 261.4(a) (6) and (7) were added, effective July 5, 1985.

§ 261.5 Special requirements for hazardous waste generated by small quantity generators.

(a) A generator is a small quantity generator in a calendar month if he generates less than 1000 kilograms of hazardous waste in that month.

(b) Except for those wastes identified in paragraphs (e) and (f) of this section, a small quantity generator's hazardous wastes are not subject to regulation under Parts 262 through 265 and Parts 270 and 124 of this chapter, and the notification requirements of Section 3010 of RCRA, provided the generator complies with the requirements of paragraph (g) of this section.

(c) Hazardous waste that is recycled and that is excluded from regulation under §§ 261.6 (a)(2)(iii) and (v), (a)(3), or 266.36 is not included in the quantity determinations of this section and is not subject to any requirements of this section. Hazardous waste that is subject to the requirements of § 261.6 (b) and (c) and Subparts C, D, and F of Part 266 is included in the quantity determination of this section and is subject to the requirements of this section.

(d) In determining the quantity of hazardous waste he generates, a generator need not include:

(1) His hazardous waste when it is removed from on-site storage; or

(2) Hazardous waste produced by on-site treatment of his hazardous waste.

(e) If a small quantity generator generates acutely hazardous waste in a calendar month in quantities greater than set forth below, all quantities of that acutely hazardous waste are subject to regulation under Parts 262 through 265 and Parts 270 and 124 of this chapter, and the notification requirements of Section 3010 of RCRA:

(1) A total of one kilogram of acute hazardous wastes listed in §§ 261.31, 261.32, or 261.33(e).

(2) A total of 100 kilograms of any residue or contaminated soil, waste or

other debris resulting from the clean-up of a spill, into or on any land or water, of any acute hazardous wastes listed in §§ 261.31, 261.32, or 261.33(e).

(f) A small quantity generator may accumulate hazardous waste on-site. If he accumulates at any time more than a total of 1000 kilograms of his hazardous waste, or his acutely hazardous wastes in quantities greater than set forth in paragraph (e)(1) or (e)(2) of this section, all of those accumulated wastes for which the accumulation limit was exceeded are subject to regulation under Parts 262 through 265 and Parts 270 and 124 of this chapter, and the notification requirements of Section 3010 of RCRA. The time period of § 262.34 for accumulation of wastes on-site begins for a small quantity generator when the accumulated wastes exceed the applicable exclusion level.

(g) In order for hazardous waste generated by a small quantity generator to be excluded from full regulation under this section, the generator must:

(1) Comply with § 262.11 of this chapter;

(2) If he stores his hazardous waste on-site, store it in compliance with the requirements of paragraph (f) of this section; and

(3) Either treat or dispose of his hazardous waste in an on-site facility, or ensure delivery to an off-site storage, treatment or disposal facility, either of which is:

(i) Permitted under Part 270 of this chapter;

(ii) In interim status under Parts 270 and 265 of this chapter;

(iii) Authorized to manage hazardous waste by a State with a hazardous waste management program approved under Part 271 of this chapter;

(iv) Permitted, licensed or registered by a State to manage municipal or industrial solid waste; or

(v) A facility which:

(A) Beneficially uses or re-uses, or legitimately recycles or reclaims his waste; or

(B) Treats his waste prior to beneficial use or re-use, or legitimate recycling or reclamation.

(h) Hazardous waste subject to the reduced requirements of this section may be mixed with non-hazardous

waste and remain subject to these reduced requirements even though the resultant mixture exceeds the quantity limitations identified in this section, unless the mixture meets any of the characteristics of hazardous wastes identified in Subpart C.

(i) If a small quantity generator mixes a solid waste with a hazardous waste that exceeds a quantity exclusion level of this section, the mixture is subject to full regulation.

[45 FR 76623, Nov. 19, 1980, as amended at 46 FR 34587, July 2, 1981; 48 FR 14294, Apr. 1, 1983; 50 FR 665, Jan. 4, 1985; 50 FR 1999, Jan. 14, 1985; 50 FR 14219, Apr. 11, 1985]

EFFECTIVE DATE NOTE: At 50 FR 665, Jan. 4, 1985, as corrected at 50 FR 14219, Apr. 11, 1985, § 261.5(c) was revised, effective July 5, 1985. At 50 FR 1999, Jan. 14, 1985, § 261.5(e) (1) and (2) were revised, effective July 15, 1985. For the convenience of the user, the superseded text is set out below:

§ 261.5 Special requirements for hazardous waste generated by small quantity generators.

• • • • •

(c) Hazardous waste that is beneficially used or re-used or legitimately recycled or reclaimed and that is excluded from regulation by § 261.6(a) is not included in the quantity determinations of this section, and is not subject to any requirements of this section. Hazardous waste that is subject to the special requirements of § 261.6(b) is included in the quantity determinations of this section and is subject to the requirements of this section.

• • • • •

(e) • • •

(1) A total of one kilogram of commercial chemical products and manufacturing chemical intermediates having the generic names listed in § 261.33(e), and off-specification commercial chemical products and manufacturing chemical intermediates which, if they met specifications, would have the generic names listed in § 261.33(e).

(2) A total of 100 kilograms of any residue or contaminated soil, water or other debris resulting from the clean-up of a spill, into or on any land or water, of any commercial chemical products or manufacturing chemical intermediates having the generic names listed in § 261.33(e), or any residue or contaminated soil, water or other debris resulting from the clean-up of a spill, into or on any land or water, of any off-specification commercial chemical products or manufacturing chemical intermediates which, if

they met specifications, would have the generic names listed in § 261.33(e).

• • • • •

§ 261.6 Requirements for recyclable materials.

(a)(1) Hazardous wastes that are recycled are subject to the requirements for generators, transporters, and storage facilities of paragraphs (b) and (c) of this section, except for the materials listed in paragraphs (a)(2) and (a)(3) of this section. Hazardous wastes that are recycled will be known as "recyclable materials."

(2) The following recyclable materials are not subject to the requirements of this section but are regulated under Subparts C through G of Part 266 of this chapter and all applicable provisions in Parts 270 and 124 of this chapter:

(i) Recyclable materials used in a manner constituting disposal (Subpart C);

(ii) Hazardous wastes burned for energy recovery in boilers and industrial furnaces that are not regulated under Subpart O of Part 264 or 265 of this chapter (Subpart D);

(iii) [Reserved for used oil];

(iv) Recyclable materials from which precious metals are reclaimed (Subpart F);

(v) Spent lead-acid batteries that are being reclaimed (Subpart G).

(3) The following recyclable materials are not subject to regulation under Parts 262 through 266 or Parts 270 or 124 of this chapter, and are not subject to the notification requirements of Section 3010 of RCRA:

(i) Industrial ethyl alcohol that is reclaimed;

(ii) Used batteries (or used battery cells) returned to a battery manufacturer for regeneration;

(iii) Used oil that exhibits one or more of the characteristics of hazardous waste; or

(iv) Scrap metal.

(b) Generators and transporters of recyclable materials are subject to the applicable requirements of Parts 262 and 263 of this chapter and the notification requirements under Section

3010 of RCRA, except as provided in paragraph (a) of this section.

(c)(1) Owners or operators of facilities that store recyclable materials are regulated under all applicable provisions of Subparts A through L of Parts 264 and 265 and Parts 270 and 124 of this chapter and the notification requirement under Section 3010 of RCRA, except as provided in paragraph (a) of this section.

(2) Owners or operators of facilities that recycle recyclable materials without storing them before they are recycled are subject to the following requirements, except as provided in paragraph (a) of this section:

(i) Notification requirements under Section 3010 of RCRA;

(ii) Sections 265.71 and 265.72 (dealing with the use of the manifest and manifest discrepancies) of this chapter.

[50 FR 665, Jan. 4, 1985]

EFFECTIVE DATE NOTE: At 50 FR 665, Jan. 4, 1985, § 261.6 was revised, effective July 5, 1985. For the convenience of the user, the superseded text is set out below:

§ 261.6 Special requirements for hazardous waste which is used, re-used, recycled or reclaimed.

(a) Except as otherwise provided in paragraph (b) of this section, a hazardous waste which meets any of the following criteria is not subject to regulation under Parts 262 through 265 or Parts 270, 271, and 124 of this Chapter and is not subject to the notification requirements of Section 3010 of RCRA until such time as the Administrator promulgates regulations to the contrary:

(1) It is being beneficially used or re-used or legitimately recycled or reclaimed.

(2) It is being accumulated, stored or physically, chemically or biologically treated prior to beneficial use or re-use or legitimate recycling or reclamation.

(3) It is one of the following materials being used, reused, recycled or reclaimed in the specified manner:

(i) Spent pickle liquor which is reused in wastewater treatment at a facility holding a National Pollutant Discharge Elimination System (NPDES) permit, or which is being accumulated, stored, or physically, chemically or biologically treated before such reuse.

(b) Except for those wastes listed in paragraph (a)(3) of this section, a hazardous waste that is a sludge, or that is listed in § 261.31 or § 261.32, or that contains one or more hazardous wastes listed in § 261.31 or § 261.32; and that is transported or stored

prior to being used, re-used, recycled, or reclaimed is subject to the following requirements with respect to such transportation or storage:

(1) Notification requirements under Section 3010 RCRA.

(2) Part 262 of this chapter.

(3) Part 263 of this chapter.

(4) Applicable provisions of Subparts A through L of Part 264 of this chapter;

(5) Applicable provisions of Subparts A through L of Part 265 of this chapter

(6) Parts 270 and 124 of this chapter, with respect to storage facilities.

[45 FR 33119, May 19, 1980, as amended at 46 FR 44973, Sept. 8, 1981; 48 FR 2532, Jan. 20, 1983; 48 FR 14294, Apr. 1, 1983]

§ 261.7 Residues of hazardous waste in empty containers.

(a)(1) Any hazardous waste remaining in either (i) an empty container or (ii) an inner liner removed from an empty container, as defined in paragraph (b) of this section, is not subject to regulation under Parts 261 through 265, or Part 270 or 124 of this chapter or to the notification requirements of Section 3010 of RCRA.

(2) Any hazardous waste in either (i) a container that is not empty or (ii) an inner liner removed from a container that is not empty, as defined in paragraph (b) of this section, is subject to regulation under Parts 261 through 265, and Parts 270 and 124 of this chapter and to the notification requirements of Section 3010 of RCRA.

(b)(1) A container or an inner liner removed from a container that has held any hazardous waste, except a waste that is a compressed gas or that is identified as an acute hazardous waste listed in § 261.31, 261.32, or 261.33(e) of this chapter is empty if:

(i) All wastes have been removed that can be removed using the practices commonly employed to remove materials from that type of container, e.g., pouring, pumping, and aspirating, and

(ii) No more than 2.5 centimeters (one inch) of residue remain on the bottom of the container or inner liner, or

(iii)(A) No more than 3 percent by weight of the total capacity of the container remains in the container or inner liner if the container is less than or equal to 110 gallons in size, or

(B) No more than 0.3 percent by weight of the total capacity of the container remains in the container or inner liner if the container is greater than 110 gallons in size.

(2) A container that has held a hazardous waste that is a compressed gas is empty when the pressure in the container approaches atmospheric.

(3) A container or an inner liner removed from a container that has held an acute hazardous waste listed in § 261.31, 261.32, or 261.33(e) is empty if:

(i) The container or inner liner has been triple rinsed using a solvent capable of removing the commercial chemical product or manufacturing chemical intermediate;

(ii) The container or inner liner has been cleaned by another method that has been shown in the scientific literature, or by tests conducted by the generator, to achieve equivalent removal; or

(iii) In the case of a container, the inner liner that prevented contact of the commercial chemical product or manufacturing chemical intermediate with the container, has been removed.

[45 FR 78529, Nov. 25, 1980, as amended at 47 FR 36097, Aug. 18, 1982; 48 FR 14294, Apr. 1, 1983; 50 FR 1999, Jan. 14, 1985]

EFFECTIVE DATE NOTE: At 50 FR 1999, Jan. 14, 1985, § 261.7(b)(1) and (3) introductory texts were revised, effective July 15, 1985. For the convenience of the user, the superseded text is set out below:

§ 261.7 Residues of hazardous waste in empty containers.

• • • • •

(b)(1) A container or an inner liner removed from a container that has held any hazardous waste, except a waste that is a compressed gas or that is identified in § 261.33(c) of this chapter, is empty if:

• • • • •

(3) A container or an inner liner removed from a container that has held a hazardous waste identified in § 261.33(c) of this chapter is empty if:

• • • • •

Subpart B—Criteria for Identifying the Characteristics of Hazardous Waste and for Listing Hazardous Waste

§ 261.10 Criteria for identifying the characteristics of hazardous waste.

(a) The Administrator shall identify and define a characteristic of hazardous waste in Subpart C only upon determining that:

(1) A solid waste that exhibits the characteristic may:

(i) Cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or

(ii) Pose a substantial present or potential hazard to human health or the environment when it is improperly treated, stored, transported, disposed of or otherwise managed; and

(2) The characteristic can be:

(i) Measured by an available standardized test method which is reasonably within the capability of generators of solid waste or private sector laboratories that are available to serve generators of solid waste; or

(ii) Reasonably detected by generators of solid waste through their knowledge of their waste.

§ 261.11 Criteria for listing hazardous waste.

(a) The Administrator shall list a solid waste as a hazardous waste only upon determining that the solid waste meets one of the following criteria:

(1) It exhibits any of the characteristics of hazardous waste identified in Subpart C.

(2) It has been found to be fatal to humans in low doses or, in the absence of data on human toxicity, it has been shown in studies to have an oral LD 50 toxicity (rat) of less than 50 milligrams per kilogram, an inhalation LC 50 toxicity (rat) of less than 2 milligrams per liter, or a dermal LD 50 toxicity (rabbit) of less than 200 milligrams per kilogram or is otherwise capable of causing or significantly contributing to an increase in serious irreversible, or incapacitating reversible, illness. (Waste listed in accordance with these criteria will be designated Acute Hazardous Waste.)

(3) It contains any of the toxic constituents listed in Appendix VIII unless, after considering any of the following factors, the Administrator concludes that the waste is not capable of posing a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed:

(i) The nature of the toxicity presented by the constituent.

(ii) The concentration of the constituent in the waste.

(iii) The potential of the constituent or any toxic degradation product of the constituent to migrate from the waste into the environment under the types of improper management considered in paragraph (a)(3)(vii) of this section.

(iv) The persistence of the constituent or any toxic degradation product of the constituent.

(v) The potential for the constituent or any toxic degradation product of the constituent to degrade into non-harmful constituents and the rate of degradation.

(vi) The degree to which the constituent or any degradation product of the constituent bioaccumulates in ecosystems.

(vii) The plausible types of improper management to which the waste could be subjected.

(viii) The quantities of the waste generated at individual generation sites or on a regional or national basis.

(ix) The nature and severity of the human health and environmental damage that has occurred as a result of the improper management of wastes containing the constituent.

(x) Action taken by other governmental agencies or regulatory programs based on the health or environmental hazard posed by the waste or waste constituent.

(xi) Such other factors as may be appropriate.

Substances will be listed on Appendix VIII only if they have been shown in scientific studies to have toxic, carcinogenic, mutagenic or teratogenic effects on humans or other life forms.

(Wastes listed in accordance with these criteria will be designated Toxic wastes.)

(b) The Administrator may list classes or types of solid waste as hazardous waste if he has reason to believe that individual wastes, within the class or type of waste, typically or frequently are hazardous under the definition of hazardous waste found in Section 1004(5) of the Act.

(c) The Administrator will use the criteria for listing specified in this section to establish the exclusion limits referred to in § 261.5(c).

Subpart C—Characteristics of Hazardous Waste

§ 261.20 General.

(a) A solid waste, as defined in § 261.2, which is not excluded from regulation as a hazardous waste under § 261.4(b), is a hazardous waste if it exhibits any of the characteristics identified in this subpart.

[Comment: § 262.11 of this chapter sets forth the generator's responsibility to determine whether his waste exhibits one or more of the characteristics identified in this subpart.]

(b) A hazardous waste which is identified by a characteristic in this subpart, but is not listed as a hazardous waste in Subpart D, is assigned the EPA Hazardous Waste Number set forth in the respective characteristic in this subpart. This number must be used in complying with the notification requirements of Section 3010 of the Act and certain recordkeeping and reporting requirements under Parts 262 through 265 and Part 270 of this chapter.

(c) For purposes of this subpart, the Administrator will consider a sample obtained using any of the applicable sampling methods specified in Appendix I to be a representative sample within the meaning of Part 260 of this chapter.

[Comment: Since the Appendix I sampling methods are not being formally adopted by the Administrator, a person who desires to employ an alternative sampling method is not required to demonstrate the equivalency of his method under the procedures set forth in §§ 260.20 and 260.21.]

[45 FR 33119, May 19, 1980, as amended at 48 FR 14294, Apr. 1, 1983]

§ 261.21

§ 261.21 Characteristic of ignitability.

(a) A solid waste exhibits the characteristic of ignitability if a representative sample of the waste has any of the following properties:

(1) It is a liquid, other than an aqueous solution containing less than 24 percent alcohol by volume and has flash point less than 60°C (140°F), as determined by a Pensky-Martens Closed Cup Tester, using the test method specified in ASTM Standard D-93-79 or D-93-80 (incorporated by reference, see § 260.11), or a Setaflash Closed Cup Tester, using the test method specified in ASTM Standard D-3278-78 (incorporated by reference, see § 260.11), or as determined by an equivalent test method approved by the Administrator under procedures set forth in §§ 260.20 and 260.21.

(2) It is not a liquid and is capable, under standard temperature and pressure, of causing fire through friction, absorption of moisture or spontaneous chemical changes and, when ignited, burns so vigorously and persistently that it creates a hazard.

(3) It is an ignitable compressed gas as defined in 49 CFR 173.300 and as determined by the test methods described in that regulation or equivalent test methods approved by the Administrator under §§ 260.20 and 260.21.

(4) It is an oxidizer as defined in 49 CFR 173.151.

(b) A solid waste that exhibits the characteristic of ignitability, but is not listed as a hazardous waste in Subpart D, has the EPA Hazardous Waste Number of D001.

[45 FR 33119, May 19, 1980, as amended at 46 FR 35247, July 7, 1981]

§ 261.22 Characteristic of corrosivity.

(a) A solid waste exhibits the characteristic of corrosivity if a representative sample of the waste has either of the following properties:

(1) It is aqueous and has a pH less than or equal to 2 or greater than or equal to 12.5, as determined by a pH meter using either an EPA test method or an equivalent test method approved by the Administrator under the procedures set forth in §§ 260.20 and 260.21. The EPA test method for pH is specified as Method 5.2 in "Test

Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" (incorporated by reference, see § 260.11).

(2) It is a liquid and corrodes steel (SAE 1020) at a rate greater than 6.35 mm (0.250 inch) per year at a test temperature of 55°C (130°F) as determined by the test method specified in NACE (National Association of Corrosion Engineers) Standard TM-01-69 as standardized in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" (incorporated by reference, see § 260.11) or an equivalent test method approved by the Administrator under the procedures set forth in §§ 260.20 and 260.21.

(b) A solid waste that exhibits the characteristic of corrosivity, but is not listed as a hazardous waste in Subpart D, has the EPA Hazardous Waste Number of D002.

[45 FR 33119, May 19, 1980, as amended at 46 FR 35247, July 7, 1981]

§ 261.23 Characteristic of reactivity.

(a) A solid waste exhibits the characteristic of reactivity if a representative sample of the waste has any of the following properties:

(1) It is normally unstable and readily undergoes violent change without detonating.

(2) It reacts violently with water.

(3) It forms potentially explosive mixtures with water.

(4) When mixed with water, it generates toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.

(5) It is a cyanide or sulfide bearing waste which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.

(6) It is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement.

(7) It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.

(8) It is a forbidden explosive as defined in 49 CFR 173.51, or a Class A explosive as defined in 49 CFR 173.53

or a Class B explosive as defined in 49 CFR 173.88.

(b) A solid waste that exhibits the characteristic of reactivity, but is not listed as a hazardous waste in Subpart D, has the EPA Hazardous Waste Number of D003.

§ 261.24 Characteristic of EP toxicity.

(a) A solid waste exhibits the characteristic of EP toxicity if, using the test methods described in Appendix II or equivalent methods approved by the Administrator under the procedures set forth in §§ 260.20 and 260.21, the extract from a representative sample of the waste contains any of the contaminants listed in Table I at a concentration equal to or greater than the respective value given in that Table. Where the waste contains less than 0.5 percent filterable solids, the waste itself, after filtering, is considered to be the extract for the purposes of this section.

(b) A solid waste that exhibits the characteristic of EP toxicity, but is not listed as a hazardous waste in Subpart D, has the EPA Hazardous Waste Number specified in Table I which corresponds to the toxic contaminant causing it to be hazardous.

TABLE I—MAXIMUM CONCENTRATION OF CONTAMINANTS FOR CHARACTERISTIC OF EP TOXICITY

EPA hazardous waste number	Contaminant	Maximum concentration (milligrams per liter)
D004.....	Arsenic.....	5.0
D005.....	Barium.....	100.0
D006.....	Cadmium.....	1.0
D007.....	Chromium.....	5.0
D008.....	Lead.....	5.0
D009.....	Mercury.....	0.2
D010.....	Selenium.....	1.0
D011.....	Silver.....	5.0
D012.....	Endrin (1,2,3,4,10,10-hexachloro-1,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo, endo-5,8-dimethano-naphthalene).....	0.02
D013.....	Lindane (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer).....	0.4
D014.....	Methoxychlor (1,1,1-Trichloro-2,2-bis [p-methoxyphenyl]ethane).....	10.0
D015.....	Toxaphene (C ₁₂ H ₈ Cl ₆ , Technical chlorinated camphene, 87-89 percent chlorine).....	0.5

TABLE I—MAXIMUM CONCENTRATION OF CONTAMINANTS FOR CHARACTERISTIC OF EP TOXICITY—Continued

EPA hazardous waste number	Contaminant	Maximum concentration (milligrams per liter)
D016.....	2,4-D, (2,4-Dichlorophenoxyacetic acid).....	10.0
D017.....	2,4,5-TP Silvex (2,4,5-Trichlorophenoxypropionic acid).....	1.0

Subpart D—Lists of Hazardous Wastes

§ 261.30 General.

(a) A solid waste is a hazardous waste if it is listed in this subpart, unless it has been excluded from this list under §§ 260.20 and 260.22.

(b) The Administrator will indicate his basis for listing the classes or types of wastes listed in this Subpart by employing one or more of the following Hazard Codes:

Ignitable Waste.....	(F)
Corrosive Waste.....	(C)
Reactive Waste.....	(R)
EP Toxic Waste.....	(E)
Acute Hazardous Waste.....	(H)
Toxic Waste.....	(T)

Appendix VII identifies the constituent which caused the Administrator to list the waste as an EP Toxic Waste (E) or Toxic Waste (T) in §§ 261.31 and 261.32.

(c) Each hazardous waste listed in this subpart is assigned an EPA Hazardous Waste Number which precedes the name of the waste. This number must be used in complying with the notification requirements of Section 3010 of the Act and certain record-keeping and reporting requirements under Parts 262 through 265 and Part 270 of this chapter.

(d) The following hazardous wastes listed in § 261.31 or § 261.32 are subject to the exclusion limits for acutely hazardous wastes established in § 261.5: EPA Hazardous Wastes Nos. F020, F021, F022, F023, F026, and F027.

§ 261.31

(45 FR 33119, May 19, 1980, as amended at 48 FR 14294, Apr. 1, 1983; 50 FR 2000, Jan. 14, 1985)

EFFECTIVE DATE NOTE: At 50 FR 2000, Jan. 14, 1985, § 261.30(d) was revised, effective July 15, 1985. For the convenience of the user, the superseded text is set out below:

§ 261.30 General.

(d) The following hazardous wastes listed in § 261.31 or § 261.32 are subject to the exclusion limits for acutely hazardous wastes established in § 261.5: (Reserved)

§ 261.31 Hazardous wastes from non-specific sources.

The following solid wastes are listed hazardous wastes from non-specific sources unless they are excluded under §§ 260.20 and 260.22 and listed in Appendix IX.

Industry and EPA hazardous waste No.	Hazardous waste	Hazard code
Generic:		
F001.....	The following spent halogenated solvents used in degreasing: tetrachloroethylene, trichloroethylene, methylene chloride, 1,1,1-trichloroethane, carbon tetrachloride, and chlorinated fluorocarbons; and sludges from the recovery of these solvents in degreasing operations.	(T)
F002.....	The following spent halogenated solvents: tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,2,2-trifluoroethane, ortho-dichlorobenzene, and trichlorofluoromethane; and the still bottoms from the recovery of these solvents.	(T)
F003.....	The following spent non-halogenated solvents: xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobutyl ketone, n-butyl alcohol, cyclohexanone, and methanol; and the still bottoms from the recovery of these solvents.	(F)
F004.....	The following spent non-halogenated solvents: creosote and creosylic acid, and nitrobenzene; and the still bottoms from the recovery of these solvents.	(T)
F005.....	The following spent non-halogenated solvents: toluene, methyl ethyl ketone, carbon disulfide, isobutanol, and pyridine; and the still bottoms from the recovery of these solvents.	(F, T)
F006.....	Wastewater treatment sludges from electroplating operations except from the following processes: (1) sulfuric acid anodizing of aluminum; (2) tin plating on carbon steel; (3) zinc plating (segregated basin) on carbon steel; (4) aluminum or zinc-aluminum plating on carbon steel; (5) cleaning/stripping associated with tin, zinc and aluminum plating on carbon steel; and (6) chemical etching and milling of aluminum.	(T)
F018.....	Wastewater treatment sludges from the chemical conversion coating of aluminum.....	(T)
F007.....	Spent cyanide plating bath solutions from electroplating operations.....	(R, T)
F008.....	Plating bath residues from the bottom of plating baths from electroplating operations where cyanides are used in the process.	(R, T)
F009.....	Spent stripping and cleaning bath solutions from electroplating operations where cyanides are used in the process.	(R, T)
F010.....	Quenching bath residues from oil baths from metal heat treating operations where cyanides are used in the process.	(R, T)
F011.....	Spent cyanide solutions from salt bath pot cleaning from metal heat treating operations.	(R, T)
F012.....	Quenching waste water treatment sludges from metal heat treating operations where cyanides are used in the process.	(T)
F024.....	Wastes, including but not limited to, distillation residues, heavy ends, tars, and reactor clean-out wastes from the production of chlorinated aliphatic hydrocarbons, having carbon content from one to five, utilizing free radical catalyzed processes. (This listing does not include light ends, spent filters and filter aids, spent desiccants, wastewater, wastewater treatment sludges, spent catalysts, and wastes listed in § 261.32.)	(T)
F020.....	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tri- or tetrachlorophenol, or of intermediates used to produce their pesticide derivatives. (This listing does not include wastes from the production of Hexachlorophene from highly purified 2,4,5-trichlorophenol.)	(H)
F021.....	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of pentachlorophenol, or of intermediates used to produce its derivatives.	(H)

Industry and EPA hazardous waste No.	Hazardous waste	Hazard code
F022	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tetra-, penta-, or hexachlorobenzenes under alkaline conditions.	(H)
F023	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tri- and tetrachlorophenols. (This listing does not include wastes from equipment used only for the production or use of hexachlorophene from highly purified 2,4,5-trichlorophenol.)	(H)
F026	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tetra-, penta-, or hexachlorobenzenes under alkaline conditions.	(H)
F027	Discarded unused formulations containing tri-, tetra-, or pentachlorophenol or discarded unused formulations containing compounds derived from these chlorophenols. (This listing does not include formulations containing hexachlorophene synthesized from prepurified 2,4,5-trichlorophenol as the sole component.)	(H)
F028	Residues resulting from the incineration or thermal treatment of soil contaminated with EPA Hazardous Waste Nos. F020, F021, F022, F023, F026, and F027.	(T)

[46 FR 4617, Jan. 16, 1981, as amended at 46 FR 27477, May 20, 1981; 49 FR 5312, Feb. 10, 1984; 49 FR 37070, Sept. 21, 1984; 50 FR 665, Jan. 4, 1985; 50 FR 2000, Jan. 14, 1985]

EFFECTIVE DATE NOTE: At 50 FR 665, Jan. 4, 1985, the hazardous waste listings for F007, F008, F009, F010, F011, and F012 were revised, effective July 5, 1985. At 50 FR 2000, Jan. 14, 1985, the hazardous waste listings for F020, F021, F022, F023, F026, F027, and F028 were added, effective July 15, 1985. For the convenience of the user, the superseded text is set out below:

§ 261.31 Hazardous wastes from non-specific sources.

Industry and EPA hazardous waste No.	Hazardous waste	Hazard code
F007	Spent cyanide plating bath solutions from electroplating operations (except for precious metals electroplating spent cyanide plating bath solutions).	(R, T)
F008	Plating bath sludges from the bottom of plating baths from electroplating operations where cyanides are used in the process (except for precious metals electroplating plating bath sludges).	(R, T)
F009	Spent stripping and cleaning bath solutions from electroplating operations where cyanides are used in the process (except for precious metals electroplating spent stripping and cleaning bath solutions).	(R, T)
F010	Quenching bath sludge from oil baths from metal heat treating operations where cyanides are used in the process (except for precious metals heat-treating quenching bath sludges).	(R, T)
F011	Spent cyanide solutions from salt bath pot cleaning from metal heat treating operations (except for precious metals heat treating spent cyanide solutions from salt bath pot cleaning).	(R, T)
F012	Quenching wastewater treatment sludges from metal heat treating operations where cyanides are used in the process (except for precious metals heat treating quenching wastewater treatment sludges).	(T)

§ 261.32 Hazardous wastes from specific sources.

The following solid wastes are listed hazardous wastes from specific sources unless they are excluded under §§ 260.20 and 260.22 and listed in Appendix IX.

Industry and EPA hazardous waste No.	Hazardous waste	Hazard code
Wood preservation: K001	Bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or pentachlorophenol.	(T)

Industry and EPA hazardous waste No.	Hazardous waste	Hazard code
Inorganic pigments:		
K002	Wastewater treatment sludge from the production of chrome yellow and orange pigments.	(T)
K003	Wastewater treatment sludge from the production of molybdate orange pigments.	(T)
K004	Wastewater treatment sludge from the production of zinc yellow pigments.	(T)
K005	Wastewater treatment sludge from the production of chrome green pigments.	(T)
K006	Wastewater treatment sludge from the production of chrome oxide green pigments (anhydrous and hydrated).	(T)
K007	Wastewater treatment sludge from the production of iron blue pigments.	(T)
K008	Oven residue from the production of chrome oxide green pigments.	(T)
Organic chemicals:		
K009	Distillation bottoms from the production of acetaldehyde from ethylene.	(T)
K010	Distillation side cuts from the production of acetaldehyde from ethylene.	(T)
K011	Bottom stream from the wastewater stripper in the production of acrylonitrile.	(R, T)
K013	Bottom stream from the acetonitrile column in the production of acrylonitrile.	(R, T)
K014	Bottoms from the acetonitrile purification column in the production of acrylonitrile.	(T)
K015	Still bottoms from the distillation of benzyl chloride.	(T)
K016	Heavy ends or distillation residues from the production of carbon tetrachloride.	(T)
K017	Heavy ends (still bottoms) from the purification column in the production of epichlorohydrin.	(T)
K018	Heavy ends from the fractionation column in ethyl chloride production.	(T)
K019	Heavy ends from the distillation of ethylene dichloride in ethylene dichloride production.	(T)
K020	Heavy ends from the distillation of vinyl chloride in vinyl chloride monomer production.	(T)
K021	Aqueous spent antimony catalyst waste from fluoromethanes production.	(T)
K022	Distillation bottom tars from the production of phenol/acetone from cumene.	(T)
K023	Distillation light ends from the production of phthalic anhydride from naphthalene.	(T)
K024	Distillation bottoms from the production of phthalic anhydride from naphthalene.	(T)
K083	Distillation light ends from the production of phthalic anhydride from ortho-xylene.	(T)
K084	Distillation bottoms from the production of phthalic anhydride from ortho-xylene.	(T)
K025	Distillation bottoms from the production of nitrobenzene by the nitration of benzene.	(T)
K026	Stripping still tails from the production of methyl ethyl pyridines.	(T)
K027	Centrifuge and distillation residues from toluene diisocyanate production.	(R, T)
K088	Spent catalyst from the hydrochlorinator reactor in the production of 1,1,1-trichloroethane.	(T)
K029	Waste from the product steam stripper in the production of 1,1,1-trichloroethane.	(T)
K095	Distillation bottoms from the production of 1,1,1-trichloroethane.	(T)
K086	Heavy ends from the heavy ends column from the production of 1,1,1-trichloroethane.	(T)
K030	Column bottoms or heavy ends from the combined production of trichloroethylene and perchloroethylene.	(T)
K083	Distillation bottoms from aniline production.	(T)
K103	Process residues from aniline extraction from the production of aniline.	(T)
K104	Combined wastewater streams generated from nitrobenzene/aniline production.	(T)
K085	Distillation or fractionation column bottoms from the production of chlorobenzenes.	(T)
K105	Separated aqueous stream from the reactor product washing step in the production of chlorobenzenes.	(T)
Inorganic chemicals:		
K071	Brine purification mude from the mercury cell process in chlorine production, where separately prepurified brine is not used.	(T)
K073	Chlorinated hydrocarbon waste from the purification step of the diaphragm cell process using graphite anodes in chlorine production.	(T)
K106	Wastewater treatment sludge from the mercury cell process in chlorine production.	(T)
Pesticides:		
K031	By-product salts generated in the production of MSMA and cacodylic acid.	(T)
K032	Wastewater treatment sludge from the production of chlordane.	(T)
K033	Wastewater and scrub water from the chlorination of cyclopentadiene in the production of chlordane.	(T)
K034	Filter solids from the filtration of hexachlorocyclopentadiene in the production of chlordane.	(T)
K097	Vacuum stripper discharge from the chlordane chlorinator in the production of chlordane.	(T)
K035	Wastewater treatment sludges generated in the production of creosote.	(T)
K036	Still bottoms from toluene reclamation distillation in the production of disulfoton.	(T)
K037	Wastewater treatment sludges from the production of disulfoton.	(T)
K038	Wastewater from the washing and stripping of phosphate production.	(T)
K039	Filter cake from the filtration of diethylphosphorodithioic acid in the production of phosphate.	(T)
K040	Wastewater treatment sludge from the production of phosphate.	(T)
K041	Wastewater treatment sludge from the production of toxaphene.	(T)
K098	Untreated process wastewater from the production of toxaphene.	(T)

Industry and EPA hazardous waste No.	Hazardous waste	Hazard code
K042	Heavy ends or distillation residues from the distillation of tetrachlorobenzene in the production of 2,4,5-T.	(T)
K043	2,6-Dichlorophenol waste from the production of 2,4-D	(T)
K099	Untreated wastewater from the production of 2,4-D	(T)
Explosives:		
K044	Wastewater treatment sludges from the manufacturing and processing of explosives	(R)
K045	Spent carbon from the treatment of wastewater containing explosives	(R)
K046	Wastewater treatment sludges from the manufacturing, formulation and loading of lead-based mixing compounds	(T)
K047	Pink/red water from TNT operations	(R)
Petroleum refining:		
K048	Dissolved air flotation (DAF) float from the petroleum refining industry	(T)
K049	Slip oil emulsion solids from the petroleum refining industry	(T)
K050	Heat exchanger bundle cleaning sludge from the petroleum refining industry	(T)
K051	API separator sludge from the petroleum refining industry	(T)
K052	Tank bottoms (feeded) from the petroleum refining industry	(T)
Iron and steel:		
K061	Emission control dust/sludge from the primary production of steel in electric furnaces	(T)
K062	Spent pickle liquor from steel finishing operations	(C, T)
Secondary lead:		
K069	Emission control dust/sludge from secondary lead smelting	(T)
K100	Waste leaching solution from acid leaching of emission control dust/sludge from secondary lead smelting	(T)
Veterinary pharmaceuticals:		
K084	Wastewater treatment sludges generated during the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds	(T)
K101	Distillation tar residue from the distillation of aniline-based compounds in the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds	(T)
K102	Residue from the use of activated carbon for decolorization in the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds	(T)
Ink formulation: K086	Solvent washes and sludges, caustic washes and sludges, or water washes and sludges from cleaning tubs and equipment used in the formulation of ink from pigments, driers, soaps, and stabilizers containing chromium and lead	(T)
Coking:		
K060	Ammonia still lime sludge from coking operations	(T)
K067	Decanter tank tar sludge from coking operations	(T)

[46 FR 4618, Jan. 16, 1981, as amended at 46 FR 27476-27477, May 20, 1981; 49 FR 37070, Sept. 21, 1984]

§ 261.33 Discarded commercial chemical products, off-specification species, container residues, and spill residues thereof.

The following materials or items are hazardous wastes when they are discarded or intended to be discarded as described in § 261.2(a)(2)(i), when they are burned for purposes of energy recovery in lieu of their original intended use, when they are used to produce fuels in lieu of their original intended use, when they are applied to the land in lieu of their original intended use, or when they are contained in products that are applied to the land in lieu of their original intended use.

(a) Any commercial chemical product, or manufacturing chemical intermediate having the generic name

listed in paragraph (e) or (f) of this section.

(b) Any off-specification commercial chemical product or manufacturing chemical intermediate which, if it met specifications, would have the generic name listed in paragraph (e) or (f) of this section.

(c) Any container or inner liner removed from a container that has been used to hold any commercial chemical product or manufacturing chemical intermediate having the generic names listed in paragraph (e) of this section, or any container or inner liner removed from a container that has been used to hold any off-specification chemical product and manufacturing chemical intermediate which, if it met specifications, would have the generic name listed in paragraph (e) of this

section, unless the container is empty as defined in § 261.7(b)(3) of this chapter.

(Comment: Unless the residue is being beneficially used or reused, or legitimately recycled or reclaimed; or being accumulated, stored, transported or treated prior to such use, re-use, recycling or reclamation, EPA considers the residue to be intended for discard, and thus a hazardous waste. An example of a legitimate re-use of the residue would be where the residue remains in the container and the container is used to hold the same commercial chemical product or manufacturing chemical product or manufacturing chemical intermediate it previously held. An example of the discard of the residue would be where the drum is sent to a drum reconditioner who reconditions the drum but discards the residue.)

(d) Any residue or contaminated soil, water or other debris resulting from the cleanup of a spill into or on any land or water of any commercial chemical product or manufacturing chemical intermediate having the generic name listed in paragraph (e) or (f) of this section, or any residue or contaminated soil, water or other debris resulting from the cleanup of a spill, into or on any land or water, of any off-specification chemical product and manufacturing chemical intermediate which, if it met specifications, would have the generic name listed in paragraph (e) or (f) of this section.

(Comment: The phrase "commercial chemical product or manufacturing chemical intermediate having the generic name listed in . . ." refers to a chemical substance which is manufactured or formulated for commercial or manufacturing use which consists of the commercially pure grade of the chemical, any technical grades of the chemical that are produced or marketed, and all formulations in which the chemical is the sole active ingredient. It does not refer to a material, such as a manufacturing process waste, that contains any of the substances listed in paragraphs (e) or (f). Where a manufacturing process waste is deemed to be a hazardous waste because it contains a substance listed in paragraphs (e) or (f), such waste will be listed in either § 261.31 or 261.32 or will be identified as a hazardous waste by the characteristics set forth in Subpart C of this part.)

(e) The commercial chemical products, manufacturing chemical intermediates or off-specification commercial chemical products or manufacturing

chemical intermediates referred to in paragraphs (a) through (d) of this section, are identified as acute hazardous wastes (H) and are subject to be the small quantity exclusion defined in § 261.5(e).

(Comment: For the convenience of the regulated community the primary hazardous properties of these materials have been indicated by the letters T (Toxicity), and R (Reactivity). Absence of a letter indicates that the compound only is listed for acute toxicity.)

These wastes and their corresponding EPA Hazardous Waste Numbers are:

Hazardous waste No.	Substance
P023	Acetaldehyde, chloro-
P002	Acetamide, N-(aminomethyl)-
P057	Acetamide, 2-fluoro-
P058	Acetic acid, fluoro-, sodium salt
P066	Acetimidic acid, N-[(methylcarbamoyl)oxy]thio-, methyl ester
P001	3-(alpha-Acetylbenzyl)-4-hydroxycoumarin and salts, when present at concentrations greater than 0.3%
P002	1-Acetyl-2-thiourea
P003	Acrolein
P070	Aldicarb
P004	Aldrin
P005	Allyl alcohol
P006	Aluminum phosphide
P007	5-(Aminomethyl)-3-isoxazolid
P008	4-Aminopyridine
P009	Ammonium picrate (R)
P118	Ammonium vanadate
P010	Arsenic acid
P012	Arsenic (III) oxide
P011	Arsenic (V) oxide
P011	Arsenic pentoxide
P012	Arsenic trisulfide
P038	Arsine, diethyl-
P064	Azidine
P013	Barium cyanide
P024	Benzenamine, 4-chloro-
P077	Benzenamine, 4-nitro-
P028	Benzene, (chloromethyl)-
P042	1,2-Benzenediol, 4-[1-hydroxy-2-(methylamino)ethyl]-
P014	Benzenethiol
P028	Benzyl chloride
P015	Beryllium dust
P016	Bis(chloromethyl) ether
P017	Bromacetone
P018	Brucine
P021	Calcium cyanide
P123	Camphene, octachloro-
P103	Carbamimidicacetic acid
P022	Carbon disulfide
P022	Carbon disulfide
P095	Carbonyl chloride
P033	Chlorine cyanide
P023	Chloroacetaldehyde
P024	p-Chloroaniline
P026	1-(o-Chlorophenyl)thiourea
P027	3-Chloropropionitrile
P029	Copper cyanides

Hazardous waste No.	Substance	Hazardous waste No.	Substance
P030	Cyanides (soluble cyanide salts), not elsewhere specified	P068	Methyl hydrazine
P031	Cyanogen	P069	Methyl isocyanate
P033	Cyanogen chloride	P070	2-Methylthioacetate
P036	Dichlorophenylarsine	P071	Methyl parathion
P037	Dieldrin	P072	alpha-Naphthylthiourea
P038	Diethylarsine	P073	Nickel carbonyl
P039	O,O-Diethyl S-[2-(ethylthio)ethyl] phosphorothioate	P074	Nickel cyanide
P041	Diethyl-p-nitrophenyl phosphite	P075	Nickel(II) cyanide
P040	O,O-Diethyl O-pyrazinyl phosphorothioate	P076	Nickel tetracarbonyl
P043	Diisopropyl fluorophosphate	P077	Nicotine and salts
P044	Dimethoate	P078	Nitric oxide
P045	3,3-Dimethyl-1-(methylthio)-2-butanone, O-[(methylamino)carbonyl] oxime	P079	p-Nitroaniline
P071	O,O-Dimethyl O-p-nitrophenyl phosphorothioate	P078	Nitrogen dioxide
P062	Dimethylnitrosamine	P076	Nitrogen(II) oxide
P046	alpha, alpha-Dimethylphenethylamine	P078	Nitrogen(IV) oxide
P047	4,6-Dinitro-o-cresol and salts	P081	Nitroguanidine (R)
P034	4,6-Dinitro-o-cyclohexylphenol	P082	N-Nitrosodimethylamine
P048	2,4-Dinitrophenol	P084	N-Nitrosodimethylamine
P020	Dinoseb	P050	5-Norbornene-2,3-dimethanol, 1,4,5,6,7,7-hexachloro, cyclic sulfate
P065	Diphosphoramide, octamethyl-	P085	Octamethylpyrophosphoramide
P039	Dauflon	P087	Osmium oxide
P049	2,4-Dithiobaurist	P087	Osmium tetroxide
P106	Dithiopyrophosphoric acid, tetraethyl ester	P088	7-Oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid
P050	Endosulfan	P089	Parathion
P068	Endothal	P034	Phenol, 2-cyclohexyl-4,6-dinitro-
P051	Endrin	P048	Phenol, 2,4-dinitro-
P042	Epinephrine	P047	Phenol, 2,4-dinitro-6-methyl-
P046	Ethanolamine, 1,1-dimethyl-2-phenyl-	P020	Phenol, 2,4-dinitro-6-(1-methylpropyl)-
P064	Ethanolamine, N-methyl-N-nitroso-	P009	Phenol, 2,4,6-trinitro-, ammonium salt (R)
P101	Ethyl cyanide	P036	Phenyl dichloroarsine
P054	Ethyleneimine	P062	Phenylmercuric acetate
P067	Famphur	P093	N-Phenylthiourea
P056	Fluorine	P094	Phorate
P057	Fluoroacetamide	P095	Phosgene
P058	Fluoroacetic acid, sodium salt	P096	Phosphine
P065	Fulminic acid, mercury(II) salt (R,T)	P041	Phosphonic acid, diethyl p-nitrophenyl ester
P059	Haptachlor	P044	Phosphorodithioic acid, O,O-dimethyl S-[2-(methylamino)-2-oxoethyl]ester
P051	1,2,3,4,10,10-Hexachloro-8,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo,endo-1,4:5,8-dimethanonaphthalene	P043	Phosphorothioic acid, bis(1-methylethyl)-ester
P037	1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo,exo-1,4:5,8-dimethanonaphthalene	P094	Phosphorothioic acid, O,O-diethyl S-(ethylthio)methyl ester
P080	1,2,3,4,10,10-Hexachloro-1,4,4a,5,6,8a-hexahydro-1,4:5,8-endo,endo-dimethanonaphthalene	P088	Phosphorothioic acid, O,O-diethyl O-(p-nitrophenyl) ester
P004	1,2,3,4,10,10-Hexachloro-1,4,4a,5,6,8a-hexahydro-1,4:5,8-endo,exo-dimethanonaphthalene	P040	Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester
P060	Hexachlorocyclohexane, endo,exo-dimethanonaphthalene	P097	Phosphorothioic acid, O,O-dimethyl O-[(di-methylamino)sulfonyl]phenyl ester
P082	Hexaethyl tetraphosphate	P110	Plumbane, tetraethyl-
P116	Hydrazinecarbohydrazide	P099	Potassium cyanide
P068	Hydrazine, methyl-	P099	Potassium silver cyanide
P083	Hydrocyanic acid	P070	Propenal, 2-methyl-2-(methylthio)-, O-[(methylamino)carbonyl]oxime
P083	Hydrogen cyanide	P101	Propanenitrile
P096	Hydrogen phosphide	P027	Propanenitrile, 3-chloro-
P064	Isocyanic acid, methyl ester	P069	Propanenitrile, 2-hydroxy-2-methyl-
P007	3(2H)-Isosaxolone, 5-(aminomethyl)-	P081	1,2,3-Propanetriol, trinitrate- (R)
P085	Mercury, (acetato-O)phenyl-	P017	2-Propanone, 1-bromo-
P085	Mercury fulminate (R,T)	P102	Propargyl alcohol
P016	Methane, oxybis(chloro)-	P003	2-Propanol
P112	Methane, tetranitro- (R)	P005	2-Propan-1-ol
P118	Methanethiol, trichloro-	P067	1,2-Propylenimine
P059	4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-	P102	2-Propyn-1-ol
P066	Methylol	P008	4-Pyridine
P067	2-Methylaziridine	P075	Pyridine, (S)-[3-(1-methyl-2-pyrrolidinyl)-, and salts]

Hazardous waste No.	Substance
P106	Sodium cyanide
P107	Strontium sulfide
P108	Strychnidin-10-one, and salts
P108	Strychnidin-10-one, 2,3-dimethoxy-
P108	Strychnine and salts
P115	Sulfuric acid, thallium(I) salt
P109	Tetraethylthiopyrophosphate
P110	Tetraethyl lead
P111	Tetraethylpyrophosphate
P112	Tetranitromethane (R)
P062	Tetraphosphoric acid, hexaethyl ester
P113	Thalic acid
P113	Thallium(III) oxide
P114	Thallium(I) selenate
P115	Thallium(I) sulfate
P045	Thiofanox
P049	Thiomidocarbonic diamide
P014	Thiophenol
P116	Thiosemicarbazide
P026	Thiourea, (2-chlorophenyl)-
P072	Thiourea, 1-naphthalenyl-
P083	Thiourea, phenyl-
P123	Toxaphene
P118	Triphenylmethaneethiol
P119	Vanadic acid, ammonium salt
P120	Vanadium pentoxide
P120	Vanadium(V) oxide
P001	Warfarin, when present at concentrations greater than 0.3%
P121	Zinc cyanide
P122	Zinc phosphide (R,T)
P122	Zinc phosphide, when present at concentrations greater than 10%

(f) The commercial chemical products, manufacturing chemical intermediates, or off-specification commercial chemical products referred to in paragraphs (a) through (d) of this section, are identified as toxic wastes (T) unless otherwise designated and are subject to the small quantity exclusion defined in § 261.5 (a) and (f).

[Comment: For the convenience of the regulated community, the primary hazardous properties of these materials have been indicated by the letters T (Toxicity), R (Reactivity), I (Ignitability) and C (Corrosivity). Absence of a letter indicates that the compound is only listed for toxicity.]

These wastes and their corresponding EPA Hazardous Waste Numbers are:

Hazardous Waste No.	Substance
U001	Acetaldehyde (I)
U034	Acetaldehyde, trichloro-
U087	Acetamide, N-(4-ethoxyphenyl)-
U005	Acetamide, N-9H-fluoren-2-yl-
U112	Acetic acid, ethyl ester (I)
U144	Acetic acid, lead salt
U214	Acetic acid, thallium(I) salt

Hazardous Waste No.	Substance
U002	Acetone (I)
U003	Acetonitrile (I,T)
U248	2-(alpha-Acetoxybenzyl)-4-hydroxycoumarin and salts, when present at concentrations of 0.3% or less
U004	Acetophenone
U005	2-Acetylaminofluorene
U006	Acetyl chloride (C,R,T)
U007	Acrylamide
U008	Acrylic acid (I)
U008	Acrylonitrile
U150	Alanine, 3-[p-bis(2-chloroethyl)amino]phenyl-, L-
U011	Anisole
U012	Aniline (I,T)
U014	Auramine
U015	Azaserine
U010	Azaro[2',3',4']pyrrolo[1,2-a]indole-4,7-dione, 6-amino-8-[(aminocarbonyl)oxy]methyl-, 1,1a,2,8,8a,8b-hexahydro-8a-methoxy-5-methyl-,
U157	Benz[1]acanthrene, 1,2-dihydro-3-methyl-
U016	Benz[c]acridine
U016	3,4-Benzacridine
U017	Benzal chloride
U018	Benz[a]anthracene
U018	1,2-Benzanthracene
U094	1,2-Benzanthracene, 7,12-dimethyl-
U012	Benzaniline (I,T)
U014	Benzaniline, 4,4'-carbonimidoylbis(N,N-dimethyl-
U049	Benzaniline, 4-chloro-2-methyl-
U093	Benzaniline, N,N'-dimethyl-4-phenylazo-
U156	Benzaniline, 4,4'-methylenebis(2-chloro-
U222	Benzaniline, 2-methyl-, hydrochloride
U181	Benzaniline, 2-methyl-5-nitro
U019	Benzene (I,T)
U038	Benzenesulfonic acid, 4-chloro-alpha-(4-chlorophenyl)-alpha-hydroxy, ethyl ester
U030	Benzene, 1-bromo-4-phenoxy-
U037	Benzene, chloro-
U190	1,2-Benzenedicarboxylic acid anhydride
U028	1,2-Benzenedicarboxylic acid, [bis(2-ethylhexyl)] ester
U069	1,2-Benzenedicarboxylic acid, dibutyl ester
U088	1,2-Benzenedicarboxylic acid, diethyl ester
U102	1,2-Benzenedicarboxylic acid, dimethyl ester
U107	1,2-Benzenedicarboxylic acid, di-n-octyl ester
U070	Benzene, 1,2-dichloro-
U071	Benzene, 1,3-dichloro-
U072	Benzene, 1,4-dichloro-
U017	Benzene, (dichloromethyl)-
U223	Benzene, 1,3-diisocyanatomethyl-, (R,T)
U239	Benzene, dimethyl-(I,T)
U201	1,3-Benzenediol
U127	Benzene, hexachloro-
U056	Benzene, hexahydro- (I)
U188	Benzene, hydroxy-
U220	Benzene, methyl-
U105	Benzene, 1-methyl-1,2,4-dinitro-
U106	Benzene, 1-methyl-2,6-dinitro-
U203	Benzene, 1,2-methylenedioxy-4-allyl-
U141	Benzene, 1,2-methylenedioxy-4-propenyl-
U090	Benzene, 1,2-methylenedioxy-4-propyl-
U055	Benzene, (1-methylethyl)- (I)
U189	Benzene, nitro- (I,T)
U183	Benzene, pentachloro-
U185	Benzene, pentachloro-nitro-
U020	Benzenesulfonic acid chloride (C,R)
U020	Benzenesulfonyl chloride (C,R)
U207	Benzene, 1,2,4,5-tetrachloro-
U023	Benzene, (trichloromethyl)-(C,R,T)

Hazardous Waste No.	Substance
U0234	Benzene, 1,3,5-trinitro- (R,T)
U021	Benzidine
U0202	1,2-Benzothiazole-3-one, 1,1-dioxide
U120	Benzo[<i>k</i>]fluorene
U022	Benzo[<i>a</i>]pyrene
U022	3,4-Benzopyrene
U197	p-Benzquinone
U023	Benzotrifluoride (C,R,T)
U050	1,2-Benzphenanthrene
U085	2,2'-Bioxane (I,T)
U021	(1,1'-Biphenyl)-4,4'-diamine
U073	(1,1'-Biphenyl)-4,4'-diamine, 3,3'-dichloro-
U091	(1,1'-Biphenyl)-4,4'-diamine, 3,3'-dimethoxy-
U095	(1,1'-Biphenyl)-4,4'-diamine, 3,3'-dimethyl-
U024	Bis(2-chloroethoxy) methane
U027	Bis(2-chloroisopropyl) ether
U244	Bis(dimethylthiocarbamoyl) disulfide
U028	Bis(2-ethylhexyl) phthalate
U246	Bromine cyanide
U225	Bromoform
U030	4-Bromophenyl phenyl ether
U128	1,3-Butadiene, 1,1,2,3,4,4-hexachloro-
U172	1-Butanamine, N-butyl-N-nitroso-
U035	Butanoic acid, 4-[(bis(2-chloroethyl)amino) benzene-
U031	1-Butanol (I)
U159	2-Butanone (I,T)
U160	2-Butanone peroxide (R,T)
U053	2-Butanol
U074	2-Butene, 1,4-dichloro- (I,T)
U031	n-Butyl alcohol (I)
U136	Cacodylic acid
U032	Calcium chromate
U238	Carbamic acid, ethyl ester
U178	Carbamic acid, methylisothio-, ethyl ester
U178	Carbamide, N-ethyl-N-nitroso-
U177	Carbamide, N-methyl-N-nitroso-
U219	Carbamide, thio-
U087	Carbamoyl chloride, dimethyl-
U215	Carbonic acid, diethanol(I) salt
U156	Carbonochloridic acid, methyl ester (I,T)
U033	Carbon oxyfluoride (R,T)
U211	Carbon tetrachloride
U033	Carbonyl fluoride (R,T)
U034	Chloral
U035	Chlorambucil
U036	Chlordane, technical
U026	Chloromethazine
U037	Chlorobenzene
U039	4-Chloro-m-cresol
U041	1-Chloro-2,3-epoxypropene
U042	2-Chloroethyl vinyl ether
U044	Chloroform
U046	Chloromethyl methyl ether
U047	bis-Chloronaphthalene
U048	o-Chlorophenol
U049	4-Chloro-o-toluidine, hydrochloride
U032	Chromic acid, calcium salt
U050	Chrysene
U051	Creosote
U052	Creosols
U052	Cresylic acid
U053	Crotonaldehyde
U055	Cumene (I)
U246	Cyanogen bromide
U197	1,4-Cyclohexadienedione
U056	Cyclohexane (I)
U057	Cyclohexanone (I)
U130	1,3-Cyclopentadiene, 1,2,3,4,5,6-hexa- chloro-
U058	Cyclophosphamide
U240	2,4,4-D, salts and esters
U059	Daunomycin

Hazardous Waste No.	Substance
U208	Ethane, 1,1,1,2-tetrachloro-
U209	Ethane, 1,1,2,2-tetrachloro-
U218	Ethanethioamide
U247	Ethane, 1,1,1-trichloro-2,2-bis(p-methoxy-phenyl)-
U227	Ethane, 1,1,2-trichloro-
U043	Ethane, chloro-
U042	Ethane, 2-chloroethoxy-
U078	Ethane, 1,1-dichloro-
U079	Ethane, trans-1,2-dichloro-
U210	Ethane, 1,1,2,2-tetrachloro-
U173	Ethanol, 2,2'-(nitrocamino)bis-
U004	Ethanone, 1-phenyl-
U006	Ethanoyl chloride (C,R,T)
U112	Ethyl acetate (I)
U113	Ethyl acrylate (I)
U238	Ethyl carbamate (urethan)
U038	Ethyl 4,4'-dichlorobenzilate
U114	Ethylenebis(dithiocarbamic acid)
U087	Ethylene dibromide
U077	Ethylene dichloride
U115	Ethylene oxide (I,T)
U116	Ethylene thiourea
U117	Ethyl ether (I)
U076	Ethylene dichloride
U118	Ethylmethacrylate
U119	Ethyl methanesulfonate
U139	Ferric dextran
U120	Fluoranthene
U222	Formaldehyde
U123	Formic acid (C,T)
U124	Furan (I)
U125	2-Furancarboxaldehyde (I)
U147	2,5-Furandione
U213	Furan, tetrahydro- (I)
U125	Furfural (I)
U124	Fururan (I)
U206	D-Glucopyranose, 2-deoxy-2-(3-methyl-3-nitro-succinyl)-
U126	Glycidylaldehyde
U163	Guandine, N-nitroso-N-methyl-N'-nitro-
U127	Hexachlorobenzene
U128	Hexachlorobutadiene
U129	Hexachlorocyclohexane (gamma isomer)
U130	Hexachlorocyclopentadiene
U131	Hexachloroethane
U132	Hexachlorophene
U243	Hexachloropropene
U133	Hydrazine (R,T)
U086	Hydrazine, 1,2-diethyl-
U098	Hydrazine, 1,1-dimethyl-
U099	Hydrazine, 1,2-dimethyl-
U109	Hydrazine, 1,2-diphenyl-
U134	Hydrofluoric acid (C,T)
U134	Hydrogen fluoride (C,T)
U135	Hydrogen sulfide
U096	Hydroperoxide, 1-methyl-1-phenylethyl- (R)
U136	Hydroxydimethylamine oxide
U116	2-Midazolinedione
U137	Indeno[1,2,3-cd]pyrene
U139	Iron dextran
U140	Isobutyl alcohol (I,T)
U141	Isosafrole
U142	Kapone
U143	Lasiocarpine
U144	Lead acetate
U145	Lead phosphate
U146	Lead subacetate
U129	Undane
U147	Maleic anhydride
U148	Maleic hydrazide
U149	Malonitrile

Hazardous Waste No.	Substance
U150	Melphalan
U151	Mercury
U152	Methacrylonitrile (I,T)
U092	Methanamine, N-methyl- (I)
U029	Methane, bromo-
U045	Methane, chloro- (I,T)
U046	Methane, chloromethoxy-
U068	Methane, dibromo-
U080	Methane, dichloro-
U075	Methane, dichlorodifluoro-
U138	Methane, iodo-
U119	Methanesulfonic acid, ethyl ester
U211	Methane, tetrachloro-
U121	Methane, trichlorofluoro-
U153	Methanethiol (I,T)
U225	Methane, tribromo-
U044	Methane, trichloro-
U121	Methane, trichlorofluoro-
U123	Methanoic acid (C,T)
U036	4,7-Methanonden, 1,2,4,5,6,7,8,8-octa-chloro-3a,4,7,7a-tetrahydro-
U154	Methanol (I)
U155	Methapyrilene
U247	Methoxychlor
U184	Methyl alcohol (I)
U029	Methyl bromide
U186	1-Methylbutadiene (I)
U045	Methyl chloride (I,T)
U156	Methyl chlorocarbonate (I,T)
U226	Methylchloroform
U157	3-Methylcholanthrene
U158	4,4'-Methylenebis(2-chloroaniline)
U132	2,2'-Methylenebis(3,4,6-trichlorophenol)
U068	Methylene bromide
U080	Methylene chloride
U122	Methylene oxide
U159	Methyl ethyl ketone (I,T)
U180	Methyl ethyl ketone peroxide (R,T)
U138	Methyl iodide
U161	Methyl isobutyl ketone (I)
U162	Methyl methacrylate (I,T)
U163	N-Methyl-N'-nitro-N-nitrosoguanidine
U181	4-Methyl-2-pentanone (I)
U184	Methylthiourea
U010	Mitomycin C
U059	5,12-Naphthacenedione, (8S-cis)-8-acetyl-10-[(2-amino-2,3,6-trideoxy-alpha-L-xylo-hexopyranosyl)oxy]-7,8,9,10-tetrahydro-6,8,11-trihydroxy-1-methoxy-
U185	Naphthalene
U047	Naphthalene, 2-chloro-
U186	1,4-Naphthalenedione
U238	2,7-Naphthalenedisulfonic acid, 3,3'-[(3,3'-dimethyl-(1,1'-biphenyl)-4,4'-diyl)]-bis-(azo)bis(5-amino-4-hydroxy)-, tetrasodium salt
U186	1,4-Naphthoquinone
U167	1-Naphthylamine
U168	2-Naphthylamine
U167	alpha-Naphthylamine
U188	beta-Naphthylamine
U026	2-Naphthylamine, N,N'-bis(2-chloromethyl)-
U169	Nitrobenzene (I,T)
U170	p-Nitrophenol
U171	2-Nitropropane (I)
U172	N-Nitrosodi-n-butylamine
U173	N-Nitrosodiethanolamine
U174	N-Nitrosodiethylamine
U111	N-Nitroso-N-propylamine
U176	N-Nitroso-N-ethylurea
U177	N-Nitroso-N-methylurea
U178	N-Nitroso-N-methylurethane

Hazardous Waste No.	Substance
U178	N-Nitrosopiperidine
U180	N-Nitrosopiperidine
U181	5-Nitro-o-toluidine
U183	1,2-Oxaziridines, 2,2-dioxide
U058	2H-1,3,2-Oxazaphosphorine, 2-[bis(2-chloro-ethyl)amino]tetrahydro-, oxide 2-
U116	Odrane (I,T)
U041	Odrane, 2-(chloromethyl)-
U182	Parsidehyde
U183	Pentachlorobenzene
U184	Pentachloroethane
U185	Pentachloronitrobenzene
See F027	Pentachlorophenol
U186	1,3-Pentadiene (I)
U187	Phenacetin
U188	Phenol
U048	Phenol, 2-chloro-
U039	Phenol, 4-chloro-3-methyl-
U061	Phenol, 2,4-dichloro-
U062	Phenol, 2,6-dichloro-
U101	Phenol, 2,4-dimethyl-
U170	Phenol, 4-nitro-
See F027	Phenol, pentachloro-
Do	Phenol, 2,3,4,6-tetrachloro-
Do	Phenol, 2,4,5-trichloro-
Do	Phenol, 2,4,6-trichloro-
U137	1,10-(1,2-phenylene)pyrene
U145	Phosphoric acid, Lead salt
U067	Phosphorodithioic acid, O,O-diethyl-, S-methyl-ester
U188	Phosphorous sulfide (R)
U190	Phthalic anhydride
U191	2-Picoline
U182	Pronamide
U184	1-Propanamine (I,T)
U110	1-Propanamine, N-propyl- (I)
U066	Propene, 1,2-dibromo-3-chloro-
U148	Propenedinitrile
U171	Propene, 2-nitro- (I)
U027	Propene, 2,2'-oxybis[2-chloro-
U193	1,3-Propene sulfone
U235	1-Propanol, 2,3-dibromo-, phosphate (3:1)
U126	1-Propanol, 2,3-epoxy-
U140	1-Propanol, 2-methyl- (I,T)
U002	2-Propanone (I)
U007	2-Propanamide
U084	Propene, 1,3-dichloro-
U243	1-Propene, 1,1,2,3,3,3-hexachloro-
U009	2-Propenenitrile
U152	2-Propenenitrile, 2-methyl- (I,T)
U008	2-Propenoic acid (I)
U113	2-Propenoic acid, ethyl ester (I)
U118	2-Propenoic acid, 2-methyl-, ethyl ester
U182	2-Propenoic acid, 2-methyl-, methyl ester (I,T)
See F027	Propionic acid, 2-(2,4,5-trichlorophenoxy)-
U184	n-Propylamine (I,T)
U083	Propylene dichloride
U186	Pyridine
U155	Pyridine, 2-[(2-(dimethylamino)-2-phenyl-mino)-
U179	Pyridine, hexahydro-N-nitroso-
U181	Pyridine, 2-methyl-
U184	4(1H)-Pyrimidinone, 2,3-dihydro-6-methyl-2-thioxo-
U180	Pyrolic, tetrahydro-N-nitroso-
U200	Reserpine
U201	Resorcinol
U202	Saccharin and salts
U203	Safrole
U204	Selenious acid
U204	Selenium dioxide
U206	Selenium disulfide (R,T)

Hazardous Waste No.	Substance
U016	L-Serine, diazoacetate (ester)
See F027	Silver
U089	4,4'-Sulbenediol, alpha, alpha'-diethyl-
U208	Serpicozocin
U135	Sulfur hydride
U103	Sulfuric acid, dimethyl ester
U189	Sulfur phosphide (R)
U205	Sulfur selenide (R,T)
See F027	2,4,5-T
U207	1,2,4,5-Tetrachlorobenzene
U208	1,1,1,2-Tetrachloroethane
U208	1,1,2,2-Tetrachloroethane
U210	Tetrachloroethylene
See F027	2,3,4,6-Tetrachlorophenol
U213	Tetrahydrofuran (I)
U214	Thallium(I) acetate
U215	Thallium(I) carbonate
U216	Thallium(I) chloride
U217	Thallium(I) nitrate
U218	Thioacetamide
U183	Thiomethanol (I,T)
U219	Thiourea
U244	Thiram
U220	Toluene
U221	Toluenediamine
U223	Toluene diisocyanate (R,T)
U222	O-Toluidine hydrochloride
U011	1H-1,2,4-Triazol-3-amine
U226	1,1,1-Trichloroethane
U227	1,1,2-Trichloroethane
U228	Trichloroethene
U228	Trichloroethylene
U121	Trichloromonofluoromethane
See F027	2,4,5-Trichlorophenol
Do	2,4,6-Trichlorophenol
Do	2,4,5-Trichlorophenoxyacetic acid
U234	sym-Triisobutylbenzene (R,T)
U182	1,3,5-Trioxane, 2,4,5-trimethyl-
U235	Tris(2,3-dibromopropyl) phosphate
U236	Trypan blue
U237	Uracil, 5[bis(2-chloromethyl)amino]-
U237	Uracil mustard
U043	Vinyl chloride
U248	Warfarin, when present at concentrations of 0.3% or less
U239	Xylene (I)
U200	Yohimban-16-carboxylic acid, 11,17-dimethoxy-18-[(3,4,5-trimethoxy-benzoyl)oxy]-, methyl ester
U249	Zinc phosphide, when present at concentrations of 10% or less

[45 FR 78529, 78541, Nov. 25, 1980, as amended at 46 FR 27477, May 20, 1981; 49 FR 19923, May 10, 1984; 49 FR 665, Jan. 4, 1985; 50 FR 2000, Jan. 14, 1985]

EFFECTIVE DATE NOTE: At 50 FR 665, Jan. 4, 1985, § 261.33 introductory text was revised, effective July 5, 1985. At 50 FR 2000, Jan. 14, 1985, the table in paragraph (f) was amended by revising certain hazardous waste numbers, effective July 15, 1985. For the convenience of the user, the superseded introductory text (published at 49 FR 37070, Sept. 21, 1984), and entries in the paragraph (f) table, are set out below:

§ 261.33 Discarded commercial chemical products, off-specification species, container residues and spill residues thereof.

The following materials or items are hazardous wastes if and when they are discarded or intended to be discarded unless they are excluded under §§ 260.20 and 260.22 and listed in Appendix IX.

• • • • •
(f) • • •

Hazardous waste No.	Substance
U242	Pentachlorophenol
U242	Phenol, pentachloro-
U212	Phenol, 2,3,4,6-tetrachloro-
U212	Phenol, 2,4,5-trichloro-
U230	Phenol, 2,4,6-trichloro-
U231	Propionic acid, 2-(2,4,5-trichlorophenoxy)-
U233	Silver
U232	2,4,5-T
U212	2,3,4,6-Tetrachlorophenol
U230	2,4,5-Trichlorophenol
U231	2,4,6-Trichlorophenol
U230	2,4,5-Trichlorophenoxyacetic acid

APPENDIX I—REPRESENTATIVE SAMPLING METHODS

The methods and equipment used for sampling waste materials will vary with the form and consistency of the waste materials to be sampled. Samples collected using the sampling protocols listed below, for sampling waste with properties similar to the indicated materials, will be considered by the Agency to be representative of the waste.

Extremely viscous liquid—ASTM Standard D140-70 Crushed or powdered material—ASTM Standard D346-76 Soil or rock-like material—ASTM Standard D420-69 Soil-like material—ASTM Standard D1452-65 Fly Ash-like material—ASTM Standard D2234-76 [ASTM Standards are available from ASTM, 1916 Race St., Philadelphia, PA 19103]

Containerized liquid wastes—"COLIWASA" described in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical

Methods," U.S. Environmental Protection Agency, Office of Solid Waste, Washington, D.C. 20460. (Copies may be obtained from Solid Waste Information, U.S. Environmental Protection Agency, 26 W. St. Clair St., Cincinnati, Ohio 45268)

Liquid waste in pits, ponds, lagoons, and similar reservoirs—"Pond Sampler" described in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods."

This manual also contains additional information on application of these protocols.

APPENDIX II—EP TOXICITY TEST PROCEDURES

A. Extraction Procedure (EP)

1. A representative sample of the waste to be tested (minimum size 100 grams) shall be obtained using the methods specified in Appendix I or any other method capable of yielding a representative sample within the meaning of Part 260. [For detailed guidance on conducting the various aspects of the EP see "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" (incorporated by reference, see § 260.11).]

2. The sample shall be separated into its component liquid and solid phases using the method described in "Separation Procedure" below. If the solid residue obtained using this method totals less than 0.5% of the original weight of the waste, the residue can be discarded and the operator shall treat the liquid phase as the extract and proceed immediately to Step 8.

3. The solid material obtained from the Separation Procedure shall be evaluated for its particle size. If the solid material has a surface area per gram of material equal to, or greater than, 3.1 cm² or passes through a 9.5 mm (0.375 inch) standard sieve, the operator shall proceed to Step 4. If the surface area is smaller or the particle size larger than specified above, the solid material shall be prepared for extraction by crushing, cutting or grinding the material so that

* These methods are also described in "Samplers and Sampling Procedures for Hazardous Waste Streams," EPA 600/2-80-018, January 1980.

* The percent solids is determined by drying the filter pad at 80°C until it reaches constant weight and then calculating the percent solids using the following equation:

$$\frac{(\text{weight of pad} + \text{solid}) - (\text{tare weight of pad})}{\text{initial weight of sample}} \times 100$$

it passes through a 0.5 mm (0.375 inch) sieve or, if the material is in a single piece, by subjecting the material to the "Structural Integrity Procedure" described below.

4. The solid material obtained in Step 3 shall be weighed and placed in an extractor with 18 times its weight of deionized water. Do not allow the material to dry prior to weighing. For purposes of this test, an acceptable extractor is one which will impart sufficient agitation to the mixture to not only prevent stratification of the sample and extraction fluid but also insure that all sample surfaces are continuously brought into contact with well mixed extraction fluid.

5. After the solid material and deionized water are placed in the extractor, the operator shall begin agitation and measure the pH of the solution in the extractor. If the pH is greater than 5.0, the pH of the solution shall be decreased to 5.0 ± 0.2 by adding 0.5 N acetic acid. If the pH is equal to or less than 5.0, no acetic acid should be added. The pH of the solution shall be monitored, as described below, during the course of the extraction and if the pH rises above 5.2, 0.5N acetic acid shall be added to bring the pH down to 5.0 ± 0.2 . However, in no event shall the aggregate amount of acid added to the solution exceed 4 ml of acid per gram of solid. The mixture shall be agitated for 24 hours and maintained at 20°-40°C (68°-104°F) during this time. It is recommended that the operator monitor and adjust the pH during the course of the extraction with a device such as the Type 45-A pH Controller manufactured by Chemtrix, Inc., Hillsboro, Oregon 97123 or its equivalent, in conjunction with a metering pump and reservoir of 0.5N acetic acid. If such a system is not available, the following manual procedure shall be employed:

(a) A pH meter shall be calibrated in accordance with the manufacturer's specifications.

(b) The pH of the solution shall be checked and, if necessary, 0.5N acetic acid shall be manually added to the extractor until the pH reaches 5.0 ± 0.2 . The pH of the solution shall be adjusted at 15, 30 and 60 minute intervals, moving to the next longer interval if the pH does not have to be adjusted more than 0.5N pH units.

(c) The adjustment procedure shall be continued for at least 6 hours.

(d) If at the end of the 24-hour extraction period, the pH of the solution is not below 5.2 and the maximum amount of acid (4 ml per gram of solids) has not been added, the pH shall be adjusted to 5.0 ± 0.2 and the extraction continued for an additional four hours, during which the pH shall be adjusted at one hour intervals.

6. At the end of the 24 hour extraction period, deionized water shall be added to

the extractor in an amount determined by the following equation:

$$V = (20)(W) - 18(W) - A$$

V = ml deionized water to be added

W = weight in grams of solid charged to extractor

A = ml of 0.5N acetic acid added during extraction

7. The material in the extractor shall be separated into its component liquid and solid phases as described under "Separation Procedure."

8. The liquids resulting from Steps 2 and 7 shall be combined. This combined liquid (or the waste itself if it has less than ¼ percent solids, as noted in step 2) is the extract and shall be analyzed for the presence of any of the contaminants specified in Table I of § 261.24 using the Analytical Procedures designated below.

Separation Procedure

Equipment: A filter holder, designed for filtration media having a nominal pore size of 0.45 micrometers and capable of applying a 5.3 kg/cm² (75 psi) hydrostatic pressure to the solution being filtered, shall be used. For mixtures containing nonabsorptive solids, where separation can be effected without imposing a 5.3 kg/cm² pressure differential, vacuum filters employing a 0.45 micrometers filter media can be used. (For further guidance on filtration equipment or procedures see "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" incorporated by reference, see § 260.11). Procedure:^a

(i) Following manufacturer's directions, the filter unit shall be assembled with a filter bed consisting of a 0.45 micrometer filter membrane. For difficult or slow to filter mixtures a prefilter bed consisting of the following prefilters in increasing pore size (0.65 micrometer membrane, fine glass

^aThis procedure is intended to result in separation of the "free" liquid portion of the waste from any solid matter having a particle size >0.45 µm. If the sample will not filter, various other separation techniques can be used to aid in the filtration. As described above, pressure filtration is employed to speed up the filtration process. This does not alter the nature of the separation. If liquid does not separate during filtration, the waste can be centrifuged. If separation occurs during centrifugation, the liquid portion (centrifugate) is filtered through the 0.45 µm filter prior to becoming mixed with the liquid portion of the waste obtained from the initial filtration. Any material that will not pass through the filter after centrifugation is considered a solid and is extracted.

fiber prefilter, and coarse glass fiber prefilter) can be used.

(ii) The waste shall be poured into the filtration unit.

(iii) The reservoir shall be slowly pressurized until liquid begins to flow from the filtrate outlet at which point the pressure in the filter shall be immediately lowered to 10-15 psig. Filtration shall be continued until liquid flow ceases.

(iv) The pressure shall be increased stepwise in 10 psi increments to 75 psig and filtration continued until flow ceases or the pressurizing gas begins to exit from the filtrate outlet.

(v) The filter unit shall be depressurized, the solid material removed and weighed and then transferred to the extraction apparatus, or, in the case of final filtration prior to analysis, discarded. Do not allow the material retained on the filter pad to dry prior to weighing.

(vi) The liquid phase shall be stored at 4°C for subsequent use in Step 8.

B. Structural Integrity Procedure

Equipment: A Structural Integrity Tester having a 3.18 cm (1.25 in.) diameter hammer weighing 0.33 kg (0.73 lbs.) and having a free fall of 15.24 cm (6 in.) shall be used. This device is available from Associated Design and Manufacturing Company, Alexandria, VA 22314, as Part No. 125, or it may be fabricated to meet the specifications shown in Figure 1.

Procedure

1. The sample holder shall be filled with the material to be tested. If the sample of waste is a large monolithic block, a portion shall be cut from the block having the dimensions of a 3.3 cm (1.3 in.) diameter x 7.1 cm (2.8 in.) cylinder. For a fixated waste, samples may be cast in the form of a 3.3 cm (1.3 in.) diameter x 7.1 cm (2.8 in.) cylinder for purposes of conducting this test. In such cases, the waste may be allowed to cure for 30 days prior to further testing.

2. The sample holder shall be placed into the Structural Integrity Tester, then the hammer shall be raised to its maximum height and dropped. This shall be repeated fifteen times.

3. The material shall be removed from the sample holder, weighed, and transferred to the extraction apparatus for extraction.

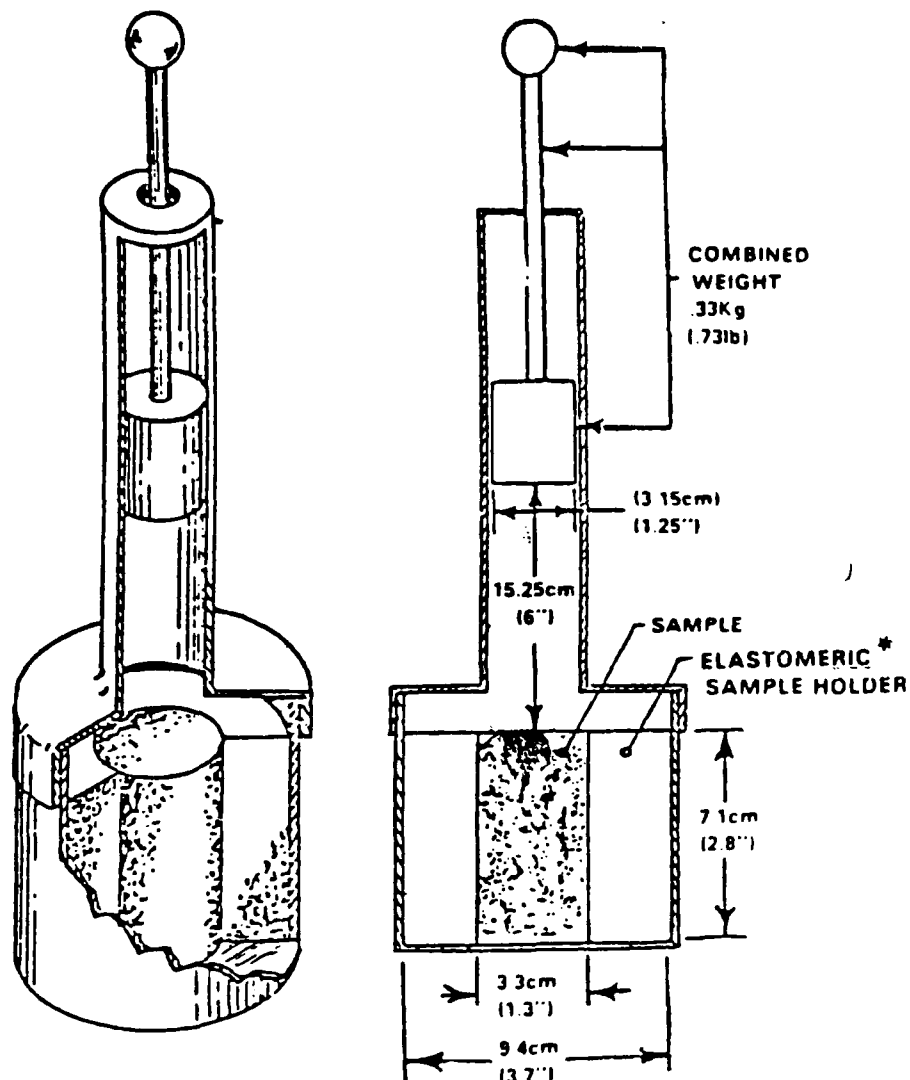
Analytical Procedures for Analyzing Extract Contaminants

The test methods for analyzing the extract are as follows:

1. For arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, endrin, lindane, methoxychlor, toxaphene, 2,4-D[2,4-dichlorophenoxyacetic acid] or 2,4,5-TP [2,4,5-trichlorophenoxypropionic acid]: "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" (incorporated by reference, see § 260.11).

2. [Reserved]

For all analyses, the methods of standard addition shall be used for quantification of species concentration.



*ELASTOMERIC SAMPLE HOLDER FABRICATED OF MATERIAL FIRM ENOUGH TO SUPPORT THE SAMPLE

Figure 1
COMPACTION TESTER

[45 FR 33119, May 19, 1980, as amended at 46 FR 35247, July 7, 1981]

APPENDIX III—CHEMICAL ANALYSIS TEST METHODS

Tables 1, 2, and 3 specify the appropriate analytical procedures, described in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," (incorporated by reference, see § 260.11) which shall be used to determine whether a sample contains a given Appendix VII or VIII toxic constituent.

Table 1 identifies each Appendix VII or VIII organic constituent along with the approved measurement method. Table 2 identifies the corresponding methods for inorganic species. Table 3 summarizes the contents of SW-846 and supplies specific section and method numbers for sampling and analysis methods.

Prior to final sampling and analysis method selection the analyst should consult the specific section or method described in SW-846 for additional guidance on which of the approved methods should be employed for a specific sample analysis situation.

TABLE 1—ANALYSIS METHODS FOR ORGANIC
CHEMICALS CONTAINED IN SW-846

Compound	First edition method(s)	Second edition method(s)
Acetonitrile	8.03, 8.24	8030, 8240
Acrolein	8.03, 8.24	8030, 8240
Acrylamide	8.01, 8.24	8015, 8240
Acrylonitrile	8.03, 8.24	8030, 8240
Benzene	8.02, 8.24	8020, 8024
Benz(a)anthracene	8.10, 8.25	8100, 8250, 8310
Benz(a)pyrene	8.10, 8.25	8100, 8250, 8310
Benzotrifluoride	8.12, 8.25	8120, 8250
Benzyl chloride	8.01, 8.12, 8.24, 8.25	8120, 8250
Benzo(b)fluoranthene	8.10, 8.25	8100, 8250, 8310
Bis(2-chloroethoxy)methane	8.01, 8.24	8010, 8240
Bis(2-chloroethyl)ether	8.01, 8.24	8010, 8240
Bis(2-chloropropyl)ether	8.01, 8.24	8010, 8240
Carbon disulfide	8.01, 8.24	8015, 8240
Carbon tetrachloride	8.01, 8.24	8010, 8240
Chlordane	8.08, 8.25	8080, 8250
Chlorinated biphenyls	8.08, 8.25	8080, 8250
Chlorinated dibenzo-p-dioxins		8280
Chlorinated dibenzofurans		8280
Chloroacetaldehyde	8.01, 8.24	8010, 8240
Chlorobenzene	8.01, 8.02, 8.24	8020, 8240
Chloroform	8.01, 8.24	8010, 8240
Chloromethane	8.01, 8.24	8010, 8240
2-Chlorophenol	8.04, 8.25	8040, 8250
Chrysene	8.10, 8.25	8100, 8250, 8310
Cresole ¹	8.10, 8.25	8100, 8250
Cresol(s)	8.04, 8.25	8040, 8250
Cresylic Acid(s)	8.04, 8.25	8040, 8250

TABLE 1—ANALYSIS METHODS FOR ORGANIC
CHEMICALS CONTAINED IN SW-846—Continued

Compound	First edition method(s)	Second edition method(s)
Dichlorobenzene(s)	8.01, 8.02, 8.12, 8.25	8010, 8120, 8250
Dichloroethane(s)	8.01, 8.24	8010, 8240
Dichloromethane	8.01, 8.24	8010, 8240
Dichlorophenoxyacetic acid	8.04, 8.25	8150, 8250
Dichloropropanol	8.12, 8.25	8120, 8250
2,4-Dimethylphenol	8.04, 8.25	8040, 8250
Dinitrobenzene	8.08, 8.25	8080, 8250
4,6-Dinitro-o-cresol	8.04, 8.25	8040, 8250
2,4-Dinitrotoluene	8.08, 8.25	8080, 8250
Endrin	8.08, 8.25	8080, 8250
Ethyl ether	8.01, 8.02, 8.24	8015, 8240
Formaldehyde	8.01, 8.24	8015, 8240
Formic acid	8.08, 8.25	8250
Heptachlor	8.08, 8.25	8080, 8250
Hexachlorobenzene	8.12, 8.25	8120, 8250
Hexachlorobutadiene	8.12, 8.25	8120, 8250
Hexachloroethane	8.12, 8.25	8010, 8240
Hexachlorocyclopentadiene	8.12, 8.25	8120, 8250
Lindane	8.08, 8.25	8080, 8250
Maleic anhydride	8.08, 8.25	8250
Methanol	8.01, 8.24	8010, 8240
Methoxyl	8.32	8250
Methyl ethyl ketone	8.01, 8.02, 8.24	8015, 8240
Methyl isobutyl ketone	8.01, 8.02, 8.24	8015, 8240
Naphthalene	8.10, 8.25	8100, 8250
Naphthoquinone	8.08, 8.08, 8.25	8080, 8250
Nitrobenzene	8.08, 8.25	8080, 8250
4-Nitrophenol	8.04, 8.25	8040, 8240
Paraldehyde (trimer of acetaldehyde)	8.01, 8.24	8015, 8240
Pentachlorophenol	8.04, 8.25	8040, 8250
Phenol	8.04, 8.25	8040, 8250
Phorase	8.22	8140
Phosphorothioic acid esters	8.08, 8.08, 8.22	8140
Phthalic anhydride	8.08, 8.08, 8.25	8080, 8250
2-Picoline	8.08, 8.08, 8.25	8080, 8250
Pyridine	8.08, 8.08, 8.25	8080, 8250
Tetrachlorobenzene(s)	8.12, 8.25	8120, 8250
Tetrachloroethane(s)	8.01, 8.24	8010, 8240
Tetrachloroethene	8.01, 8.24	8010, 8240
Tetrachlorophenol	8.04, 8.24	8040, 8250
Toluene	8.02, 8.24	8020, 8024
Toluenediamine	8.25	8250
Toluene diisocyanate(s)	8.08, 8.25	8250
Toxaphene	8.08, 8.25	8080, 8250
Trichloroethane	8.01, 8.24	8010, 8240
Trichloroethane(s)	8.01, 8.24	8010, 8240
Trichlorofluoromethane	8.01, 8.24	8010, 8240
Trichlorophenol(s)	8.04, 8.25	8040, 8250
2,4,5-Trichlorophenoxy propionic acid	8.40, 8.25	8150, 8250
Trichloropropane	8.01, 8.24	8010, 8240
Vinyl chloride	8.01, 8.24	8010, 8240
Vinylidene chloride	8.01, 8.24	8010, 8240
Xylene	8.02, 8.24	8020, 8240

¹ Analyte for phenanthrene and carbazole; if these are present in a ratio between 1.4:1 and 5:1 creosote should be considered present.

TABLE 2—ANALYSIS METHODS FOR INORGANIC CHEMICALS CONTAINED IN SW-846

Compound	First edition method(s)	Second edition method(s)
Antimony	8.50	7040, 7041
Arsenic	8.51	7080, 7081
Barium	8.52	7080, 7081
Cadmium	8.53	7080, 7081
Chromium	8.54	7190, 7191
Chromium: Hexavalent	8.545, 8.546	7195, 7196

TABLE 2—ANALYSIS METHODS FOR INORGANIC CHEMICALS CONTAINED IN SW-846—Continued

Compound	First edition method(s)	Second edition method(s)
Lead	8.547	7197
Mercury	8.56	7420, 7421
Nickel	8.57	7470, 7471
Selenium	8.58	7520, 7521
Silver	8.59	7740, 7741
Cyanides	8.60	7780, 7781
Total Organic Halogen	8.65	9010
Sulfides	8.66	9020
	8.67	9030

TABLE 3—SAMPLING AND ANALYSIS METHODS CONTAINED IN SW-846

Title	First edition		Second edition	
	Section No.	Method No.	Section No.	Method No.
Sampling of Solid Wastes	1.0		1.0	
Development of Appropriate Sampling Plans	1.0		1.1	
Regulatory and Scientific Objectives	1.0-2		1.1.1	
Fundamental Statistical Concepts	1.0-3		1.1.2	
Basic Statistical Strategies	1.0-7		1.1.3	
Simple Random Sampling			1.1.3.1	
Stratified Random Sampling			1.1.3.2	
Systematic Random Sampling			1.1.3.3	
Special Considerations	1.0-7			
Composite Sampling			1.1.4.1	
Subsampling			1.1.4.2	
Cost and Loss Functions			1.1.4.3	
Implementation of Sampling Plan	1.0-7		1.2	
Selection of Sampling Equipment			1.2.1	
Composite Liquid Waste Sampler	3.2.1		1.2.1.1	
Weighted Bottle	3.2.2		1.2.1.2	
Dipper	3.2.3		1.2.1.3	
Thief	3.2.4		1.2.1.4	
Trier	3.2.5		1.2.1.5	
Auger	3.2.6		1.2.1.6	
Scoop and Shovel	3.2.7		1.2.1.7	
Selection of Sample Containers	3.3		1.2.2	
Processing and Storage of Samples	3.3		1.2.3	
Documentation of Chain of Custody	2.0		1.3	
Sample Labels	2.0-1		1.3.1	
Sample Seals	2.0-3		1.3.2	
Field Log Book	2.0-5		1.3.3	
Chain-of-Custody Record	2.0-6		1.3.4	
Sample Analysis Request Sheet	2.0-9		1.3.5	
Sample Delivery to Laboratory	2.0-10		1.3.6	
Shipping of Samples	2.0-10		1.3.7	
Receipt and Logging of Sample	2.0-12		1.3.8	
Assignment of Sample for Analysis	2.0-13		1.3.9	
Sampling Methodology	3.0		1.4	
Containers	3.2-2		1.4.1	
Tanks	3.2-2		1.4.2	
Waste Piles	3.2-2		1.4.3	
Landfills and Lagoons	3.2-2		1.4.4	
Waste Evaluation Procedures			2.0	
Characteristics of Hazardous Waste			2.1	
Ignitability	4.0		2.1.1	
Pensky-Martens Closed-Cup Method	4.1		2.1.1	1010
Setaflash Closed-Cup Method	4.1		2.1.1	1020
Corrosivity	5.0		2.1.2	
Corrosivity Toward Steel	5.3		2.1.2	1110
Reactivity	6.0		2.1.3	
Extraction Procedure Toxicity	7.0		2.1.4	

TABLE 3—SAMPLING AND ANALYSIS METHODS CONTAINED IN SW-846—Continued

Title	First edition		Second edition	
	Section No.	Method No.	Section No.	Method No.
Extraction Procedure Toxicity Test	7.1, 7.2, 7.5			
Method and Structural Integrity Test	7.4		2.1.4	1310
Sample Workup Techniques			4.0	
Inorganic Techniques	8.49		4.1	
Acid Digestion for Flame AAS	1		4.1	3010
Acid Digestion for Furnace AAS	1		4.1	3020
Acid Digestion of Oil, Grease, or Wax	8.49-8		4.1	3030
Dissolution Procedure for Oil, Grease or Wax	8.49-8			
Alkaline Digestion	8.0	8.498	4.1	3080
Organic Techniques	8.0		4.2	
Separatory Funnel Liquid-Liquid Extraction	8.0	8.1	4.2	3510
Continuous Liquid-Liquid Extraction	8.0	8.01	4.2	3520
Acid-Base Cleanup Extraction	8.0	8.84	4.2	3530
Sonolite Extraction	8.0	8.86	4.2	3540
Sonication Extraction	8.0	8.85	4.2	3550
Sample Introduction Techniques			5.0	
Headspace	8.0	8.82	5.0	5020
Purge-and-Trap	8.0	8.83	5.0	5030
Inorganic Analytical Methods	8.0		7.0	
Antimony, Flame AAS	8.0	8.50	7.0	7470
Antimony, Furnace AAS	8.0	8.50	7.0	7471
Arsenic, Flame AAS	8.0	8.51	7.0	7080
Arsenic, Furnace AAS	8.0	8.51	7.0	7081
Barium, Flame AAS	8.0	8.52	7.0	7080
Barium, Furnace AAS	8.0	8.52	7.0	7081
Cadmium, Flame AAS	8.0	8.53	7.0	7130
Cadmium, Furnace AAS	8.0	8.53	7.0	7131
Chromium, Flame AAS	8.0	8.54	7.0	7090
Chromium, Furnace AAS	8.0	8.54	7.0	7191
Chromium, Hexavalent, Coprecipitation	8.0	8.545	7.0	7195
Chromium, Hexavalent, Colorimetric	8.0	8.546	7.0	7196
Chromium, Hexavalent, Chelation	8.0	8.547	7.0	7197
Lead, Flame AAS	8.0	8.56	7.0	7420
Lead, Furnace AAS	8.0	8.56	7.0	7421
Mercury, Cold Vapor, Liquid	8.0	8.57	7.0	7470
Mercury, Cold Vapor, Solid	8.0	8.57	7.0	7471
Nickel, Flame AAS	8.0	8.58	7.0	7520
Nickel, Furnace AAS	8.0	8.58	7.0	7521
Selenium, Flame AAS	8.0	8.59	7.0	7740
Selenium, Gaseous Hydride AAS	8.0	8.59	7.0	7741
Silver, Flame AAS	8.0	8.60	7.0	7780
Silver, Furnace AAS	8.0	8.60	7.0	7781
Organic Analytical Methods	8.0		8.0	
Gas Chromatographic Methods	8.0		8.1	
Halogenated Volatile Organics	8.0	8.01	8.1	8010
Nonhalogenated Volatile Organics	8.0	8.01	8.1	8015
Aromatic Volatile Organics	8.0	8.02	8.1	8020
Acrolein, Acrylonitrile, Acetonitrile	8.0	8.03	8.1	8030
Phenols	8.0	8.04	8.1	8040
Phthalate Esters	8.0	8.06	8.1	8060
Organochlorine Pesticides and PCBs	8.0	8.08	8.1	8080
Nitroaromatics and Cyclic Ketones	8.0	8.09	8.1	8090
Polynuclear Aromatic Hydrocarbons	8.0	8.10	8.1	8100
Chlorinated Hydrocarbons	8.0	8.12	8.1	8120
Organophosphorus Pesticides	8.0	8.22	8.1	8140
Chlorinated Herbicides	8.0	8.40	8.1	8150
Gas Chromatographic/Mass Spectroscopy Methods (GC/MS)	8.0		8.2	
GC/MS Volatiles	8.0	8.24	8.2	8240
GC/MS Semi-Volatiles, Packed Column	8.0	8.25	8.2	8250
GC/MS Semi-Volatiles, Capillary	8.0	8.27	8.2	8270
Analysis of Chlorinated Dioxins and Dibenzofurans			8.2	8280
High Performance Liquid Chromatographic Methods (HPLC)	8.0		8.3	
Polynuclear Aromatic Hydrocarbons	8.0	8.10	8.3	8310
Miscellaneous Analytical Methods	8.0		9.0	
Cyanide: Total and Amenable to Chlorination	8.0	8.66	9.0	9010
Total Organic Halogen (TOX)	8.0	8.66	9.0	9020
Sulfides	8.0	8.67	9.0	9030
pH Measurement	8.0	8.2	9.0	9040

TABLE 3—SAMPLING AND ANALYSIS METHODS CONTAINED IN SW-846—Continued

Title	First edition		Second edition	
	Section No.	Method No.	Section No.	Method No.
Quality Control/Quality Assurance	10.0		10.1	
Introduction	10.0		10.1	
Program Design	10.0		10.2	
Sampling	10.0		10.3	
Analysis	10.0		10.4	
Data Handling	10.0		10.5	

¹See specific metal.

[48 FR 18257, Apr. 8, 1983, as amended at 50 FR 2000, Jan. 14, 1985]

EFFECTIVE DATE NOTE: At 50 FR 2000, Jan. 14, 1985, Part 261, App. III was amended as follows: In Table 1, the entry for "Chlorinated dibenzodioxins" was removed, and the entries for "Chlorinated dibenzo-p-dioxins, and "Chlorinated dibenzofurans" were added. In Table 3, the entry for "Analysis of Chlorinated Dioxins and Dibenzofurans" was added under "Organic Analytical Methods—Gas Chromatographic/Mass Spectroscopy Methods (GC/MS)" after the entry "GC/MS Semi-Volatiles, Capillary". These amendments are effective July 15, 1985. For the convenience of the user, the superseded entry from Table 1 is set out below:

TABLE 1—ANALYTICAL METHODS FOR ORGANIC CHEMICALS CONTAINED IN SW-846

Compound	First edition method(s)	Second edition method(s)
Chlorinated dibenzodioxins	8.08, 8.25 8080, 8250	

APPENDIX IV—[RESERVED FOR RADIOACTIVE WASTE TEST METHODS]

APPENDIX V—[RESERVED FOR INFECTIOUS WASTE TREATMENT SPECIFICATIONS]

APPENDIX VI—[RESERVED FOR ETIOLOGIC AGENTS]

APPENDIX VII—BASIS FOR LISTING HAZARDOUS WASTE

EPA hazardous waste No.	Hazardous constituents for which listed
F001	Tetrachloroethylene, methylene chloride trichloroethylene, 1,1,1-trichloroethane, carbon tetrachloride, chlorinated fluorocarbons.
F002	Tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,2,2-trifluoroethane, ortho-dichlorobenzene, trichlorofluoromethane.
F003	N.A.
F004	Cresols and cresylic acid, nitrobenzene.
F006	Toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine.
F008	Cadmium, hexavalent chromium, nickel, cyanide (complexed).
F007	Cyanide (salts).
F008	Cyanide (salts).
F010	Cyanide (salts).
F011	Cyanide (salts).
F012	Cyanide (complexed).
F019	Hexavalent chromium, cyanide (complexed).
F020	Tetra- and pentachlorodibenzo-p-dioxins; tetra- and pentachlorodibenzofurans; tri- and tetrachlorophenols and their chlorophenoxy derivative acids, esters, ethers, amine and other salts.
F021	Penta- and hexachlorodibenzo-p-dioxins; penta- and hexachlorodibenzofurans; pentachlorophenol and its derivatives.
F022	Tetra-, penta-, and hexachlorodibenzo-p-dioxins; tetra-, penta-, and hexachlorodibenzofurans.
F023	Tetra-, and pentachlorodibenzo-p-dioxins, tetra- and pentachlorodibenzofurans; tri- and tetrachlorophenols and their chlorophenoxy derivative acids, esters, ethers, amine and other salts.

EPA hazardous waste No.	Hazardous constituents for which listed	EPA hazardous waste No.	Hazardous constituents for which listed
F024	Chloromethane, dichloromethane, trichloromethane, carbon tetrachloride, chloroethylene, 1,1-dichloroethane, 1,2-dichloroethane, trans-1,2-dichloroethylene, 1,1-dichloroethylene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethylene, 1,1,1,2-tetra-chloroethane, 1,1,2,2-tetrachloroethane, tetrachloroethylene, pentachloroethane, hexachloroethane, allyl chloride (3-chloropropene), dichloropropene, dichloropropene, 2-chloro-1,3-butadiene, hexachloro-1,3-butadiene, hexachlorocyclopentadiene, hexachlorocyclohexane, benzene, chlorobenzene, dichlorobenzenes, 1,2,4-trichlorobenzene, tetrachlorobenzene, pentachlorobenzene, hexachlorobenzene, toluene, naphthalene.	K030	Ethylene dichloride, 1,1,1-trichloroethane, 1,1,2-trichloroethane, tetrachloroethanes (1,1,2,2-tetrachloroethane and 1,1,1,2-tetrachloroethane), trichloroethylene, tetrachloroethylene, carbon tetrachloride, chloroform, vinyl chloride, vinylidene chloride.
F026	Tetra-, penta-, and hexachlorodibenzo-p-dioxins; tetra-, penta-, and hexachlorodibenzofurans.	K021	Antimony, carbon tetrachloride, chloroform.
F027	Tetra-, penta-, and hexachlorodibenzo-p-dioxins; tetra-, penta-, and hexachlorodibenzofurans; tri-, tetra-, and pentachlorophenols and their chlorophenoxy derivative acids, esters, ethers, amine and other salts.	K022	Phenol, tars (polycyclic aromatic hydrocarbons).
F028	Tetra-, penta-, and hexachlorodibenzo-p-dioxins; tetra-, penta-, and hexachlorodibenzofurans; tri-, tetra-, and pentachlorophenols and their chlorophenoxy derivative acids, esters, ethers, amine and other salts.	K023	Phthalic anhydride, maleic anhydride.
K001	Pentachlorophenol, phenol, 2-chlorophenol, p-chloro-m-cresol, 2,4-dimethylphenyl, 2,4-dinitrophenol, trichlorophenols, tetrachlorophenols, 2,4-dinitrophenol, cresols, chrysene, naphthalene, fluoranthene, benzo(b)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, benzo(a)anthracene, dibenz(a,h)anthracene, acenaphthalene, benz(a)anthracene, dibenz(a,h)anthracene, acenaphthalene, benz(a)anthracene, dibenz(a,h)anthracene, acenaphthalene.	K024	Phthalic anhydride, 1,4-naphthoquinone.
K002	Hexavalent chromium, lead.	K025	Meta-dinitrobenzene, 2,4-dinitrotoluene.
K003	Hexavalent chromium, lead.	K026	Paraldehyde, pyridines, 2-picoline.
K004	Hexavalent chromium.	K027	Toluene diisocyanate, toluene-2, 4-diamine.
K005	Hexavalent chromium, lead.	K028	1,1,1-trichloroethane, vinyl chloride.
K006	Hexavalent chromium.	K029	1,2-dichloroethane, 1,1,1-trichloroethane, vinyl chloride, vinylidene chloride, chloroform.
K007	Cyanide (complexed), hexavalent chromium.	K030	Hexachlorobenzene, hexachlorobutadiene, hexachloroethane, 1,1,1,2-tetrachloroethane, 1,1,2,2-tetrachloroethane, ethylene dichloride.
K008	Chloroform, formaldehyde, methylene chloride, methyl chloride, paraldehyde, formic acid.	K031	Arsenic.
K010	Chloroform, formaldehyde, methylene chloride, methyl chloride, paraldehyde, formic acid, chloroacetaldehyde.	K032	Hexachlorocyclopentadiene.
K011	Acrylonitrile, acetonitrile, hydrocyanic acid.	K033	Hexachlorocyclopentadiene.
K013	Hydrocyanic acid, acrylonitrile, acetonitrile.	K034	Hexachlorocyclopentadiene.
K014	Acetonitrile, acrylamide.	K035	Cresols, chrysene, naphthalene, fluoranthene, benzo(b)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, benzo(a)anthracene, dibenz(a,h)anthracene, acenaphthalene.
K015	Benzyl chloride, chlorobenzene, toluene, benzotrifluoride.	K036	Toluene, phosphorothioic and phosphorothioic acid esters.
K016	Hexachlorobenzene, hexachlorobutadiene, carbon tetrachloride, hexachloroethane, perchloroethylene.	K037	Toluene, phosphorothioic and phosphorothioic acid esters.
K017	Epichlorohydrin, chloroethers (bis(chloromethyl) ether and bis (2-chloroethyl) ethers), trichloropropene, dichloropropene.	K038	Formaldehyde, phosphorothioic and phosphorothioic acid esters.
K018	1,2-dichloroethane, trichloroethylene, hexachlorobutadiene, hexachlorobenzene.	K039	Phosphorothioic and phosphorothioic acid esters.
K019	Ethylene dichloride, 1,1,1-trichloroethane, 1,1,2-trichloroethane, tetrachloroethanes (1,1,2,2-tetrachloroethane and 1,1,1,2-tetrachloroethane), trichloroethylene, tetrachloroethylene, carbon tetrachloride, chloroform, vinyl chloride, vinylidene chloride.	K040	Formaldehyde, phosphorothioic and phosphorothioic acid esters.
		K041	Toxaphene.
		K042	Hexachlorobenzene, ortho-dichlorobenzene.
		K043	2,4-dichlorophenol, 2,6-dichlorophenol, 2,4,6-trichlorophenol.
		K044	N.A.
		K045	N.A.
		K046	Lead.
		K047	N.A.
		K048	Hexavalent chromium, lead.
		K049	Hexavalent chromium, lead.
		K050	Hexavalent chromium.
		K051	Hexavalent chromium, lead.
		K052	Lead.
		K053	Cyanide, naphthalene, phenolic compounds, arsenic.
		K054	Hexavalent chromium, lead, cadmium.
		K055	Hexavalent chromium, lead.
		K056	Hexavalent chromium, lead, cadmium.
		K057	Mercury.
		K058	Chloroform, carbon tetrachloride, hexachloroethane, trichloroethane, tetrachloroethylene, dichloroethylene, 1,1,2,2-tetrachloroethane.
		K059	Aniline, diphenylamine, nitrobenzene, phenylenediamine.
		K060	Arsenic.
		K061	Benzene, dichlorobenzenes, trichlorobenzenes, tetrachlorobenzenes, pentachlorobenzene, hexachlorobenzene, benzyl chloride.
		K062	Lead, hexavalent chromium.
		K063	Phenol, naphthalene.
		K064	Phthalic anhydride, maleic anhydride.
		K065	Phthalic anhydride.

EPA hazard-ous waste No.	Hazardous constituents for which listed
K005	1,1,2-trichloroethane, 1,1,1,2-tetrachloroethane, 1,1,2,2-tetrachloroethane.
K006	1,2-dichloroethane, 1,1,1-trichloroethane, 1,1,2-trichloroethane.
K007	Chlordane, heptachlor.
K008	Toxaphene.
K009	2,4-dichlorophenol, 2,4,6-trichlorophenol.
K100	Hexavalent chromium, lead, cadmium.
K101	Arsenic.
K102	Arsenic.
K103	Aniline, nitrobenzene, phenylenediamine.
K104	Aniline, benzene, diphenylamine, nitrobenzene, phenylenediamine.
K105	Benzene, monochlorobenzene, dichlorobenzenes, 2,4,6-trichlorophenol.
K106	Mercury.

N.A.—Waste is hazardous because it fails the test for the characteristic of ignitability, corrosivity, or reactivity.

[46 FR 4619, Jan. 16, 1981, as amended at 46 FR 27477, May 20, 1981; 49 FR 5312, Feb. 10, 1984; 50 FR 2000, Jan. 14, 1985]

EFFECTIVE DATE NOTE: At 50 FR 2000, Jan. 14, 1985, Part 261, App. VII was amended by adding the entries for F020 through F023, and F026 through F028, effective July 15, 1985.

APPENDIX VIII—HAZARDOUS CONSTITUENTS

Acetonitrile (Ethanenitrile)
Acetophenone (Ethanone, 1-phenyl)
3-(alpha-Acetylbenzyl)-4-hydroxycoumarin and salts (Warfarin)
2-Acetylaminofluorene (Acetamide, N-(9H-fluoren-2-yl))
Acetyl chloride (Ethanoyl chloride)
1-Acetyl-2-thiourea (Acetamide, N-(aminothioxomethyl))
Acrolein (2-Propenal)
Acrylamide (2-Propenamide)
Acrylonitrile (2-Propenenitrile)
Aflatoxins
Aldrin (1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a,8b-hexahydro-endo,exo-1,4,5,8-Dimethanonaphthalene)
Allyl alcohol (2-Propen-1-ol)
Aluminum phosphide
4-Aminobiphenyl ([1,1'-Biphenyl]-4-amine)
6-Amino-1,1a,2,8,8a,8b-hexahydro-8-(hydroxymethyl)-8a-methoxy-5-methyl-carbamate azirino[2,3':3,4]pyrrolo[1,2-a]indole-4,7-dione, (ester) (Mitomycin C) (Azirino[2,3':3,4]pyrrolo[1,2-a]indole-4,7-dione, 6-amino-8-[(aminocarbonyloxy)methyl]-1,1a,2,8,8a,8b-hexahydro-8a-methoxy-5-methyl)
5-(Aminomethyl)-3-isoxazolol (3(2H)-Isoxazolone, 5-(aminomethyl)) 4-Aminopyridine (4-Pyridinamine)
Amitrole (1H-1,2,4-Triazol-3-amine)

Aniline (Benzenamine)
Antimony and compounds, N.O.S.*
Aramite (Sulfurous acid, 2-chloroethyl-, 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester)
Arsenic and compounds, N.O.S.*
Arsenic acid (Orthoarsenic acid)
Arsenic pentoxide (Arsenic (V) oxide)
Arsenic trioxide (Arsenic (III) oxide)
Auramine (Benzenamine, 4,4'-carbonimidoylbis[N,N-Dimethyl-, mono-hydrochloride])
Azaserine (L-Serine, diazoacetate (ester))
Barium and compounds, N.O.S.*
Barium cyanide
Benz[c]acridine (3,4-Benzacridine)
Benz[a]anthracene (1,2-Benzanthracene)
Benzene (Cyclohexatriene)
Benzenearsonic acid (Arsonic acid, phenyl-)
Benzene, dichloromethyl- (Benzal chloride)
Benzenethiol (Thiophenol)
Benzidine ([1,1'-Biphenyl]-4,4'-diamine)
Benzo[b]fluoranthene (2,3-Benzofluoranthene)
Benzo[j]fluoranthene (7,8-Benzofluoranthene)
Benzo[a]pyrene (3,4-Benzopyrene)
p-Benzoquinone (1,4-Cyclohexadienedione)
Benzotrifluoride (Benzene, trichloromethyl-)
Benzyl chloride (Benzene, (chloromethyl-))
Beryllium and compounds, N.O.S.*
Bis(2-chloroethoxy)methane (Ethane, 1,1'-(methylenebis(oxy))bis(2-chloro-1))
Bis(2-chloroethyl) ether (Ethane, 1,1'-oxybis(2-chloro-1))
N,N-Bis(2-chloroethyl)-2-naphthylamine (Chlornaphazine)
Bis(2-chloroisopropyl) ether (Propane, 2,2'-oxybis(2-chloro-1))
Bis(chloromethyl) ether (Methane, oxybis(chloro-1))
Bis(2-ethylhexyl) phthalate (1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl) ester)
Bromoacetone (2-Propanone, 1-bromo-)
Bromomethane (Methyl bromide)
4-Bromophenyl phenyl ether (Benzene, 1-bromo-4-phenoxy-)
Brucine (8trychnidin-10-one, 2,3-dimethoxy-)
2-Butanone peroxide (Methyl ethyl ketone, peroxide)
Butyl benzyl phthalate (1,2-Benzenedicarboxylic acid, butyl phenylmethyl ester)
2-sec-Butyl-4,6-dinitrophenol (DNBP) (Phenol, 2,4-dinitro-6-(1-methylpropyl-))
Cadmium and compounds, N.O.S.*
Calcium chromate (Chromic acid, calcium salt)
Calcium cyanide

* The abbreviation N.O.S. (not otherwise specified) signifies those members of the general class not specifically listed by name in this appendix.

Carbon disulfide (Carbon bisulfide)
Carbon oxyfluoride (Carbonyl fluoride)
Chloral (Acetaldehyde, trichloro-)
Chlorambucil (Butanoic acid, 4-[bis(2-chloroethyl)amino]benzene-)
Chlordane (alpha and gamma isomers) (4,7-Methanoindan, 1,2,4,5,6,7,8,8-octachloro-3,4,7,7a-tetrahydro-) (alpha and gamma isomers)
Chlorinated benzenes, N.O.S.*
Chlorinated ethane, N.O.S.*
Chlorinated fluorocarbons, N.O.S.*
Chlorinated naphthalene, N.O.S.*
Chlorinated phenol, N.O.S.*
Chloroacetaldehyde (Acetaldehyde, chloro-)
Chloroalkyl ethers, N.O.S.*
p-Chloroaniline (Benzenamine, 4-chloro-)
Chlorobenzene (Benzene, chloro-)
Chlorobenzilate (Benzenoacetic acid, 4-chloro-alpha-(4-chlorophenyl)-alpha-hydroxy-, ethyl ester)
2-Chloro-1, 3-butadiene (chloroprene)
p-Chloro-m-cresol (Phenol, 4-chloro-3-methyl)
1-Chloro-2,3-epoxypropane (Oxirane, 2-(chloromethyl-))
2-Chloroethyl vinyl ether (Ethene, (2-chloroethoxy-))
Chloroform (Methane, trichloro-)
Chloromethane (Methyl chloride)
Chloromethyl methyl ether (Methane, chloromethoxy-)
2-Chloronaphthalene (Naphthalene, beta-chloro-)
2-Chlorophenol (Phenol, o-chloro-)
1-(o-Chlorophenyl)thiourea (Thiourea, (2-chlorophenyl-))
3-Chloropropene (allyl chloride)
3-Chloropropionitrile (Propanenitrile, 3-chloro-)
Chromium and compounds, N.O.S.*
Chrysene (1,2-Benzphenanthrene)
Citrus red No. 2 (2-Naphthol, 1-[(2,6-dimethoxyphenyl)azo]-)
Coal tars
Copper cyanide
Creosote (Creosote, wood)
Cresols (Cresylic acid) (Phenol, methyl-)
Crotonaldehyde (2-Butenal)
Cyanides (soluble salts and complexes), N.O.S.*
Cyanogen (Ethanedinitrile)
Cyanogen bromide (Bromine cyanide)
Cyanogen chloride (Chlorine cyanide)
Cycasin (beta-D-Glucopyranoside, (methyl-ONN-azoxy)methyl-)
2-Cyclohexyl-4,6-dinitrophenol (Phenol, 2-cyclohexyl-4,6-dinitro-)
Cyclophosphamide (2H-1,3,2-Oxazaphosphorine, [bis(2-chloroethyl)amino]-tetrahydro-, 2-oxide)
Daunomycin (5,12-Naphthacenedione, (8S-cis)-8-acetyl-10-[(3-amino-2,3,6-trideoxy)-alpha-L-lyxo-hexopyranosyl]oxy)-7,8,9,10-tetrahydro-6,8,11-trihydroxy-1-methoxy-)

DDD (Dichlorodiphenyldichloroethane) (Ethane, 1,1-dichloro-2,2-bis(p-chlorophenyl-))
DDE (Ethylene, 1,1-dichloro-2,2-bis(4-chlorophenyl-))
DDT (Dichlorodiphenyltrichloroethane) (Ethane, 1,1,1-trichloro-2,2-bis(p-chlorophenyl-))
Diallate (S-(2,3-dichloroallyl) diisopropylthiocarbamate)
Dibenz[a,h]acridine (1,2,5,6-Dibenzacridine)
Dibenz[a,j]acridine (1,2,7,8-Dibenzacridine)
Dibenz[a,h]anthracene (1,2,5,6-Dibenzanthracene)
7H-Dibenz[c,g]carbazole (3,4,5,6-Dibenzcarbazole)
Dibenzo[a,e]pyrene (1,2,4,5-Dibenzopyrene)
Dibenzo[a,h]pyrene (1,2,5,6-Dibenzopyrene)
Dibenzo[a,l]pyrene (1,2,7,8-Dibenzopyrene)
1,2-Dibromo-3-chloropropane (Propane, 1,2-dibromo-3-chloro-)
1,2-Dibromoethane (Ethylene dibromide)
Dibromomethane (Methylene bromide)
Di-n-butyl phthalate (1,2-Benzenedicarboxylic acid, dibutyl ester)
o-Dichlorobenzene (Benzene, 1,2-dichloro-)
m-Dichlorobenzene (Benzene, 1,3-dichloro-)
p-Dichlorobenzene (Benzene, 1,4-dichloro-)
Dichlorobenzene, N.O.S.* (Benzene, dichloro-, N.O.S.*)
3,3'-Dichlorobenzidine ([1,1'-Biphenyl]-4,4'-diamine, 3,3'-dichloro-)
1,4-Dichloro-2-butene (2-Butene, 1,4-dichloro-)
Dichlorodifluoromethane (Methane, dichlorodifluoro-)
1,1-Dichloroethane (Ethylidene dichloride)
1,2-Dichloroethane (Ethylene dichloride)
trans-1,2-Dichloroethene (1,2-Dichloroethylene)
Dichloroethylene, N.O.S.* (Ethene, dichloro-, N.O.S.*)
1,1-Dichloroethylene (Ethene, 1,1-dichloro-)
Dichloromethane (Methylene chloride)
2,4-Dichlorophenol (Phenol, 2,4-dichloro-)
2,6-Dichlorophenol (Phenol, 2,6-dichloro-)
2,4-Dichlorophenoxyacetic acid (2,4-D), salts and esters (Acetic acid, 2,4-dichlorophenoxy-, salts and esters)
Dichlorophenylarsine (Phenyl dichloroarsine)
Dichloropropane, N.O.S.* (Propane, dichloro-, N.O.S.*)
1,2-Dichloropropane (Propylene dichloride)
Dichloropropanol, N.O.S.* (Propanol, dichloro-, N.O.S.*)
Dichloropropene, N.O.S.* (Propene, dichloro-, N.O.S.*)
1,3-Dichloropropene (1-Propene, 1,3-dichloro-)
Dieldrin (1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octa-hydro-endo,exo-1,4,5,8-Dimethanonaphthalene)
1,2,3,4-Diepoxybutane (2,2'-Bioxirane)
Diethylarsine (Arsine, diethyl-)

N,N-Diethylhydrazine (Hydrazine, 1,2-diethyl)
 O,O-Diethyl 8-methyl ester of phosphorodithioic acid (Phosphorodithioic acid, O,O-diethyl 8-methyl ester)
 O,O-Diethylphosphoric acid, O-p-nitrophenyl ester (Phosphoric acid, diethyl p-nitrophenyl ester)
 Diethyl phthalate (1,2-Benzenedicarboxylic acid, diethyl ester)
 O,O-Diethyl O-2-pyrazinyl phosphorothioate (Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester)
 Diethylstilbesterol (4,4'-Stilbenediol, alpha, alpha-diethyl, bis(di-hydrogen phosphate, (E)-))
 Dihydroazafrole (Benzene, 1,3-methylene-dioxy-4-propyl-)
 3,4-Dihydroxy-alpha-(methylamino)methyl benzyl alcohol (1,2-Benzenediol, 4-(1-hydroxy-2-(methylamino)ethyl)-)
 Diisopropylfluorophosphate (DFP) (Phosphorofluoric acid, bis(1-methylethyl) ester)
 Dimethoate (Phosphorodithioic acid, O,O-dimethyl 8-[2-(methylamino)-2-oxoethyl] ester)
 3,3'-Dimethoxybenzidine ((1,1'-Biphenyl)-4,4'-diamine, 3,3'-dimethoxy-)
 p-Dimethylaminoazobenzene (Benzenamine, N,N-dimethyl-4-(phenylazo)-)
 7,12-Dimethylbenz[a]anthracene (1,2-Benzanthracene, 7,12-dimethyl-)
 3,3'-Dimethylbenzidine ((1,1'-Biphenyl)-4,4'-diamine, 3,3'-dimethyl-)
 Dimethylcarbamoyl chloride (Carbamoyl chloride, dimethyl-)
 1,1-Dimethylhydrazine (Hydrazine, 1,1-dimethyl-)
 1,2-Dimethylhydrazine (Hydrazine, 1,2-dimethyl-)
 3,3-Dimethyl-1-(methylthio)-2-butanone, O-[(methylamino) carbonyl]oxime (Thiofanox)
 alpha, alpha-Dimethylphenethylamine (Ethanamine, 1,1-dimethyl-2-phenyl-)
 2,4-Dimethylphenol (Phenol, 2,4-dimethyl-)
 Dimethyl phthalate (1,2-Benzenedicarboxylic acid, dimethyl ester)
 Dimethyl sulfate (Sulfuric acid, dimethyl ester)
 Dinitrobenzene, N.O.S.* (Benzene, dinitro, N.O.S.*)
 4,6-Dinitro-o-cresol and salts (Phenol, 2,4-dinitro-6-methyl-, and salts)
 2,4-Dinitrophenol (Phenol, 2,4-dinitro-)
 2,4-Dinitrotoluene (Benzene, 1-methyl-2,4-dinitro-)
 2,6-Dinitrotoluene (Benzene, 1-methyl-2,6-dinitro-)
 Di-n-octyl phthalate (1,2-Benzenedicarboxylic acid, dioctyl ester)
 1,4-Dioxane (1,4-Diethylene oxide)
 Diphenylamine (Benzenamine, N-phenyl-)
 1,2-Diphenylhydrazine (Hydrazine, 1,2-diphenyl-)

Di-n-propylnitrosamine (N-Nitroso-di-n-propylamine)
 Disulfoton (O,O-diethyl 8-[2-(ethylthio)ethyl] phosphorodithioate)
 2,4-Dithiobiuret (Thioimidodicarbonic diamide)
 Endosulfan (5-Norbornene, 2,3-dimethanol, 1,4,5,6,7,7-hexachloro-, cyclic sulfite)
 Endrin and metabolites (1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo,endo-1,4:5,8-dimethanonaphthalene, and metabolites)
 Ethyl carbamate (Urethan) (Carbamic acid, ethyl ester)
 Ethyl cyanide (propanenitrile)
 Ethylenebisdithiocarbamic acid, salts and esters (1,2-Ethanedithiolbis(carbamodithioic acid, salts and esters)
 Ethylenimine (Aziridine)
 Ethylene oxide (Oxirane)
 Ethylenethiourea (2-Imidazolidinethione)
 Ethyl methacrylate (2-Propenoic acid, 2-methyl-, ethyl ester)
 Ethyl methanesulfonate (Methanesulfonic acid, ethyl ester)
 Fluoranthene (Benzo[j,k]fluorene)
 Fluorine
 2-Fluoroacetamide (Acetamide, 2-fluoro-)
 Fluoroacetic acid, sodium salt (Acetic acid, fluoro-, sodium salt)
 Formaldehyde (Methylene oxide)
 Formic acid (Methanoic acid)
 Glycidylaldehyde (1-Propanol-2,3-epoxy)
 Halomethane, N.O.S.*
 Heptachlor (4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-)
 Heptachlor epoxide (alpha, beta, and gamma isomers) (4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-2,3-epoxy-3a,4,7,7-tetrahydro-, alpha, beta, and gamma isomers)
 Hexachlorobenzene (Benzene, hexachloro-)
 Hexachlorobutadiene (1,3-Butadiene, 1,1,2,3,4,4-hexachloro-)
 Hexachlorocyclohexane (all isomers) (Lindane and isomers)
 Hexachlorocyclopentadiene (1,3-Cyclopentadiene, 1,2,3,4,5,6-hexachloro-)
 Hexachlorodibenzo-p-dioxins
 Hexachlorodibenzofurans
 Hexachloroethane (Ethane, 1,1,1,2,2,2-hexachloro-)
 1,2,3,4,10,10-Hexachloro-1,4,4a,5,6,8a-hexahydro-1,4:5,8-endo,endo-dimethanonaphthalene (Hexachlorohexahydro-endo,endo-dimethanonaphthalene)
 Hexachlorophene (2,2'-Methylenebis(3,4,6-trichlorophenol))
 Hexachloropropene (1-Propene, 1,1,2,3,3,3-hexachloro-)
 Hexaethyl tetraphosphate (Tetraphosphoric acid, hexaethyl ester)
 Hydrazine (Diamine)
 Hydrocyanic acid (Hydrogen cyanide)
 Hydrofluoric acid (Hydrogen fluoride)

Hydrogen sulfide (Sulfur hydride)
 Hydroxydimethylarsine oxide (Caeodylic acid)
 Indeno(1,2,3-cd)pyrene (1,10-(1,3-phenylene)pyrene)
 Iodomethane (Methyl iodide)
 Iron dextran (Ferric dextran)
 Isocyanic acid, methyl ester (Methyl isocyanate)
 Isobutyl alcohol (1-Propanol, 2-methyl-)
 Isosafrole (Benzene, 1,2-methylenedioxy-4-allyl-)
 Kepone (Decachlorooctahydro-1,3,4-Methano-2H-cyclobuta[cd]pentalen-2-one)
 Lasiocarpine (2-Butenoic acid, 2-methyl-, 7-[(2,3-dihydroxy-2-(1-methoxyethyl)-3-methyl-1-oxobutoxy)methyl]-2,3,5,7a-tetrahydro-1H-pyrrrolizin-1-yl ester)
 Lead and compounds, N.O.S.*
 Lead acetate (Acetic acid, lead salt)
 Lead phosphate (Phosphoric acid, lead salt)
 Lead subacetate (Lead, bis(acetato-O)tetrahydroxytri-)
 Maleic anhydride (2,5-Furandione)
 Maleic hydrazide (1,2-Dihydro-3,6-pyridazinedione)
 Malononitrile (Propanedinitrile)
 Melphalan (Alanine, 3-[p-bis(2-chloroethyl)amino]phenyl-, L-)
 Mercury fulminate (Fulminic acid, mercury salt)
 Mercury and compounds, N.O.S.*
 Methacrylonitrile (2-Propenenitrile, 2-methyl-)
 Methanethiol (Thiomethanol)
 Methapyriline (Pyridine, 2-[(2-dimethylamino)ethyl]-2-thenylamino-)
 Metholmyl (Acetimidic acid, N-[(methylcarbamoyl)oxy]thio-, methyl ester)
 Methoxychlor (Ethane, 1,1,1-trichloro-2,2-bis(p-methoxyphenyl)-)
 2-Methylaziridine (1,2-Propylenimine)
 3-Methylcholanthrene (Benz[*a*]aceanthrylene, 1,2-dihydro-3-methyl-)
 Methyl chlorocarbonate (Carbonochloridic acid, methyl ester)
 4,4'-Methylenebis(2-chloroaniline) (Benzenamine, 4,4'-methylenebis(2-chloro-))
 Methyl ethyl ketone (MEK) (2-Butanone)
 Methyl hydrazine (Hydrazine, methyl-)
 2-Methylactonitrile (Propanenitrile, 2-hydroxy-2-methyl-)
 Methyl methacrylate (2-Propenoic acid, 2-methyl-, methyl ester)
 Methyl methanesulfonate (Methanesulfonic acid, methyl ester)
 2-Methyl-2-(methylthio)propionaldehyde-o-(methylcarbonyl) oxime (Propanal, 2-methyl-2-(methylthio)-, O-[(methylamino)carbonyl]oxime)
 N-Methyl-N-nitro-N-nitrosoguanidine (Guanidine, N-nitroso-N-methyl-N-nitro-)
 Methyl parathion (O,O-dimethyl O-(4-nitrophenyl) phosphorothioate)

Methylthiouracil (4-1H-Pyrimidinone, 2,3-dihydro-6-methyl-2-thioxo-)
 Mustard gas (Sulfide, bis(2-chloroethyl-))
 Naphthalene
 1,4-Naphthoquinone (1,4-Naphthalenedione)
 1-Naphthylamine (alpha-Naphthylamine)
 2-Naphthylamine (beta-Naphthylamine)
 1-Naphthyl-2-thiourea (Thiourea, 1-naphthalenyl-)
 Nickel and compounds, N.O.S.*
 Nickel carbonyl (Nickel tetracarbonyl)
 Nickel cyanide (Nickel (II) cyanide)
 Nicotine and salts (Pyridine, (8)-3-(1-methyl-2-pyrrolidinyl)-, and salts)
 Nitric oxide (Nitrogen (II) oxide)
 p-Nitroaniline (Benzenamine, 4-nitro-)
 Nitrobenzine (Benzene, nitro-)
 Nitrogen dioxide (Nitrogen (IV) oxide)
 Nitrogen mustard and hydrochloride salt (Ethanamine, 2-chloro-, N-(2-chloroethyl)-N-methyl-, and hydrochloride salt)
 Nitrogen mustard N-Oxide and hydrochloride salt (Ethanamine, 2-chloro-, N-(2-chloroethyl)-N-methyl-, and hydrochloride salt)
 Nitroglycerine (1,2,3-Propanetriol, trinitrate)
 4-Nitrophenol (Phenol, 4-nitro-)
 4-Nitroquinoline-1-oxide (Quinoline, 4-nitro-1-oxide-)
 Nitrosamine, N.O.S.*
 N-Nitrosodi-n-butylamine (1-Butanamine, N-butyl-N-nitroso-)
 N-Nitrosodietanolamine (Ethanol, 2,2-(nitrosoimino)bis-)
 N-Nitrosodiethylamine (Ethanamine, N-ethyl-N-nitroso-)
 N-Nitrosodimethylamine (Dimethylnitrosamine)
 N-Nitroso-N-ethylurea (Carbamide, N-ethyl-N-nitroso-)
 N-Nitrosomethylethylamine (Ethanamine, N-methyl-N-nitroso-)
 N-Nitroso-N-methylurea (Carbamide, N-methyl-N-nitroso-)
 N-Nitroso-N-methylurethane (Carbamic acid, methylnitroso-, ethyl ester)
 N-Nitrosomethylvinylamine (Ethanamine, N-methyl-N-nitroso-)
 N-Nitrosomorpholine (Morpholine, N-nitroso-)
 N-Nitrosornicotine (Nicotine, N-nitroso-)
 N-Nitroso-piperidine (Pyridine, hexahydro-, N-nitroso-)
 Nitrosopyrrolidine (Pyrrole, tetrahydro-, N-nitroso-)
 N-Nitrososarcosine (Sarcosine, N-nitroso-)
 5-Nitro-o-toluidine (Benzenamine, 2-methyl-5-nitro-)
 Octamethylpyrophosphoramide (Diphosphoramide, octamethyl-)
 Osmium tetroxide (Osmium (VIII) oxide)
 7-Oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid (Endothal)

Paraldehyde (1,3,5-Trioxane, 2,4,6-trimethyl-)
 Parathion (Phosphorothioic acid, O,O-diethyl O-(p-nitrophenyl) ester)
 Pentachlorobenzene (Benzene, pentachloro-)
 Pentachlorodibenzo-p-dioxins
 Pentachlorodibenzofurans
 Pentachloroethane (Ethane, pentachloro-)
 Pentachloronitrobenzene (PCNB) (Benzene, pentachloronitro-)
 Pentachlorophenol (Phenol, pentachloro-)
 Phenacetin (Acetamide, N-(4-ethoxyphenyl)-)
 Phenol (Benzene, hydroxy-)
 Phenylenediamine (Benzenediamine)
 Phenylmercury acetate (Mercury, acetatophenyl-)
 N-Phenylthiourea (Thiourea, phenyl-)
 Phosgene (Carbonyl chloride)
 Phosphine (Hydrogen phosphide)
 Phosphorodithioic acid, O,O-diethyl S-[(ethylthio)methyl] ester (Phorate)
 Phosphorothioic acid, O,O-dimethyl O-[(dimethylamino)sulfonyl]phenyl ester (Famphur)
 Phthalic acid esters, N.O.S.* (Benzene, 1,2-dicarboxylic acid, esters, N.O.S.*)
 Phthalic anhydride (1,2-Benzenedicarboxylic acid anhydride)
 2-Picoline (Pyridine, 2-methyl-)
 Polychlorinated biphenyl, N.O.S.*
 Potassium cyanide
 Potassium silver cyanide (Argentate(1-), dicyano-, potassium)
 Pronamide (3,5-Dichloro-N-(1,1-dimethyl-2-propynyl)benzamide)
 1,3-Propane sultone (1,2-Oxathiolane, 2,2-dioxide)
 n-Propylamine (1-Propanamine)
 Propylthiouracil (Undecamethylenediamine, N,N'-bis(2-chlorobenzyl)-, dihydrochloride)
 2-Propyn-1-ol (Propargyl alcohol)
 Pyridine
 Reserpine (Yohimban-16-carboxylic acid, 11,17-dimethoxy-18-[(3,4,5-trimethoxybenzoyl)oxy]-, methyl ester)
 Resorcinol (1,3-Benzenediol)
 Saccharin and salts (1,2-Benzisothiazolin-3-one, 1,1-dioxide, and salts)
 Saffrole (Benzene, 1,2-methylenedioxy-4-allyl-)
 Selenious acid (Selenium dioxide)
 Selenium and compounds, N.O.S.*
 Selenium sulfide (Sulfur selenide)
 Selenourea (Carbamimidoseleonic acid)
 Silver and compounds, N.O.S.*
 Silver cyanide
 Sodium cyanide
 Streptozotocin (D-Glucopyranose, 2-deoxy-2-(3-methyl-3-nitrosoureido)-)
 Strontium sulfide
 Strychnine and salts (Strychnidin-10-one, and salts)
 1,2,4,5-Tetrachlorobenzene (Benzene, 1,2,4,5-tetrachloro-)

2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) (Dibenzo-p-dioxin, 2,3,7,8-tetrachloro-)
 Tetrachlorodibenzo-p-dioxins
 Tetrachlorodibenzofurans
 Tetrachloroethane, N.O.S.* (Ethane, tetrachloro-, N.O.S.*)
 1,1,1,2-Tetrachloroethane (Ethane, 1,1,1,2-tetrachloro-)
 1,1,2,2-Tetrachloroethane (Ethane, 1,1,2,2-tetrachloro-)
 Tetrachloroethane (Ethene, 1,1,2,2-tetrachloro-)
 Tetrachloromethane (Carbon tetrachloride)
 2,3,4,6-Tetrachlorophenol (Phenol, 2,3,4,6-tetrachloro-)
 Tetraethyldithiopyrophosphate (Dithiopyrophosphoric acid, tetraethyl-ester)
 Tetraethyl lead (Plumbane, tetraethyl-)
 Tetraethylpyrophosphate (Pyrophosphoric acid, tetraethyl ester)
 Tetranitromethane (Methane, tetranitro-)
 Thallium and compounds, N.O.S.*
 Thallous oxide (Thallium (III) oxide)
 Thallium (I) acetate (Acetic acid, thallium (I) salt)
 Thallium (I) carbonate (Carbonic acid, dithallium (I) salt)
 Thallium (I) chloride
 Thallium (I) nitrate (Nitric acid, thallium (I) salt)
 Thallium selenite
 Thallium (I) sulfate (Sulfuric acid, thallium (I) salt)
 Thioacetamide (Ethanethioamide)
 Thiosemicarbazide (Hydrazinecarbothioamide)
 Thiourea (Carbamide thio-)
 Thiram (Bis(dimethylthiocarbamoyl) disulfide)
 Toluene (Benzene, methyl-)
 Toluenediamine (Diaminotoluene)
 o-Toluidine hydrochloride (Benzenamine, 2-methyl-, hydrochloride)
 Tolyene diisocyanate (Benzene, 1,3-diisocyanatomethyl-)
 Toxaphene (Camphene, octachloro-)
 Tribromomethane (Bromoform)
 1,2,4-Trichlorobenzene (Benzene, 1,2,4-trichloro-)
 1,1,1-Trichloroethane (Methyl chloroform)
 1,1,2-Trichloroethane (Ethane, 1,1,2-trichloro-)
 Trichloroethene (Trichloroethylene)
 Trichloromethanethiol (Methanethiol, trichloro-)
 Trichloromonofluoromethane (Methane, trichlorofluoro-)
 2,4,5-Trichlorophenol (Phenol, 2,4,5-trichloro-)
 2,4,6-Trichlorophenol (Phenol, 2,4,6-trichloro-)
 2,4,5-Trichlorophenoxyacetic acid (2,4,5-T) (Acetic acid, 2,4,5-trichlorophenoxy-)
 2,4,5-Trichlorophenoxypropionic acid (2,4,5-TP) (Silvex) (Propionic acid, 2-(2,4,5-trichlorophenoxy)-)

Trichloropropane, N.O.S.* (Propane, trichloro-, N.O.S.*)
 1,2,3-Trichloropropane (Propane, 1,2,3-trichloro-)
 O,O,O-Triethyl phosphorothioate (Phosphorothioic acid, O,O,O-triethyl ester)
 sym-Trinitrobenzene (Benzene, 1,3,5-trinitro-)
 Tris(1-aziridinyl) phosphine sulfide (Phosphine sulfide, tris(1-aziridinyl)-)
 Tris(2,3-dibromopropyl) phosphate (1-Propanol, 2,3-dibromo-, phosphate)
 Trypan blue (2,7-Naphthalenedisulfonic acid, 3,3'-[(3,3'-dimethyl(1,1'-biphenyl)-4,4'-diyl)bis(azo)]bis(5-amino-4-hydroxy-, tetrasodium salt)
 Uracil mustard (Uracil 5-bis(2-chloroethyl)amino-)
 Vanadic acid, ammonium salt (ammonium vanadate)
 Vanadium pentoxide (Vanadium (V) oxide)
 Vinyl chloride (Ethene, chloro-)
 Zinc cyanide
 Zinc phosphide

[46 FR 27477, May 20, 1981; 46 FR 29708, June 3, 1981, as amended at 49 FR 5312, Feb. 10, 1984; 50 FR 2000, Jan. 14, 1985]

EFFECTIVE DATE NOTE: At 50 FR 2000, Jan. 14, 1985, Part 261, App. VIII was amended by adding the entries for Hexachlorodibenzo-p-dioxins, Hexachlorodibenzofurans, Pentachlorodibenzo-p-dioxins, Pentachlorodibenzofurans, Tetrachlorodibenzo-p-dioxins, and Tetrachlorodibenzofurans, effective July 15, 1985.

APPENDIX IX—WASTES EXCLUDED UNDER §§ 260-20 AND 260.22

TABLE 1—WASTES EXCLUDED FROM NON-SPECIFIC SOURCES

Facility	Address	Waste description
Key-Fries, Inc.	Stoney Point, NY.	Biological aeration lagoon sludge and filter press sludge generated after September 21, 1984, which contain EPA Hazardous Waste Nos. F003 and F005 as well as that disposed of in a holding lagoon as of September 21, 1984.
Metropolitan Sewer District of Greater Cincinnati.	Cincinnati, OH.	Sludged bottom ash sludge (approximately 25,000 cubic yards), contained in the North Lagoon, on September 21, 1984, which contains EPA Hazardous Waste Nos. F001, F002, F003, F004, and F006.

TABLE 2—WASTES EXCLUDED FROM SPECIFIC SOURCES

Facility	Address	Waste description
(Reserved)		

TABLE 3—WASTES EXCLUDED FROM COMMERCIAL CHEMICAL PRODUCTS, OFF-SPECIFICATION SPECIES, CONTAINER RESIDUES, AND SOIL RESIDUES THEREOF

Facility	Address	Waste description
Union Carbide Corp.	Tulsa, LA.	Contaminated soil (approximately 11,000 cubic yards), which contains acrolein in concentrations of less than 9 ppm.

[49 FR 37070, Sept. 21, 1984]

APPENDIX X—METHOD OF ANALYSIS FOR CHLORINATED DIBENZO-P-DIOXINS AND -DIBENZOFURANS 1 2 2 4

Method 8280

1. Scope and Application

¹This method is appropriate for the analysis of tetra-, penta-, and hexachlorinated dibenzo-p-dioxins and -dibenzofurans.

²Analytical protocol for determination of TCDDs in phenolic chemical wastes and soil samples obtained from the proximity of chemical dumps. T.O. Tierman and M. Taylor. Brehm Laboratory, Wright State University, Dayton, OH 45435.

³Analytical protocol for determination of chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans in river water. T.O. Tierman and M. Taylor. Brehm Laboratory, Wright State University, Dayton, OH 45435.

⁴In general, the techniques that should be used to handle these materials are those which are followed for radioactive or infectious laboratory materials. Assistance in evaluating laboratory practices may be obtained from industrial hygienists and persons specializing in safe laboratory practices. Typical infectious waste incinerators are probably not satisfactory devices for disposal of materials highly contaminated with CDDs or CDFs. Safety instructions are outlined in EPA Test Method 613(4.0).

See also: 1) "Program for monitoring potential contamination in the laboratory following the handling and analyses of chlorinated dibenzo-p-dioxins and dibenzofurans" by F. D. Hileman et al., *In: Human and En-*

Continued

1.1 This method measures the concentration of chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans in chemical wastes including still bottoms, filter aids, sludges, spent carbon, and reactor residues, and in soils.

1.2 The sensitivity of this method is dependent upon the level of interferences.

1.3 This method is recommended for use only by analysts experienced with residue analysis and skilled in mass spectral analytical techniques.

1.4 Because of the extreme toxicity of these compounds, the analyst must take necessary precautions to prevent exposure to himself, or to others, of materials known or believed to contain CDDs or CDFs.

2. Summary of the Method

2.1 This method is an analytical extraction cleanup procedure, and capillary column gas chromatograph-low resolution mass spectrometry method, using capillary column GC/MS conditions and internal standard techniques, which allow for the measurement of PCDDs and PCDFs in the extract.

2.2 If interferences are encountered, the method provides selected general purpose cleanup procedures to aid the analyst in their elimination.

3. Interferences

3.1 Solvents, reagents, glassware, and other sample processing hardware may yield discrete artifacts and/or elevated baselines causing misinterpretation of gas chromatograms. All of these materials must be demonstrated to be free from interferences under the conditions of the analysis by running method blanks. Specific selection of reagents and purification of solvents by distillation in all-glass systems may be required.

3.2 Interferences co-extracted from the samples will vary considerably from source to source, depending upon the diversity of the industry being sampled. PCDD is often associated with other interfering chlorinated compounds such as PCB's which may be at concentrations several orders of magnitude higher than that of PCDD. While general cleanup techniques are provided as part of this method, unique samples may require additional cleanup approaches to achieve the sensitivity stated in Table 1.

3.3 The other isomers of tetrachlorodibenzo-p-dioxin may interfere with the measurement of 2,3,7,8-TCDD. Capillary column gas chromatography is required to resolve

those isomers that yield virtually identical mass fragmentation patterns.

4. Apparatus and Materials

4.1. Sampling equipment for discrete or composite sampling.

4.1.1 Grab sample bottle—amber glass, 1-liter or 1-quart volume. French or Boston Round design is recommended. The container must be washed and solvent rinsed before use to minimize interferences.

4.1.2. Bottle caps—threaded to screw on to the sample bottles. Caps must be lined with Teflon. Solvent washed foil, used with the shiny side towards the sample, may be substituted for the Teflon if sample is not corrosive.

4.1.3. Compositing equipment—automatic or manual composing system. No tygon or rubber tubing may be used, and the system must incorporate glass sample containers for the collection of a minimum of 250 ml. Sample containers must be kept refrigerated after sampling.

4.2 Water bath—heated, with concentric ring cover, capable of temperature control ($\pm 2^\circ\text{C}$). The bath should be used in a hood.

4.3 Gas chromatograph/mass spectrometer data system.

4.3.1 Gas chromatograph: An analytical system with a temperature-programmable gas chromatograph and all required accessories including syringes, analytical columns, and gases.

4.3.2 Column: SP-2250 coated on a 30 m long \times 0.25 mm I.D. glass column (Supelco No. 2-3714 or equivalent). Glass capillary column conditions: Helium carrier gas at 30 cm/sec linear velocity run splitless. Column temperature is 210°C .

4.3.3 Mass spectrometer: Capable of scanning from 35 to 450 amu every 1 sec or less, utilizing 70 volts (nominal) electron energy in the electron impact ionization mode and producing a mass spectrum which meets all the criteria in Table 2 when 50 ng of decafluorotriphenyl-phosphine (DFTPP) is injected through the GC inlet. The system must also be capable of selected ion monitoring (SIM) for at least 4 ions simultaneously, with a cycle time of 1 sec or less. Minimum integration time for SIM is 100 ms. Selected ion monitoring is verified by injecting .015 ng of TCDD Cl^{31} to give a minimum signal to noise ratio of 5 to 1 at mass 328.

4.3.4 GC/MS interface: Any GC-to-MS interface that gives acceptable calibration points at 50 ng per injection for each compound of interest and achieves acceptable tuning performance criteria (see Sections 6.1-6.3) may be used. GC-to-MS interfaces constructed of all glass or glass-lined materials are recommended. Glass can be deactivated by silanizing with dichlorodimethylsilane. The interface must be capable of

transporting at least 10 ng of the compounds of interest from the GC to the MS.

4.3.5 Data system: A computer system must be interfaced to the mass spectrometer. The system must allow the continuous acquisition and storage on machine-readable media of all mass spectra obtained throughout the duration of the chromatographic program. The computer must have software that can search any GC/MS data file for ions of a specific mass and that can plot such ion abundances versus time or scan number. This type of plot is defined as an Extracted Ion Current Profile (EICP). Software must also be able to integrate the abundance, in any EICP, between specified time or scan number limits.

4.4 Pipettes—Disposable, Pasteur, 150 mm long \times 5 mm ID (Fisher Scientific Co., No. 13-678-6A or equivalent).

4.5 Flint glass bottle (Teflon-lined screw cap).

4.6 Reacti-vial (silanized) (Pierce Chemical Co.).

5. Reagents

5.1 Potassium hydroxide (ACS), 2% in distilled water.

5.2 Sulfuric acid (ACS), concentrated.

5.3 Methylene chloride, hexane, benzene, petroleum ether, methanol, tetradecane-petroleum quality or equivalent.

5.4 Prepare stock standard solutions of TCDD and ^{31}Cl -TCDD (molecular weight 328) in a glove box. The stock solutions are stored in a glovebox, and checked frequently for signs of degradation or evaporation, especially just prior to the preparation of working standards.

5.5 Alumina-basis, Woelm; 80/200 mesh. Before use activate overnight at 600°C , cool to room temperature in a desiccator.

5.6 Prepurified nitrogen gas

6.0 Calibration

6.1 Before using any cleanup procedure, the analyst must process a series of calibration standards through the procedure to validate elution patterns and the absence of interferences from reagents.

6.2 Prepare GC/MS calibration standards for the internal standard technique that will allow for measurement of relative response factors of at least three CDD/ ^{31}Cl -CDD ratios. Thus, for TCDDs, at least three TCDD/ ^{31}Cl -TCDD and TCDF/ ^{31}Cl -TCDF must be determined.* The ^{31}Cl -

* ^{31}Cl -labelled 2,3,7,8-TCDD and 2,3,7,8-TCDF are available from K.O.R. Isotopes, and Cambridge Isotopes, Inc., Cambridge, MA. Proper standardization requires the use of a specific labelled isomer for each congener to be determined. However, the only labelled isomers readily available are ^{31}Cl -2,3,7,8-TCDD and ^{31}Cl -2,3,7,8-TCDF. This method therefore uses these isomers as surrogates for the CDDs and CDFs. When

TCDD/ ^{31}Cl concentration in the standard should be fixed and selected to yield a reproducible response at the most sensitive setting of the mass spectrometer. Response factors for PCDD and HxCDD may be determined by measuring the response of the tetrachloro-labelled compounds relative to that of the unlabelled 1,2,3,4- or 2,3,7,8-TCDD, 1,2,3,4,7-PCDD or 1,2,3,4,7,8-HxCDD, which are commercially available.*

6.3 Assemble the necessary GC/MS apparatus and establish operating parameters equivalent to those indicated in Section 11.1 of this method. Calibrate the GC/MS system according to Eichelberger, et al. (1978) by the use of decafluorotriphenyl phosphine (DFTPP). By injecting calibration standards, establish the response factors for CDDs vs. ^{31}Cl -TCDD, and for CDFs vs. ^{31}Cl -TCDF. The detection limit provided in Table 1 should be verified by injecting .015 ng of ^{31}Cl -TCDD which should give a minimum signal to noise ratio of 5 to 1 at mass 328.

7. Quality Control

7.1 Before processing any samples, the analyst should demonstrate through the analysis of a distilled water method blank, that all glassware and reagents are interference-free. Each time a set of samples is extracted, or there is a change in reagents, a method blank should be processed as a safeguard against laboratory contamination.

7.2 Standard quality assurance practices must be used with this method. Field replicates must be collected to measure the precision of the sampling technique. Laboratory replicates must be analyzed to establish the precision of the analysis. Fortified samples must be analyzed to establish the accuracy of the analysis.

8. Sample Collection, Preservation, and Handling

8.1 Grab and composite samples must be collected in glass containers. Conventional sampling practices should be followed, except that the bottle must not be prewashed with sample before collection. Composite samples should be collected in glass containers in accordance with the requirements of the RCRA program. Sampling equipment must be free of tygon and other potential sources of contamination.

8.2 The samples must be iced or refrigerated from the time of collection until ex-

other labelled CDDs and CDFs are available, their use will be required.

* This procedure is adopted because standards are not available for most of the CDDs and CDFs, and assumes that all the congeners will show the same response as the unlabelled congener used as a standard. Although this assumption may not be true in all cases, the error will be small.

Environmental Risks of Chlorinated Dioxins and Related Compounds, R.E. Tucker, et al., eds., Plenum Publishing Corp., 1983. 2) Safety procedures outlined in EPA Method 813, Federal Register volume 44, No. 233, December 3, 1979.

traction. Chemical preservatives should not be used in the field unless more than 24 hours will elapse before delivery to the laboratory. If an aqueous sample is taken and the sample will not be extracted within 48 hours of collection, the sample should be adjusted to a pH range of 6.0-8.0 with sodium hydroxide or sulfuric acid.

8.3 All samples must be extracted within 7 days and completely analyzed within 30 days of collection.

9. Extraction and Cleanup Procedures

9.1 Use an aliquot of 1-10 g sample of the chemical waste or soil to be analyzed. Soils should be dried using a stream of prepurified nitrogen and pulverized in a ball-mill or similar device. Perform this operation in a clear area with proper hood space. Transfer the sample to a tared 125 ml flint glass bottle (Teflon-lined screw cap) and determine the weight of the sample. Add an appropriate quantity of ¹⁴C-labelled 2,3,7,8-TCDD (adjust the quantity according to the required minimum detectable concentration), which is employed as an internal standard.

9.2 Extraction

9.2.1 Extract chemical waste samples by adding 10 ml methanol, 40 ml petroleum ether, 50 ml doubly distilled water, and then shaking the mixture for 2 minutes. Tars should be completely dissolved in any of the recommended neat solvents. Activated carbon samples must be extracted with benzene using method 3540 in SW-846 (Test Methods for Evaluating Solid Waste—Physical/Chemical Methods, available from G.P.O. Stock #055-022-81001-2). Quantitatively transfer the organic extract or dissolved sample to a clean 250 ml flint glass bottle (Teflon lined screw cap), add 50 ml doubly distilled water and shake for 2 minutes. Discard the aqueous layer and proceed with Step 9.3.

9.2.2 Extract soil samples by adding 40 ml of petroleum ether to the sample, and then shaking for 20 minutes. Quantitatively transfer the organic extract to a clean 250 ml flint glass bottle (Teflon-lined screw cap), add 50 ml doubly distilled water and shake for 2 minutes. Discard the aqueous layer and proceed with Step 9.3.

9.3 Wash the organic layer with 50 ml of 20% aqueous potassium hydroxide by shaking for 10 minutes and then remove and discard the aqueous layer.

9.4 Wash the organic layer with 50 ml of doubly distilled water by shaking for 2 minutes, and discard the aqueous layer.

9.5 Cautiously add 50 ml concentrated sulfuric acid and shake for 10 minutes. Allow the mixture to stand until layers separate (approximately 10 minutes), and remove and discard the acid layer. Repeat acid washing until no color is visible in the acid layer.

9.6 Add 50 ml of doubly distilled water to the organic extract and shake for 2 minutes. Remove and discard the aqueous layer and dry the organic layer by adding 10g of anhydrous sodium sulfate.

9.7 Concentrate the extract to incipient dryness by heating in a 55° C water bath and simultaneously flowing a stream of prepurified nitrogen over the extract. Quantitatively transfer the residue to an alumina microcolumn fabricated as follows:

9.7.1 Cut off the top section of a 10 ml disposable Pyrex pipette at the 4.0 ml mark and insert a plug of silanized glass wool into the tip of the lower portion of the pipette.

9.7.2 Add 2.8g of Woelm basic alumina (previously activated at 600° C overnight and then cooled to room temperature in a desiccator just prior to use).

9.7.3 Transfer sample extract with a small volume of methylene chloride.

9.8 Elute the microcolumn with 10 ml of 3% methylene chloride-in-hexane followed by 15 ml of 20% methylene chloride-in-hexane and discard these effluents. Elute the column with 15 ml of 50% methylene chloride-in-hexane and concentrate this effluent (55° C water bath, stream of prepurified nitrogen) to about 0.3-0.5 ml.

9.9 Quantitatively transfer the residue (using methylene chloride to rinse the container) to a silanized Reacti-Vial (Pierce Chemical Co.). Evaporate, using a stream of prepurified nitrogen, almost to dryness, rinse the walls of the vessel with approximately 0.5 ml methylene chloride, evaporate just to dryness, and tightly cap the vial. Store the vial at 5° C until analysis, at which time the sample is reconstituted by the addition of tridecane.

9.10 Approximately 1 hour before GC-MS (HRGC-LRMS) analysis, dilute the residue in the micro-reaction vessel with an appropriate quantity of tridecane. Gently swirl the tridecane on the lower portion of the vessel to ensure dissolution of the CDDs and CDFs. Analyze a sample by GC/EC to provide insight into the complexity of the problem, and to determine the manner in which the mass spectrometer should be used. Inject an appropriate aliquot of the sample into the GC-MS instrument, using a syringe.

9.11 If, upon preliminary GC-MS analysis, the sample appears to contain interfering substances which obscure the analyses for CDDs and CDFs, high performance liquid chromatographic (HPLC) cleanup of the extract is accomplished, prior to further GC-MS analysis.

10. HPLC Cleanup Procedure¹

¹ For cleanup see also method #8320 or #8330, SW-846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (1982).

10.1 Place approximately 2 ml of hexane in a 50 ml flint glass sample bottle fitted with a Teflon-lined cap.

10.2 At the appropriate retention time, position sample bottle to collect the required fraction.

10.3 Add 2 ml of 5% (w/v) sodium carbonate to the sample fraction collected and shake for one minute.

10.4 Quantitatively remove the hexane layer (top layer) and transfer to a micro-reaction vessel.

10.5 Concentrate the fraction to dryness and retain for further analysis.

11. GC/MS Analysis

11.1 The following column conditions are recommended: Glass capillary column conditions: SP-2250 coated on a 30 m long x 0.25 mm I.D. glass column (Supelco No. 2-3714, or equivalent) with helium carrier gas at 30 cm/sec linear velocity, run splitless. Column temperature is 210° C. Under these conditions the retention time for TCDDs is about 9.5 minutes. Calibrate the system daily with a minimum, three injections of standard mixtures.

11.2 Calculate response factors for standards relative to ¹⁴C-TCDD/F (see Section 12).

11.3 Analyze samples with selected ion monitoring of at least two ions from Table 3. Proof of the presence of CDD or CDF exists if the following conditions are met:

11.3.1 The retention time of the peak in the sample must match that in the standard, within the performance specifications of the analytical system.

11.3.2 The ratio of ions must agree within 10% with that of the standard.

11.3.3 The retention time of the peak maximum for the ions of interest must exactly match that of the peak.

11.4 Quantitate the CDD and CDF peaks from the response relative to the ¹⁴C-TCDD/F internal standards. Recovery of the internal standard should be greater than 50 percent.

11.5 If a response is obtained for the appropriate set of ions, but is outside the expected ratio, a co-eluting impurity may be suspected. In this case, another set of ions characteristic of the CDD/CDF molecules should be analyzed. For TCDD a good choice of ions is m/e 257 and m/e 259. For TCDF a good choice of ions is m/e 241 and 243. These ions are useful in characterizing the molecular structure to TCDD or TCDF. For analysis of TCDD good analytical technique would require using all four ions, m/e 257, 320, 322, and 328, to verify detection and signal to noise ratio of 5 to 1. Suspected impurities such as DDE, DDD, or PCB residues can be confirmed by checking for their major fragments. These materials can be removed by the cleanup columns. Failure to meet criteria should be explained in the report, or the sample reanalyzed.

11.6 If broad background interference restricts the sensitivity of the GC/MS analysis, the analyst should employ cleanup procedures and reanalyze by GC/MS. See section 10.0.

11.7 In those circumstances where these procedures do not yield a definitive conclusion, the use of high resolution mass spectrometry is suggested.

12. Calculations

12.1 Determine the concentration of individual compounds according to the formula:

$$\text{Concentration, } \mu\text{g/gm} = \frac{A \times A_s}{G \times A_u \times R_f}$$

where:

A = μg of internal standard added to the sample¹

G = gm of sample extracted

A_s = area of characteristic ion of the compound being quantified.

A_u = area of characteristic ion of the internal standard

R_f = response factor²

¹The proper amount of standard to be used is determined from the calibration curve (See Section 6.0).

²If standards for PCDDs/Fs and HxCDDs/Fs are not available, response factors for ions derived from these congeners are calculated relative to ¹⁴C-TCDD/F. The

Response factors are calculated using data obtained from the analysis of standards according to the formula:

analyst may use response factors for 1,2,3,4- or 2,3,7,8-TCDD, 1,2,3,4,7-PeCDD, or 1,2,3,4,7,8-HxCDD for quantitation of TCDDs/Fs, PeCDDs/Fs and HxCDDs/Fs, respectively. Implicit in this requirement is the assumption that the same response is obtained from PCDDs/Fs containing the same numbers of chlorine atoms.

$$Rf = \frac{A_s \times C_u}{A_u \times C_s}$$

where:

C_u = concentration of the internal standard
 C_s = concentration of the standard compound

12.2 Report results in micrograms per gram without correction for recovery data. When duplicate and spiked samples are analyzed, all data obtained should be reported.

12.3 Accuracy and Precision. No data are available at this time.

TABLE 1—GAS CHROMATOGRAPHY OF TCDD

Column	Retention time (min.)	Detection limit (μg/kg) ¹
Glass capillary	9.5	0.003

¹ Detection limit for liquid samples is 0.003 μg/L. This is calculated from the minimum detectable GC response being

equal to five times the GC background noise assuming a 1 ml effective final volume of the 1 liter sample extract, and a GC injection of 5 microliters. Detection levels apply to both electron capture and GC/MS detection. For further details see 44 FR 69526 (December 3, 1979).

TABLE 2—DFTPP KEY IONS AND ION ABUNDANCE CRITERIA¹

Mass	Ion abundance criteria
51	30–60% of mass 198.
68	Less than 2% of mass 69.
70	Less than 2% of mass 69.
127	40–60% of mass 198.
197	Less than 1% of mass 198.
198	Base peak, 100% relative abundance.
199	5–9% of mass 198.
275	10–30% of mass 198.
365	Greater than 1% of mass 198.
441	Present but less than mass 443.
442	Greater than 40% of mass 198.
443	17–23% of mass 442.

¹ J. W. Eichleberger, L. E. Hama, and W. L. Budde. 1975. Reference compound to calibrate ion abundance measurement in gas chromatography-mass spectrometry. Analytical Chemistry 47:995.

TABLE 3—LIST OF ACCURATE MASSES MONITORED USING GC SELECTED-ION MONITORING, LOW RESOLUTION, MASS SPECTROMETRY FOR SIMULTANEOUS DETERMINATION OF TETRA-, PENTA-, AND HEXACHLORINATED DIBENZO-*p*-DIOXINS AND DIBENZOFURANS

Class of chlorinated dibenzodioxin or dibenzofuran	Number of chlorine substituents (x)	Monitored m/z for dibenzodioxins $C_{12}H_{6-2x}O_2I_x$	Monitored m/z for dibenzofurans $C_{12}H_{5-2x}OCl_x$	Approximate theoretical ratio expected on basis of isotopic abundance
Tetra	4	¹ 319.897 321.894 ² 327.885 ³ 256.933 ⁴ 258.930	¹ 303.902 305.903 ² 311.894	0.74 1.00 0.21 0.20
Penta	5	¹ 353.856 355.855	¹ 337.863 339.860	0.57 1.00
Hexa	6	389.816 391.813	373.821 375.818	1.00 0.67

¹ Molecular ion peak.

² C_{12} -labelled standard peaks.

³ Ions which can be monitored in TCDD analyses for confirmation purposes.

[50 FR 2001, Jan. 14, 1985]

EFFECTIVE DATE NOTE: At 50 FR 2001, Jan. 14, 1985, Part 261, App. X was added, effective July 15, 1985.

APPENDIX C

QUALITY ASSURANCE PROJECT PLAN

(Must Be Completed For All Field Operations)

Project Name: _____

Project Manager: _____

Field Operations: _____

QA Office Concurrence: _____ Date: _____

ESD Peer Review: _____ Date: _____

Project No.: _____ Account No.: _____

Laboratory Designated: _____ EPA _____ CLP _____ Private

Sample Numbers assigned: from _____ to _____

Sample Schedule and Milestones:

/ Activity/Date: / / / / / / / / / /

/

Reports Required: _____

Regional Sample Control Center Review _____

Date: _____

Project Description and Site Location:

Project Measurement Objectives (Intended use of data):

Sample rationale and network derivation:

Analyses Rationale:

<u># of Samples</u>	<u>Parameter</u>	<u>QA Samples</u>	<u>Matrix</u>	<u>Container</u>	<u>Holding Time</u>	<u>Preservation</u>

Data Quality Objectives:

<u>Parameter</u>	<u>Method #</u>	<u>Detection Limits</u>	<u>Precision</u>	<u>Accuracy</u>	<u>Completeness</u>

Sample procedures to be used:

Sample Custody and Documentation:

Calibration Procedures and Frequency:

Preventative Maintenance:

If, for any reason, the schedules or procedures above cannot be followed, the appropriate person must complete a "Sample Alteration Checklist" for each element changed and have it (them) verified and reviewed by the Project Manager and the QA Officer/Peer Review. (See page 5)

Laboratory Data Reduction / QA Review:

Field Data Reduction/QA Review:

Reports (as deliverable or required):

System and Performance Audits:

Scheduled: _____ Conducted: _____

Corrective Action: (IF YES, COMPLETE CORRECTIVE ACTION CHECKLIST AND/OR SAMPLE ALTERATION FORMS, Appendix B.)

QA Report to Management:

Safety:

SAMPLE ALTERATION CHECKLIST

Project Name and Number:

Material to be sampled:

Measurement Parameter:

Standard Procedure for Field collection & Laboratory Analysis (cite references):

Reason for change in Field Procedure or Analytical Variation:

Variation from Field or Analytical Procedure:

Special Equipment, Materials, or Personnel Required:

Initiators Name: _____ Date: _____

Project Approval: _____ Date: _____

Laboratory Approval: _____ Date: _____

QA Officer/Reviewer: _____ Date: _____

Sample Control Center: _____ Date: _____

CORRECTIVE ACTION CHECKLIST

Project Name and Number:

Sample Dates Involved:

Measurement Parameter(s):

Acceptable Data Range:

Problem Areas Requiring Corrective Action:

Measures Required to Correct Problems:

Means of Detecting Problems and Verifying Correction:

Initiators Name: _____ **Date:** _____

Project Approval: _____ **Date:** _____

Laboratory Approval: _____ **Date:** _____

QA Officer/Reviewer: _____ **Date:** _____

Sample Control Center: _____ **Date:** _____