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EPA

Background Document for Capacity Analysis for Land Disposal Restrictions: Newly Identified Chlorinated Aliphatics Production Wastes (Proposed Rule)

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1. INTRODUCTION

This document presents the capacity analysis that the U.S. Environmental Protection Agency (EPA) conducted to support the proposed land disposal restrictions (LDRs) for newly proposed chlorinated aliphatics production wastes. EPA is proposing to list as hazardous three wastes from chlorinated aliphatics production, and to concurrently set LDR treatment standards for these wastes. EPA conducts capacity analyses for all newly identified hazardous wastes to evaluate the need for national capacity variances from the land disposal prohibitions.[1] The capacity analysis provides estimates of the quantities of wastes that will require alternative commercial treatment prior to land disposal as a result of the LDRs and estimates alternative commercial treatment capacity available to manage wastes restricted from land disposal.

1.1 LEGAL BACKGROUND

The Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA), enacted on November 8, 1984, set priorities for hazardous waste management. Land disposal, which had been the most widely used method for managing hazardous waste, is now the least preferred option.[2] Under HSWA, EPA must promulgate regulations restricting the land disposal of hazardous wastes according to a strict statutory schedule. As of the effective date of each regulation, land disposal of wastes covered by that regulation is prohibited unless (1) the waste meets the treatment standards that have been established, or (2) it can be demonstrated that there will be no migration of hazardous constituents from the disposal unit for as long as the waste remains hazardous.

Under the LDR Program, EPA must identify levels or methods of treatment that substantially reduce the toxicity of a waste or the likelihood of migration of hazardous constituents from the waste [RCRA §3004(m)]. Whenever possible, EPA prefers to define treatment in terms of performance (i.e., maximum acceptable concentrations of hazardous constituents in the treated waste or residuals), rather than in terms of specific treatment methods, and thus provide the regulated community with flexibility in complying with the LDRs. EPA's standards are generally based on the performance of the best demonstrated available technology (BDAT) for that waste, as documented by treatment data collected at well-designed and well-operated systems using that technology, or are based on data derived from the treatment of similar wastes that are as difficult or more difficult to treat. For the three chlorinated aliphatics production wastes proposed for listing, a combination of numerical treatment standards and technology-specific treatment standards are proposed. Additional information regarding the development of treatment standards is found in EPA's Best Demonstrated Available Technology (BDAT) Background Document for Chlorinated Aliphatics Production Wastes, June 1999.

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[1] The LDRs are effective when promulgated unless the Administrator grants a national capacity variance from the otherwise applicable date and establishes a different date (not to exceed two years beyond the statutory deadline) based on "...the earliest date on which adequate alternative treatment, recovery, or disposal capacity which protects human health and the environment will be available" (RCRA section 3004(h)(2)).

[2] RCRA defines land disposal "to include, but not be limited to, any placement of such hazardous waste in a landfill, surface impoundment, waste pile, injection well, land treatment facility, salt dome formation, salt bed formation, or underground mine or cave" (RCRA section 3004(k)).

If finalized, the LDRs are effective on the same date that the hazardous waste listing determinations become effective (typically six months from publication in the Federal Register), unless EPA grants a national capacity variance from the statutory date because of a lack of available treatment capacity [see RCRA section 3004(h)(2)]. For every waste, EPA considers – on a national basis – both the capacity of commercially available treatment technologies and the quantity of restricted wastes currently sent to land disposal for which onsite treatment capacity is not available. If EPA expects that adequate alternative commercial treatment capacity is available for a particular waste, the land disposal restrictions are effective when the new hazardous waste listings become effective. If not, EPA establishes an alternative effective date based on the earliest date on which adequate treatment capacity will be available or two years, whichever is less. Once the variance expires, the wastes must meet the LDR treatment standards prior to being land disposed.

RCRA also allows generators to apply for extensions to the LDRs on a case-by-case basis for specific wastes generated at a specific facility for which there is not adequate capacity [RCRA section 3004(h)(3)]. EPA may grant case-by-case capacity variances to applicants who can demonstrate that: (1) no capacity currently exists anywhere in the U.S. to treat a specific waste, <u>and</u> (2) A binding contractual commitment is in place to construct or otherwise provide alternative capacity, but due to circumstances beyond the applicant's control, such alternative capacity cannot reasonably be made available by the effective date (40 CFR 268.5).[3]

HSWA's schedule divided hazardous wastes into three broad categories: solvent and dioxin wastes; California list wastes;[4] and "scheduled" wastes. Exhibit 1-1 summarizes the previous LDR and LDR-related rulemakings and their respective promulgation dates. EPA restricted surface disposed solvents and dioxins from land disposal on November 7, 1986 and deep well injected solvents and dioxins from land disposal on July 26, 1988. The final rule for California list wastes, which was issued on July 8, 1987, covers wastes originally listed by the State of California and fully adopted by HSWA. The "scheduled" wastes consist of all wastes that were identified or listed as hazardous prior to November 8, 1984 but were not included in the first two categories listed above. HSWA's statutory timetable required that EPA restrict one-third of these wastes by August 8, 1988, two-thirds by June 8, 1989, and the remaining third by May 8, 1990. For hazardous wastes that are newly identified or listed after November 8, 1984, EPA is required to promulgate land disposal prohibitions within six months of the date of identification or listing [RCRA Section 3004(g)(4)].

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[3] RCRA also allows generators to petition for a variance from treatment standards if the waste cannot be treated to meet LDR standards due to its chemical or physical properties. These variances are known as treatability variances (40 CFR 268.44).

[4] The "California list" comprises the following classes of wastes: liquid hazardous wastes with a pH of less than or equal to 2.0 (acidic corrosive wastes); all liquid hazardous wastes containing free cyanides, various metals, and polychlorinated biphenyls (PCBs) exceeding statutory concentration levels; and all wastes (liquid, sludge, or solid) containing halogenated organic compounds (HOCs) in concentrations greater than or equal to specified statutory levels.

Exhibit 1-1. Summary of Land Disposal Restrictions and Related Rulemakings

Rulemaking	Federal Register Notice	Promulgation/ Proposal Date
Solvents and Dioxins (surface disposed)	51 *FR* 40572	November 7, 1986
Solvents and Dioxins (deep well injected)	53 *FR* 28188	July 26, 1988
California List (surface disposed)	52 *FR* 25760	July 8, 1987
California List (deep well injected)	53 *FR* 30908	July 26, 1988
First Third Rule	53 *FR* 31138	August 8, 1988
First Third Rule (deep well injected)	54 *FR* 25416	June 7, 1989
Second Third Rule	54 *FR* 26594	June 8, 1989
Third Third Rule	55 *FR* 22520	May 8, 1990
Newly Listed Wastes and Hazardous Debris (Phase I) Land Disposal Restrictions; Final Rule	57 *FR* 37194	August 18, 1992
Interim Final Rule for Vacated Treatment Standards	58 *FR* 29860	May 24, 1993
Land Disposal Restrictions Phase II - Universal Treatment Standards, and Treatment Standards for Organic Toxicity Characteristic Wastes and Newly Listed Wastes (Phase II); Final Rule	59 *FR* 47980	September 19, 1994
Land Disposal Restrictions Phase III - Decharacterized Wastewaters, Carbamate Wastes, and Spent Potliners; Final Rule	61 *FR* 15566, 15660	April 8, 1996
Emergency Revision of the Land Disposal Restrictions (LDR Phase III) Treatment Standards for Listed Hazardous Wastes from Carbamate Production; Final Rule	61 *FR* 43924	August 26, 1996
Emergency Extension of the K088 Capacity Variance (Phase III - Final Rule)	62 *FR* 1992, 62 *FR* 37693	January 14, 1997, July 14, 1997
Treatment Standards for Wood Preserving Wastes, Paperwork Reduction and Streamlining, Exemptions from RCRA for Certain Processed Materials, and Miscellaneous Hazardous Waste Provisions (Phase IV - Final Rule)	62 *FR* 25998	May 12, 1997
Clarification of Standards for Hazardous Waste Land Disposal Restriction Treatment Variances (Final Rule)	62 *FR* 64504	December 5, 1997
Organobromine Production Wastes; Identification and Listing of Hazardous Waste; Land Disposal Restrictions; et al.; Final Rule	63 *FR* 24596	May 4, 1998
Land Disposal Restrictions Phase IV: Final Rule Promulgating Treatment Standards for Metal Wastes and Mineral Processing Wastes; Mineral Processing Secondary Materials and Bevill Exclusion Issues; Treatment Standards for Hazardous Soils, and Exclusion of Recycled Wood Preserving Wastewaters, Final Rule	63 *FR* 28556	May 26, 1998
Hazardous Waste Management System; Identification and Listing of Hazardous Waste; Petroleum Refining Process Wastes; Land Disposal Restrictions for Newly Identified Wastes; et al.; Final Rule	63 *FR* 42110	August 6, 1998
Hazardous Remediation Waste Management Requirements (HWIR-Media); Final Rule	63 *FR* 65874	November 30, 1998

1.2 CAPACITY ANALYSIS METHODOLOGY

In evaluating the need for national capacity variances, EPA estimates the quantities of waste requiring alternative commercial treatment as a result of the LDRs and the capacity available at commercial treatment facilities to manage the restricted wastes. By comparing the capacity demand with the available commercial capacity, EPA can identify capacity shortfalls and make proposed determinations concerning national capacity variances. The first step in satisfying the goals of a capacity analysis is to make a "threshold" analysis, which dictates whether a national treatment capacity variance is needed for the two years following promulgation of a waste's LDR treatment standards or is not needed at all. Thus, EPA estimates the required and available commercial treatment capacity for all affected wastes and facilities, but often only to the extent needed to make this threshold analysis. For example, when upper-bound estimates of required capacity are well below lower-bound estimates of available capacity, then generally a variance is not needed and the analysis can stop. Similarly, when lower-bound estimates of required capacity far exceed the upper-bound estimates of available capacity, then often the two-year maximum capacity variance is needed. Results that are between two extremes generally require EPA to conduct further analyses.[5]

This section provides an overview of EPA's methodology in estimating required and available commercial treatment capacity.

1.2.1 Analysis of Required Commercial Treatment Capacity

Required commercial treatment capacity represents the quantity of wastes currently being land disposed that cannot be treated on site and will consequently need commercial treatment to meet the LDR treatment standards. Required commercial capacity includes the residuals generated by treatment of these wastes (i.e., the quantity of generated residuals that will need treatment prior to land disposal).

EPA identifies the waste streams potentially affected by the LDRs by types of land disposal units, including surface impoundments, waste piles, land treatment units, landfills, underground injection wells, salt dome formations, salt bed formations, and underground mines and caves. Not all of these disposal methods are used for the K173 to K175 wastes; only those land disposal methods reported to be used for these chlorinated aliphatics production wastes (discussed in Section 3.3) are addressed in the capacity analysis.

To assess the type of alternative capacity required to treat the affected wastes, EPA conducts a "treatability analysis" for each waste stream. Based on the waste's physical and chemical form and information about prior management practices, EPA assigns the quantity of affected waste to an appropriate technology (i.e., a technology that can meet the treatment

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[5] EPA also derived estimates of affected facilities and waste quantities for the regulatory impact analysis (RIA). However, the goals of a capacity analysis and an RIA are very different, which often results in reasonable differences in methodologies, data, and results. In contrast to the capacity analysis' focus on required and available capacity during the next two years and its initial focus on threshold determinations, the RIA concentrates on estimating specific potential significant (or dominant) long-term costs and benefits of the LDR treatment standards. Thus, the RIA does not conduct a threshold analysis of treatment capacity. Furthermore, the RIA evaluates affected facilities and wastes over a much longer time frame.

standards). For treatment standards proposed as numerical standards, more than one technology may be applicable. For treatment standards proposed as technology standards, only one technology is applicable. Mixtures of RCRA wastes (i.e., waste streams described by more than one waste code) can present special treatability concerns because they often contain constituents (e.g., organics and metals) requiring different types of treatment. To treat these wastes, EPA develops a treatment train that will effectively treat all waste types in the group (e.g., incineration followed by stabilization of the incinerator ash). In these cases, EPA estimates the amount of residuals that would be generated by treatment of the original quantity of waste and includes these residuals in the quantities requiring alternative treatment capacity.

EPA identifies the quantities of waste requiring alternative treatment on a facility level basis. If the appropriate treatment technology is not available on site, or if adequate available capacity is not present to manage the waste, then the appropriate quantity of waste requiring alternative treatment is aggregated into a national demand for commercial capacity. EPA excludes from the estimates of required commercial capacity those wastes that are managed in onsite treatment systems.

1.2.2 Analysis of Available Commercial Treatment Capacity

The analyses conducted to estimate available commercial treatment capacity focuses on treatment capacity projected to be available for the two years following the effective date of the final rule, starting from the baseline capacity identified from the most recent land disposal restrictions final rule. As shown in Exhibit 1-1, this was the rule finalizing listing determinations and land disposal restrictions for petroleum refining wastes (63 *FR* 42110, August 6, 1998).

Available treatment capacity can be analyzed by grouping facilities into four categories:

(1) commercial - capacity available at facilities that manage waste from any facility;
(2) onsite (private) - capacity available at facilities that manage only waste generated onsite;
(3) captive - capacity available at facilities that manage only waste from other facilities under the same ownership; and
(4) limited commercial - capacity available at facilities that manage waste from a limited number of facilities not under the same ownership.

For capacity analyses, estimates on available capacity reflect available commercial capacity. The determination of available capacity focuses on commercial facilities. Consequently, most estimates of capacity presented in this document represent commercially available capacity.

In order to make a proposed determination whether to grant a national capacity variance for the wastes proposed to be listed in today's rule, EPA analyzed available commercial capacity for alternative treatment technologies capable of meeting the LDR treatment standards. This analysis included estimating the maximum, or design capacity, for appropriate waste management systems, and estimating the amount of waste currently going to these systems (utilized capacity). Available capacity was estimated as the difference between the maximum and utilized capacity values. For today's proposed rule, EPA analyzed the commercial capacity of combustion (including incineration and reuse as fuel), stabilization for hazardous waste, mercury recovery, and wastewater treatment. These technologies were identified as capable of meeting proposed LDR treatment standards for one or more of the wastes proposed to be listed as discussed in Section 2.

1.3 SUMMARY OF CAPACITY ANALYSIS FOR TODAY'S PROPOSED RULE

For today's rule, EPA is proposing to list K173 through K175 as hazardous wastes:

- K173: Wastewaters from the production of chlorinated aliphatic hydrocarbons, except wastewaters generated from the production of vinyl chloride monomer using mercuric chloride catalyst in an acetylene-based process. This listing includes wastewaters from the production of chlorinated aliphatic hydrocarbons having carbon chain lengths ranging from one to and including five, with varying amounts and positions of chlorine substitution.

- K174: Wastewater treatment sludges from the production of ethylene dichloride or vinyl chloride monomer (including sludges that result from commingled ethylene dichloride or vinyl chloride monomer wastewater and other wastewater), unless the sludges meet the following conditions: (I) they are disposed of in a Subtitle C or D landfill licensed or permitted by the state or federal government; (ii) they are not otherwise placed on the land prior to final disposal; and (iii) the generator maintains documentation demonstrating that the waste was either disposed of in an onsite landfill or consigned to a transporter or disposal facility that provided a written commitment to dispose of the waste in an offsite landfill. Respondents in any action brought to enforce the requirements of Subtitle C must, upon a showing by the government that the respondent managed wastewater treatment sludges from the production of vinyl chloride monomer or ethylene dichloride, demonstrate that they meet the terms of the exclusion set forth above. In doing so, they must provide appropriate documentation (*e.g.*, contracts between the generator and the landfill owner/operator, invoices documenting delivery of waste to landfill, etc.) that the terms of the exclusion were met.

- K175 <u>Option 1</u>: Wastewater treatment sludges from the production of vinyl chloride monomer using mercuric chloride catalyst in an acetylene-based process.

  K175 <u>Option 2</u>: Wastewater treatment sludges from the production of vinyl chloride monomer using mercuric chloride catalyst in an acetylene-based process, <u>unless</u> I) the sludges are disposed in a Subtitle C landfill, and ii) the sludges do not fail the toxicity characteristic for mercury in 40 CFR 261.24, and iii) the generator maintains documentation demonstrating that the waste was disposed of in a Subtitle C landfill or consigned to a transporter or disposal facility that provided a written commitment to dispose of the waste in a Subtitle C landfill. Respondents in any action brought to enforce the requirements of Subtitle C must, upon a showing by the government that the respondent managed wastewater treatment sludges from the production of vinyl chloride monomer using mercuric chloride catalyst in an acetylene-based process, demonstrate that they meet the terms of the exclusion set forth above. In doing so, they must provide appropriate documentation (*e.g.*, contracts between the generator and the landfill owner/operator, invoices documenting delivery of waste to landfill, analytical results or other information showing the waste does not fail the toxicity characteristic for mercury, etc.) that the terms of the exclusion were met.

Treatment standards for these wastes are proposed to be as follows:

- Wastewater and nonwastewater forms of K173: Numerical treatment standards for bis (2-chloroethyl) ether, chloroform, pentachlorophenol, phenol, 2,4,6-trichlorophenol, chromium, nickel, and forms of hepta-, hexa-, penta-, and tetra- dioxins and furans.

- Wastewater and nonwastewater forms of K174: Numerical treatment standards for arsenic, and forms of hepta-, hexa-, penta-, and tetra- dioxins and furans.

- Nonwastewater forms of K175: Technology-specific standard (RMERC) for sludges with greater than 260 mg/kg of total mercury; and numerical treatment standards for wastes and RMERC residues with less than 260 mg/kg mercury. An alternative numerical treatment standard is proposed for nonwastewater forms of K175 regardless of mercury content, provided that landfill disposal conditions are met (i.e., pH less than 6.0 and no excess sulfides in co-disposed wastes).

- Wastewater forms of K175: numerical treatment standards for mercury.

EPA has identified that most K173 wastes can adequately be treated onsite using existing management methods to meet the proposed LDR requirements. Several facilities generating K173 presently utilize underground injection with approved no-migration determinations; EPA expects that these facilities can continue to use this management method. EPA also evaluated an option where the quantity of K173 waste presently managed using underground injection would require offsite management.

The required alternative treatment capacity for K174 nonwastewater may be as low as 1,800 MT (1,900 tons) per year if most generators meet the proposed requirements for the contingent management listing. If the generators do not manage K174 nonwastewater according to contingent management for the listing designation, the waste generated must meet LDR standards before land disposal, and the total quantity requiring treatment may be up to 96,000 MT (106,000 tons) per year.

For K175, EPA estimates that up to 120 MT (130 tons) per year may require alternative commercial treatment.

To assess the need for national capacity variances, EPA estimated the quantities of waste requiring alternative commercial treatment as a result of the land disposal restrictions and the capacity available at commercial treatment facilities to manage the restricted wastes. Exhibit 1-2 indicates the quantities of land disposed wastes requiring alternative commercial treatment or recovery capacity as a result of today's proposed rule. Exhibit 1-2 also indicates whether adequate treatment capacity is available for these wastes. Based on the results of the capacity analysis, EPA is proposing to not grant a national capacity variance for wastewater or nonwastewater forms of K173, K174, or K175, including those surface disposed or underground injected.

Exhibit 1-2. Chlorinated Aliphatics Production Wastes Proposed for Listing: Capacity Analysis Summary

Waste Stream	Quantities Requiring Alternative Capacity (tons/year)	Type of Treatment Required	Adequate Commercial Treatment Capacity Available?
K173	0 (if underground injection continues; >540,000 (if underground injection is discontinued)	Wastewater treatment (if necessary)	Yes
K174 and K175 Wastewaters	0	---	Yes
K174 Nonwastewaters	<106,000 (no contingent listing) <1,900 (contingent listing)	Incineration	Yes
K175 Nonwastewaters	<130	Mercury recovery followed by stabilization, or stabilization followed by landfilling	Yes
Soil and Debris Contaminated with K173, K174, and K175	Minimal	---	Yes

1.4 ORGANIZATION OF BACKGROUND DOCUMENT SUPPORTING THE CAPACITY ANALYSIS

This background document, which presents the capacity analyses conducted for the proposal of LDR standards for newly proposed chlorinated aliphatics production wastes, is organized into four sections, as described below:

- **Section 1: Introduction.** Provides background, general methodology, and a summary of the analysis.

- **Section 2: Available Treatment Capacity.** Describes the detailed methodology and data used to assess available commercial capacity for hazardous waste treatment applicable to these wastes.

- **Section 3: Required Capacity for Newly Listed Chlorinated Aliphatics Production Wastes.** Describes the detailed methodology and data used to assess required treatment capacity for newly proposed chlorinated aliphatics production wastes (K173, K174, K175).

- **Section 4: Capacity Analysis Results.** Describes the results of the capacity analysis by comparing available treatment capacity (Section 2) with required treatment capacity (Section 3).

2. AVAILABLE TREATMENT CAPACITY

This section presents EPA's estimates of available commercial treatment capacity for the newly proposed chlorinated aliphatics production wastes. Section 2.1 summarizes the results of EPA's analysis of commercial combustion capacity at incinerators and boilers and industrial furnaces (BIFs). Section 2.2 summarizes the results of EPA's analysis of the available commercial capacity for other treatment technologies applicable for these wastes.

2.1 COMMERCIAL HAZARDOUS WASTE COMBUSTION CAPACITY

EPA is proposing numerical treatment standards, based on universal treatment standards, for nonwastewater forms of K173 and K174. Combustion was used to develop universal treatment standards for all of the organic constituents in the wastes which are proposed to be included in 40 CFR 268.40 for K173 and K174. Combustion, therefore, represents one treatment technique that can be used to achieve these numerical treatment standards.

In assessing the available treatment capacity for combustion, EPA compiled data for hazardous waste incinerators, which have the sole purpose of destroying hazardous wastes, and for boilers and industrial furnaces (BIFs), which have the dual purpose of destroying hazardous wastes and deriving energy from the waste that can be then used for other industrial processes. A summary of the methodology and data is provided below.

2.1.1 Methodology and Data

In 1993, the Hazardous Waste Treatment Council (HWTC) and the Cement Kiln Recycling Coalition (CKRC) surveyed their membership to obtain data on combustion capacity, which was then submitted to EPA. Subsequent to the original HWTC survey, members also received a supplemental questionnaire regarding the burning of soils. In 1994, the Environmental Technologies Council (ETC) submitted updates to the HWTC Survey from its members.[6] Survey responses received from incinerators are classified as confidential business information (CBI). Following the receipt of the original surveys, EPA reviewed the data submitted by each facility to evaluate the completeness, consistency, and accuracy of the information. EPA identified and reconciled data gaps and anomalies by contacting the respective HWTC or CKRC coordinators and the individual facilities in question.[7]

The data contains facility information (e.g., location, EPA identification number of burner, number of units currently on-line), unit specific information (e.g., type of incinerator/kiln unit, operating hours per year, types of hazardous waste feed systems, types of hazardous waste burned in 1992), and waste-type specific information (e.g., tons of hazardous waste burned in

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[6] In 1994, HWTC became the Environmental Technologies Council (ETC). ETC provided EPA with a 1994 update to the commercial incinerator survey.

[7] Background Document for Capacity Analysis for Land Disposal Restrictions Phase II – Universal Standards, and Treatment Standards for Organic Toxicity Characteristic Wastes and Other Newly Listed Wastes. Volume 1: Capacity Analysis Methodology and Results, Chapter 2. U.S. EPA. August 1994. (In docket for 59 FR 47980, September 19, 1994.)

1992, average hazardous waste feed rate, maximum practical capacity, maximum permit capacity). To preserve the confidentiality of the survey and updated data, only aggregated results for these CBI data are provided.

The information received from facilities participating in these surveys does not lend itself to simple summation and tabulation of results because facilities sometimes differed in their approach to reporting quantities burned or burning capacity. Incineration systems can generally accept multiple waste forms (e.g., pumpable sludges and aqueous liquids) and accepting larger amounts of one waste form may reduce the capacities for others. In responding to the HWTC survey (and ETC updates), facilities sometimes grouped waste types for their capacity-related responses. For example, if a feed system can accommodate both liquids and pumpable sludges, a facility may report a capacity for both forms grouped together. To address this interchangeability of waste forms, EPA's LDR capacity analysis accommodated the reported waste groupings (e.g., one capacity estimate for liquids and pumpable sludges combined).

A second issue also relating to the interchangeability of waste forms required more extensive consideration. In the HWTC survey (and ETC update), some facilities reported the maximum combustion capacity for individual waste forms that together exceed the reported overall capacity of the unit. As a result, summing these individual capacities results in a total capacity that far exceeds what a facility may practically accommodate. EPA developed the following algorithm to address this situation.

The waste apportionment algorithm focuses on three primary variables: the quantity of waste burned during the year, the maximum practical capacity of the unit, and the available capacity for burning hazardous waste. The available capacity for a waste form (e.g., aqueous liquids, dry solids) is obtained by taking the difference between the quantity of the form burned (hazardous and non-hazardous waste) and the maximum capacity for the waste form. EPA's approach assumes that a facility will not stop burning non-hazardous waste if it is currently burning non-hazardous waste but all unutilized capacity will be used for hazardous waste. Difficulties arise, however, because facilities report maximum capacities for each waste form without regard to capacity accounted for by other waste forms. Consequently, the sum of maximum capacities for all waste forms may exceed the total capacity. In these cases, EPA distributed the total maximum hazardous waste capacities reported by each facility to individual waste forms based on burning practices. The utilization rate for each waste form was calculated by dividing the larger of the quantity of hazardous waste burned or total waste burned for that waste form by the sum of the quantities burned for all waste forms. A new maximum hazardous waste capacity for each waste form was then calculated by multiplying the utilization rate for that waste form by the maximum practical capacity for the incineration unit as a whole. If the calculated maximum capacity for a waste form exceeded the reported value for that form, EPA used the reported value. In this case, the difference between the calculated and reported value was then redistributed to other waste forms using a hierarchy based on the types of wastes in this rule for which capacity has historically been most limited relative to demand. EPA used the following order for redistributing capacity:[8]

[8] ibid, page 2-10 to 2-12 to see example.

(1) Soils;
(2) Bulk Solids;
(3) Containerized Solids;
(4) Nonpumpable Sludges;
(5) Pumpable Sludges;
(6) Compressed Gases;
(7) Non-aqueous Liquids; and
(8) Aqueous Liquids.

Cement kiln capacity for hazardous waste is limited by air emission limits (e.g., BIF limits under 40 CFR 266 Subpart H), feed system limitations (e.g., particle size and viscosity limits), and product (i.e., cement clinker) quality considerations. For instance, cement quality considerations may require that wastes burned in cement kilns have a heating value of at least 5,000 BTU/lb to ensure adequate temperatures in the kiln. (Comments received by EPA in the past, however, indicate that some kilns accept wastes below this heating value.) Incineration capacity is also limited by air emission limits and other permit limits (such as heat release limits), and feed system limits. EPA has taken these limitations into account in its estimates of available commercial combustion capacity.

Once the baseline[9] available combustion estimates were calculated using the above methodology (i.e., based on information received from the facilities participating in the HWTC and CKRC surveys conducted in 1993 and updates by ETC in 1994), EPA subtracted the required combustion capacity for any previously regulated wastes that are not accounted for in the data received from the incinerators or BIFS (e.g., LDR Phase I wastes under variance, LDR Phase II , III, and IV wastes, and recently listed petroleum refining wastes)[10] to derive the available combustion capacity for the proposed dye and pigment manufacturing wastes. The capacity required for Phase II, III, and IV wastes, and newly listed petroleum refining process wastes were not reflected in the estimates of utilized capacity because the Phase II, III, and IV rules, and Listing/LDR rule for petroleum refining process wastes were not in effect when the estimates were submitted to EPA. In addition, some Phase I wastes (F037 and F038 in particular) were under a variance for at least part of the period of time for which EPA received capacity estimates.

Also, when EPA finalized the LDR Phase IV rule, EPA conducted additional analysis by developing assumptions to account for the uncertainty associated with the age of the bulk of the data (which are now several years old) and assessing the potential trends in combustion capacity over the next two years. This additional analysis primarily involved three activities: (1) updating available capacity where possible using facility-specific CBI submitted by Rollins Environmental

[9] "Pre-Baseline" available combustion capacity estimates are presented in Exhibit 2-1 (i.e., estimates prior to accounting for LDR Phase I, II, III, IV wastes, and recently listed petroleum refining process wastes).

[10] LDR Phase I Final Rule: 57 *FR* 37194, August 18, 1992; LDR Phase II Final Rule: 59 *FR* 47980, September 19, 1994; LDR Phase III Final Rule; 61 *FR* 15566, April 8, 1996; LDR Phase IV Final Rules: 62 *FR* 25998, May 12, 1997 and 63 *FR* 28556, May 26, 1998; Listing and LDR Final Rule for Petroleum Refining Process Wastes: 63 *FR* 42110, August 6, 1998

Services (RES) in 1996 as a public comment to the LDR Phase IV proposed rule[11], (2) applying assumptions where necessary to obtain a range of overall available capacity, and (3) researching potential impacts of upcoming maximum achievable control technology (MACT) standards.

2.1.2 Available Combustion Capacity

Exhibit 2-1 summarizes EPA's estimates of "pre-baseline" available commercial hazardous waste combustion (incinerators and BIFs) capacity by waste form. This exhibit also provides summarized estimates of available capacity by two broad categories of waste physical forms: (1) liquids and (2) sludges/solids. The following analysis has focused on the availability of capacity only for solids/sludges because the newly listed petroleum refining process wastes are expected to fall entirely within this broad category of physical forms.

[11] Background Document for Land Disposal Restrictions - Wood Preserving Wastes (Final Rule): Capacity Analysis and Response to Capacity-Related Comments, April 1997, pages 4-7 to 4-12.

Exhibit 2-1. Pre-Baseline Available Commercial Hazardous Waste Combustion Capacity Summary

Waste Form	Incinerators			BIFs			Total Available (1000 tpy)
	Maximum (1000 tpy)	Available (1000 tpy)	Percent Utilized	Maximum (1000 tpy)	Available (1000 tpy)	Percent Utilized	
Liquids (aqueous)	190	92	51	NA	NA	NA	92
Liquids (non-aqueous)	346	159	54	NA	NA	NA	159
Reported as All Liquids (aqueous & non-aqueous)	82	56	31	1,548	702	55	759
Reported as Liquids & Pumpable Sludges Grouped	32	20	38	236	49	79	68
Pumpable Sludges	116	66	43	37	12	68	78
Nonpumpable Sludges	32	17	47	5	1	72	18
Reported as Solids & Nonpumpable Sludges Grouped	53	38	27	35	11	69	49
Bulk Solids	133	70	47	25	18	30	88
Dry Solids	NA	NA	NA	49	39	20	39
Containerized Solids	231	102	56	146	106	28	208
Compressed Gases	5	3	43	NA	NA	NA	3
Soils	169	157	7	NA	NA	NA	157
TOTAL LIQUIDS	650	327	50	1,785	751	58	1,078
TOTAL SOLIDS & SLUDGES	734	450	39	298	187	37	638
TOTAL	1,390	780	44	2,083	938	55	1,718

Notes:

1. This pre-baseline capacity summary is based on survey data compiled during 1993 and 1994. For details of capacity for individual combustion units – incinerators and BIFs – refer to U.S. EPA's "Background Document for Capacity Analysis for Land Disposal Restrictions Phase III-Decharacterized Wastewaters, Carbamate and Organobromine Wastes, and Spent Potliners (Final Rule)", February 1996, Chapter 2.
2. Although estimates of available capacity for today's final rule are based on this capacity summary, the final values include adjustments for the additional capacity required due to Phases II, III and IV LDR rules. Details of adjustments are provided in the text.

As shown in Exhibit 2-1, the available sludge/solid commercial combustion capacity – prior to accounting for the capacity required due to the Phase I through IV rules – is 638,000 tons/year.[12] Post-Phase I and II, but pre-Phase III and IV, data obtained from one major treater, RES, through comments and subsequent submissions of CBI, as well as extrapolation of these data to all other combustion data, were used to update this pre-baseline estimate and to simultaneously account for Phase I and II wastes. The result is approximately 489,000 tons/year of available pre-Phase III and IV capacity,[13] with a range between about 410,000 to 568,000 tons/year.[14] For the Phase III wastes, EPA estimated that the relevant required sludge/solid combustion capacity is 4,600 tons/year. Therefore, the overall pre-Phase IV combustion capacity for sludges/solids is estimated at 484,000 tons/year; between about 406,000 to 564,000 tons/year. In the Phase IV rulemaking for wood preserving wastes, EPA estimated that approximately 9,000 tons/year of non-liquid/nonwastewater combustion capacity is required for wastes from wood preserving operations.[15] Thus, EPA estimates that approximately 475,000 tons/year (397,000 to 555,000 tons/year) of combustion capacity is available to treat wastes restricted from land disposal by the remainder of the Phase IV rulemaking. In the Phase IV rulemaking for TC metal and mineral processing wastes, EPA estimated that approximately 32,000 tons/year (8,800 to 52,000 tons/year) of combustion capacity is required.[16] Finally, as a result of the August 6, 1998 finalizing listing and LDR standards for four newly listed petroleum refining wastes (K169-K172), approximately 8,000 tons/year of sludges of combustion capacity is required.[17] Thus, EPA estimates that approximately 435,000 tons/year (337,000 to 538,000 tons/year) of combustion capacity is available to treat the newly identified dye and pigment wastes estimated to be 100,000 tons/year. Even though soil and debris contaminated with wood preserving

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[12] EPA summed the available capacity of "pumpable sludges" (78,000 tons/year), "nonpumpable sludges" (18,000 tons/year), "solids and non-pumpable sludges" (49,000 tons/year), "bulk solids" (88,000 tons/year), "dry solids" (39,000 tons/year), "containerized solids" (208,000 tons/year), and "soils" (157,000 tons/year).

[13] To calculate this quantity, EPA first developed separate estimates of available combustion capacity for RES facilities and non-RES facilities. EPA determined the pre-baseline capacity available at non-RES facilities by subtracting the pre-baseline combustion at RES facilities from the pre-baseline estimate of national sludge, solid, and soil combustion available capacity, and then subtracting an estimate of the non-RES share of wastes restricted from land disposal due to the Phase I and II rulemakings. EPA then added this result to the estimated increase in RES available capacity to estimate the total pre-Phase III available capacity for incinerators and BIFs. Because most of the information used in these calculations is CBI, EPA can not disclose the details in this document.

[14] Because of the age of the data used and the uncertainties of the various assumptions used, EPA developed a "best estimate" and a range of available combustion capacity values. EPA's best estimate is based on a calculation of the current percentage of the Phase I and Phase II wastes that RES is combusting. The range was calculated by assuming that RES is combusting a lesser percentage than the best estimate (lower end), or is burning a greater percentage than the best estimate (upper bound).

[15] Background Document for Land Disposal Restrictions - Wood Preserving Wastes (Final Rule), Capacity Analysis and Response to Capacity-Related Comments, April 1997, page 3-13

[16] U.S. Environmental Protection Agency. Capacity Analysis for Land Disposal Restrictions--Phase IV: Newly Identified Toxicity Characteristic Metal Wastes and Mineral Processing Wastes (Final Rule) Background Document. Section 3.6.10, page 3-28. April 1998.

[17] U.S. Environmental Protection Agency. Background Document for Capacity Analysis for Land Disposal Restrictions: Newly Identified Petroleum Refining Wastes (Final Rule). Section 3.3, page 3-15. August, 1998.

wastes[18] would utilize some combustion capacity, there is still more than adequate combustion capacity to treat the much lesser volume of newly proposed dye and pigment wastes.

Since the baseline combustion capacity data were several years old, some combustion facilities have closed, others have opened, and others have made process changes affecting their capability and capacity to treat hazardous wastes.[19] Much of this information is industry proprietary in nature and cannot be quantified in this report. In addition, several facilities that had proposed expansion of thermal capacity have now abandoned their proposals.[20] Difficulties in permitting make it highly unlikely that other combustion units could be brought on-line in the near-term (i.e., within two years). Recent industry publications indicate that the public continues to oppose nearly every proposed hazardous waste management facility, and state and local legislative bodies continue to pass restrictive siting laws or permitting moratoriums. As a result, many project sponsors have already, or may eventually, find the process too costly.[21] Therefore, the available combustion capacity is expected to remain relatively steady through the year 2001.

2.1.3 Dioxin-Containing Waste Treatment Capacity

The basis for listing K173 and K174 includes dioxins and furans. Additionally, treatment standards are proposed for dioxins and furans in K174. EPA has previously established treatment standards for other dioxin and furan-containing wastes. For such wastes, treatment using combustion has been required, or treatment standards have been established based on BDAT using combustion. These dioxin-containing wastes include the following:

- F020 to F023 and F026 to F027 (various chlorinated benzene and chlorinated phenol wastes). The basis for listing includes chlorinated dioxins and furans. Numerical treatment standards for dioxins and furans are established. Additional requirements for these wastes are presented in 40 CFR Part 264 Subpart O.

- F032 (wastewaters from wood preserving processes using or previously using chlorophenolic formulations). The basis for listing includes tetra-, penta-, hexa-, and hepta- chlorinated dioxins and furans. Numerical treatment standards for dioxins and furans are established based on combustion, with alternative technology standards of combustion.

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[18] Note that the two-year capacity variance for soil and debris contaminated with wood preserving wastes which was effective from May 12, 1997 (62 FR 25998) has expired.

[19] Background Document for "Capacity Analysis for Land Disposal Restrictions–Phase IV: Newly Identified Toxicity Characteristic Metal Wastes and Mineral Processing Wastes (Final Rule), April 1998," page 2-15 to 2-17.

[20] "Commercial Hazardous Waste Management Facilities: 1997 Survey of North America," The Hazardous Waste Consultant. March/April 1997.

[21] ibid.

- Certain dioxins and furans have UTS. The numerical standards for F020 to F023, F026 to F027, and F032 are identical to the UTS.

The combustion of F020 to F023 and F026 to F027 is required to be conducted in a "six 9's" destruction and removal efficiency combustion device. See 40 CFR Part 264 Subpart O. Commenters to the proposed Wood Preserving LDR rule stated that only one incinerator in the US (Laidlaw [formerly Aptus], Coffeyville KS) is licensed to accept dioxin and furan wastes, and its available capacity is less than 6,600 tons/yr for non-PCB wastes.[22]

However, similar destruction efficiency is not required for F032. As stated in the Wood Preserving Wastes Capacity Analysis Background Document, EPA did not require the combustion of F032 wastes in a "six 9's" destruction and removal efficiency combustion device. Therefore, facilities could combust F032 wastes at any RCRA facility regulated under 40 CFR Part 266 or 264, Subpart O without having to monitor the concentrations of dioxins and furans left behind in the combustion residues. In addition, facilities could combust F032 wastes in combustion devices regulated under CFR Part 265, Subpart O units, provided the residues meet the applicable standards for each regulated dioxin or furan constituent, or make a demonstration that their combustion is at least equivalent to that required of permitted incinerators or Part 266 BIFs, in which case these interim status incinerators would also have the option of not monitoring for dioxins in combustion residue. Using the preliminary 1997 BRS (release date of April 1999), eight facilities reported managing F032 waste using incineration in 1997.[23] As shown in Exhibit 1-1, land disposal restrictions for F032 were finalized in 1997, indicating that for at least part of the year the treatment standards were in effect.

The proposed treatment standards for K173 and K174 wastes are similar to the requirements for treating F032 waste, in that only numerical standards are proposed (rather than required combustion in a "six 9's" incinerator). Therefore, the combustion capacity presented in this section is valid for the chlorinated aliphatics production wastes proposed for listing.

2.2 OTHER TREATMENT SYSTEM CAPACITIES

This section discusses commercial treatment capacity other than hazardous waste combustion. Specifically, it presents EPA's capacity analysis for the processes specified in Exhibit 1-2: mercury recovery, stabilization, landfilling, and wastewater treatment. These are presented in Sections 2.2.1 through 2.2.4, respectively. Section 2.2.5 discusses commercially available underground injection.

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[22] U.S. EPA. Background Document for Land Disposal Restrictions -- Wood Preserving Wastes (final rule). April 1997, page 4-14.

[23] These facilities are Ensco (El Dorado, AR), Laidlaw (Coffeyville, KS), LWD (Calvert City, KY), Clean Harbors (Kimball, NE), Waste Technologies Industries (East Liverpool, OH), Safety Kleen (Roebuck, SC), Chemical Waste Management (Port Arthur, TX), Laidlaw (Clive, UT).

2.2.1 Available Mercury Recovery Capacity

A technology-based treatment standard (RMERC) is proposed for nonwastewater forms of K175 with greater than 260 mg/kg total mercury. RMERC, as described in 40 CFR 268.42, is the retorting or roasting of mercury. This section discusses available RMERC capacity including special characteristics of K175 that may affect its acceptance by hazardous waste treatment facilities.

K175 can potentially be treated by two types of facilities: (1) facilities recovering mercury using RMERC from a wide variety of wastes (including industrial wastes), and (2) larger treatment, storage, disposal (TSD) facilities for which mercury retorting likely comprises only a part of their operations (e.g., the facility may also conduct incineration, stabilization, and other technologies not necessarily limited to mercury-containing wastes).[24] The identification of RMERC facilities that accept industrial wastes, and would therefore be candidates for accepting K175, was conducted using the 1995 BRS, other information sources such as previous EPA facility visits or contacts, and the Internet. This identification is presented in EPA's 1998 report entitled "Waste Specific Evaluation of RMERC Treatment Standard," which is available in the public docket for the Advanced Notice of Proposed Rulemaking "Potential Revisions to the Land Disposal Restrictions Mercury Treatment Standards," (May 28, 1999; 64 *FR* 28949). This report shows that the following facilities currently accept mercury containing industrial wastes and treat the wastes using RMERC:

- AERC (Bethlehem, PA)
- Bethlehem Apparatus (Hellerton and Allentown, PA)
- Burlington Environmental (Kent WA)
- Drug and Laboratory Disposal, Inc. (Plainwell, MI)
- E.I. DuPont de Nemours & Company (Orange, TX)
- ENSCO (Dalton, GA)
- Mercury Recycling (Brisbane, CA)
- Mercury Refining Company (Albany, NY).
- NSSI (Houston TX)

By examining the 1995 BRS, EPA found that approximately 3,200 tons of mercury containing waste was retorted in 1995 (includes both commercial and captive facilities) ("Waste Specific Evaluation of RMERC Treatment Standard," July 1998, EPA). Most of this quantity is represented by D009, in the form of inorganic solids. Appendix E presents the BRS data used and presented in the 1998 RMERC report. EPA has no current estimate of the nationwide RMERC capacity available. For this reason, EPA's assessment of available capacity for K175 will carry uncertainty.

There is also uncertainty in the ability of RMERC to effectively treat K175. This is a waste with high concentrations (greater than 1 percent) of mercury sulfide. In comparison to

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[24] Facilities principally accepting only fluorescent bulbs are unlikely to accept K175. This is because, in general, they do not accept other types of industrial mercury-containing wastes.

other forms of mercury in wastes, such as elemental mercury or mercury oxide, mercury sulfide creates some special considerations for RMERC. For example, EPA Hazardous Waste No. K106, wastewater treatment sludge from the mercury cell process in chlorine production, is also comprised of mercury sulfide. Mercury sulfide is particularly difficult to treat because elemental mercury condensed from the fuming process in mercury retorters easily recombines with the available sulfide ions. Additives are needed to prevent recombination, but this addition to the treatment train leads to an increase in waste treatment costs[25]. Although land disposal restrictions for K106 are currently promulgated as RMERC, negative public comments were initially received disputing the effectiveness of RMERC for this waste, arguing it was not demonstrated (U.S. EPA, "Final Best Demonstrated Available Technology (BDAT) Background Document for Mercury Containing Wastes D009, K106, P065, P092, and U151," May 1990). At the present time, several chlorine production facilities effectively manage their sulfide-containing K106 in onsite RMERC units, demonstrating the applicability of RMERC for this mercury sulfide waste. Difficulties of mercury sulfide treatment were also documented in the EPA "Waste Specific Evaluation of RMERC Treatment Standard" 1998 report.

The presence of organic material may also cause difficulties for treatment (for example, the sludge contains 43 percent organic matter and an oil and grease content of 4 percent), as well as the presence of chloride (not measured, but likely present in the waste). Difficulties associated with the presence of chloride and organic chloride include the formation of impurities and acids in the presence of steam that are corrosive to equipment. Further details are presented in the EPA "Waste Specific Evaluation of RMERC Treatment Standard" 1998 report. Additional information regarding the physical and chemical characteristics of K175 and the applicability of RMERC is presented in EPA's "Best Demonstrated Available Technology (BDAT) Background Document for Chlorinated Aliphatics Production Wastes," June 1999.

EPA is proposing RMERC as one option for the treatment standard. Based on EPA and industry experience with RMERC treatment of K106 mercury sulfide wastes, and the comments by one commercial RMERC facility, EPA will closely monitor the ability of this waste to be effectively treated using RMERC. There is also uncertainty in the quantity of excess capacity available to treat K175 by RMERC. EPA is requesting actual treatment performance data for this or similar wastes from commercial facilities as a basis of selecting a treatment technology for final promulgation.

2.2.2 Available Stabilization Capacity

EPA is proposing a numerical treatment standard for residues of RMERC, and for nonwastewater forms of K175 with less than 260 mg/kg mercury. Additionally, as an alternative to the technology-specific standard of RMERC for nonwastewater forms of K175 with greater than 260 mg/kg, EPA is proposing numerical treatment standards. To fulfill any of these numerical treatment standards, stabilization may be used.

[25] Correspondence between John Austin of EPA and John Boyle of Bethlehem Apparatus regarding mercury sulfide waste.

Besides combustion, stabilization is a primary conventional commercial treatment technology for the wastes proposed for listing as hazardous. EPA estimates that there are several million tons per year of available stabilization capacity. In analyzing alternative treatment capacity for stabilization for the chlorinated aliphatics production wastes, EPA built on the capacity analysis conducted for the Third Third LDR rule. This analysis was based on data contained in the May 1990 TSDR Capacity Data Set.[26] The TSDR Capacity Data Set contains results from the National Survey of Hazardous Waste Treatment, Storage, Disposal and Recycling Survey (the TSDR Survey). The TSDR Survey was administered in 1987 to 2,500 facilities and was designed to provide comprehensive information on current and planned hazardous waste management, and practices at RCRA-permitted and interim status treatment, storage, recycling, and disposal facilities. The TSDR Survey collected projections of capacity changes from 1986 through 1992.

Following the original TSDR Survey, EPA updated the TSDR Capacity Data Set for critical technologies based on confirmation of planned capacity changes and other information received since the survey (e.g., comments on proposed rules). Updated information was obtained by contacting facilities and verifying critical projected capacities reported in the TSDR Survey. A key part of this analysis was a review of Biennial Reporting System (BRS) data for the proposed rule for Phase IV wastes.[27]

To estimate the available stabilization capacity for treatment residuals derived from the newly identified chlorinated aliphatics wastes, the capacity demand for previous LDR rules was subtracted from the available stabilization capacity estimated from the TSDR Capacity Data Set and updates. The available stabilization capacity from the TSDR Survey and updates was 3,125,000 tons per year. EPA estimated in the Third Third rulemaking that the capacity required as a result of the Third Third and previous LDR rules was 1,921,000 tons per year. Furthermore, the capacity required for Phase I was 77,000 tons per year, for Phase II wastes was 0 tons per year,[28] and for Phase III wastes was 0 tons per year.[29] For the Phase IV rule for TC metal and mineral processing wastes, EPA determined that most of the newly identified wastes are already meeting the Phase IV treatment standards, or will require relatively minor modifications to existing treatment systems, and thus little additional commercial stabilization capacity will be needed. Furthermore, even if some capacity <u>is</u> required as a result of the Phase IV rule, EPA expects that the high elasticity of stabilization capacity (i.e., the little time needed to develop additional stabilization capacity) will more than counter this required capacity.

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[26] U.S. EPA, Commercial Treatment/Recovery Data Set, pages. 37-45, 54-57, 91-95 May 1990.

[27] U.S. Environmental Protection Agency. Capacity Analysis for Land Disposal Restrictions--Phase IV: Newly Identified Toxicity Characteristic Metal Wastes and Mineral Processing Wastes (Final Rule) Background Document. Section 2.1. April 1998.

[28] EPA believes that stabilization may be required to treat underlying hazardous metal constituents in some Phase II organic TC wastes after combustion but that the actual amount of combustion residuals requiring stabilization capacity is a small fraction of available capacity.

[29] EPA believes that stabilization may be required to treat underlying hazardous metal constituents in some Phase III wastes after combustion but that the actual amount of residuals requiring stabilization capacity is a small fraction of available capacity.

2.2.3 Available Landfilling Capacity

Landfilling typically represents a "baseline" management method for compliance with Subtitle C requirements. Under a capacity variance, a generator would be able to dispose of their hazardous waste in a Subtitle C without additional treatment. Therefore, analysis of landfill capacity will not typically be a factor in EPA's consideration of whether to grant a national capacity variance.

However, one option for the land disposal restrictions for K175 includes the placement of the treated hazardous waste in a Subtitle C landfill that has certain restrictions. These restrictions include that the waste not be co-disposed with: (1) other wastes with pH greater than 6.0, and (2) other wastes do not contain excess sulfides. Data obtained from six hazardous waste landfills show that the pH of landfill leachate (and therefore the pH of the co-disposed wastes) may range from 5.8 to 11 (U.S. EPA, Development Document for Proposed Effluent Limitations Guidelines and Standards for the Landfills Point Source Category, January 1998, EPA-821-R-97-022). Therefore, it is apparent that some landfills can achieve the first criteria. However, information regarding the types of wastes disposed is generally not available. Landfill facilities typically divide their landfills into cells, allowing for the disposal of different wastes in different cells, where wastes from different cells are separated by berms. Therefore, it is possible that an individual landfill would have multiple cells, allowing for the disposal of certain wastes (e.g., low-sulfide wastes) in segregated cells allowing for compliance with the land disposal restriction requirements.

2.2.4 Available Wastewater Treatment Capacity

Wastewater forms of K173, K174, and K175 may require commercial treatment. For example, one of the wastes, K173, is often generated in a wastewater form, and commercial treatment may be required.

EPA estimated available wastewater treatment capacity for the Phase IV rule.[30] In 1991, EPA's Office of Water developed the Waste Treatment Industry Questionnaire to collect information on centralized wastewater treatment capacity. The information collected during this effort represents 1989 data and includes maximum and available treatment capacity. Approximately 40 million tons (9.7 billion gallons) of wastewater treatment capacity are available each year at 65 facilities. In addition, there are 11 additional treatment facilities that were not included in this estimate because they did not supply the requested capacity information. By assigning the average available capacity of 638,000 tons per year to each of the non-reporting facilities, EPA estimates a total available commercial wastewater treatment capacity of more than 47 million tons each year. According to data collected for the Third Third rulemaking, the capacity is in the form of many types of treatment such as biological, metal treatment, etc.

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[30] U.S. EPA. Background Document for Land Disposal Restrictions -- Wood Preserving Wastes (final rule). April 1997. Pages 2-6 through 2-10.

EPA used the 1991 BRS to confirm this estimate of available wastewater treatment capacity. Specifically, the PS form of the 1991 BRS contains information on the utilized and maximum capacity of the facility's waste treatment system. EPA found the total available wastewater treatment capacity reported in the BRS at facilities representing approximately 90 percent of the total operational capacity reported in the Waste Treatment Industry Questionnaire.[31] According to the 1991 BRS, these facilities had 33 million tons (7.9 billion gallons) of available capacity. Adjusting this estimate to reflect the fact that it represents an estimated 90 percent, rather than 100 percent, of the total operational capacity, approximately 37 million tons of available wastewater treatment capacity are available. This estimate compares favorably to the estimate of 47 million tons obtained from the Office of Water data.

2.2.5 Available Commercial Underground Injection Capacity

K173 wastes are aqueous and could be managed by commercially available underground injection. This section examines if the commercial capacity exists for underground injection of these wastewaters by providing pertinent details from EPA's 1998 report on underground injection data and related issues for the Phase IV rule[32].

In 1984, Congress banned the use of injection wells for waste disposal unless EPA determined that a prohibition was not required to protect human health and the environment. This regulation impacted Class I underground injection facilities operating Class I injection wells. Class I wells, by definition, inject municipal or industrial waste beneath the lowermost underground source of drinking water.

As described in the 1998 EPA report for the Phase IV rule, data for Class I facilities and wells were obtained from the following sources:

- EPA's UICWELLS (that is, Class I Injection Wells Database Version 6 updated through 1995);
- The 1993 Biennial Reporting System (BRS) for the Hazardous Waste Report required by Sections 3002 and 3004 of RCRA; and
- Personal communications with injection well operators, and EPA Regional and State Underground Injection Control program personnel.

The data primarily included injectate data for each facility, available process description data, well specific data (that is, well flow rates and operating status) and injected waste volumes as reported in the BRS.

[31] Specifically, the estimate includes all aqueous organic and/or inorganic treatment systems.

[32] U.S. EPA. Background Document for Analysis of the Land Disposal Restrictions - Phase IV: Underground Injection Data and Issues. April 1998.

According to these 1995 data[33], there are a total of 41 Class I underground injection commercial facilities operating 60 Class I wells. Twenty-one Class I wells are used for RCRA hazardous waste disposal and fourteen of these wells are identified as having an available commercial injection capacity totaling 565 millions of gallons per year.[34] Impacts from the Phase IV final rule are not expected to significantly affect this capacity; the two largest generators evaluated are subject to a two-year natural capacity variance (May 26, 1998; 63 *FR* 28627).

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[33] U.S. EPA. Background Document for Analysis of the Land Disposal Restrictions - Phase IV: Underground Injection Data and Issues. April 1998. Page 12.

[34] U.S. EPA. Background Document for Analysis of the Land Disposal Restrictions - Phase IV: Underground Injection Data and Issues. April 1998. Exhibit E-1.

3. REQUIRED CAPACITY FOR CHLORINATED ALIPHATICS PRODUCTION WASTES

3.1 INTRODUCTION

This section describes the required treatment capacity for the newly proposed K173, K174, and K175 chlorinated aliphatics production wastes. The overall purpose of this analysis is to estimate the new demand for commercial Subtitle C treatment and recovery capacity resulting from the proposed listing of these hazardous wastes and simultaneous promulgation of land disposal restrictions. The quantity of K173, K174, and K175 estimated to require commercial offsite treatment capacity as a result of this analysis is then compared to the national estimate of available Subtitle C commercial treatment capacity (presented in Section 2). When EPA promulgates final LDR standards for these wastes, EPA will use data from the capacity analysis to assess the need for a national capacity variance from the LDRs as specified in RCRA 3004(h)(2).

This capacity analysis incorporates data and information on K173, K174, and K175 generation and management collected during the EPA industry study of chlorinated aliphatics production wastes. Section 3.1 contains information on the processes generating K173, K174, and K175. Section 3.2 describes the data sources used in estimating the quantities of K173, K174, and K175 generated and managed. Section 3.3 presents EPA's assessment of the quantities of K173, K174, and K175 potentially requiring commercial treatment. Sections 3.4 to 3.6 describe other aspects of the capacity analysis relevant to K173, K174, and K175 wastes.

3.1.1 Background

Background information on the regulatory background of the K173, K174, and K175 wastes, the processes that generate the wastes, and the regulatory definitions of these wastes is presented here. Specifically, regulatory background for K173, K174, and K175 is presented in Section 3.1.1, industry overview is provided in Section 3.1.2, and a description of the processes generating the wastes are presented in Section 3.1.3.

Regulatory Background of Previous Solid Waste Regulations Affecting Industry

EPA previously promulgated a series of listings that apply to the chlorinated aliphatics industry in previous investigations in the 1980s. Many of the same facilities affected by these hazardous waste listings are likely affected by the proposed rule. These listing are associated both with general chlorinated aliphatics production processes and with the production of specific chlorinated aliphatic chemicals. These wastes, listed as hazardous in 40 CFR §261.31 and 261.32, are as follows:

- F024: Process wastes, including but not limited to, distillation residues, heavy ends, tars, and reactor clean-out wastes from the production of certain chlorinated aliphatic hydrocarbons by free radical catalyzed processes. These chlorinated aliphatic hydrocarbons are those having carbon chain lengths ranging from one to and including five, with varying amounts and positions of chlorine substitution. (This listing does not include wastewaters, wastewater treatment sludges, spent catalysts, and wastes listed in §261.31 or §261.32.)

- F025: Condensed light ends, spent filters and filter aids, and spent desiccant wastes from the production of certain chlorinated aliphatic hydrocarbons, by free radical catalyzed processes. These chlorinated aliphatic hydrocarbons are those having carbon chain lengths ranging from one to and including five, with varying amounts and positions of chlorine substitution.

- K016: Heavy ends or distillation residues from the production of carbon tetrachloride.

- K018: Heavy ends from the fractionation column in ethyl chloride production.

- K019: Heavy ends from the distillation of vinyl chloride in vinyl chloride monomer production.

- K020: Heavy ends from the distillation of vinyl chloride in vinyl chloride monomer production.

- K028: Spent catalyst from the hydrochlorinator reactor in the production of 1,1,1-trichloroethane.

- K029: Waste from the product steam stripper in the production of 1,1,1-trichloroethane.

- K030: Column bottoms of heavy ends from the combined production of trichloroethylene and perchloroethylene.

- K095: Distillation bottoms from the production of 1,1,1-trichloroethane.

- K096: Heavy ends from the heavy ends column from the production of 1,1,1-trichloroethane

The F-listed wastes were promulgated on December 11, 1989, and the K-listed wastes were promulgated on November 12, 1980. In addition to these listed hazardous wastes, there are a number of chlorinated aliphatics chemicals that are listed hazardous wastes when they are discarded, off-specification, container residues, or spills (U and P list wastes). Finally, a number of chlorinated aliphatic compounds are part of the toxicity characteristic; solid wastes containing these constituents above TC levels are hazardous wastes. These constituents are as follows:

- D019 Carbon Tetrachloride
- D022 Chloroform
- D028 1,2-Dichloroethane
- D029 1,1-Dichloroethylene
- D033 Hexachlorobutadiene
- D034 Hexachloroethane

- D039 Tetrachloroethylene
- D040 Trichloroethylene
- D043 Vinyl chloride

The F024 listing, which covers a variety of process wastes from the manufacture of chlorinated aliphatics, specifically excludes the two waste streams addressed in today's listing determination: wastewaters and wastewater treatment sludges. In 1984, HSWA amended RCRA by instituting explicit new hazardous waste management requirements, including land disposal restriction (LDR) schedules for all listed hazardous wastes (Solvents and Dioxins, California List, First Third, Second Third, and Third Third). Congress directed EPA (through HSWA) to investigate wastes generated by the chlorinated aliphatics production industry [RCRA Section 3001(e)(2)]. In 1989, the Environmental Defense Fund (EDF) sued EPA, in part, for failing to meet the statutory deadlines of Section 3001(e)(2) of RCRA (EDF *vs.* Browner; Civ. No. 89-0598 D.D.C.). To resolve most of the issues of the case, EDF and EPA entered into a consent decree, which was approved by the court on December 9, 1994 and has been amended subsequently to revise dates. The consent decree sets out an extensive series of deadlines for promulgating RCRA rules and for completing certain studies and reports. Paragraph 1.m of the consent decree obliges EPA to promulgate a final listing determination on or before September 30, 2000 for wastewaters and wastewater treatment sludges generated from the production of chlorinated aliphatics (specifically, from the production of the same chlorinated aliphatics products specified in the F024 listing). The proposed K173, K174, and K175 wastes include those studied as a result of the consent decree.

Chlorinated Aliphatics Wastes Proposed for Listing

The wastes proposed for listing under 40 CFR Part 261 in today's rule are as follows:

- K173: Wastewaters from the production of chlorinated aliphatic hydrocarbons, except wastewaters generated from the production of vinyl chloride monomer using mercuric chloride catalyst in an acetylene-based process. This listing includes wastewaters from the production of chlorinated aliphatic hydrocarbons having carbon chain lengths ranging from one to and including five, with varying amounts and positions of chlorine substitution.

- K174: Wastewater treatment sludges from the production of ethylene dichloride or vinyl chloride monomer (including sludges that result from commingled ethylene dichloride or vinyl chloride monomer wastewater and other wastewater), unless the sludges meet the following conditions: (I) they are disposed of in a Subtitle C or D landfill licensed or permitted by the state or federal government; (ii) they are not otherwise placed on the land prior to final disposal; and (iii) the generator maintains documentation demonstrating that the waste was either disposed of in an onsite landfill or consigned to a transporter or disposal facility that provided a written commitment to dispose of the waste in an offsite landfill. Respondents in any action brought to enforce the requirements of Subtitle C must, upon a showing by the government that the respondent managed wastewater treatment sludges from the production of vinyl chloride monomer or ethylene dichloride, demonstrate that they meet the terms of the exclusion set forth above. In doing so, they must provide appropriate documentation (*e.g.*, contracts between the generator and the landfill owner/operator, invoices documenting delivery of waste to landfill, etc.) that the terms of the exclusion were met.

- K175 Option 1: Wastewater treatment sludges from the production of vinyl chloride monomer using mercuric chloride catalyst in an acetylene-based process.

  K175 Option 2: Wastewater treatment sludges from the production of vinyl chloride monomer using mercuric chloride catalyst in an acetylene-based process, unless I) the sludges are disposed in a Subtitle C landfill, and ii) the sludges do not fail the toxicity characteristic for mercury in 40 CFR 261.24, and iii) the generator maintains documentation demonstrating that the waste was disposed of in a Subtitle C landfill or consigned to a transporter or disposal facility that provided a written commitment to dispose of the waste in a Subtitle C landfill. Respondents in any action brought to enforce the requirements of Subtitle C must, upon a showing by the government that the respondent managed wastewater treatment sludges from the production of vinyl chloride monomer using mercuric chloride catalyst in an acetylene-based process, demonstrate that they meet the terms of the exclusion set forth above. In doing so, they must provide appropriate documentation (*e.g.*, contracts between the generator and the landfill owner/operator, invoices documenting delivery of waste to landfill, analytical results or other information showing the waste does not fail the toxicity characteristic for mercury, etc.) that the terms of the exclusion were met.

It is important to note that an individual facility generating wastewater treatment sludge from the production of ethylene dichloride or vinyl chloride monomer may not necessarily be required to manage the waste as hazardous, due to the proposed conditional listing. In fact, the vast majority of K174 waste presently generated would not require management as a hazardous waste under this conditional listing, as further described in Section 3.3.

3.1.2 Chlorinated Aliphatics Industries Overview

For the purposes of the current listing investigation, EPA defined "chlorinated aliphatic" as it had previously in the F024 listing. Specifically, a chlorinated aliphatic is defined as any organic compound characterized by straight-chain, branched-chain, or cyclic hydrocarbons containing one to five carbons, with varying amounts and locations of chlorine substitution. Hydrocarbons are organic compounds composed solely of the atoms hydrogen and carbon. Aliphatics occur where the chemical bonding between carbon atoms are single, double, or triple covalent bonds (not aromatic bonds). Cyclic aliphatic hydrocarbons included in this class consist of alkanes, alkenes or alkadienes, and alkynes. For an aliphatic to be chlorinated, the hydrogen atoms in the "aliphatic hydrocarbon" have been chemically replaced with chlorine atoms, at different positions and also in multiple positions. It should be noted that while the F024 and F025 definitions are limited to wastes generated from the production of chlorinated aliphatics by free radical catalyzed processes, EPA did not limit the current industry study to free radical catalyzed processes.

Chlorinated aliphatics products and intermediates were reported by industry from EPA's RCRA 3007 survey response (see Section 3.2.1). Data on these products and information on the facilities producing them are not included due to business confidentiality concerns. Following this most recent EPA data collection, additional facilities have closed while others have opened or increased capacity. Chlorinated aliphatic production volumes have increased significantly over the past several years. This trend of increasing production capacity is expected to continue in future, keeping total facility capacity in line with demand for chlorinated aliphatic products. Detailed discussion concerning chlorinated aliphatics production facilities is presented in EPA's Listing Background Document for the Chlorinated Aliphatics Industry Listing Determinations (1999). The effect of these changes on future waste generation was not investigated.[35]

Chlorinated aliphatics production facilities are primarily located in and around the petroleum industry along the Gulf Coast. The majority of these locations are fully integrated petrochemical processing facilities in which chlorinated aliphatic wastewaters are co-managed with non-chlorinated aliphatic wastewaters creating a "non-dedicated" wastewater sludge. There are a number of facilities whose wastewater treatment systems manage only chlorinated aliphatics wastewaters; for the purpose of this report these treatment systems, and resulting sludges, are termed "dedicated".

Chlorinated aliphatics production involves the production of both chlorinated products and intermediates. A chlorinated aliphatic "intermediate" is a chemical which is produced and consumed onsite in a chlorinated aliphatic process; a chlorinated aliphatic "product" is a chemical which is either sold or shipped off site or is consumed onsite in a non-chlorinated aliphatic process. For example, vinyl chloride monomer (VCM) consumed onsite in the manufacture of polyvinyl chloride (a polymer) is considered a product, while ethylene dichloride (EDC) consumed during the manufacture of VCM is considered an intermediate. The most significant chlorinated aliphatic product is VCM. This is most often produced using the balanced process, with EDC as an intermediate and/or co-product (i.e., the "EDC/VCM balanced process").

3.1.3 Processes Generating Chlorinated Aliphatics Wastes

Chlorinated aliphatics are produced using several different production processes. The Listing Background Document identifies 13 different processes used to manufacture various products. Two processes are discussed below: production of EDC/VCM using the balanced process, and production of VCM using the acetylene process. These processes generate wastes K174 and K175, respectively. Although K173 (wastewaters) can be generated from any chlorinated aliphatics production process, their generation will only be discussed in the context of EDC/VCM using the balanced process. This is the single most common process investigated in this industry.

The wastes proposed for listing, K173, K174, and K175, contain toxic constituents which are included as the proposed basis for listing these wastes; other constituents have proposed

[35] Significantly, Borden Chemicals and Plastics (Geismar, LA) is expanding their acetylene-based VCM production process, a process generating K175. This is the only facility that generates K175 in the U.S. (From Listing Background Document.)

numerical or technology-based treatment standards. These constituents are included in Appendix C.

Generic EDC/VCM Production Using the Balanced Process

Manufacture of EDC and VCM is the most common process in the chlorinated aliphatics industry. There are 17 EDC and/or VCM production processes at 15 facilities (12 processes manufacture EDC and VCM, while the remaining five only manufacture EDC). EDC/VCM manufacture accounts for the vast majority of the chlorinated aliphatics industry market share.

EDC and VCM are commonly manufactured in the chlorinated aliphatic industry by the "balanced process." The balanced process consists of three primary reaction steps: 1) direct chlorination of ethylene to produce EDC, 2) thermal cracking of EDC to produce VCM and hydrogen chloride (HCl), and 3) oxychlorination of ethylene and HCl from thermal cracking to produce additional EDC. Prior to thermal cracking, the crude EDC undergoes purification. Typically EDC is manufactured as an intermediate in the subsequent manufacture of VCM. However, in some cases EDC is manufactured onsite and sent offsite as product or purchased from an offsite source and used onsite to manufacture VCM. In addition, there is single facility in the United States which manufactures VCM via hydrochlorination of acetylene, which generates K175 (this production process is discussed below).

Following the manufacture of VCM, many facilities consume VCM onsite as an intermediate in the manufacture of polyvinyl chloride (PVC). This polymerization reaction is not within the scope of this listing determination, and was not investigated in the course of the Industry Study.

Wastes produced during the EDC/VCM production process are mainly generated from distillation and purification processes, scrubbers used during start-up/shut-down, washings, phase separation, rainwater, and equipment washdowns.

Two process wastewater streams are commonly formed from the manufacture of crude EDC (both would be classified as K173). The most common process wastewater consists of water generated as by-product from the oxychlorination reaction, that is separated from the organic EDC phase; this aqueous phase also includes other wastewaters from caustic washing of wet crude EDC and removal of water from wet EDC. In addition, a second process wastewater that may be generated periodically consists of various scrubber waters generated during start-up/shut-down operations. These two process wastewater streams, along with steam stripped drainage wastewaters generated from equipment washdown and rainwater in the process areas are commonly commingled prior to management.

Wastewater treatment sludges are generated from the treatment EDC/VCM wastewaters. These sludges would be classified as K174. Sludges are generally dewatered using either plate-and-frame filter presses or belt filter presses and dewatered sludge is temporarily stored in roll-off containers prior to onsite or offsite transportation and management.

VCM Production Using the Acetylene Process (VCM-A)

Production of vinyl chloride monomer based on acetylene is less common than the aforementioned EDC/VCM balanced process using ethylene as feedstock. In fact, EPA's industry study identified only one chlorinated aliphatics facility (Borden Chemicals and Plastics; Geismar, LA) using the acetylene-based process. The quantity of VCM that can be produced from this process accounts for approximately 2 percent of the nationwide 1998 capacity of VCM production (www.chemexpo.com, "Vinyl Chloride Product Profile").

This process uses acetylene and anhydrous hydrogen chloride as raw materials in a hydrochlorination reaction to produce vinyl chloride monomer. The basic process chemistry is shown below.

$$CH{\equiv}CH + HCl \rightarrow CH_2{=}CHCl$$

In the Borden process, acetylene (C_2H_2) from the onsite acetylene plant is first purified to remove water. Following drying, the acetylene is mixed with anhydrous hydrogen chloride (HCl) and flows through tubular catalytic reactors. Once in the reactors, the acetylene and HCl combine to form VCM (C_2H_3Cl). Mercuric chloride supported on activated carbon is used as the catalyst in all reactors. The reactor products are sent to a phase separator. The liquid phases, consisting primarily of VCM, are forwarded to purification. The vapor phases are recycled to the reactor steps.

VCM purification consists of a series of distillation columns. Through this series of columns, the following compounds are recovered:

- Unreacted HCl and acetylene, which are recycled back to the reactors.
- Purified VCM, which is sold as a product.
- "Heavy ends" from the process. These are combusted onsite.

The only wastewater generated from this process is rainwater and other padwater collected from the process area. Due to the presence of residual mercuric chloride catalyst from catalyst change-outs on the process pad, the padwater (containing mercury) is forwarded to a separate sodium sulfide treatment system prior to being discharged under an NPDES permit. This wastewater is not part of the proposed scope of K173, and is proposed to not be listed.

Mercury sulfide wastewater treatment sludge is generated from the treatment of the process area padwater. This sludge is dewatered prior to temporary storage onsite in a container. This waste is proposed to be listed as K174.

3.2 DATA SOURCES

3.2.1 RCRA §3007 Questionnaire

EPA developed an extensive questionnaire under the authority of §3007 of RCRA for distribution to the chlorinated aliphatics production industry. The purpose of the RCRA §3007 Questionnaire was to gather information about solid and hazardous waste management practices in the U.S. chlorinated aliphatics production industry. EPA used this information to determine whether certain waste streams should be managed as hazardous under RCRA and added to the list of hazardous wastes under 40 CFR 261. The questionnaire included sections requesting information with respect to:

- Corporate and facility information
- Types of chlorinated aliphatic products and chlorinated aliphatic intermediates manufactured at the facility
- Types of processes at the facility
- Solvent use during the manufacturing process
- Specific production processes; as well as residuals generated
- Residuals characterization
- General residual management information
- Specific onsite residual management information
- Source reduction efforts, and
- Signed certification.

EPA distributed the survey in November of 1992 to 57 facilities and/or corporations identified as potential manufacturers of chlorinated aliphatic chemicals. As described in Section 3.1.2, the results of the survey indicate that 27 facilities manufactured chlorinated aliphatics in 1991.

The completed surveys were reviewed for completeness and data were entered into a relational data base. An exhaustive engineering review of each facility's response was conducted, resulting in follow-up letters and/or telephone calls to facility representatives seeking clarifications, corrections, and additional data where needed.

EPA suspended activity on this listing determination project for two and a half years between the fall of 1993 and spring of 1996. Upon resuming the listing determination activities in 1996, EPA initiated a review of data collected prior to the work stoppage. EPA contacted facility representatives to gather information regarding the current status of chlorinated aliphatics production operations. Ultimately, in June of 1997 EPA sent requests for updated data (for calendar year 1996) regarding consent decree wastes generated by each facility. Data from these responses were similarly reviewed and entered into a database. Based on the updated information, two chlorinated aliphatics manufacturers ceased operations, leaving a total of 25 chlorinated aliphatics production facilities. EPA expects that each of these facilities generates one of the three wastes proposed for listing.

3.2.2 Record Sampling and Site Visits

EPA initiated field activities with a series of engineering site visits. The primary purpose of the site visits was to gather first-hand information about production processes, as well as waste generation, management, and characterization data for each of the consent decree wastes. To fulfill these objectives, EPA selected 16 facilities for site visits prior to record sampling. These facilities were selected in order to obtain the most representative sampling of all chlorinated aliphatics processes, and to examine dedicated wastewater treatment units, when possible. EPA selected three of these facilities for familiarization samples, collecting a total of 15 samples to assess the effectiveness of the laboratory analytical methods for the analysis of the actual residuals of concern.

Upon completion of the familiarization sampling and analysis effort, EPA initiated record sampling and analysis of the two consent decree wastes (wastewaters and wastewater treatment sludges) from twelve facilities. EPA collected 52 samples (41 wastewaters and 11 wastewater treatment sludges). A portion of the wastewater samples were used in characterizing K173 wastes, and portions of the wastewater treatment sludge samples were used in characterizing K174 and K175 wastes.

3.2.3 Biennial Reporting System

Data from the 1995 and 1997 Biennial Reporting System were used to evaluate available onsite treatment capacity. Preliminary 1997 data were made available in April 1999; it was used with caution because of its preliminary nature but at the same time is valuable because it represents the most recent information. A significant limitation of the 1997 data is that it lacks onsite waste treatment practices for hazardous waste generators; this type of information was only available from the 1995 data. BRS data contains onsite treatment or management practices for hazardous wastes generated by chlorinated aliphatics manufacturers. As discussed in Section 3.3.3 below, all manufacturers were investigated to determine if they had onsite hazardous waste incinerators, then assessed to determine if they reported burning wastes similar in form to K174 sludges. Initially, 1995 data were used. The 1997 BRS data were used for checking or verifying selected facilities who gave uncertain conclusions using the 1995 data.

The 1997 BRS data were also used to check if commercial treatment facilities combusted wastes similar in composition to the K174 wastes proposed for listing. Specifically, commercial facilities were investigated to determine how wood preserving waste F032 was commercially managed. Land disposal restrictions for F032 were finalized in May 1997, and therefore would have been effective for part of the reporting year. F032 and the newly proposed K173 and K174 wastes include dioxins and furans as the basis for listing (261 App VII). Facilities that would accept F032, therefore, may similarly accept K174 as well.

3.3 METHODOLOGY, ASSUMPTIONS, AND PRELIMINARY RESULTS

In conducting the capacity analysis for K173, K174, and K175 chlorinated aliphatic production wastes, EPA estimated the quantities and summarized the physical and chemical characteristics of the wastes that will require hazardous waste commercial treatment and/or recovery as a result of LDRs. The method that EPA developed for the K173, K174, and K175 chlorinated aliphatic production wastes capacity analysis is comprised of three steps:

1. Estimate the annual quantity of K173, K174, and K175 generated. Information on waste generation and current management practices (treatment, storage, disposal, and recycling) of K173, K174, and K175 was collected in the RCRA 3007 surveys described in Section 3.2 of this report.

2. Estimate annual quantity of waste currently meeting LDR standards. Many facilities already manage their waste, onsite or offsite, using methods that would likely satisfy the LDR treatment standards. These management methods differ for each of the three wastes. Management methods were determined using the RCRA 3007 surveys described in Section 3.2 of this report. The quantity being managed in this fashion can be subtracted from the required commercial treatment capacity.

3. Estimate annual quantity with onsite treatment or recovery availability. Many facilities have appropriate onsite treatment technologies that can result in all, or most, of the facility's generated waste volume being managed onsite and not requiring commercial treatment capacity. This assessment was made using sources such as BRS, described in Section 3.2 of this report.

The results of these three steps determine how much offsite commercial capacity is required to manage K173, K174, and K175. Exhibit 3-1 summarizes the results of this analysis. The derivation of the quantities presented in Exhibit 3-1 is discussed in the subsequent sections.

Exhibit 3-1. Generation and Management Practices of K173, K174, and K175 Wastes Following Effective Date of LDRs (quantities are averages, in tons, using 1996 data)

Waste Stream	(1) Annual Quantity Generated	(2) Annual Quantity Currently Meeting LDR Standards [a]	(3) Annual Quantity with Onsite Treatment/ Recovery Availability [b]	(4) Annual Quantity Requiring Commercial Treatment [c]
K173 Wastewater and Nonwastewater	12,700,000	12,700,000 [d]	Not applicable	0
K174 Nonwastewater (no contingent listing)	<118,000	20	12,000	<106,000
K174 Nonwastewater (contingent listing)	1,900	0	0	1,900
K175 Nonwastewater	130	0	0	130

Quantities of K174 and K175 wastewaters are negligible. All quantities are rounded.
a. Quantity in which current management practice is assumed to meet LDR standards.
b. Estimated quantity of wastes that could be managed onsite, but are not (such as management in incinerators).
c. Estimated quantity requiring offsite commercial treatment. Equals column 1 minus column 2 minus column 3.
d. Assumes quantity currently managed by underground injection can continue to be managed this way.

EPA's capacity analysis is slightly different for each of the three wastes proposed for listing. For K173, EPA evaluated the wastes only generated by chlorinated aliphatics production activities. Many of the facilities investigated manufacture many different kinds of organic chemicals (not limited to chlorinated aliphatics), and combine the resulting wastewaters at the headworks. In its capacity analysis, EPA assumed, should offsite treatment be necessary, that a facility would manage the listed wastewaters separately from any nonhazardous wastewater (i.e., it would not combine wastes from chlorinated aliphatics production with wastes from other plant production).

For K174, EPA evaluated the total quantity of such sludge actually generated by the facilities. As mentioned previously, wastewater treatment systems at chlorinated aliphatics facilities may receive wastewaters from the production of more than one product class. The total quantity of sludge generated, and reported, by industry was used in the capacity analysis. This is sometimes different than the quantities that EPA used in its other analyses, such as the risk assessment. In addition, EPA is proposing two regulatory options for listing. In the first contingent listing option, only K174 waste that is not landfilled would meet the listing criteria. In the second option, all of the K174 waste would be listed as hazardous. This capacity analysis considers both options.

For K175, only one facility was found to generate this waste. This facility's waste is generated from wastewaters segregated from other processes (i.e., prior to headworks). For this waste, distinctions between "apportioned" and "total" quantities are moot because the waste is generated entirely from chlorinated aliphatics production. This quantity was used in the capacity analysis for determining possible treatment capacity.

It is important to note that, for these analyses, if any facility undergoes waste minimization activities by modifying physical plants or incorporating units to separate the wastes and deem the wastes more amenable to recovery, the quantity requiring treatment will decrease. Therefore, if generating facilities continue waste minimization efforts following the promulgation of the proposed rule, then the quantity of hazardous waste requiring treatment would decrease (if the wastes are listed as hazardous). Such waste minimization activities include modifying wastewater treatment processes (to segregate chlorinated aliphatic production wastewaters from other wastewaters, for example), volume reduction activities (e.g., more efficient sludge dewatering), or activities to make the waste more amenable to recovery.

3.3.1 K173 Wastes

EPA found that K173 is typically a wastewater stream as defined in 40 CFR 268.2. However, facilities may generate K173 with total suspended solids greater than 1 percent, such that the waste would be considered a "nonwastewater." In its capacity analysis, EPA evaluates both wastewaters and nonwastewaters together because waste management options are the same regardless of solids content (as long as the waste exhibits physical properties of a pumpable aqueous waste). EPA is specifically proposing an exclusion from the "derived-from" rule which would exempt sludges generated from K173 from classification as K173 (such sludges could happen to meet the definition of K174, however).

EPA evaluated the quantity of K173 requiring offsite commercial treatment using the three step process described above. First, EPA estimated the quantity of K173 generated annually. Second, EPA estimated how much of this quantity was already managed in a manner consistent with the proposed land disposal restrictions. Third, EPA considered potential onsite and offsite treatment capacity for this waste, to allow for uncertainty in its analysis.

Estimating Quantity Generated

EPA used results from the 1997 RCRA 3007 surveys to estimate the annual quantity of K173 wastewater generated. Annual generation quantities were available on a plant specific level for this waste. Because K173 wastewaters are continuously generated, EPA's capacity analysis used the quantity generated in 1996 as representative of the quantity generated in any year. A total of 24 facilities generated a total of 11.5 million metric tons (12.7 million tons) of K173 waste in 1996. The generation rates of each facility, and the subsequent management of the waste, is presented in Appendix A.

Facilities generating chlorinated aliphatics products are likely to produce other organic chemicals. Wastewaters from chlorinated aliphatics production (K173) are sometimes commingled with other non-chlorinated aliphatics wastewaters at the headworks, prior to treatment. The above quantities refer only to K173 wastewaters prior to mixing (if any) at the wastewater treatment plant headworks.

Current Management of K173

The various K173 management methods reported in the questionnaire for 1996 are summarized in Exhibit 3-2. For each management method, EPA assessed if the specific management activity is expected to comply with the final LDR standards. As shown in Exhibit 3-2, all of the K173 is presently managed in a manner that does not require further treatment or alternative management, either onsite or offsite, with the potential exception of underground injection. Each of the waste management methods described in Exhibit 3-2 are discussed in detail below:

- Treatment in an onsite tank system. All facilities investigated manage their K173 in tanks, rather than in surface impoundments. Surface impoundment management would classify as land disposal and be prohibited upon the promulgation of land disposal restrictions. However, tank-based systems are not subject to such restrictions. All facilities manage their wastewaters exclusively in tanks.

- Discharge under NPDES permit or discharge to a publicly owned treatment works. Permitted industrial wastewater point source discharges (e.g., NPDES discharges) are excluded as RCRA solid wastes [40 CFR §261.4(a)(2)], as are wastes mixed with sewage and treated in a publicly owned treatment works [40 CFR §261.4(a)(1)].

- Discharge to a privately owned treatment works. Three facilities use this management method, utilizing three different offsite facilities.[36] These offsite treatment facilities are not identified included due to business confidentiality concerns. The 1995 and 1997 BRS were investigated for these three waste treatment facilities. All three were found to have EPA identification numbers, and one was found to accept other aqueous hazardous wastes from offsite. This facility (not identified due to business confidentiality concerns), accepted organics-containing wastewaters for treatment and therefore would likely be able to accept K173 if it were listed as hazardous. The treatment facility likely already complies with land disposal restrictions because it has accepted other hazardous wastes for at least four years (since 1995). According to the 1995 BRS, the remaining two facilities do not report receiving hazardous wastes for treatment, but report generating and subsequently treating hazardous wastes using onsite wastewater treatment processes. Therefore, these two facilities also are likely to be managing hazardous wastes consistent with land disposal restrictions.

- Reuse or recycling. Three different facilities reported this management practice. Names of these facilities are not included due to business confidentiality concerns. In general, EPA encourages the minimization or recycling of hazardous wastes. Hazardous waste reuse or recycling results in the generation of less waste requiring offsite commercial treatment capacity. Whether recycling continues at these three facilities following the promulgation of listing and land disposal restriction regulations, however, is in part dependent on the specific recycling or reuse process employed by the generator and other site-specific regulatory factors. However, all three facilities have the ability to treat these recycled or reused K173 wastes onsite, if necessary (i.e., all three facilities also discharge a portion of K173 using techniques such as discharge to a POTW). Therefore, if for some reason recycling was not continued, EPA expects the three facilities to manage their wastes onsite in their wastewater treatment system and not require offsite treatment capacity.

- Onsite underground injection. RCRA Section 3004(k) includes underground injection as land disposal, which is prohibited following land disposal restrictions. RCRA Section 3004(d)(1) allows for wastes to be disposed in a manner exempt from land disposal restrictions, so long as EPA determines that there is no migration from the disposal unit for the subject wastes. Two facilities currently manage K173 using

[36] Each of these three waste treaters are located in the same city as the generating facility.

underground injection, using wells with approved no-migration petitions. EPA assessed two cases for these facilities: that K173 could be added to the facilities' petitions within the effective date of the listings if finalized, and if K173 could not be added to the petition in a timely manner. If K173 could be included in the petition, then the facilities could continue to use this management method. Consideration of alternative offsite management is presented later in this section. Details regarding underground injection activities at these two facilities are presented in Appendix B.

EPA also evaluated the quantity of K173 that would require alternative treatment, if management in underground injection wells could not be continued following the effective date of the listing. The quantity of K173 generated by these facilities is presented in Appendix B. At one of the facilities, the quantity of K173 generated in 1996 was approximately 500,000 MT (550,000 tons). No alternative onsite treatment capacity is available at the facilities using underground injection (i.e., discharge to POTW or to surface water). Therefore, this quantity would require offsite treatment, if the current disposal method of underground injection is discontinued.

In conclusion, EPA expects that the entire quantity of K173 presently generated, 11.5 million MT (12.7 tons), can continue to be managed using the management methods presently employed. To acknowledge uncertainty regarding whether the practice of underground injection could continue, EPA estimates that one facility would require 500,000 MT (550,000 tons) of offsite treatment capacity, if the practice was discontinued. Information regarding the quantity of K173 generated at the remaining facility is in Appendix B; this quantity would also require offsite treatment capacity.

Exhibit 3-2. Reported Management Methods for K173

Management Method	Comment
Treatment in an onsite tank system, with NPDES discharge	Expected to continue; no surface impoundments were identified in treatment train.
Treatment in an onsite tank system, with discharge to privately-owned treatment works	Expected to continue; no surface impoundments were identified in treatment train.
Treatment in an onsite tank system, with subsequent recycling or reuse either onsite or offsite	Expected to continue; no surface impoundments were identified in treatment train.
Treatment in an onsite tank system, with subsequent onsite underground injection	Expected to continue; underground injection wells have approved no-migration petitions. EPA also evaluated a scenario where the practice is discontinued.
Treatment in an onsite tank system, with discharge to publicly-owned treatment works	Expected to continue; no surface impoundments were identified in treatment train.

Source: 1996 Survey data. Survey data from 1996 also list two other streams identified as "wastewaters." (These streams were reported as such by the generating facilities.) These waste streams were reported as being managed by offsite incineration (0 MT) and offsite landfill (19 MT). They likely represent one-time clean-out (maintenance) wastes rather than the more frequently generated K173 wastewaters. Therefore, they may not be subject to the listing definition and these volumes were not included in the capacity analysis. However, given the small volume, even if these particular wastes were ultimately classified as K173 there would be sufficient offsite treatment capacity for these wastes, as demonstrated for K174 nonwastewaters in Section 3.3.2 of this report.

3.3.2 K174 Wastes

The physical characteristic of K174 is a sludge. EPA expects K174 to be generated in nonwastewater form; no quantities of wastewater forms of K174 are expected to be generated. In its capacity analysis, EPA evaluated both the contingent management option and the option assuming this waste would require management as hazardous regardless of management. Subsequently, the quantity requiring alternative treatment differs for each of these listing options. As a result of this, EPA evaluated the quantity of K174 requiring offsite commercial treatment for both listing options using the same three step process described in Section 3.3. First, EPA estimated the quantity of K174 generated annually under each option. Second, EPA estimated how much of this quantity was already managed in a manner consistent with the proposed land disposal restrictions. Third, EPA estimated the potential onsite treatment capacity for this sludge.

EPA relied on the waste management information presented in Exhibit 3-3 in evaluating the required capacity for each option. Exhibit 3-3 lists all facilities potentially generating K174.

Exhibit 3-3. Summary of Waste Management and Incineration Practices for K174						
Facility	Quantity Generated (MT) (Based on 1996 Survey Data)	Waste Management Practice (based on 1996 Survey Data)	Onsite Incineration Conducted? (Based on BRS)[a]	Quantity Incinerated in 1995 (MT) (Based on BRS)	Commercial Incineration Needed?	
					Contingent	No Contingent
Borden Chemicals and Plastics, Geismar, LA	2,904	Offsite NH landfill	N	–	N	Y
Dow Chemical, Freeport, TX	77,850	Onsite NH landfill Onsite Haz. landfill	Y	17,900	N	Y
Dow Chemical, Plaquemine, LA	11,100	Onsite NH landfill	Y	2,300,000	N	N
Formosa, Baton Rouge, LA	700	Offsite NH landfill	N	–	N	Y
Formosa, Point Comfort, TX	3,688	Offsite NH landfill	N	–	N	Y
The Geon Company, LaPorte, TX	1,804	Offsite NH landfill	N	–	N	Y
Georgia Gulf, Plaquemine, LA	1,750	Onsite land treatment	N	–	Y	Y
Occidental Chemical, Convent, LA	500	Offsite NH landfill	N	–	N	Y
Occidental Chemical, Deer Park, TX	442	Offsite Haz. landfill	N - only liquids	–	N	Y
Oxymar, Gregory, TX	1,605	Offsite NH landfill Offsite Haz. landfill	N - only liquids	–	N	Y
PPG Industries, Lake Charles, LA	2,200	Offsite NH landfill	N	–	N	Y
Condea Vista Chemical Company, Westlake, LA	18	On- and offsite Haz. incin.	N/A	N/A	N	N
Westlake Monomers, Calvert City, KY[b]	2,648	N/A	N	–[b]	N	Y
TOTALS	107,209		2 facilities	–	Contingent management: 11 facilities, 96,091 MT Not contingent management: 1 facility, 1,750 MT	

This entire table is NON-CBI. Data Sources: RCRA §3007 Questionnaire for the Chlorinated Aliphatics Industry update (1996 data), and 1995 BRS.

[a] Determination based on BRS form codes: "Y" means facility reported onsite incineration for solids or sludges in 1995 BRS database.

[b] The K174 sludge quantity for this facility was estimated in the Economics Background Document. This facility did not report generating a sludge in the 1996 survey (the facility was assumed to manage this waste using landfilling). In its Economics Background Document, EPA estimated that if the facility generated a sludge in the future, the quantity of sludge would be approximately equal to the quantity of its generated wastewater (298,000 MT/yr) multiplied by 0.89 percent (the average ratio of sludge quantity to wastewater quantity, for all facilities supplying such data). All other K174 sludge quantities were taken from the 1996 Questionnaire update.

NH: Non-Hazardous; Haz: Hazardous

Contingent Listing Option: Not Listed if Managed in Landfill

In this option, the waste would not be hazardous (or subject to LDRs) if managed in a Subtitle D or Subtitle C landfill. EPA used data from the 1997 RCRA survey, summarized in Exhibit 3-3, to determine that only two facilities would generate a hazardous waste under this option. These two facilities conduct management by incineration (Condea Vista/Westlake, LA) and land treatment (Georgia Gulf/Plaquemine, LA). These facilities generated a total of 1,770 metric tons (1,950 tons) of K174 waste in 1996.

The facility conducting hazardous waste incineration is expected to be able to continue this practice following promulgation of the rule, if this contingent management option is finalized. Only 20 metric tons (22 tons) are presently managed by incineration and would require further treatment or alternative management. The remaining 1,750 metric tons (1,925 tons) that are land treated would require alternative treatment in order to meet the final LDR standards. Based on the Questionnaire update and 1995 BRS data, the Georgia Gulf facility does not have an onsite incinerator or landfill. Therefore, the 1,750 metric tons (1,925 tons) generated by this facility would require offsite commercial treatment in order to meet the LDR standards. EPA's capacity analysis for the K174 contingent management option is presented in Exhibit 3-4.

Exhibit 3-4. Capacity Analysis Summary for Nonwastewater Forms of K174: Contingent Listing Option

Step in Methodology	Quantity, MT (and tons)
1. Annual Quantity Generated	1,770 MT (1,950 tons)
2. Annual Quantity Currently Meeting LDR Standards	20 MT (22 tons)
3. Annual Quantity that Could be Managed Using Onsite Treatment or Recovery	0
4. Annual Quantity Requiring Commercial Treatment	1,750 tons (1925 MT)

Listing Option: No Contingent Management

In this option, the waste would be hazardous (and subject to LDRs) regardless of the management method selected. EPA used data from the 1997 RCRA survey, summarized in Exhibit 3-3, to determine that 13 facilities generated a total of 107,000 metric tons (117,700 tons) of K174 waste in 1996.

Various K174 management methods reported in the questionnaire for 1996 are summarized in Exhibit 3-3. They include: 1) management in a non-hazardous waste landfill, 2) management in a hazardous waste landfill, 3) land treatment and 4) hazardous waste incineration. Management in a landfill is the predominant management method employed industry-wide, but this management method is unlikely to continue, without additional treatment, following the effective date of the LDRs. Only the quantity currently manager using hazardous waste incineration is likely to continue following the effective date of the LDRs. This facility, Condea Vista/Westlake, LA, manages 20 metric tons (22 tons) in this manner. The remaining quantity of

106,080 metric tons (116,688 tons) that is generated by 12 facilities and subsequently land disposed (i.e., land treated or landfilled) would require alternative treatment in order to meet the final LDR treatment standards.

EPA also identified facilities that are likely to conduct onsite hazardous waste incineration, but do not presently manage their K174 wastes in this manner. As shown in Exhibit 3-3, one facility (Dow/Plaquemine, LA) is expected to have sufficient onsite Subtitle C incineration capacity. This is based on the fact that the facility reported incinerating nearly 2.1 million metric tons (2.3 million tons) of hazardous solids or sludges in the 1995 BRS. This facility generated 11,100 metric tons (12,200 tons) of K174 in 1996, and therefore the additional waste volume would represent a small fraction of its 1995 incinerator feed. On the other hand, Dow Freeport operates an onsite hazardous waste incinerator but does not appear likely to manage its generated K174 in its onsite incinerator. Dow incinerated 17,900 MT of hazardous waste in 1995 and it is not apparent that they would be able to incinerate an additional 78,000 MT of K174. EPA's analysis for nonwastewater forms of K174, assuming no contingent management option, is summarized in Exhibit 3-5.

In conclusion, for this listing option, 11 of the 13 K174 generating facilities would require offsite commercial treatment following promulgation of the listing and land disposal restrictions. Condea Vista/Westlake, LA currently meets the LDR standards by incinerating all K174 wastes while Dow/Plaquemine is expected to have sufficient Subtitle C incineration capacity. Based on the Questionnaire update and 1995 BRS data, the remaining 11 facilities either do not have onsite Subtitle C incinerators or do not have sufficient onsite capacity. Therefore, the remaining 95,900 metric tons (105,500 tons) generated at the 11 facilities would require offsite commercial treatment.

Exhibit 3-5. Capacity Analysis Summary for Nonwastewater Forms of K174: No Contingent Listing

Step in Methodology	Quantity, MT (in tons)
1. Annual Quantity Generated	107,000 (117,700)
2. Annual Quantity Currently Meeting LDR Standards	20 (22)
3. Annual Quantity that Could be Managed Using Onsite Treatment or Recovery	11,100 (12,200)
4. Annual Quantity Requiring Commercial Treatment	95,900 (105,500)

3.3.3 K175 Wastes

K175 is generated in nonwastewater form (i.e., a sludge). EPA estimates that no quantities of K175 wastewaters are generated, and would therefore not require alternative commercial treatment.

Only one facility reported generating K175: Borden Chemicals and Plastics in Geismar, LA, at a rate of 120 MT/year. The waste is generated from wastewaters resulting from the change-out of mercury chloride catalyst from the chlorinated aliphatics production process, as well as other process area streams such as runoff and leaks. The wastewater is treated with sodium sulfide to generate a mercury sulfide waste. The mercury TCLP concentration of this waste exceeds the maximum concentration for the Toxicity Characteristic (0.2 ppm) for D009. However, in 1988 the Louisiana DEQ determined the waste was not hazardous, and therefore not subject to many RCRA regulations (including land disposal restrictions for D009). Although the sludge has this nonhazardous designation, it is sent to a hazardous waste landfill in Carlyes Louisiana for disposal (from EPA, Stabilization and Testing of Mercury Containing Wastes, March 31, 1999; and site visit report for Borden Chemicals in Geismar Louisiana).

K175 would be prohibited from land disposal if it was listed as hazardous. Present management (in a hazardous waste landfill) would not meet land disposal restrictions and alternative management would be required.

The Borden Chemicals facility does not have alternative onsite capacity. Specifically, EPA is proposing RMERC as the technology-specific treatment standard for K175. Borden Chemicals does not have onsite RMERC capacity, and therefore would require offsite commercial treatment of this waste. As an alternative, EPA is proposing that stabilization could be conducted, with subsequent management in a landfill meeting other co-disposal requirements including pH of other wastes equal to 6 or less. The Borden Chemicals facility does not have such a landfill.

In conclusion, the entire quantity of K175 presently generated, 120 MT, would require offsite commercial treatment capacity if the listing and land disposal restrictions were finalized. The findings of the capacity analysis for proposed hazardous waste K175 are summarized in Exhibit 3-6.

Exhibit 3-6. Capacity Analysis Summary for K175

Step in Methodology	Quantity, MT (and tons)
1. Annual Quantity Generated	120 MT (130 tons)
2. Annual Quantity Currently Meeting LDR Standards	0
3. Annual Quantity that Could be Managed Using Onsite Treatment or Recovery	0
4. Annual Quantity Requiring Commercial Treatment	120 MT (130 tons)

3.4 CONTAMINATED SOIL AND DEBRIS

In addition to the production wastes generated from chlorinated aliphatics manufacturers on a routine basis, EPA also considered the quantity of contaminated soil and debris present at these facilities. For soil and debris contaminated with the newly listed wastes, EPA is proposing to not grant a national capacity variance. EPA believes that the majority of contaminated soil and debris can and will be managed onsite and therefore would not require substantial offsite commercial treatment capacity. Therefore, EPA is proposing to not granting a national capacity variance to hazardous soil and debris contaminated with the newly listed wastes covered under this rule.

EPA believes that a number of factors will help maintain adequate LDR treatment capacity for soil and debris contaminated with newly listed wastes. First, if the contaminated soil is not excavated (e.g., in-situ treatment), then the LDRs will not be applied to these wastes in the first place. If disturbed, contaminated soil can be managed onsite through use of a corrective action management unit (CAMU) and temporary unit (TU). This allows an area of a facility to be remediated without triggering LDR standards, if the remediated material is placed back into the area following remediation. This rule was finalized on February 16, 1993 (58 *FR* 8659) and is codified in 40 CFR Part 264 Subpart S. In these cases, the volume of soil requiring offsite treatment may be small. Also, if necessary, a facility can apply for a case-by-case extension or a treatability variance to manage or treat these wastes. Additionally, there are new technologies becoming available to treat contaminated soil and debris that still might require further treatment. According to U.S. EPA's Capacity Analysis Background Document for Phase IV Wastes (U.S. EPA, 1998), currently there are 108 venders using innovative treatment technologies to treat contaminated soils onsite. The innovative treatment technologies being used are as follows: soil vapor extraction, thermal desorption, ex-situ bioremediation, in-situ bioremediation, soil washing, solvent extraction, dechlorination as well as other innovative treatment technologies.[37]

Second, for those contaminated soils for which the LDRs are triggered, recent EPA action will decrease demand for BDAT treatment capacity. Specifically, in the final Phase IV LDR rule (63 *FR* 28556, May 26, 1998), EPA promulgated alternative LDR treatment standards (10 times the universal treatment standard (UTS) or 90 percent reduction) for soils contaminated with hazardous wastes. EPA believes that these less stringent treatment standards will increase the availability of capacity to treat soil contaminated with newly listed refinery wastes. EPA recognizes that implementation of the alternative soil treatment standards probably will not be immediate because States are not required to adopt less stringent RCRA rules and because there will be some time between the selection and actual implementation of remedial treatment technologies. Nevertheless, EPA believes that these alternative treatment standards will provide another viable option for facilities with contaminated soils to comply with LDR requirements.

Third, the LDRs also provide flexibility in selecting treatment methods for debris contaminated with the proposed chlorinated aliphatics production wastes. EPA previously identified 17 different treatment methods as BDAT for hazardous debris; these methods fall into one of three categories: extraction (e.g., abrasive blasting, liquid or vapor phase solvent extraction, thermal desorption), destruction (e.g., biodegradation, chemical oxidation, thermal destruction), or immobilization (e.g., macroencapsulation or microencapsulation). 57 *FR* 37194 (Aug. 18, 1992). Hazardous debris that has been treated using one of the specified extraction or destruction technologies and that does not exhibit a hazardous waste characteristic after treatment, is no longer a hazardous waste and need not be managed in a Subtitle C facility. Hazardous debris contaminated with a listed waste that has been treated by one of the specified immobilization technologies is still a hazardous waste and must be managed in a Subtitle C

[37] US EPA Background Document for Capacity Analysis for Land Disposal Restrictions- Phase IV: Toxicity Characteristic Metal Wastes and Newly Identified Mineral Processing Wastes (Final Rule). Pages E-50 through E-72 April 1998.

facility (see 40 CFR 268.45(c)). The hazardous debris rule also gives generators the option of treating the debris to the waste-specific treatment standards for the waste contaminating the debris, although the treated debris must then continue to be managed as a hazardous waste. EPA believes that this flexible approach for contaminated debris helps ensure adequate treatment capacity for these materials.

Finally, given the current state of uncertainty surrounding certain pending EPA and Congressional actions, LDR treatment capacity for contaminated media is likely to remain adequate for at least the next few years. For example, a lawsuit challenging the final CAMU rule has been pending since 1993. The parties to the litigation had agreed to put the case on hold until EPA promulgated the final HWIR rule for contaminated media (i.e., the HWIR Media rule, which was finalized on November 30, 1998). Until the CAMU litigation is resolved, there may continue to be some degree of unwillingness by hazardous waste generators to initiate voluntary remedial activities under the flexible approach authorized by the CAMU rule. Similarly, EPA believes that existing uncertainty over how the HWIR Media, once finalized, may alter LDR requirements for contaminated media, has resulted in a general decrease in the pace of some remediation activities. Moreover, several bills are pending in Congress that would amend RCRA to provide EPA and the States with greater flexibility with respect to LDR treatment requirements for contaminated media. This uncertainty over regulatory requirements, in turn, has contributed to a decrease in the demand for commercial treatment for contaminated media.

3.5 MIXED RADIOACTIVE WASTES CONTAMINATED WITH K173, K174, and K175

EPA identified no quantity of K173, K174, and K175 destined for treatment as mixed radioactive wastes. EPA is proposing to not grant a national capacity variance for mixed radioactive wastes or for soil and debris contaminated with mixed radioactive wastes.

3.6 OTHER REGULATIONS RELEVANT TO K173, K174, AND K175

Each of EPA's major program offices has long-standing regulatory controls that apply to the chlorinated aliphatics industry. Some of the more significant programs with some relevance to OSW's proposed land disposal restrictions include the following:

- The Clean Air Act's National Emission Standards for Hazardous Air Pollutants (NESHAPs) for organic hazardous air pollutants from the synthetic organic chemical manufacturing industry at 40 CFR Part 63 include the following regulations:

  - Subpart F, which applies to any plant which produces ethylene dichloride (EDC) via oxychlorination, vinyl chloride monomer (VCM) by any process, or one or more polymers containing any fraction of polymerized VCM and limits the concentration of vinyl chloride to less than 10 ppm in process wastewaters and sets standards for emissions of VCM from a variety of fugitive emission sources.

  - Subpart G, which regulates process vents, storage vessels, transfer operations, and wastewater.

- The Clean Air Act's National Ambient Air Quality Standards (NAAQS), which prescribe limits for SOx, CO, particulates, NOx, and ozone.

- The Clean Water Act sets specific effluent guidelines for discharges to surface waters and POTWs for facilities in the organic chemical, plastic, and synthetic fibers sector, which includes manufacturers of chlorinated aliphatics.

- The Toxicity Characteristic, particularly for chlorinated aliphatic chemicals (e.g., vinyl chloride, D043), in combination with existing K and F hazardous waste listings applicable to chlorinated aliphatics (e.g., F024). There are existing land disposal restrictions (LDR) for such wastes.

EPA is presently pursuing regulatory approaches which may impact facilities manufacturing chlorinated aliphatics and generating K173, K174, and K175. These programs, obtained from the April 26, 1999 Unified Agenda (www.gpo.gov), are as follows:

- Land Disposal Restrictions; Potential Revisions to the Land Disposal Restrictions Mercury Treatment Standards: EPA published an Advanced Notice of Proposed Rulemaking (ANPRM) to solicit data and comments on treatment data that EPA has gathered on the treatment of mercury wastes (May 28, 1999; 64 *FR* 28949). The data and information gathered by this ANPRM process are intended to be used to propose revised treatment standards for some forms of mercury hazardous wastes in a future rulemaking.

- NESHAP for Chlorine Production: EPA is evaluating emissions from facilities engaged in the production of chlorine and sodium hydroxide (caustic). Hazardous air pollutants emitted include chlorine, hydrogen chloride, and mercury. Some of these facilities may be co-located with chlorinated aliphatics producers.

- NSPS for Synthetic Organic Chemicals Manufacturing Industry: EPA proposed a rule (September 12, 1994) to develop a new source performance standard to control air emissions of volatile organic compounds from wastewater treatment operations of the synthetic chemical manufacturing industry. The rule is scheduled to be finalized in April 2000. Generators of K173, K174, and K175 would likely be subject to this rule, and because it impacts wastewater treatment operations the quantities of K173, K174, and K175 may be affected although the direction or magnitude of any change in waste quantities is difficult to predict.

When completed, some of the regulatory programs underway may have little effect on the generation rates and subsequent management of K173, K174, and K175 wastes. However, the effects of these programs are difficult to assess because they are preliminary. EPA will reassess the impacts of these programs on K173, K174, and K175 waste generation and management when these relevant regulatory programs are further developed or are finalized.

4. CAPACITY ANALYSIS RESULTS

This section presents the results of capacity analysis for alternative commercial treatment of the proposed chlorinated aliphatics production wastes (K173, K174, and K175). A brief summary of these results was presented in Section 1 of this document (see Exhibit 1-2). The capacity analysis itself is based on assessment of available treatment capacity (Section 2) and the required capacity for treatment of K173, K174, and K175 (Section 3). This section compares estimates of required capacity to that commercially available for these wastes proposed to be listed.

EPA is proposing numerical treatment standards, equivalent to universal treatment standards, to wastewater and nonwastewater forms of K173 and K174. For wastewater forms of K175, EPA is also proposing numerical treatment standards equivalent to universal treatment standards. For nonwastewater forms of K175, EPA is proposing a technology-specific standard of RMERC. EPA is also proposing, for consideration, a treatment standard for K175 nonwastewaters that includes a numerical treatment standard in addition to restrictions concerning the landfill disposal of the waste.

The available data sources indicate that K173 wastes are predominantly wastewaters, but may exhibit total suspended solids content greater than 1 percent, such that they would be classified as nonwastewaters (40 CFR 268.2). EPA has found that most facilities generating K173 manage these wastes in tank-based systems prior to a permitted discharge to a surface water or POTW. The available data also indicate that certain facilities manage K173 using underground injection with existing approved no-migration determinations. K173 managed by land disposal units may require alternative treatment if onsite management to meet the LDR standards or alternative onsite management is not available. EPA expects that sufficient offsite treatment capacity is available to manage K173 generated by these facilities. Specifically, EPA estimates that approximately 37 million tons per year of offsite wastewater treatment capacity are available, which is well above the quantity of K173 generated by these facilities. Therefore, sufficient commercial capacity exists to manage K173 from these facilities should the need for treatment of K173 wastes arise.

Based on EPA's information, the facilities managing K173 wastes by underground injection have existing approved no-migration determinations. If an injection well has received a no-migration determination, it can inject a newly prohibited waste if the waste is similar to wastes included in the initial no-migration petition (63 *FR* 28626, May 26, 1998). Further, EPA's sampling and analysis results from one of the facilities shows that none of the constituents proposed for inclusion in 40 CFR 268.40 for K173 (i.e., numerical treatment standards) were present at concentrations greater than the proposed numerical treatment standards.

Based on the available data presented above, EPA is not proposing a national capacity variance for surface-disposed or underground-injected K173 wastes. However, EPA recognizes that there are uncertainties in the available data such that a facility may require extra time (beyond the effective date) to comply with the new listing and land disposal restrictions requirements, if finalized. For example, any facility with an approved no-migration determination without the waste already incorporated in the determination may need to submit a modified petition (40 CFR Part 148.20 (f)) if the facility desires to continue its underground injection management of the waste. Potentially, the permit modification process for no-migration petition may be time-consuming. Also, EPA realizes that K173 can be variable in composition and not always exhibit concentrations below the proposed numerical treatment standards. There are potential logistical difficulties as well. For example, if a facility generates high volumes of K173 and cannot manage the waste onsite in a manner compliant with the LDR standards, they may need to make considerable logistical adjustments such as repiping, retooling, and development of transportation networks at the plant in order to ship the wastewater offsite for treatment or disposal. Additionally, although commercial treatment or disposal capacity is available, the logistics of transporting high volumes of wastewater may be problematic, particularly if existing piping, onsite storage, or loading are not in place. Should these difficulties arise such that both onsite and offsite treatment and disposal are not available for facilities currently using underground injection, EPA will consider all available data and information provided during the public comment period and revise its capacity analysis accordingly in making the final capacity determination.

For K174 wastes, the available data sources indicate that there is no quantity of the wastewater form of K174 that will require alternative commercial treatment (there is adequate wastewater treatment capacity available should the need for treatment of the wastewater form of K174 arise as shown in Section 2.2.4). From the available data sources, required alternative treatment capacity for K174 nonwastewater may be as low as 1,900 tons per year if most generators meet the proposed requirements for contingent management listing (i.e., management in a Subtitle C or Subtitle D landfill). If the generators do not manage K174 nonwastewater according to contingent management for the listing designation, the waste generated must meet LDR standards before land disposal, and the total quantity requiring treatment may be up to 106,000 tons per year. The numerical treatment standards can likely be met using combustion, as discussed in Section 2.1. EPA estimates that the commercially available sludge and solid combustion capacity is at least 300,000 tons per year and therefore sufficient to treat the proposed nonwastewater forms of K174 that would require treatment. Therefore, EPA is proposing not to grant a capacity variance for K174 nonwastewaters or wastewaters.

For K175 wastes, the available data sources indicate that there is no quantity of the wastewater form of K175 that will require alternative commercial treatment (there is adequate wastewater treatment capacity available should the need for treatment of the wastewater form of K175 arise, as shown in Section 2.2.4). For nonwastewater form of K175, EPA estimates that up to 130 tons per year may require alternative commercial treatment. In one option, the land disposal restrictions are proposed as a technology-specific standard (i.e., RMERC). EPA has identified at least one facility that operates commercially and that potentially can be used for the treatment of K175; other RMERC facilities may potentially be used in treating this waste. RMERC is discussed in Section 2.2.1 of this report. EPA expects that treatment residuals from these wastes may require additional treatment capacity (*e.g.*, stabilization of the ash following combustion of the wastes) to achieve the proposed numerical treatment standard for any metal constituents that may be present in the residuals. As shown in Section 2.2.2, EPA estimates that there is several million tons per year of commercial stabilization capacity available for RMERC residues.

As an option to RMERC, EPA is proposing a numerical treatment standard for nonwastewater forms of K175, followed by certain landfill restrictions consisting of disposal in a landfill with pH less than 6, with no excess sulfides. EPA expects that commercial treaters can customize their treatment process to immobilize the waste, attain a pH of less than 6.0, and meet the treatment standard. Therefore, sufficient commercial treatment capacity exists for this proposed K175 hazardous waste. EPA is proposing to not grant a national capacity variance from LDR treatment standards for nonwastewater or wastewater forms of K175.

EPA's capacity analysis is based on industry-specific data obtained through the RCRA 3007 survey, as well as other sources. Based on this data, EPA found that no quantities of K173, K174, or K175 are managed in wastewater treatment systems that contain land-based units (i.e., surface impoundments). EPA requests comments concerning any of these wastes managed in surface impoundments. EPA notes that any K173, K174, or K175 wastes that are managed in a newly regulated surface impoundment (i.e., an impoundment that becomes subject to RCRA regulation as a result of the new waste listing) may continue to be managed in the impoundment for up to four years, provided that the impoundment is in compliance with the groundwater monitoring requirements of 40 CFR 265, Subpart F within 12 months after promulgation of the new waste listing (40 CFR 268.14). After four years, surface impoundments must meet the RCRA minimum technology requirements (MTRs). Surface impoundments also may continue to treat wastes that do not meet LDR treatment standards if the surface impoundments are in compliance with 40 CFR 268.4 (the surface impoundment exemption), or if facilities obtain no-migration variances for the units (40 CFR 268.44). Under the surface impoundment exemption, owners or operators must follow specific sampling and testing, removal, subsequent management, and recordkeeping requirements.

EPA believes that most soil and debris contaminated with K173, K174, or K175 can and will be managed onsite and therefore would not require substantial offsite commercial treatment capacity. As discussed in detail in Section 3.5, if the contaminated soil is not excavated (e.g., in-situ treatment), then the LDRs will not be applied to these wastes in the first place. If disturbed, contaminated soil may be managed onsite as a corrective action management unit (CAMU) and temporary unit (TU). Other factors will also limit the demand for commercial treatment capacity for contaminated soil and debris contaminated with these wastes, including the alternative treatment standards promulgated under the Phase IV LDR rule (63 *FR* 28556, May 26, 1998) and the "debris rule" codified in LDR Phase I (57 *FR* 37194, Aug. 18, 1992). EPA believes that adequate capacity will be available for contaminated soil affected by today's rule. Therefore, EPA is not granting a national capacity variance for these wastes. However, EPA recognizes that some wastes could possess unique properties that make them more difficult to treat than the wastes on which the standards are based. In such cases, the affected party may petition EPA for a treatability variance per 40 CFR 268.44. In addition, EPA established a new site-specific, risk-based variance for the technology-based alternative soil treatment standards promulgated in Phase IV. This variance can be used when treatment to concentrations of hazardous constituents are greater (i.e., higher) than those specified in the alternative soil treatment standards is shown to minimize short- and long-term threats to human health and the environment. In this way, on a case-by-case basis, risk-based LDR treatment standards approved through a variance process could "cap" the technology-based treatment standards (see 63 *FR* 28606, May 26, 1998). For these newly identified wastes, the affected party may also request a capacity variance extension per 40 CFR 268.5 on a case-by-case basis.

In summary, EPA is not proposing to grant a national capacity variance for nonwastewater or wastewater forms of K173, K174, or K175 being surface-disposed or underground injected. EPA is not proposing to grant a national capacity variance for soil and debris contaminated with K173, K174, or K175 wastes. EPA estimates that there are no generated quantities of mixed radioactive wastes contaminated with K173, K174, or K175 or soil and debris contaminated with these radioactive mixed wastes and EPA is not proposing to grant a national capacity variance for such wastes. Therefore, if finalized, the LDR standards become effective when the K173, K174, and K175 listings becomes effective. As discussed earlier in this document, the LDR treatment standards become effective essentially at the same time a listing does unless EPA grants a national capacity variance [see RCRA Section 3004 (h)(2)]. Also, RCRA allows generators to apply for an extension to the LDR effective date on a case-by-case basis for specific wastes generated at a specific facility for which there is not adequate capacity [RCRA Section 3004 (h)(3)].

5. REFERENCES

U.S. Environmental Protection Agency (National Risk Management Research Laboratory), Stabilization and Testing of Mercury Containing Wastes, March 31, 1999.

U.S. Environmental Protection Agency. Listing Background Document for the Chlorinated Aliphatics Industry Listing Determinations. 1999.

U.S. EPA, "Final Best Demonstrated Available Technology (BDAT) Background Document for Mercury Containing Wastes D009, K106, P065, P092, and U151," May 1990.

Appendix A. Generation and Management of K173

Data and information in this appendix are not included due to business confidentiality concerns.

Appendix B. Facilities Managing K173 in Underground Injection Wells

Underground Injection Control Background Support Documentation for Newly Listed Hazardous Waste Codes Proposed as K173, K174 and K175 (Chlorinated Aliphatics Production Wastes)

Background and Principal Findings

Two facilities dispose of chlorinated aliphatics production wastewaters in one or more onsite underground injection wells, according to 1996 survey data. This waste is proposed to be listed as K173. Both facilities manage hazardous wastes in their wells, and have approved no-migration petitions for them. Management of a listed hazardous waste (such as K173, if finalized) in an underground injection well is allowed under RCRA as long as an approved no-migration petition is in place or the managed waste meets LDR treatment standards. However, both the underground injection permit and the associated no-migration approval may need to be modified to include K173. No facilities reported managing wastes proposed as K174 or K175 using underground injection.

Evaluation of non-CBI information for DuPont/Dow indicate that chlorinated aliphatics wastewaters (proposed K173) comprise a majority of the total waste disposed by underground injection. Analyses of both the generated wastes and the disposed wastes indicate that all parameters are below the proposed K173 LDR treatment standards (to the extent data are available). Therefore, even if this facility did not modify its no-migration petition, the disposed wastes would appear to satisfy the proposed LDR treatment standards without further treatment. Summary evaluation of the second facility is not presented due to business confidentiality concerns.

Constituents with Proposed LDR Treatment Standards

The following numerical treatment levels are proposed for wastewater forms of K173:

Bis (2-chloroethyl) ether; 0.033 mg/L
Chloroform; 0.046 mg/L
Pentachlorophenol; 0.089 mg/L
Phenol; 0.039 mg/L
2,4,6-Trichlorophenol; 0.035 mg/L
Chromium; 2.77 mg/L
Nickel; 3.98 mg/L
Hepta-dioxins and furans, and penta-furans (4 isomers); 35 ppt for each isomer or class
Hexa-, penta-, and tetra- dioxins and furans (5 isomers); 63 ppt for each isomer or class

Sampling and Analysis Data

Data are available from record sampling activities and from the surveys. Record sampling and an engineering site visit was conducted at the DuPont/Dow facility. RCRA 3007 survey responses are available from both facilities. Record sampling represents the most comprehensive analysis of the wastes for constituents with proposed LDR treatment standards. Survey data provides some data for every stream generated, but typically not with the level of detail necessary for determining the presence or absence of the above constituents with proposed LDR treatment standards. In some cases the survey data are based on engineering estimates and not analytical data.

The following record samples of wastewaters were collected at these two facilities:

- DuPont/Dow, LaPlace LA: DD-03 (dichlorobutene isomerization scrubber water)
- DuPont/Dow, LaPlace LA: DD-04 (wastewater for hydrochloric acid recovery)
- DuPont/Dow, LaPlace LA: DD-05 (chloroprene brine from steam stripping)
- No wastewater samples were collected at the second facility.

None of the collected samples represent "headworks" or combined effluent. However, with the exception of sample DD-04 which is recycled, they represent large quantities of wastes that are ultimately managed by underground injection. Record sampling data for these three samples were compared to the proposed LDR treatment standards. None of the samples have concentration levels exceeding the proposed treatment standards, as follows:

<u>Sample DD-03</u>
Chloroform 0.024 mg/L
Nickel 0.27 mg/L
Chromium 0.012 mg/L
All other proposed LDR constituents were either not detected or not analyzed

<u>Sample DD-04</u>
Nickel 1.06 mg/L
Dioxins/furans no isomer exceeds 1.1 ppt
All other proposed LDR constituents were either not detected or not analyzed

<u>Sample DD-05</u>
Nickel 0.04 mg/L
Dioxins/furans no isomer exceeds 1 ppt
All other proposed LDR constituents were either not detected or not analyzed

Data for chlorinated aliphatics wastewaters were available from the two surveys. However both facilities claimed information in this section of the survey as confidential; these data are not included here.

Wastewater Management

DuPont/Dow reported generating a total of 500,000 MT of chlorinated aliphatics process wastewaters in 1996, from its questionnaire (this is about 380,000 gallons per day, assuming 350 days/year). Quantities treated at the second facility are not included due to business confidentiality concerns. Descriptions of the type of treatment systems employed are not included due to business confidentiality concerns.

Permitting Information

Details regarding each facility's underground injection activity is included in the "Complete Facility Report" for each facility available from the respective states. The report for DuPont/Dow is shown below. The report for second facility is not included due to business confidentiality concerns

DuPont/Dow

Six Class I wells (nonhazardous and hazardous) have approved no-migration petitions. Average flow is 83 gallons per minute (1995 data) although the wells do not operate continuously. An estimate of 250,000 gallons per month was also provided but this is inconsistent with both the 83 gallons per minute (about 3.6 million gallons per month continuous) and the quantity of chlorinated aliphatics wastewater reported from the RCRA 3007 survey (380,000 gallons/day as indicated above). The well is permitted to receive many characteristic, F-listed, K-listed, P-listed, and U-listed wastes. Analytical test results are available from 1994. The only proposed LDR constituents reported are chromium (0.267 mg/L) and nickel (0.90 mg/L). Both are below the proposed LDR treatment levels.

Complete Facility Report

Facility ID #: LAD001890367 **Facility Type: Non-Commercial**
Additional Permit Number: 95-07WD,91-26WD
Name: **E.I. duPont (Pontchartrain Works)** Region: 6
Address: P.O. Box 2000
City: LaPlace State: LA Zip Code: 70069
SIC Code(s): 2822 2869
Total # of Wells: 6 Reported as: Individual
No Migration Petition Status (if applicable): Approved
Source: LA Dept. of Natural Resources, Joe Ball (Injecting Division)

Well Ids: Wells # s 1 - 6 Well Class: C1 N & NH
Operating Status: Active
Location: 30 03' 18.7" / 90 31' 14.2"
Converted Oil/Gas Well: No
Well Depth: 5,203 ft Thickness: Unknown
Porosity: 32% Permeability: 1,300 md
USDW Depth: 1,040 ft

Average Flow rate: Average: 83.25 Gallons Per Minute
Maximum Flow rate: 130.08 Gallons Per Minute
Injection Interval:
2,477 - 2,757 ft
Onsite Injection: 0.2455 M Gal/Mon
Offsite Injection: 0.0000 M Gal/Mon

Injection Zone Notes:

2,035 - 2,757 ft

Confining Zone Notes:

Unknown

Waste Sources:

CHLORAPRENE PRODUCED PROCESS WASTE WATER
NEOPRENE PRODUCED PROCESS WASTE WATER
STORM WATER RUNOFF
CHLOROBUTADIENE
DICHLOROBUTENE
ETHYLENE GLYCOL
MONOETHYL ETHER
NICKEL
TOLUENE

Approved RCRA Waste Codes:

D001, D002, D003, D004, D005, D006, D007, D008, D009, D010, D011, D012, D013, D014, D015, D016, D017, F001, F002, F003, F004, F005, F006, F024, K009, K010, K014, K015, K016, K017, K018, K019, K020, K021, K022, K023, K024, K025, K026, K028, K029, K030, K031, K032, K033, K034, K035, K036, K037, K038, K039, K040, K041, K042, K043, K048, K049, K050, K051, K052, K054, K084, K093, K094, K095, K096, K097, K098, K099, K101, K102, P001, P002, P003, P004, P005, P007, P008, P013, P014, P016, P017, P018, P020, P021, P022, P023, P024, P026, P027, P028, P029, P030, P031, P033, P034, P037, P038, P039, P040, P041, P042, P043, P044, P045, P046, P047, P048, P049, P050, P051, P054, P057, P058, P059, P060, P062, P064, P066, P067, P068, P069, P070, P071, P072, P075, P076, P077, P078, P079, P080, P081, P082, P083, P084, P088, P089, P097, P098, P099, P101, P102, P103, P104, P105, P106, P116, P118 P123, U001, U002, U003, U004, U005, U007, U008, U009, U010, U011, U012, U014, U015, U016, U017, U018, U019, U021, U022, U024, U025, U026, U027, U028, U031, U034, U035, U036, U037, U038, U039, U041, U042, U044, U045, U046, U047, U048, U049, U050, U051, U052, U053, U055, U056, U057, U058, U059, U060, U061, U062, U063, U064, U066, U069, U070, U071, U072, U073, U074, U076, U077, U078, U079, U080, U081, U082, U083, U084, U085, U086, U087, U088, U089, U090, U091, U092, U093, U094, U095, U097, U098, U099, U101, U102, U103, U104, U105, U106, U107, U108, U109, U110, U111, U112, U113, U114, U115, U116, U117, U118, U119, U121, U122, U123, U124, U125, U126, U127, U128, U129, U130, U131, U132, U136, U137, U140, U141, U142, U147, U148, U149, U150, U151, U152, U153, U154, U155, U156, U157, U158, U159, U161, U162, U163, U164, U165, U166, U167, U168, U169, U170, U171, U172, U173, U174, U176, U177, U178, U179, U180, U181, U182, U183, U184, U185, U186, U187, U188, U190, U191, U192, U193, U194, U196, U197, U200, U201, U202, U203, U218, U219, U220, U221, U222, U226, U227, U228, U230, U231, U232, U233, U235, U238, U239, U240, U242, U243, U244, & U247.

Waste Constituents and Concentrations

ANILINE		5.0mg/l - 91.0mg/l
CHLOROBUTADIENE		8.0mg/l - 130.3 mg/l
DICHLOROBUTENE		4.00000mg/l
PH	Hazardous Wells	11.8 - 12.7
	Nonhazardous Wells	8.9 - 10.4
PROPYL CELLOSOLVE		122.67mg/l - 202.70000mg/l
TOTAL SUSPENDED SOLIDS		22.0mg/l - 80.0mg/l
4-ADP		0.05000mg/l
BENZENE		0.10000mg/l
MISC.ORGANICS(PAAB,MGN,HMI)		14.23000mg/l
CHLOROBUTADIENE		130.30000mg/l
CHROMIUM		0.26700mg/l
COPPER		3.43000mg/l
DICHLOROBUTENE		4.00000mg/l
LEAD		3.03000mg/l
NICKEL		0.90000mg/l
TOLUENE		14.00000mg/l

Data Notes:

Average flow rates, maximum flow rates and onsite injection figures are for 1995.

Actual number of days injected for 1995: 61 (well 1), 349 (well 2).

Thicknesses of the injection intervals are either based on information provided, or are calculated based on size of the injection interval (per conversation with Joe Ball, 1/3/95).

Waste constituent data averaged from 7/94 - 9/94 test results.

Robert E. Smith (EPA Headquarters, 202-260-5559) is UIC Program contact for above information (5/14/99)

Appendix C. Constituents Present in K173, K174, and K175 Wastes

Certain constituents are proposed as the basis for listing K173, K174, and K175 in 40 CFR Part 261 Appendix VII. In addition, numerical treatment standards are proposed for these wastes, for inclusion in 40 CFR §268.40. The purpose of this Appendix is to describe these constituents in greater detail, specifically their concentration in the subject wastes and how the contaminant is expected to be present in the waste. Tables C-1, C-2, and C-3 present this information. Although a number of other constituents are present in these wastes, EPA is not proposing them for inclusion in either 40 CFR Part 261 Appendix VII or 40 CFR §268.40. The proposed definitions of K173, K174, and K175 are presented in Section 3 of the report.

The principal products produced by the chlorinated aliphatics manufacturing industry are ethylene dichloride (EDC), and vinyl chloride monomer (VCM). The principal use of EDC is a chemical intermediate in the production of VCM, while VCM is used in the production of polyvinyl chloride, a widely used polymer. The manufacture of chlorinated aliphatics is within the scope of Standard Industrial Classification (SIC) code 2869 (industrial organic chemicals, not elsewhere classified). Chlorinated aliphatics production corresponds to North American Industry Classification System (NAICS) code 32511 (petrochemical manufacturing) or code 325199 (all other basic organic chemical manufacturing). Polymer production (the end use of VCM) is within the scope of SIC code 2821 (plastics material and synthetic resins and nonvulcanized elastomers). Polymer production corresponds to NAICS code 325211 (plastics material and resin manufacture).

Ethylene dichloride and vinyl chloride monomer are produced in the following series of reactions:

Balanced Process (the predominant process in the industry)

1) direct chlorination of ethylene to produce EDC:

$$CH_2{=}CH_2 + Cl_2 \rightarrow ClCH_2CH_2Cl$$

2) thermal cracking of EDC (following purification from previous step) to produce VCM and hydrogen chloride:

$$ClCH_2CH_2Cl \rightarrow CH_2{=}CHCl + HCl$$

3) oxychlorination of ethylene and HCl from thermal cracking to produce EDC:

$$CH_2{=}CH_2 + 2HCl + ½\ O_2 \rightarrow ClCH_2CH_2Cl + H_2O$$

The overall reaction from these three steps is the production of vinyl chloride as follows:

$$2\ CH_2{=}CH_2 + Cl_2 + ½\ O_2 \rightarrow 2\ CH_2{=}CHCl + H_2O$$

As shown in the overall reaction, ethylene dichloride is consumed as an intermediate in the reaction to vinyl chloride, and this is the typical case at many facilities. However, in some cases EDC is manufactured onsite and sent offsite as a product or purchased from an offsite source and used onsite to manufacture VCM. Following the manufacture of VCM, many facilities consume VCM onsite as an intermediate in the manufacture of polyvinyl chloride (PVC).

Acetylene Based Process (less common industry-wide):

$$CH{\equiv}CH + HCl \rightarrow CH_2{=}CHCl$$

Table C-1. Constituents Present in K173 Wastes				
Constituent	Maximum Concentration in Waste [A] (Total, ug/L)	Listing or LDR Constituent [B]	PBT Chemical [C]	Source of Contaminant [D]
1,2,3,4,6,7,8-HpCDD	0.00031	Both	Yes (as PCDD)	Reaction by-product
1,2,3,4,6,7,8,-HpCDF	0.043	Both	Yes (as PCDF)	Reaction by-product
1,2,3,6,7,8,9-HpCDF	0.012	Both	Yes (as PCDF)	Reaction by-product
HxCDDs	0.00051	Both	Yes (as PCDD)	Reaction by-product
HxCDFs	0.0093	Both	Yes (as PCDF)	Reaction by-product
PeCDDs	Not detected	Both	Yes (as PCDD)	Reaction by-product
PeCDFs	0.0027	Both	Yes (as PCDF)	Reaction by-product
TCDDs	0.000049	Both	Yes (as PCDD)	Reaction by-product
TCDFs	0.00086	Both	Yes (as PCDF)	Reaction by-product
Bis(2-chloroethyl)ether	260	LDR	No	To be determined
Chloroform	700	LDR	Yes	To be determined
Pentachlorophenol	60	LDR	Yes	To be determined
Phenol	160	LDR	Yes	To be determined
2,4,6-Trichlorophenol	93	LDR	No	To be determined
Chromium (all species)	2,860	LDR	Yes	To be determined
Nickel	40,600	LDR	Yes	To be determined

See footnotes following Table C-3.

Table C-2. Constituents Present in K174 Wastes					
Constituent	Maximum Concentration in Waste [A]		Listing or LDR Constituent [B]	PBT Chemical [C]	Source of Contaminant [D]
	Total (ug/kg)	TCLP (ug/L)			
1,2,3,4,6,7,8-HpCDD	0.777	Not detected	Both	Yes (as PCDD)	Reaction by-product
1,2,3,4,6,7,8,-HpCDF	20.7	0.0011	Both	Yes (as PCDF)	Reaction by-product
1,2,3,6,7,8,9-HpCDF	13.5	0.0004	Both	Yes (as PCDF)	Reaction by-product
HxCDDs	(not given)	Not detected	Both	Yes (as PCDD)	Reaction by-product
HxCDFs	(not given)	0.00007	Both	Yes (as PCDF)	Reaction by-product
PeCDDs	(not given)	Not detected	Both	Yes (as PCDD)	Reaction by-product
PeCDFs	(not given)	Not detected	Both	Yes (as PCDF)	Reaction by-product
TCDDs	(not given)	Not detected	Both	Yes (as PCDD)	Reaction by-product
TCDFs	(not given)	0.000049	Both	Yes (as PCDF)	Reaction by-product
Arsenic	27,000	53	LDR	Yes	To be determined

See footnotes following Table C-3.

Table C-3. Constituents Present in K175 Wastes					
Constituent	Maximum Concentration in Waste [A]		Listing or LDR Constituent [B]	PBT Chemical [C]	Source of Contaminant [D]
	Total (mg/kg)	TCLP (mg/L)			
Mercury	9,200	0.26	Both	Yes	Catalyst for VCM Production

Footnotes for Tables C-1, C-2, and C-3:

Common names of dioxin and furan constituents are as follows:

1,2,3,4,6,7,8-Heptachlorodibenzo-*p*-dioxin
1,2,3,4,6,7,8-Heptachlorodibenzofuran
1,2,3,4,7,8,9-Heptachlorodibenzofuran
All Hexachlorodibenzo-*p*-dioxins
All Hexachlorodibenzofurans
All Pentachlorodibenzo-*p*-dioxins
All Pentachlorodibenzofurans
All tetrachlorodi-benzo-*p*-dioxins
All tetrachlorodibenzofurans

A. Maximum concentrations are based on EPA record sampling activities. Data are provided in Best Demonstrated Available Technology (BDAT) Background Document for Chlorinated Aliphatics Wastes.
B. ‘Listing’ indicates that it is proposed for inclusion in 40 CFR 261 Appendix VII. ‘LDR’ indicates that it is proposed for inclusion in 40 CFR 268.40.
C. EPA’s draft list of ‘RCRA PBT Chemicals’ was published on November 9, 1998 (63 *FR* 60341).
D. Source of contaminant in waste is based on engineering judgement.

Appendix D. Chlorinated Aliphatic Products and Product Manufacturers

Data and information in this appendix are not included due to business confidentiality concerns.

Appendix E. Quantity of Mercury-Bearing Hazardous Wastes Managed by Retorting in 1995 By Waste Code (Including Both Onsite and Offsite Management), Tons[a, b]

Waste Type	All Waste Codes	D009	K071	K101	K102	K106	P065	P092	U151
Elemental Mercury[c]	95	94	0	0	0	0	0	0	8
Inorganic Sludges[d]	0	0	0	0	0	0	0	0	0
Inorganic Solids Other Than Soil[e]	3,007	2,724	0	0	0	283	0	0	15
Soil[f]	36	36	0	0	0	0	0	0	0
Lab Packs[g]	36	36	0	0	0	0	0	0	0
Organic Solids[h]	7	7	0	0	0	0	0	0	0
Inorganic Liquids Other Than Waste Liquid Mercury[i]	22	22	0	0	0	0	0	0	0
Total	3,203	2,919	0	0	0	283	0	0	23

Source: "Waste Specific Evaluation of RMERC Treatment Standard," EPA 1998. From 1995 Biennial Reporting System, GM and WR Forms DataBackground Document in RCRA Docket F-1999-MTSP-FFFFF, "Potential Revisions to the Land Disposal Restrictions Mercury Treatment Standards," Advanced Notice of Proposed Rulemaking, 64 Federal Register 28949 (May 28, 1999).

Table Notes:

[a] - Retorting is defined as BRS system type code M012.

[b] - Columns do not sum to the total for all waste codes because waste streams may carry more than one waste code, resulting in double counting.

[c] - This category is defined as BRS form code B117.

[d] - This category is defined as BRS form codes B501-B516 and B519.

[e] - This category is defined as BRS form codes B303-B316 and B319.

[f] - This category is defined as BRS form codes B301 and B302.

[g] - This category is defined as BRS form codes B001-B004 and B009.

[h] - This category is defined as BRS form codes B401-B407 and B409.

[i] - This category is defined as BRS form codes B101-B116 and B119.