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Comparison of Risks for Leachate from Coal Combustion Product Landfills and Impoundments with Risks for Leachate from Municipal Solid Waste Landfill Facilities

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Comparison of Risks for Leachate from Coal Combustion Product Landfills and Impoundments with Risks for Leachate from Municipal Solid Waste Landfill Facilities

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EPRI Project Manager
K. Ladwig

ELECTRIC POWER RESEARCH INSTITUTE
3420 Hillview Avenue, Palo Alto, California 94304-1338 • PO Box 10412, Palo Alto, California 94303-0813 • USA
800.313.3774 • 650.855.2121 • askepri@epri.com • www.epri.com

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AECOM, Inc.
2 Technology Park Drive
Westford, MA 01886

Principal Investigator
L.J.N. Bradley

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ABSTRACT

The purpose of this evaluation is to provide a human health and ecological risk-based comparison of leachate from municipal solid waste (MSW) landfills to leachate from coal combustion product (CCP) landfills and impoundments. Leachate is the liquid that drains or "leaches" from a landfill and is generated principally by the infiltration of precipitation and/or the percolation of precipitation through the landfill. Leachate was chosen as the metric for comparison in this evaluation because the leachate is characteristic of the disposal site and its specific contents, and its potential for impact on the environment, to the extent possible, is independent of the geology or geography of the location of the disposal site. By comparison, groundwater data collected in the vicinity of a disposal site, whether it be an MSW or a CCP landfill/impoundment, are influenced not only by the constituents leaching from the site, but also by the site-specific groundwater characteristics, including depth and flow, that will then dilute the leachate constituent concentrations. Therefore, a comparison of the leachates from MSW and CCP landfills/impoundments allows a direct comparison of their respective contents and the behavior of the contents in terms of leachate formation and, to the extent possible, independent of complicating factors such as geologic or geographic setting.

MSW leachate data were obtained from the U.S. Environmental Protection Agency's (U.S. EPA's) LEACH 2000 database. After evaluating each source of components for this database, leachate data for over 200 constituents from a total of 121 MSW landfills were used in this evaluation. These data have been assumed to be representative of the more than 3000 MSW landfills in the United States.

CCP leachate data were queried from the Electric Power Research Institute's (EPRI's) Combustion Product Information (CPInfo) database. CPInfo is a database containing analytical results from solid composition, laboratory leaching, and field leachate testing performed by EPRI since 1985. The results compiled for this study reflect the contents of the database as of October 2010. They represent 47 inorganic constituents from 30 CCP management units and are considered to be representative of CCP management units in the United States.

Summary statistics (minimum, maximum, and 50th and 90th percentile concentrations) were calculated for each dataset. A cumulative risk-based screening method was used in conjunction with human health and ecological risk-based screening levels to develop estimates of comparative risks between the MSW and CCP leachate datasets. Based on the results of this risk-based comparison, it can be concluded that the relative human health risks associated with leachates from MSW landfills and fly ash management are similar.

Keywords
Coal combustion products
Impoundment
Landfill
Leachate
Municipal solid waste
Risk-based comparison

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1
INTRODUCTION

The U.S. Environmental Protection Agency (USEPA) is currently in the process of developing national regulations for coal combustion product (CCP) disposal under the Resource Conservation and Recovery Act (RCRA). Previously, USEPA determined that CCPs did not warrant hazardous waste regulation under Subtitle C of RCRA, but it has reopened this as an option for the current rulemaking. CCPs almost never exceed the hazardous waste thresholds in the Toxicity Characteristic Leaching Procedure (TCLP), the test used under RCRA to determine if a waste is hazardous by characteristic. However, USEPA is considering designating CCPs as a listed hazardous waste based primarily on risk assessment modeling and documented cases of groundwater and surface water impacts.

A major consideration in the regulatory discussion is risk posed by leachate from CCP landfills and impoundments and its impact on the environment. CCP impoundments and landfills are typically monofills that are fairly consistent in composition when compared with the much more numerous and ubiquitous Subtitle D municipal solid waste (MSW) landfills, which can receive a wide variety of wastes and are regulated as nonhazardous waste under RCRA. The leachates from these two types of landfills are also very different, with CCP leachate consisting of a relatively consistent list of inorganic constituents, while MSW landfill leachate can consist of a wide variety and heterogeneous mixture of inorganic and organic constituents. However, the relative risks of the leachates can be compared using risk-based screening methods.

The purpose of this evaluation is to provide a human health and ecological risk-based comparison of leachate from MSW landfills to leachate from CCP landfills and impoundments. Leachate is the liquid that drains or "leaches" from a landfill and is generated principally by the infiltration of precipitation and/or the percolation of precipitation through the disposal site. Leachate was chosen as the metric for comparison in this evaluation because the leachate is characteristic of the disposal site and its specific contents, and its potential for impact on the environment, to the extent possible, is independent of the geology or geography of the location of the disposal site. By comparison, groundwater data collected in the vicinity of a disposal site, whether it be an MSW or CCP landfill/impoundment, are influenced not only by the constituents leaching from the site, but also by the site-specific groundwater characteristics including depth and flow that will then dilute the leachate constituent concentrations. Therefore, a comparison of the leachates from MSW and CCP landfills/impoundments allows a direct comparison of their respective contents and the behavior of the contents in terms of leachate formation, and to the extent possible, independent of complicating factors such as geologic or geographic setting.

The report is organized into the following sections:

- Leachate databases are discussed in Section 2. The CCP leachate data were provided by the Electric Power Research Institute (EPRI). The scientific literature was searched for sources of MSW leachate data, and the database chosen as the source of data used for this comparison study was the USEPA LEACH 2000 database.
- Risk-based comparison methods are discussed in Section 3. The leachate data were evaluated using risk-based comparison methods. Both human health risks and ecological risks were evaluated.
- The results of the risk-based comparisons are presented in Section 4, along with an evaluation of those results.
- A summary and conclusions of the work are presented in Section 5.
- References are provided in Section 6.

2
LEACHATE DATABASES

2.1 MSW Leachate Data

MSW landfill leachate data were collected from available published and industry trade group sources. Sources identified for review included USEPA Division of Solid Waste, the Environmental Research and Education Foundation (EREF), and the Solid Waste Association of North America (SWANA), as well as various other data available to the public from ongoing and historical monitoring at multiple MSW landfill sites.

2.1.1 Data Sources

Several data sources were identified as noted below.

USEPA. The USEPA Online Library System (OLS) was searched using key words: municipal/landfill/leachate. This search produced multiple documents. The summary or abstract of each document was reviewed and a subset of documents was identified for obtaining complete citations, most of which were obtained. (The list of documents appears in the bibliography in Appendix A.) While the documents provided good background into the historical characterization of leachate, most of the documents were not prepared with companion database compilation.

University of Central Florida. The University of Central Florida has been on the forefront of academic research in the area of bioreactor landfills. Part of that body of research has been to characterize leachate composition over the various biological phases of the life of a landfill. Researchers at the University of Central Florida have been studying various aspects of solid waste for over a decade. Although the current focus is on the design and operation of bioreactor landfills, some preliminary research was performed to develop a database for municipal solid waste landfill leachate characterization. The library for the university's Civil and Environmental Engineering Department was queried for relevance to the objective of this study. Of the references cited, "Analysis of Florida MSW Landfill Leachate Quality" (Reinhart and Grosh, 1998) appeared most relevant. This study compiled a database of leachate quality from landfills across Florida as maintained by the Florida Department of Environmental Protection (DEP). The objective of the study was to determine 1) if data obtained regionally within the state varied from region to region; and 2) if other parameters such as waste type, operation, and so on were significant factors for use in differentiating leachate quality.

Solid Waste Association of North America. SWANA is conducting research that includes assessing future risk posed by landfill liner failures regulated under RCRA Subtitle D. This

assessment drew on previous work that was aimed at developing a database of representative leachate characteristics for use in risk evaluation, titled "The Effectiveness of Municipal Solid Waste Landfills in Controlling Releases of Heavy Metals to the Environment" (SWANA, 2004). That study did not compile data but rather performed statistical analysis of data collected by Science Applications International Corporation (SAIC) under contract to USEPA (USEPA, September 2000a), in a database entitled LEACH 2000.

Environmental Research and Education Foundation (EREF). EREF funded a study titled "Municipal Solid Waste Landfill Leachate Characterization Study" in 2007. This study was authored by three independent investigators (Gibbons et al., 2007). The goal of the study was twofold: the first goal was to assess MSW leachate data from MSW only, MSW plus construction and demolition (C&D) debris, and MSW plus special waste to determine if significant differences exist; the second goal was to look at trends in MSW leachate characterization over time. Both goals required compilation of an MSW leachate database that was sufficiently rigorous for comparative statistical evaluation. The data came from the Waste Management proprietary database Applied Landfill Information Analysis System (ALIAS), which is compiled from landfill leachate sample analysis electronic data deliverables sent directly from laboratories subcontracted to Waste Management. While summary statistics are provided in the report, EREF did not maintain the database and could not provide it for this study.

Relevant Articles. In addition to the above-cited documents, the compiled bibliographies from each of these studies were surveyed for potential relevant references. A subset of articles were compiled and reviewed. The bibliography in Appendix A includes these articles. While these articles provided useful context for MSW leachate characterization, most did not provide sufficient access to individual numerical data to enable compilation of an independent database.

2.1.2 Relevant Databases

Of the various sources of information reviewed, there were three potentially available and accessible databases for purposes of this study: 1) the SAIC-compiled LEACH 2000 database funded by USEPA in 2000 (USEPA, 2000a); 2) the University of Florida database compiled in 1998 (Reinhart and Grosh, 1998); and 3) the EREF study published in 2007 (Gibbons et al., 2007). For each of the databases, this section summarizes the study objective of the database, the identification of data sources used to compile the database, the parameters included in the database, and qualifying comments on use of the database. Table 2-1 summarizes the information presented in this section.

Table 2-1
Compiled Databases Identified For MSW Leachate

Reference/Year	Primary Database Developer	Purpose of Study	Number of Landfills Represented in Database	Parameters Included
Characterization and Evaluation of Landfill Leachate/2000 (USEPA, 2000a)	SAIC under contract to USEPA	To develop a comprehensive database to permit an assessment of the effect of various factors on leachate quality and quantity	60 BFI MSW landfills 47 CWM landfills (mixed)	Conventional parameters, metals, organics
Municipal Solid Waste Landfill Leachate Characterization Study/2007 (Gibbons et al., 2007)	Three principal investigators under contract to the Environmental Research and Education Foundation	To compile a characterization of MSW leachate from various climates and wastes to determine if compounds are affected by waste age, capping condition, and the presence of landfill gas collection	Not specified – data came from the Waste Management proprietary database Applied Landfill Information Analysis System (ALIAS), which is compiled from electronic data deliverables sent from the laboratory	Metals and organics
Analysis of Florida MSW Landfill Leachate/1998 (Reinhart and Grosh, 1998)	University of Central Florida	To develop an MSW leachate characteristics database specific to Florida and regions within Florida for use in other research	39 Class I landfills (MSW only) as reported to the Florida Department of Environmental Protection	Conventional parameters, metals, organics

LEACH 2000 Database. The LEACH 2000 database was compiled by SAIC under contract to the USEPA (EPA Contract No. 68-W6-0068). It was published in draft form under the title "Characterization and Evaluation of Landfill Leachate" in September 2000, but it was never issued as final. It is stated in the draft report that the development of a comprehensive database of landfill leachate characteristics was an integral part of the study. The data compilation encompassed several sources, including data from industry (data from 60 MSW landfills from Browning Ferris Incorporated (BFI) and data from 47 MSW landfills from Chemical Waste Management (CWM)); data from two previous USEPA research efforts (one specifically on C&D landfills and one authored by the USEPA Office of Water (OW) consisting of a database of 21 MSW landfills); and data from two state agencies (65 MSW landfills from the Florida DEP and 39 MSW landfills from the Wisconsin Department of Natural Resources (DNR)). The

compilers of the LEACH 2000 database reviewed data for acceptance into the database. The acceptance criteria were:

- The data represented leachate characteristics on an individual sample basis
- The type of landfill from which the data were retrieved had to be clearly identified
- The data had to be from a reliable source
- The data had to be in electronic format to avoid manual entry and error

The researchers noted that data compilation did not employ any statistical assessment prior to compilation nor was there any attempt to represent or bias the sample by geography. The database includes conventional parameters (for example, alkalinity and pH), metals, and organics in leachate from various landfill types (only MSW data were evaluated for the current study). The draft report did not cite how non-detect results were addressed in the database. Detection limits are reported for some of the data, and in some cases it is apparent from review that non-detect results were assigned a value of zero (0).

University of Central Florida Database. The University of Central Florida database was compiled by researchers Debra Reinhart and Caroline Grosh for the Florida Center for Solid and Hazardous Waste Management. It was published under the title "Analysis of Florida MSW Landfill Leachate Quality" in July 1998 (Reinhart and Grosh, 1998). It was noted that landfill leachate databases compiled up to the date of the study were not geographically specific and do not provide sufficient differentiation to assess the impact of site-specific parameters such as age, water balance, and type of waste and landfill operation. The objective of this database compilation, therefore, was to compile data from lined MSW landfills in Florida that provide parameterization to the maximum extent possible. The data reviewed for compilation came from 55 Class I landfills, which in Florida are permitted to receive MSW only. The database compilers reviewed data for acceptance into the database. The acceptance criteria were:

- Each landfill had to be lined
- At least one year of data had to be available from each site (this was needed to assess trends)

The researchers noted that they did not perform any type of statistical assessment prior to compiling the data; the intent of the study was to sort data by geography, so site-specific data on water balance and so on were critical to the usability of the data and, therefore, required in the parameterization. The database includes conventional parameters, metals, and organics in leachate from various landfill types (only MSW data were evaluated for the current study). Non-detect results were assumed to be one-half the detection limit.

EREF Database. The EREF database was compiled by three independent researchers under a grant to EREF (Gibbons et al., 2007). It is stated in the report that the purpose of the study was to characterize leachate from MSW landfills from various climates and waste types to determine if leachate constituent trends are affected by capping, age of waste, and landfill gas collection. The data compilation drew on previous work conducted by Gibbons, which compiled data from multiple types of landfills over the period from 1984 to 1991, from 48 disposal facilities owned or operated by Waste Management. The current EREF study supplemented the historical

database by Gibbons from Waste Management's ALIAS database from 22 MSW landfills. The database compilers reviewed data for acceptance into the database. The acceptance criteria were in part determined by:

- Availability of geographical information
- Climate data
- Operational characteristics of the landfill

These criteria were critical to the objective of the study, which was to parse leachate characteristics by waste type, age of waste, climate/precipitation, and landfill construction (leachate collection system, liner and cover, landfill gas collection, and leachate recirculation). The database includes conventional parameters, metals, and organics in leachate from various landfill types (only MSW data were evaluated for the current study). The draft report stated that non-detect results were addressed in the database by inserting the median reporting limit of the population of data.

2.1.3 Selection of a Database for Further Evaluation

When selecting the database(s) for inclusion in this analysis, several factors were considered:

- Availability – is the database available electronically?
- Comprehensiveness – are results available on a per sample basis, or are only summary statistics available?
- Representativeness – are the results generally representative of MSW landfills across the United States?

University of Central Florida Database. Although sample-specific results are provided by the University of Central Florida database, and the database could be made available electronically, the fact that it is confined only to MSW landfills in the state of Florida made it of limited use for this study. Note it is likely that much of these data are represented in the LEACH 2000 database (see below), although a specific comparison could not be made.

EREF Database. The EREF database could not be made available for this project. Although the researchers did offer to provide any requested summary statistics, upon additional investigation by EREF, it was determined that only summary statistics for inorganics were available; the data for the other analytes were not readily available. This made this database of limited use for this study.

LEACH 2000 Database. The LEACH 2000 database was available in a plain text, or "flat file," format. The acceptance criteria for data inclusion in the LEACH 2000 database were noted in the previous section. Data are available in this database for individual samples taken from a large number of landfills, although the geographic region is not noted for each landfill represented in the database, and the report notes:

> The search for data did not attempt to employ any statistical sampling approach. That is, the data are not necessarily a representative sample by geographic region...

As noted in Table 2-1, LEACH 2000 includes analytical data for conventional parameters, inorganics, and organics in landfill leachate. Datasets were obtained from both industry and USEPA sources (note that only data from MSW landfills were evaluated in this current study). States were also solicited for landfill leachate data; however, few had databases that met the inclusion criteria. The data included in the LEACH 2000 database are summarized below:

- BFI – data for 60 MSW landfills
- CWM – data for 47 landfills from a 1992 study of leachate quality; landfills included MSW landfills, commercial hazardous waste landfills, and industrial codisposal landfills
- USEPA – data for 21 C&D landfills
- USEPA OW – data for 35 landfills are included, and of these 21 were identified as MSW landfills
- State of Florida (FL) – data for 65 MSW landfills
- State of Wisconsin (WI) – data for 70 landfills, 39 of which were for MSW landfills

Because of the wide range of data included in the LEACH 2000 database, its availability in an electronic format, and its general representativeness in terms of MSW landfills, this database was selected for further evaluation in this study.

2.2 CCP Leachate Data

CCP leachate data were queried from EPRI's Combustion Product Information (CPInfo) database. CPInfo is a database containing analytical results from solid composition, laboratory leaching, and field leachate testing performed by EPRI since 1985. The database is continually updated as new data become available, and the results compiled for this study reflect the contents of the database as of October 2010.

Listed below are the criteria used to help to ensure that data contained in CPInfo are representative of combustion products:

- Only original data developed for specific EPRI projects are entered, rather than data cited from other sources, unless those other sources are well documented and readily available. This criterion was implemented to reduce the potential for entering redundant data.
- Results presented as averages and ranges were not entered. In some cases, only averages and ranges were presented in reports, and every effort was made to locate the source data used to calculate those averages and ranges; however, if the source data were not available, then averaged results presented in those reports were not entered into the database.
- Data from combustion products mixed with other materials (for example, when used as a soil amendment) were not entered into the database. However, data for combustion products

mixed with other combustion products (for example, fly ash mixed with flue gas desulfurization (FGD) solids) were included.

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3
LEACHATE DATA SUMMARY

3.1 MSW Leachate Data Summary

Because the LEACH 2000 database was obtained in a flat file format that contained the raw data used by USEPA in its report (USEPA, 2000a), there was a significant amount of work entailed in preparing and presenting the data in a format that could be used for the risk-based comparison. The steps taken to prepare the dataset are discussed below.

3.1.1 Dataset Development

The initial LEACH 2000 file had 453,958 data records (unique analyte/location/date/landfill type combinations). To ensure that the risk-based comparison was specific for MSW landfill leachate:

- Only those records coded as MSW were retained for further evaluation.
- Only MSW data collected from 1994 forward were retained for further evaluation; as all MSW landfills were required to be lined by this time, data after this time are more likely to represent direct leachate analyses rather than to include some groundwater analytical results. (RCRA Subtitle D (40 CFR Part 258) became effective in 1993 and prescribed landfill design, construction, operation, and postclosure practices that have become the norm for present-day landfills. These include requirements for composite liner and cover systems comprising low-permeability soil plus geosynthetic membrane layers; prohibition of liquid wastes; installation of leachate collection systems; control of landfill gas, and so on.)
- The Wisconsin data in the LEACH 2000 database were excluded from further analysis. USEPA (2000a) notes:

  > In analyzing the Wisconsin data, certain patterns of statistical outliers were discovered. These patterns were consistent with intermittent misreporting of analytical units. Therefore, a detailed analysis was undertaken to identify and correct data points in the Wisconsin data suspected of having this problem.

  The flat file of the LEACH 2000 database provided for this study did not contain the units correction that USEPA conducted for the Wisconsin data. Therefore, because of the concern that the incorrect data could bias the risk-based comparison results, the decision was made not to include the Wisconsin data for this study.

Focusing the database in this manner resulted in a total of 77,818 data records for further evaluation. This resulted in the following MSW leachate data sources being used in this evaluation; for each landfill the number of sampling events for which there are data is noted:

- BFI source – 51 landfills – ranging from 1 event to 31 events
- CWM source – 1 landfill – 1 event
- EPA OW source – 19 landfills – ranging from 1 event to 12 events
- FL source – 50 landfills – ranging from 1 event to 34 events

This resulted in leachate data from a total of 121 MSW landfills being included in the risk-based comparison. These data are hereafter referred to as the "LEACH 2000 MSW" data. Appendix B lists the MSW landfills included in the evaluation and the number of sampling events for each landfill. The dataset development steps are shown graphically in Figure 3-1.

3.1.2 Data Management

Once the LEACH 2000 MSW database was identified, the data needed to be organized to be used for the risk-based screening. The following are the issues addressed.

Synonyms. Because the data were from different sources and ultimately from different laboratories, there were multiple names for some of the analytes (for example, dichloromethane and methylene chloride are equivalent chemical names for the same compound: CH_2Cl_2). To address this concern, groups of synonyms were identified where appropriate.

Unique Identifiers. There were no unique constituent identifiers in the database (for example, Chemical Abstracts Service (CAS) identifying numbers). Therefore, a database field was created, and the CAS number was entered into the database for each constituent and any of its synonyms. Constituents were then tracked in the database by the unique CAS identifier.

Detection Limits. Where analytical results were reported as not detected, detection limits were provided for only a subset of the data:

- Detection limits were not provided for any of the BFI data.
- Detection limits were provided for all of the Florida data.
- Detection limits were provided only sporadically for the other data sources.

Generally, in risk-based evaluations of data, either one-half the reported detection limit is used as a proxy concentration for a result reported as not detected (USEPA, 1989a), or other statistical distributional methods are used to assign a proxy concentration to a "nondetect" value (USEPA, 2007). However, both of these methods require that numerical detection limits be provided for results reported as not detected. As this was not the case for the LEACH 2000 database, for this evaluation a surrogate value of zero was used for all results reported as not detected. Note that for consistency this same method was used for the treatment of results reported as not detected in the CCP leachate database.

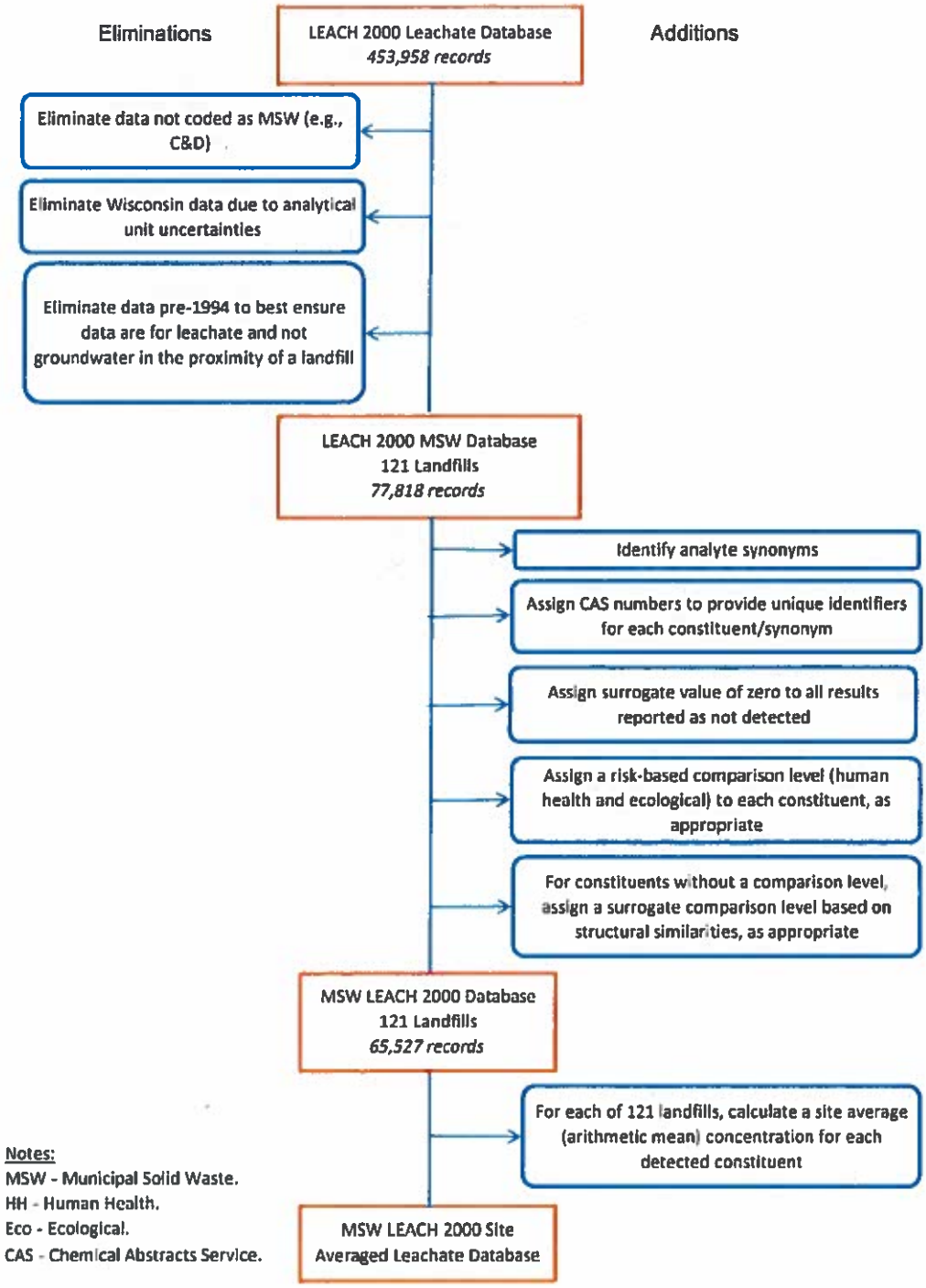

Figure 3-1
MSW data set development and management flowchart

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Assignment of Risk-Based Comparison Levels and Surrogates. As described in more detail in the next section, constituents detected at least once in the database were assigned a risk-based comparison level. Conventional parameters (for example, alkalinity and pH) for which risk-based screening levels are not available were eliminated from further consideration at this stage. Where no risk-based screening level was available for a constituent, a surrogate risk-based screening level was assigned as a comparison level based on structural similarities, where available and appropriate (for example, for the human health risk-based screening, due to structural similarities the screening value for acenaphthene was used as a surrogate for acenaphthylene). Constituents were eliminated from further consideration where appropriate structural surrogates could not be identified and dose-response data are not available. Further focusing the database in this manner resulted in a total of 65,527 data records for evaluation in the risk-based comparison.

Landfill Sampling Frequency. As noted above, for the 121 MSW landfills included in the LEACH 2000 MSW database, sampling frequency ranges from 1 event to up to 34 events. To prevent the data from one landfill from dominating the results, a site average (arithmetic mean) was calculated for each constituent sampled at each MSW landfill and detected at least once. The surrogate detection limit of 0 was used in the arithmetic mean calculation for those results reported as not detected, as described above. Appendix B also shows the number of analytes for which analytical data are available for each of the MSW landfills included in the evaluation. The data management steps are shown graphically in Figure 3-1.

3.1.3 MSW Data Summary

Appendix C provides a summary of the MSW constituent data, based on the site average data. For each constituent, the frequency of detection is provided as well as the minimum detected concentration and the maximum detected concentration. In addition, the 50th percentile and the 90th percentile concentrations are provided. Percentiles were calculated in Excel. All units are in micrograms per liter (µg/l).

3.2 CCP Leachate Data Summary

For this assessment, the following queries and filters were applied to CPInfo to obtain a representative dataset of field leachate results:

- Leachate samples collected in the field, from landfills and impoundments, were selected. Laboratory-generated leachate samples, whether obtained by displacement methods or by leaching tests, were not included.
- Leachate samples from coal-fired power plants were included. Samples from oil-fired plants were not included unless the oil-fired capacity of the plant was much less than the coal-fired capacity and/or infrequently used.
- The samples represent leachate from coal fly ash and bottom ash.
- For this analysis, FGD solids and FGD gypsum leachate samples were not included, and leachate samples from FGD materials mixed with fly ash were not included.

- Field-collected leachate samples representing interstitial porewater (for example, samples from leachate wells, lysimeters, and leachate collection systems) were included. Pond water, sluice water, and runoff water samples were not included.
- Samples from landfills and impoundments that received both high-volume CCPs and low-volume wastes were included; however, samples representing individual and distinct low-volume waste streams (for example, coal pile runoff, cooling tower blowdown, and so on) were not included.
- Non-detect results were excluded if the detection limit was a factor of two or more higher than the Federal Maximum Contaminant Level (MCL), Secondary MCL (SMCL) (USEPA, 2006), or a representative state standard for constituents that do not have a federal standard.

These queries and criteria resulted in a dataset containing 4419 analytical results from 222 samples and 30 CCP management units (CMUs). However, the number of samples varied from 1 at several CMUs to 54 at one CMU. If all individual samples had been used, the resulting dataset would have been biased toward the concentration of the leachate at the CMUs with many samples. To alleviate this bias, site averages were calculated, as was done with the MSW database.

Site averages are the mean concentration for each constituent analyzed for each CMU. In other words, if the analytical data from a power plant identified a landfill and two separate impoundments, each of these would be counted as a CMU, and three site averages were calculated for that power plant. Conversely, if a power plant only had one CMU, or if no CMU information was available, then a single site average was calculated.

Individual site average values sometimes included detect and non-detect results. In these cases, a value of zero (0) was substituted for the non-detect and used in calculation of the site average. This substitution was performed for consistency with the MSW dataset. A site average was counted as a non-detect if all analytical results used to calculate the average were non-detects. The dataset contained results for 51 inorganic constituents and pH; CPInfo did not contain any results for organic constituents in field leachate samples. However, based on information available in the literature, organic products of incomplete combustion (for example polycyclic aromatic hydrocarbons and dioxins and furans) are not present at levels of concern in CCPs (EPRI, 1987, 1998; USEPA, 2000b; Harrison, et al., 1985; Roy, et al., 1984; Chiu, et al., 1983; and Kuykendal, et al., 1989) and, therefore, would not be expected to be present in significant concentrations in CCP leachate.

The queried data for the CCP leachate database are from the EPRI technical products listed in Table 3-1.

Table 3-1
EPRI reports queried from the CPInfo database

1005267	Sep-03	Field Evaluation of the Comanagement of Utility Low-Volume Wastes with High-Volume Coal Combustion By-Products: MO Site
1012578	Nov-06	Characterization of Field Leachates at Coal Combustion Product Management Sites
EA-5922	Dec-88	Leachate Chemistry at the Montour Fly Ash Test Cell
EN-6532	May-90	Environmental Performance Assessment of Coal Ash Use Sites: Little Canada Structural Ash Fill
EN-6533	Dec-90	Environmental Performance Assessment of Coal Ash Use Sites: Waukegan Ash Embankment
TR-100955	Aug-92	Comanagement of Coal Combustion By-Products and Low-Volume Wastes: A Midwestern Site
TR-108420	Oct-98	Field Evaluation of the Comanagement of Utility Low-Volume Wastes with High-Volume Coal Combustion By-Products: P4 Site
TR-112442	Jun-99	Evaluation of an Ecolotree™ Cap for Closure of Coal Ash Disposal Sites

Appendix D provides a summary of the EPRI CCP leachate constituent data, based on the site average data. For each constituent, the frequency of detection is provided as well as the minimum detected concentration and the maximum detected concentration. In addition, the 50th percentile and the 90th percentile concentrations are provided (percentiles were calculated using Excel). All units are in micrograms per liter (µg/l).

4
RISK-BASED COMPARISON METHODS

As noted in Section 1, the purpose of this evaluation is to provide a human health and ecological risk-based comparison of leachate from MSW landfills to leachate from CCP landfills and impoundments. Leachate is the liquid that drains from a landfill and is generated principally by the infiltration of precipitation and/or the percolation of precipitation through the landfill. Leachate was chosen as the metric for comparison in this evaluation because the leachate is characteristic of the disposal site and its specific contents, and its potential for impact on the environment, to the extent possible, is independent of the geology or geography of the location of the disposal site. By comparison, groundwater data collected in the vicinity of a landfill, whether it be an MSW or CCP landfill/impoundment, are influenced not only by the constituents leaching from the site, but also by the site-specific groundwater characteristics including depth and flow that will then dilute the leachate constituent concentrations. Therefore, a comparison of the leachates from MSW and CCP landfills/impoundments allows a direct comparison of their respective contents and the behavior of the contents in terms of leachate formation, and to the extent possible, independent of complicating factors such as geologic or geographic setting.

The leachate data available for MSW landfills and for CCP landfills and impoundments are liquid concentrations. Therefore, risk-based comparison levels appropriate for liquid media concentrations were identified for both the human health evaluation and the ecological evaluation. Constituents detected at least once in the database were assigned a risk-based comparison level. Conventional parameters (for example, alkalinity and pH) for which risk-based screening levels are not available were eliminated from further consideration. Where no risk-based screening level was available for a constituent, a surrogate risk-based screening level was assigned as a comparison level based on structural similarities, where available and appropriate (for example, for the human health risk-based screening, due to structural similarities the screening value for acenaphthene was used as a surrogate for acenaphthylene). Constituents were eliminated from further consideration where appropriate structural surrogates could not be identified and dose-response data are not available.

Section 4.1 addresses the human health risk-based screening methods, and Section 4.2 addresses the ecological risk-based screening methods.

4.1 Human Health Risk-Based Comparison Methods

The fundamental basis of human health risk assessment is the four-step paradigm as identified by the USEPA (USEPA, 1989b). The steps are:

- Data Evaluation and Hazard Identification. In a site-specific risk assessment, this is the step where specific constituents are identified for quantitative analysis in the risk assessment, and where their concentrations in environmental media are identified.
- Toxicity Assessment. The toxicity or dose-response assessment evaluates the relationship between the magnitude of exposure (dose) and the potential for occurrence of specific health effects (response) for constituents evaluated in the risk assessment. Both potential carcinogenic and noncarcinogenic effects are considered. USEPA provides toxicity values and a hierarchy of sources for obtaining those values.
- Exposure Assessment. The purpose of the exposure assessment is to provide a quantitative estimate of the magnitude and frequency of potential exposure to constituents evaluated in the risk assessment by a receptor via various exposure pathways (for example, ingestion or inhalation).
- Risk Characterization. Risk characterization combines the results of the exposure assessment and the toxicity assessment to derive estimates of potentially carcinogenic and noncarcinogenic risks resulting from potential human exposures to the constituents evaluated in the risk assessment.

Basically, an estimate of health risk due to exposure to a specific constituent can be calculated by combining an estimate of the concentration of the constituent in an environmental medium, an estimate of the level of exposure to that medium over a determined time frame, and an estimate of the toxicity of the constituent by that route of exposure. In equation form:

Risk = [Constituent concentration] x [Exposure] x [Toxicity]

Conversely, a concentration of a constituent in an environmental medium associated with a specific target risk level can be calculated using the same information:

[Target constituent concentration] = Target Risk Level / ([Exposure] x [Toxicity])

This relationship serves as the basis for the development of risk-based screening levels, where the target constituent concentration is the screening level based on the defined target risk level. It should be noted here that this method is being used to provide a point of comparison between the two datasets, and does not constitute a risk assessment of either dataset.

4.1.1 Source of Risk-Based Comparison Levels

Human health risk-based screening levels are available from a variety of state and federal sources. USEPA has recently harmonized the risk-based screening levels formerly available from USEPA Regions 3, 6, and 9, and these are now available as regional screening levels, or SLs. The SLs are derived for residential soil, industrial soil, ambient air, and tap water. These values are updated on a regular basis; the most recent version is from May 2010 (USEPA, 2010). As the SLs for tap water are the only SLs presented in terms of a liquid concentration (µg/l), they are used here for this comparison. However, it is important to note that it is unrealistic to assume that either type of leachate, MSW or CCP, would be the source of tap water or drinking water.

Therefore, this comparison of the leachate concentrations to the SLs is for comparative purposes only; the comparison of the predicted risks is relevant, not the magnitude of the risks themselves.

As noted in the User's Guide for the SLs (USEPA, 2010), risk-based SLs are derived from equations combining exposure assumptions with chemical-specific toxicity values. Generic SLs are based on conservative default exposure parameters and factors that represent reasonable maximum exposure (RME) conditions for long-term/chronic exposures and are based on the methods outlined in USEPA's Risk Assessment Guidance for Superfund, Part B Manual (1991a) and Soil Screening Guidance documents (USEPA, 1996a, 1996b, and 2002).

Exposure. The tap water SLs include evaluation of the exposure routes for ingestion of water and inhalation of volatiles (volatilization is assumed to occur during household use of tap water for bathing, washing, and so on). The exposure assumptions used for the development of the tap water SLs assume that an adult ingests tap water at a rate of 2 liters per day and inhales volatiles 24 hours per day for 365 days per year for an assumed 30-year residency period (USEPA, 2010).

Toxicity. Adverse effects are classified by USEPA as potentially carcinogenic or noncarcinogenic (that is, having potential effects other than cancer). Toxicity values are available from the USEPA for potential carcinogenic effects and/or noncancer effects. The SL tables provide the toxicity values used in the SL calculations and their sources (USEPA, 2010).

Risk Characterization/Target Risk Levels. In the derivation of the USEPA SLs for constituents identified as potential carcinogens, a target cancer risk level of one in one million or 1×10^{-6} is used (USEPA, 2010). This is the low end of the USEPA target risk range of 1×10^{-6} to 1×10^{-4} (USEPA, 1991b). For constituents with noncarcinogenic effects, a target noncancer hazard quotient of 1 is used in the derivation of the SLs (USEPA, 2010). Note that the risk level and hazard index are unitless.

The USEPA Regional Screening Level table was used for the derivation of the tap water SLs (US EPA 2010). This table provides the list of constituents for which SLs are calculated, the toxicity values (both cancer and noncancer) used in the calculations, and the calculated tap water SLs. It is these tap water SLs that have been used in the risk-based comparison. The only adjustment made to the tap water SLs was for dioxins and furans, constituents that appear in the LEACH 2000 MSW database. The potential carcinogenic and noncarcinogenic effects associated with exposure to dioxin and furan congeners in the MSW database were assessed in accordance with the approach developed by USEPA (1989c). Toxicity values and SLs are available for 2,3,7,8-tetrachloro-dibenzo-p-dioxin (2,3,7,8-TCDD). The toxic equivalency factors (TEFs) provided by World Health Organization (WHO) (Van den Berg, et al., 2006) for humans have been used. The TEFs are fractions that equate the potential toxicity of each congener to that of 2,3,7,8-TCDD. The TEFs are presented in Appendix E. For each dioxin and furan congener that appears in the LEACH 2000 MSW database, the SL for 2,3,7,8-TCDD was divided by the appropriate TEF to provide a specific comparison level for that congener.

Appendix F provides the human health risk-based comparison levels used in the evaluation, and identifies synonyms and surrogates where appropriate. (As these levels are being used for risk-

based comparison purposes, and not for traditional risk assessment screening purposes, they are referred to herein as *comparison levels*.)

4.1.2 Application of the Risk-Based Comparison Levels

A simple way to evaluate risk associated with a specific environmental concentration is to compare the constituent concentration to the comparison by way of a ratio:

[Constituent concentration] / [Comparison Level] = Human Health Ratio (unitless)

Since the comparison level is based on a specific target risk level, multiplying the ratio above by that target risk level gives an estimated risk level for the constituent based on the exposure pathway and assumptions used in the derivation of the comparison level. For example, if the Human Health Ratio defined above is 5, then the constituent concentration is five times greater than the screening level, and the risk associated with the constituent concentration is five times greater than that used to develop the comparison level; the specific risk can be calculated by multiplying the Human Health Ratio by the target risk level. In this case, for potential carcinogens, the target risk level is 1×10^{-6}, so by multiplying the Human Health Ratio of 5 by 1×10^{-6}, the result is the risk associated with that constituent concentration, which is 5×10^{-6}.

The process is similar for noncarcinogens; however, as the target risk level or hazard index for noncarcinogens is 1, the Human Health Ratio is simply multiplied by 1 to derive the hazard index associated with the constituent concentration.

This type of evaluation is commonly used as a screening tool in risk assessment (for example, see Ohio Voluntary Action Program, OAC 3745-300-08(D) (OEPA, 2009)), and is consistent with the screening methodology provided by USEPA (USEPA, 1989b).

4.1.3 Risk-Based Comparison

Risk-based comparisons were conducted on the LEACH 2000 MSW leachate database and the CCP leachate database. Because a single concentration for each constituent in the datasets may not be representative of each database, the risk-based comparison was conducted on two concentration estimates for each database: the 50th percentile concentration and the 90th percentile concentration.

For each percentile for each database, constituents were divided into two groups based on whether they are classified as potential carcinogens or noncarcinogens. Constituents classified as both potential carcinogens and noncarcinogens are included in both groups. For each constituent, the following information is presented:

- The frequency of detection
- The percentile concentration
- The comparison level
- The target risk level upon which the comparison level is based

- The ratio of the constituent concentration to the comparison level was then calculated and multiplied by the target risk level of 1×10^{-6} for constituents with potential carcinogenic effects and the target hazard index of 1 for constituents with potential noncarcinogenic effects.
- For each percentile evaluated, the target risk level adjusted ratios are summed
  - separately for the constituents with potentially carcinogenic effects and for the constituents with potentially noncarcinogenic effects
  - to provide the total risk levels for potential cancer and noncancer effects

It is important to note that the relevant comparison is between the summed ratios between the MSW leachate data and the CCP leachate data. The absolute magnitude of either of the risk estimates is not germane because a drinking water pathway for either of these leachates is an incomplete exposure pathway and is an inappropriate exposure scenario. As noted above, the tap water SLs were used as the basis for the comparison levels because they are the most extensive set of human health screening levels for a liquid medium; their use does not imply that a drinking water pathway would be complete for either of these leachates.

4.2 Ecological Risk-Based Comparison Methods

The same basic process as described above for the human health evaluation is conducted for the ecological evaluation. Ecological risk is a function of the same parameters:

Risk = [Constituent concentration] x [Exposure] x [Toxicity]

However, in ecological evaluation, noncancer endpoints are assessed exclusively.

4.2.1 Sources of Risk-Based Comparison Levels

Ecological risk-based comparison levels for liquid media are available for fresh water and salt water. For this evaluation, comparison levels for freshwater surface water were compiled from the following sources:

- USEPA chronic ambient water quality criteria (AWQC) for aquatic life (USEPA, 2009a)
- USEPA Region 3 freshwater screening values (USEPA, 2008)
- USEPA Region 4 surface water screening levels (USEPA, 2001)
- USEPA Region 5 ecological screening levels (ESLs) for surface water (USEPA, 2003)

The lowest value available from these sources was conservatively selected as the ecological risk-based comparison level for the leachate evaluation.

Adjustments were made to the comparison levels for dioxins and furans, constituents that appear in the LEACH 2000 MSW database. The potential adverse ecological effects associated with exposure to dioxin and furan congeners in the MSW database were assessed in accordance with

the approach developed by USEPA (1989c). Comparison levels are available for 2,3,7,8-tetrachloro-dibenzo-p-dioxin (2,3,7,8-TCDD). WHO (Van den Berg, et al., 1998) provides TEFs for mammals, birds, and fish. (Note that while the TEFs for human health were updated in 2006, ecological TEFs for fish have not been updated.) As this is an evaluation of a liquid medium, the TEFs for fish have been used. The TEFs are fractions that equate the potential toxicity of each congener to that of 2,3,7,8-TCDD. The TEFs are presented in Appendix E. For each dioxin and furan congener that appears in the LEACH 2000 MSW database, the comparison level for 2,3,7,8-TCDD was divided by the appropriate TEF to provide a specific comparison level for that congener.

Ecological comparison levels are generally based on conservative endpoints and sensitive ecological effects data and the assumption that aquatic receptors (e.g., fish, invertebrates) are directly exposed to constituents in surface water. However, it should be noted that aquatic receptors are not in direct contact with either type of leachate.

Appendix G provides the ecological risk-based comparison levels used in the evaluation, and identifies synonyms and surrogates where appropriate.

4.2.2 Application of the Risk-Based Comparison Levels

Except for the fact that only noncancer endpoints are evaluated, application of the risk-based comparison levels for the ecological risk comparison is essentially the same as for the human health risk comparison:

[Constituent concentration] / [Comparison Level] = Ecological Ratio (unitless)

Because the target hazard index is 1 for the ecological comparison levels, the ratio is equivalent to a hazard index. For example, if the Ecological Ratio defined above is 3, then the constituent concentration is three times greater than the comparison level, and the risk associated with the constituent concentration is three times greater than that used to develop the comparison level; the specific risk can be calculated by multiplying the Ecological Ratio by the target risk level, which in this case is 1.

4.2.3 Risk-Based Comparison

As in the case for the human health screening, for each constituent the following information is presented:

- The frequency of detection
- The percentile concentration
- The comparison value
- The target risk level upon which the comparison value is based
- The ratio of the constituent concentration to the comparison value was then calculated and multiplied by the target hazard index of 1.

- The constituent-specific ecological ratios are then summed, as in the corresponding step for the human health evaluation.

It is important to note for the ecological evaluation that the relevant comparison for this evaluation is between the summed ratios for the MSW leachate data and the CCP leachate data. The absolute magnitude of either of the risk estimates is not germane, because a pathway for direct contact with leachate for ecological receptors in the field does not exist for either of these leachates; thus, it is inappropriate to assume that this exposure scenario could occur in the field.

Exhibit 404

Comp. 017360

5
RESULTS

The results of the risk-based comparison of the MSW leachate and the CCP leachate are presented below for human health and ecological endpoints.

5.1 Human Health Risk-Based Comparison Results

The results of the human health risk comparison for the MSW leachate database are presented in Appendix H (50th percentile) and Appendix I (90th percentile). The results of the human health risk comparison for the CCP leachate database are presented in Appendix J (50th percentile) and Appendix K (90th percentile). Within each table, and within each endpoint grouping (potential carcinogens, noncarcinogens), the results are rank-ordered from highest to lowest.

5.2 Ecological Risk-Based Comparison Results

The results of the ecological risk comparison for the MSW leachate dataset are presented in Appendix L (50th percentile) and Appendix M (90th percentile). The results of the ecological risk comparison for the CCP leachate database are presented in Appendix N (50th percentile) and Appendix O (90th percentile). Within each table, the results are rank-ordered from highest to lowest.

5.3 Summary

A summary of the results of all of the risk-based comparisons is presented in Table 5-1. As noted in the previous section, the relevant comparison is between the summed ratios for the MSW leachate data and the CCP leachate data. The absolute magnitude of either of the ratios is not germane, because a drinking water exposure or surface water exposure pathway for either of these leachates is an incomplete exposure pathway and an inappropriate exposure scenario. However, this risk-based evaluation is useful to compare the two leachates.

Two ratios are used to compare the MSW and CCP leachate results:

- In the first, the MSW risk-based result is divided by the CCP risk-based result.
- In the second, the CCP risk-based result is divided by the MSW result.

5.3.1 Human Health Risk-Based Results

As shown in Table 5-1, on a human health risk basis the MSW leachate and the CCP leachate are very similar and are at most within a factor of less than three of each other. The CCP leachate risk results are slightly higher than the MSW leachate risk results at the 50th percentile level, while the MSW leachate risk results are slightly higher at the 90th percentile level. Both sets of results are close enough to be assumed to be essentially equal.

Table 5-1
Summary of Risk Results

Leachate Data Source	50th Percentile (a)			90th Percentile (b)		
	HH-C	HH-NC	Eco	HH-C	HH-NC	Eco
Leach 2000 MSW	4.48E-04	1.45E+01	7.40E+06	7.27E-03	1.42E+02	8.01E+06
EPRI CCP	1.23E-03	1.83E+01	4.43E+03	6.20E-03	1.33E+02	4.20E+04
Ratio MSW/CCP	0.36	0.79	1720	1.17	1.07	191
Ratio CCP/MSW	2.75	1.26	5.81E-04	0.85	0.94	5.24E-03

Notes:
(a) Sum of risk level adjusted ratios of 50th percentile concentration to screening level
(b) Sum of risk level adjusted ratios of 90th percentile concentration to screening level

CCP – Coal Combustion Product
MSW – Municipal Solid Waste
HH-C – Potentially Carcinogenic Human Health results
HH-NC – Noncarcinogenic Human Health results
Eco – Ecological Results

5.3.2 Ecological Risk-Based Results

As shown in Table 5-1, on an ecological risk basis, the MSW leachate results are significantly (190-fold to 1700-fold) higher than the CCP leachate results. As discussed below, this difference is driven primarily by one infrequently analyzed constituent at MSW sites.

5.4 Discussion

These results provide an instructive comparison between the MSW and CCP leachate data. As just mentioned, for the human health risk-based evaluation, the risk-based results are essentially equal for the CCP and MSW leachates. The CCP leachate results are slightly higher than the MSW leachate results at the 50th percentile level, while the MSW leachate results are slightly higher at the 90th percentile level. For the ecological evaluation, the MSW leachate results are 190-fold to 1700-fold higher than the CCP leachate results (however, see the discussion below).

The fundamental difference between the CCP leachate and the MSW leachate lies in their composition. As a fairly complete combustion product of coal, CCPs are composed predominantly of inorganic constituents and are typically managed in monofills. MSW landfills accept a wide variety of wastes, and this is reflected in the long list of organic and inorganic constituents present in the MSW leachate.

Human health risk-based evaluation. In the evaluation of potential carcinogens, arsenic is the main risk driver for both leachates. As shown in Appendix C and D, arsenic was detected at a high frequency (on a site-averaged basis) for both leachate types (90:107 for the MSW leachate and 28:28 for the CCP leachate). The range of site-averaged arsenic concentrations is much higher for the MSW leachate (maximum detect was 8100 µg/l for MSW leachate versus 998 µg/l for the CCP leachate); however the percentile concentrations are higher for the CCP leachate.

The equivalence of the total potential carcinogenic risks for the two leachates is due to the many potential carcinogens present in the MSW leachate. While arsenic is the only potential carcinogen present in the CCP leachate, at the 90th percentile level there are 31 detected potential carcinogens in the MSW leachate, including volatile organic compounds, semivolatile organic compounds, PCBs, dioxins and furans, and pesticides. Some of these constituents have low total numbers of detections in the MSW site-averaged data (for example, 3:6 for 1,4-dioxane); however, these low total numbers of detections are likely more a function of being analyzed in only a small subset of the MSW landfills evaluated in the database, and not a function of a constituent's presence or absence.

The main noncancer risk drivers for the MSW leachate include manganese and arsenic, while for CCP leachate the noncancer risk drivers are molybdenum and arsenic. It is interesting that boron, considered in the field to be an indicator of CCP impacts to groundwater, also has elevated levels in MSW leachate (see Appendix C and D) as well as a high frequency of detection in the MSW leachate.

Ecological risk-based evaluation. The risk-based driver for the ecological risks for the MSW leachate is 2,4-DDE. It was detected in one landfill, but was only analyzed for that one landfill; thus, the low frequency is due to lack of analysis, not necessarily lack of presence. However, if this analyte were eliminated from the comparison, the MSW ecological risks would still be an order of magnitude (15-fold) higher than for the CCP leachate.

Potential uncertainties. Within any evaluation of environmental data, assumptions must be made due to a lack of absolute scientific knowledge, and these assumptions introduce some degree of uncertainty into the evaluation process.

This evaluation was conducted using data for leachate from both MSW and CCP management units. Leachate was chosen as the metric for comparison in this evaluation because the leachate of a landfill is characteristic of the landfill and its specific contents, and its potential for impact on the environment, to the extent possible, is independent of the geology or geography of the location of the landfill. Therefore, a comparison of the leachates from MSW and CCP landfills/impoundments allows a direct comparison of their respective contents, and this direct comparison decreases the uncertainty in the results.

Both the CCP and MSW datasets represent data from a subset of all management units. For the MSW landfill evaluation, leachate data from 121 MSW landfills are represented. These are likely, and assumed to be, representative of the data available for the approximately 3000 active MSW landfills in the United States (with estimates that there are 10,000 to 50,000 inactive MSW landfills). There are 30 CCP management units represented in the CCP dataset, and they are also considered to be representative of the CCP management units in the United States. Thus, while data are not available for all landfills or management units, there are sufficient numbers of each to be assumed to be representative for this evaluation.

Within the CCP leachate dataset (Appendix D), the majority of the constituents with risk-based screening levels have been analyzed at the majority (24-30) of the management units. This is likely due to the fact that for the most part only inorganics are present in CCP management units, and laboratory analyte lists for inorganics are fairly standardized.

However, for the MSW leachate dataset, detected constituents represent a broad range of analyte groups: volatile organic compounds, semivolatile organic compounds, pesticides, PCBs, dioxins and furans, and inorganics. It is clear from Appendix C that not all MSW landfill leachates are analyzed for the full suite of organic and inorganic constituents, and this lack of consistency in the analyses is likely leading to an underestimation of the comparative risk of the MSW leachate. Within the MSW leachate dataset (Appendix C), there are relatively few constituents that have been analyzed in the majority of landfills. Many constituents (one quarter of the approximately 200 analytes) have been analyzed at only a few landfills (that is, in less than 10% of the total 121 sites). Based on the 90th percentile MSW results for the human health cumulative risk comparison shown in Appendix I, four of the top ten risk drivers were analyzed in less than 10% (or less than 12) of the landfills. Given the variability in the MSW dataset, it is likely that additional data would result in a broader range of results for a particular constituent and therefore higher comparative risk results (especially at the 90th percentile level); thus, the comparative risk level for the MSW leachate could be underestimated, perhaps by a large amount. However, it is not possible to quantitatively estimate this uncertainty.

This evaluation has focused only on the differences in the leachates between the MSW and CCP management units. There are other differences between the two types of management units that can also contribute to the overall environmental risk that those units may present. One of these is structural stability, and this is a factor that affects both types of management units; however, MSW units are managed as landfills, and CCP units can be managed as landfills or as impoundments. The structural stability issues for the landfills are similar; however, there are structural stability issues unique to impoundments that are not applicable to MSW landfills.

In addition to leachate management for MWS landfills, operating criteria are provided under 40 CFR Part 258 for the following:

- 258.22: Disease vector control. MSW landfills have a wide variety of contents including residential food scraps, yard trimmings, wood, metals, plastics, glass, and other materials (USEPA, 2009b). These materials can attract "disease vectors," including rodents, flies, mosquitoes, and other insects, that can transmit diseases to humans. MSW landfills must have controls for these vectors (which can include the use of pesticides). In addition, there is the nuisance factor of the attraction an MSW presents for other animals such as seagulls and

other scavengers. Because of the inorganic monofill nature of CCP management units, they do not attract disease vectors, and disease vector control is not applicable to these units.

- 258.23: Explosive gases control. Because of the organic nature of much of the MSW landfill contents, methane gas is produced by the natural breakdown of these contents. Methane is a flammable and explosive gas, and it must be carefully controlled to ensure that concentrations to do not exceed the lower explosive limit within nearby structures and at the facility boundary. Again, because of the inorganic monofill nature of CCP management units, methane gas is not produced at these units, and therefore, this type of risk does not apply to these units.

5.5 Conclusion

Based on the results of this risk-based comparison, it can be concluded that the relative human health risks associated with leachates from MSW landfills and fly ash management are similar.

Exhibit 404

Comp. 017366

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Comp. 017370

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B
LEACH 2000 MSW LANDFILLS INCLUDED IN EVALUATION

Notes on the following Tables

(a) USEPA (2000)

(b) Some of the landfill names are truncated. This is how they were provided in the Leach 2000 database.

(c) Sampling rounds were defined by month/year since sampling rounds were not specified in the Leach 2000 database.

(d) Number of analytes for which analytical data are available and have human health or ecological comparison levels.

BFI - Browning Ferris Incorporated
CWM - Chemical Waste Management
FL – Florida
OW - USEPA Office of Water
USEPA - U.S. Environmental Protection Agency

LEACH 2000 MSW Landfills Included in Evaluation

Data Source (a)	Landfill (b)	Sampling Rounds (c)	Analytes with Comparison Levels (d)
BFI	ALLIS PARK	6	111
BFI	ARBOR HILLS	7	117
BFI	AZUSA	1	222
BFI	BACKRIDGE	3	49
BFI	BIGFOOT	12	76
BFI	C & C	12	173
BFI	CALGARY	5	17
BFI	CARBON	31	160
BFI	CHARLOTTE	1	81
BFI	CHICOPEE	8	141
BFI	COLONIAL	4	76
BFI	CONESTOGA	2	74
BFI	EAST BRIDGEWATER	16	86
BFI	FOOTHILLS	1	54
BFI	FRANKFORT	9	96
BFI	GREENTREE	3	157
BFI	GULF WEST	1	129
BFI	IMPERIAL	10	114
BFI	ITASCA	1	61
BFI	JEFFERSON DAVIS	4	127
BFI	KELLER CANYON	7	211
BFI	LA PAZ COUNTY	1	33
BFI	LAKE AREA MSW	1	97
BFI	LAMAR	1	12
BFI	LORAIN	1	68
BFI	LYON	3	93
BFI	MADISON PRAIRIE	17	158
BFI	MODEL FILL	2	146
BFI	MODERN	8	146
BFI	NEWBY ISLAND	3	207
BFI	OLD DOMINION	5	146
BFI	OX MOUNTAIN	12	193
BFI	PONCE	1	67
BFI	QUAD CITIES	8	181
BFI	RANDOLPH	8	137
BFI	REDBIRD	2	46
BFI	RIDGE	13	126

Exhibit 404

Data Source (a)	Landfill (b)	Sampling Rounds (c)	Analytes with Comparison Levels (d)
BFI	ROCKFORD	9	185
BFI	SAMPSON CO	1	62
BFI	SANDUSKY	2	69
BFI	SPOON RIDGE	3	21
BFI	SUNSHINE COUNTY	1	184
BFI	TESSMAN ROAD	1	148
BFI	TOLEDO	11	71
BFI	TROY	17	78
BFI	UWL	1	10
BFI	VASCO ROAD	28	222
BFI	WAUKEGAN	7	142
BFI	WILLOWCREEK	1	189
BFI	WOODLAKE	1	70
BFI	WOODLAND HILLS	6	105
CWM	41	1	138
FL	58TH ST LF (MAIN COUNTY LF)	5	23
FL	ASTATULA PH I/2A, 2B, 2C	2	20
FL	AUCILLA AREA SW FACILITY-CL I	4	28
FL	AVON PARK CLASS-3 SLF & TRANS	1	6
FL	BASE LINE LANDFILL - CLASS I	1	25
FL	BEE RIDGE LF	6	34
FL	BERMAN ROAD LANDFILL	1	11
FL	BREVARD COUNTY CENTRAL LANDFIL	3	18
FL	BRIDGEWAY ACRES CLASS I LF	5	14
FL	BRONSON SLF (LEVY COUNTY LF)	9	48
FL	CHARLOTTE COUNTY SLF (ZEMEL RD	7	32
FL	CITRUS CENTRAL SLF	34	40
FL	CROOM SLF (HIGH CORNER RD LF)	4	12
FL	DADE COUNTY RESOURCE RECOVERY	10	24
FL	DAVID J JOSEPH FACILITY	3	22
FL	DESOTO CITY SLF	7	35
FL	EAST PASCO LF (DADE CITY LF)	8	37
FL	GLADES CO SAN. LANDFILL #2	4	19
FL	GULF COAST SLF	8	25
FL	HAMILTON COUNTY CL I LANDFILL	3	24
FL	HARDEE COUNTY REGIONAL LANDFIL	11	14
FL	HERNANDO COUNTY NORTHWEST LF	5	20

Exhibit 404

LEACH 2000 MSW Landfills Included in Evaluation

Data Source (a)	Landfill (b)	Sampling Rounds (c)	Analytes with Comparison Levels (d)
FL	HIGHLANDS COUNTY SW MGMT CENTE	3	25
FL	HILLSBOROUGH HEIGHTS LF	17	30
FL	IMMOKALEE LF (#2 - STOCKADE)	11	24
FL	INDIAN RIVER COUNTY LF - CLASS	11	44
FL	KINGSWAY RD LF (DAVID J JOSEPH	11	26
FL	LEESBURG, CITY OF LANDFILL	1	2
FL	LENA RD COUNTY LF	1	8
FL	MARTIN COUNTY (PALM CITY II) S	6	31
FL	MEDLEY LANDFILL	4	24
FL	NAPLES SLF CELL #6 (COLLIER CO	11	29
FL	NEW RIVER REGIONAL LANDFILL	4	18
FL	NORTH DUVAL SLF	11	28
FL	NORTH POLK CENTRAL LF (SITE 20	4	22
FL	NORTHEAST POLK LF (SITE 204)	4	27
FL	OSCEOLA RD LF (SEMINOLE COUNTY	1	37
FL	PALM BEACH COUNTY LF #3 (DYER	9	19
FL	PASCO COUNTY RESOURCE RECOVERY	5	25
FL	PBCSWA SITE#7 RESOURCE RECOVER	10	39
FL	PUTNAM COUNTY CENTRAL LF (PHAS	18	31
FL	ROSEMARY HILL L/F EXPAN (CLASS	8	26
FL	SOUTHEAST COUNTY SLF (PICNIC L	14	23
FL	SOUTHEAST POLK LF (SITE 203)	4	26
FL	SOUTHWEST ALACHUA SLF (RENEWAL	15	30
FL	ST LUCIE CO SLF (PHASE I)	3	14
FL	TOYTOWN SLF	3	12
FL	TRAIL RIDGE LANDFILL	4	25
FL	WEST PASCO CLASS III LF	4	15
FL	WINFIELD SW FACILITY (CLASS I)	4	18
OW	16009	1	301
OW	16085	6	10
OW	16088	6	74
OW	16093	10	1
OW	16097	12	1
OW	16099	4	63
OW	16117	5	146
OW	16118	11	122
OW	16119	4	23

Data Source (a)	Landfill (b)	Sampling Rounds (c)	Analytes with Comparison Levels (d)
OW	16120	12	152
OW	16122	4	292
OW	16125	9	289
OW	16127	4	74
OW	16130	2	53
OW	16132	4	59
OW	16159	2	102
OW	16170	3	2
OW	4687	1	304
OW	4738	1	304

Exhibit 404

Comp. 017378

C
LEACH 2000 MSW DATABASE SUMMARY

Notes on the following Tables

(a) Frequency of Detection. Number of detects: Total number of data points based on site averages (i.e., each MSW landfill represents 1 data point).

(b) LEACH 2000 has data for approximately 121 MSW landfills. Sample rounds for the landfills range from 1 to 34. To ensure that results from no single landfill dominate the evaluation, site averages were calculated for each constituent at each landfill. The frequency of detection and the percentiles were calculated based on the site averaged data.

BDL - Below Detection Limit - reported where the result is based on a non-detected result

µg/l - microgram per liter

Constituent	Frequency of Detection (a) (b)	Minimum Concentration (ug/l)	Maximum Concentration (ug/l)	50th Percentile Concentration (ug/l)	90th Percentile Concentration (ug/l)
1,1,1-TRICHLOROETHANE	30:70	BDL	1.32E+02	BDL	1.50E+01
1,1,2,2-TETRACHLOROETHANE	2:59	BDL	2.50E+00	BDL	BDL
1,1,2-TRICHLOROETHANE	2:57	BDL	2.50E+00	BDL	BDL
1,1-DICHLOROETHANE	36:60	BDL	1.40E+02	2.14E+00	4.83E+01
1,1-DICHLOROETHYLENE	9:65	BDL	3.73E+01	BDL	7.14E-01
1,2,3-TRICHLOROBENZENE	1:19	BDL	5.56E-02	BDL	BDL
1,2,3-TRICHLOROPROPANE	1:45	BDL	2.50E+00	BDL	BDL
1,2,4-TRICHLOROBENZENE	3:42	BDL	2.00E+00	BDL	BDL
1,2,4-TRIMETHYLBENZENE	6:12	BDL	1.43E+01	7.27E-01	1.22E+01
1,2-DIBROMO-3-CHLOROPROPANE	4:44	BDL	1.05E-01	BDL	BDL
1,2-DIBROMOETHANE	1:48	BDL	8.30E-01	BDL	BDL
1,2-DICHLOROBENZENE	19:70	BDL	8.10E+00	BDL	1.35E+00
1,2-DICHLOROETHANE	15:61	BDL	7.00E+00	BDL	7.60E-01
1,2-DICHLOROETHENE	8:16	BDL	1.00E+01	5.50E-01	4.58E+00
1,2-DICHLOROPROPANE	10:60	BDL	2.00E+00	BDL	3.01E-01
1,2-TRANS-DICHLOROETHYLENE	7:61	BDL	7.90E+00	BDL	2.00E-02
1,3,5-TRIMETHYLBENZENE	6:12	BDL	1.19E+01	2.73E-01	5.78E+00
1,3-DICHLOROBENZENE	4:51	BDL	1.06E+01	BDL	BDL
1,3-DICHLOROPROPANE	1:50	BDL	7.50E-02	BDL	BDL
1,4-DICHLOROBENZENE	63:96	BDL	9.33E+02	2.55E+00	1.64E+01
1,4-DIOXANE	3:6	BDL	2.21E+02	2.01E+00	1.69E+02
1234678-HPCDD	2:3	BDL	5.12E-03	1.03E-04	4.12E-03
1234678-HPCDF	1:3	BDL	2.80E-05	BDL	2.24E-05
123678-HXCDD	1:3	BDL	8.70E-05	BDL	6.96E-05
123789-HXCDD	1:3	BDL	2.32E-04	BDL	1.86E-04

Constituent	Frequency of Detection (a) (b)	Minimum Concentration (ug/l)	Maximum Concentration (ug/l)	50th Percentile Concentration (ug/l)	90th Percentile Concentration (ug/l)
2,4,5-T	4:11	BDL	7.00E-01	BDL	5.50E-01
2,4-D	7:24	BDL	2.87E+01	BDL	4.70E+00
2,4-DB	1:6	BDL	7.08E+00	BDL	3.54E+00
2,4-DDE	1:1	3.33E-02	3.33E-02	3.33E-02	3.33E-02
2,4-DIMETHYLPHENOL	14:40	BDL	2.40E+01	BDL	3.08E+00
2-BUTANONE	64:75	BDL	6.49E+04	2.77E+02	8.89E+03
2-CHLOROTOLUENE	2:12	BDL	8.57E-01	BDL	3.38E-01
2-HEXANONE	14:49	BDL	7.50E+01	BDL	1.05E+01
2-METHYL-4,6-DINITROPHENOL	1:36	BDL	2.73E+00	BDL	BDL
2-METHYLNAPHTHALENE	1:20	BDL	3.05E+00	BDL	BDL
2-METHYLPHENOL	7:28	BDL	2.22E+03	BDL	2.27E+01
2-NITROPHENOL	2:38	BDL	2.19E+01	BDL	BDL
2-PROPANONE	44:51	BDL	7.57E+04	5.03E+02	9.15E+03
4,4'-DDE	1:30	BDL	5.56E-03	BDL	BDL
4,4'-DDT	3:32	BDL	1.67E-02	BDL	BDL
4-CHLORO-3-METHYLPHENOL	1:34	BDL	3.14E+01	BDL	BDL
4-ISOPROPYLTOLUENE	8:15	BDL	3.63E+01	9.21E-01	7.19E+00
4-METHYL-2-PENTANONE	37:51	BDL	3.70E+03	1.25E+01	3.90E+02
4-METHYLPHENOL	17:27	BDL	1.09E+05	2.90E+01	9.84E+02
4-NITROPHENOL	1:38	BDL	6.82E+01	BDL	BDL
ACENAPHTHENE	5:35	BDL	5.50E+01	BDL	4.33E-01
ACENAPHTHYLENE	2:33	BDL	5.70E+01	BDL	BDL
ACETONITRILE	3:7	BDL	1.33E+02	BDL	5.99E+01
ACETOPHENONE	3:12	BDL	2.20E+01	BDL	2.00E+01
ACROLEIN	2:32	BDL	6.53E+00	BDL	BDL

Constituent	Frequency of Detection (a) (b)	Minimum Concentration (ug/l)	Maximum Concentration (ug/l)	50th Percentile Concentration (ug/l)	90th Percentile Concentration (ug/l)
ACRYLONITRILE	1:50	BDL	2.50E+00	BDL	BDL
ALACHLOR	2:10	BDL	1.27E+00	BDL	1.83E-01
ALDICARB	1:5	BDL	4.09E-01	BDL	2.45E-01
ALDRIN	3:32	BDL	7.33E-02	BDL	BDL
ALPHA-BHC	3:30	BDL	2.22E-02	BDL	3.50E-05
ALUMINUM	25:25	2.47E+01	1.11E+05	6.40E+02	2.48E+04
AMENABLE CYANIDE	1:1	1.30E+01	1.30E+01	1.30E+01	1.30E+01
AMMONIA	51:52	BDL	2.00E+06	1.23E+05	5.27E+05
AMMONIA, UNION	6:6	2.00E+01	2.55E+03	4.50E+02	2.54E+03
ANILINE	1:11	BDL	1.28E+01	BDL	BDL
ANTHRACENE	1:34	BDL	8.00E-02	BDL	BDL
ANTIMONY	39:68	BDL	2.04E+02	2.75E+00	1.57E+01
AROCLOR-1016	3:12	BDL	8.80E+01	BDL	4.12E+01
ARSENIC	90:107	BDL	8.10E+03	1.54E+01	8.02E+01
ATRAZINE	2:10	BDL	5.83E-01	BDL	5.38E-01
BARIUM	90:94	BDL	1.28E+04	3.38E+02	1.48E+03
BENFLURALIN	1:5	BDL	2.07E-01	BDL	1.25E-01
BENZENE	70:99	BDL	5.63E+01	2.03E+00	9.58E+00
BENZO(B)FLUORANTHENE	1:33	BDL	2.64E+00	BDL	BDL
BENZOIC ACID	7:14	BDL	5.04E+04	2.75E-01	2.60E+04
BENZYL ALCOHOL	2:18	BDL	6.00E+01	BDL	5.70E-01
BENZYL BUTYL PHTHALATE	1:36	BDL	5.00E+00	BDL	BDL
BERYLLIUM	14:55	BDL	2.77E+02	BDL	4.22E+00
BETA-BHC	2:30	BDL	1.09E-02	BDL	BDL
BIPHENYL	1:6	BDL	1.00E+02	BDL	5.00E+01

Constituent	Frequency of Detection (a) (b)	Minimum Concentration (ug/l)	Maximum Concentration (ug/l)	50th Percentile Concentration (ug/l)	90th Percentile Concentration (ug/l)
BIS(2-ETHYLHEXYL)PHTHALATE	14:36	BDL	1.03E+03	BDL	1.63E+01
BIS(CHLOROMETHYL) ETHER	1:10	BDL	2.50E+00	BDL	2.50E-01
BORON	28:28	3.59E+01	2.58E+04	3.05E+03	1.31E+04
BROMODICHLOROMETHANE	0:66	BDL	9.40E+01	BDL	BDL
BROMOFORM	5:64	BDL	3.27E+02	BDL	BDL
BROMOMETHANE	0:63	BDL	3.70E+01	BDL	BDL
CADMIUM	45:92	BDL	1.00E+02	BDL	1.04E+01
CALCIUM	57:58	BDL	2.94E+06	2.03E+05	4.47E+05
CARBOFURAN	2:5	BDL	1.68E+00	BDL	1.54E+00
CARBON DISULFIDE	7:48	BDL	4.35E+00	BDL	2.63E-01
CARBON TETRACHLORIDE	1:64	BDL	1.00E+01	BDL	BDL
CHLORDANE	1:34	BDL	1.90E+00	BDL	BDL
CHLORIDE	101:103	BDL	3.08E+07	6.93E+05	2.87E+06
CHLORINE	1:1	2.60E+02	2.60E+02	2.60E+02	2.60E+02
CHLOROBENZENE	40:90	BDL	3.28E+01	4.49E-01	6.97E+00
CHLORODIBROMOMETHANE	5:64	BDL	1.45E+02	BDL	BDL
CHLOROETHANE	33:70	BDL	7.33E+01	BDL	1.07E+01
CHLOROFORM	17:72	BDL	6.35E+01	BDL	5.89E+00
CHLOROMETHANE	13:67	BDL	1.72E+01	BDL	1.80E+00
CHLOROTHALONIL	1:5	BDL	7.00E-02	BDL	4.20E-02
CHROMIUM	81:103	BDL	2.63E+03	2.19E+01	1.23E+02
CHROMIUM, HEXAVALENT	10:21	BDL	3.00E+01	BDL	2.93E+01
CIS-1,2-DICHLOROETHENE	27:46	BDL	6.60E+01	5.92E-01	1.70E+01
COBALT	40:60	BDL	5.20E+02	1.30E+01	5.92E+01
COPPER	69:92	BDL	5.51E+03	1.53E+01	8.93E+01

Constituent	Frequency of Detection (a) (b)	Minimum Concentration (ug/l)	Maximum Concentration (ug/l)	50th Percentile Concentration (ug/l)	90th Percentile Concentration (ug/l)
CRESOL, M + P	3:7	BDL	4.10E+03	BDL	1.92E+03
CRESOLS	1:3	BDL	1.00E+02	BDL	8.00E+01
CYANIDE	39:64	BDL	1.04E+04	2.43E+00	1.52E+02
DELTA-BHC	1:30	BDL	3.78E-02	BDL	BDL
DIALLATE	1:12	BDL	6.20E+00	BDL	BDL
DIAZINON	3:6	BDL	1.20E+01	2.45E+00	8.68E+00
DIBENZOFURAN	1:20	BDL	4.17E-01	BDL	BDL
DIBROMOMETHANE	1:44	BDL	2.50E+00	BDL	BDL
DICAMBA	3:6	BDL	7.00E-01	1.43E-01	5.25E-01
DICHLORODIFLUOROMETHANE	13:37	BDL	2.35E+01	BDL	7.70E+00
DICHLOROMETHANE	58:73	BDL	1.85E+03	5.34E+00	2.68E+02
DIELDRIN	1:33	BDL	3.00E-01	BDL	BDL
DIETHYL ETHER	3:7	BDL	9.01E+01	BDL	8.55E+01
DIETHYL PHTHALATE	13:39	BDL	2.28E+02	BDL	8.28E+00
DIMETHOATE	2:12	BDL	1.17E+00	BDL	8.79E-01
DIMETHYL PHTHALATE	3:36	BDL	4.25E+00	BDL	BDL
DIMETHYLAMINO AZOBENZENE	1:12	BDL	3.49E+00	BDL	BDL
DI-N-BUTYL PHTHALATE	9:39	BDL	5.00E+01	BDL	2.09E+00
DI-N-OCTYL PHTHALATE	1:33	BDL	6.67E-01	BDL	BDL
DISULFOTON	3:12	BDL	2.23E+01	BDL	6.91E+00
ENDOSULFAN II	1:23	BDL	1.67E-02	BDL	BDL
ENDOSULFAN SULFATE	1:27	BDL	1.55E-03	BDL	BDL
ENDRIN	1:33	BDL	1.53E-03	BDL	BDL
ETHYL ACETATE	2:5	BDL	3.70E+02	BDL	2.26E+02
ETHYLBENZENE	66:99	BDL	1.76E+02	2.00E+01	5.11E+01

Constituent	Frequency of Detection (a) (b)	Minimum Concentration (ug/l)	Maximum Concentration (ug/l)	50th Percentile Concentration (ug/l)	90th Percentile Concentration (ug/l)
FLUORANTHENE	1:34	BDL	1.10E-01	BDL	BDL
FLUORENE	4:36	BDL	2.05E+01	BDL	1.95E-01
FLUORIDE	36:37	BDL	1.55E+04	4.00E+02	2.35E+03
HEPTACHLOR	1:33	BDL	2.73E-03	BDL	BDL
HEPTACHLOR EPOXIDE	2:33	BDL	1.54E-02	BDL	BDL
HEXACHLOROBUTADIENE	2:44	BDL	1.00E+00	BDL	BDL
HYDROG SULFIDE	4:4	6.90E+02	2.19E+04	3.64E+03	1.68E+04
IODINE	1:5	BDL	1.28E+04	BDL	7.69E+03
IRON	100.100	1.20E+01	1.06E+07	1.63E+04	1.31E+05
ISOBUTYL ALCOHOL	6:16	BDL	8.20E+03	BDL	3.62E+03
ISOPHORONE	8:36	BDL	1.83E+01	BDL	2.44E+00
ISO-PROPANOL	5:7	BDL	1.89E+04	4.97E+03	1.59E+04
ISOPROPYLBENZENE	3:13	BDL	5.38E+00	BDL	2.98E+00
LEAD	66:102	BDL	4.80E+02	2.22E+00	4.18E+01
LITHIUM	2:5	BDL	2.72E+02	BDL	2.01E+02
M&P-XYLENE	27:31	BDL	3.90E+02	5.17E+01	1.50E+02
MAGNESIUM	57:57	8.08E+03	3.94E+05	9.71E+04	1.93E+05
MANGANESE	67:67	6.00E+01	1.03E+05	1.60E+03	1.84E+04
MCPA	5:6	BDL	3.12E+02	1.08E+02	2.25E+02
MCPP	3:6	BDL	3.73E+02	2.63E+01	2.36E+02
M-CRESOL (3-METHYLPHENOL)	1:13	BDL	1.44E+03	BDL	BDL
MERCURY	27:76	BDL	1.00E+01	BDL	6.53E-01
METHYL-TERT-BUTYL ETHER	10:15	BDL	2.03E+02	2.00E+00	1.04E+02
MOLYBDENUM	6:13	BDL	6.88E+01	BDL	3.43E+01
M-XYLENE	6:9	BDL	1.50E+02	6.90E+00	1.42E+02

Constituent	Frequency of Detection (a) (b)	Minimum Concentration (ug/l)	Maximum Concentration (ug/l)	50th Percentile Concentration (ug/l)	90th Percentile Concentration (ug/l)
N,N-DIMETHYLFORMAMIDE	2:5	BDL	1.00E+03	BDL	6.09E+02
NALED	1:5	BDL	2.00E+00	BDL	1.20E+00
NAPHTHALENE	37:60	BDL	2.13E+02	3.94E+00	1.86E+01
N-BUTANOL	2:5	BDL	6.64E+02	BDL	5.07E+02
NICKEL	87:100	BDL	1.40E+03	6.00E+01	2.25E+02
NITRATE	23:36	BDL	1.05E+04	3.89E+02	4.31E+03
NITRITE	5:12	BDL	1.98E+03	BDL	3.04E+02
N-NITROSODIPHENYLAMINE	2:33	BDL	1.88E+00	BDL	BDL
N-PROPYLBENZENE	4:13	BDL	2.00E+00	BDL	1.31E+00
O+P XYLENE	2:5	BDL	7.37E+01	BDL	4.48E+01
OCDD	2:4	BDL	8.00E-02	2.60E-03	5.76E-02
O-TOLUIDINE	1:12	BDL	2.08E+01	BDL	BDL
O-XYLENE	28:34	BDL	1.70E+02	1.63E+01	6.53E+01
PARATHION	1:16	BDL	1.46E-01	BDL	BDL
PCB, TOTAL	1:4	BDL	4.64E-01	BDL	3.25E-01
P-CHLOROTOLUENE	2:11	BDL	2.07E-01	BDL	1.11E-01
PENTACHLOROPHENOL	1:43	BDL	9.00E-02	BDL	BDL
PHENANTHRENE	8:38	BDL	1.83E+01	BDL	3.19E-01
PHENOL	36:50	BDL	1.74E+05	2.85E+01	5.51E+02
PHENOLIC COMPOUND	1:1	7.93E+02	7.93E+02	7.93E+02	7.93E+02
PHENOLICS, TOTAL	17:17	3.07E+01	6.10E+04	3.99E+02	2.06E+03
PHENOLS	17:18	BDL	3.22E+03	2.03E+02	1.61E+03
POTASSIUM	46:46	9.23E+03	7.75E+06	1.04E+05	8.35E+05
POTASSIUM K TOT	7:7	3.68E+04	5.45E+05	2.70E+05	4.54E+05
PROPACHLOR	1:5	BDL	9.50E-01	BDL	5.70E-01

Constituent	Frequency of Detection (a) (b)	Minimum Concentration (ug/l)	Maximum Concentration (ug/l)	50th Percentile Concentration (ug/l)	90th Percentile Concentration (ug/l)
PYRENE	1:33	BDL	1.10E+01	BDL	BDL
PYRIDINE	1:18	BDL	1.00E+00	BDL	BDL
SELENIUM	35:83	BDL	6.05E+01	BDL	1.60E+01
SILVER	32:78	BDL	6.00E+01	BDL	1.03E+01
SILVEX (2,4,5-TP)	5:22	BDL	1.30E+01	BDL	2.81E+00
SODIUM	100:101	BDL	2.85E+08	5.15E+05	1.97E+06
STRONTIUM	6:6	2.77E+02	2.09E+03	1.25E+03	2.01E+03
STYRENE	26:60	BDL	8.90E+01	BDL	5.37E+00
TETRACHLOROETHENE	23:68	BDL	1.40E+01	BDL	3.15E+00
THALLIUM	17:54	BDL	5.83E+02	BDL	5.97E+00
TIN	12:23	BDL	6.40E+02	4.43E+00	3.36E+02
TOLUENE	89:97	BDL	6.48E+02	3.30E+01	3.48E+02
TOTAL PHENOLS	13:14	BDL	1.88E+06	4.78E+02	8.85E+03
TRANS-1,3-DICHLORO-1-PROPENE	3:60	BDL	1.60E+01	BDL	BDL
TRANS-1,4-DICHLORO-2-BUTENE	2:35	BDL	1.63E+01	BDL	BDL
TRICHLOROETHENE	29:71	BDL	3.10E+01	BDL	5.50E+00
TRICHLOROFLUOROMETHANE	14:60	BDL	5.30E+02	BDL	3.68E+00
URANIUM	1:5	BDL	1.32E+02	BDL	7.80E+01
VANADIUM	49:63	BDL	4.70E+02	1.78E+01	1.25E+02
VINYL ACETATE	2:46	BDL	4.10E+02	BDL	BDL
VINYL CHLORIDE	44:84	BDL	4.20E+01	7.73E-01	6.33E+00
XYLENE TOTAL	72:79	BDL	6.46E+02	4.08E+01	1.19E+02
XYLENE, P-	1:5	BDL	3.48E+01	BDL	2.00E+01
ZINC	99:101	BDL	2.10E+04	1.03E+02	9.95E+02
ZIRCONIUM	2:5	BDL	8.20E+01	BDL	4.24E+01

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Comp. 017388

D
EPRI CCP LEACHATE DATABASE SUMMARY

Notes on the following Table:

(a) Frequency of Detection. Number of detects: Total number of data points where each landfill/impoundment represents one data point based on site averages.

(b) The CCP leachate database has data for approximately 30 landfills/impoundments. Sample rounds range from 1 to 54 for each site. To ensure that results from no single site dominate the evaluation, site averages were calculated for each constituent at each site. The frequency of detection and the percentiles were calculated based on the site averaged data.

BDL - Below Detection Limit - reported where the result is based on a non-detected result

µg/l - microgram per liter

Constituent	Frequency of Detection (a) (b)	Minimum Concentration (ug/l)	Maximum Concentration (ug/l)	50th Percentile Concentration (ug/l)	90th Percentile Concentration (ug/l)
ALKALINITY	5:5	BDL	9.09E+05	2.08E+05	6.17E+05
ALUMINUM	25:28	BDL	4.44E+04	2.05E+02	1.25E+04
AMMONIA	3:3	1.26E+03	2.93E+03	2.73E+03	2.80E+03
AMMONIA, UNIONIZED	2:2	1.60E+02	7.10E+02	4.35E+02	6.55E+02
ANTIMONY	21:22	BDL	2.00E+02	1.60E+00	8.40E+00
ARSENIC	28:28	2.23E+00	9.98E+02	5.50E+01	2.79E+02
BARIUM	28:29	BDL	3.80E+02	8.20E+01	1.77E+02
BERYLLIUM	1:23	BDL	2.67E-01	BDL	BDL
BORON	28:30	BDL	1.00E+05	6.35E+03	6.50E+04
BROMIDE	5:5	BDL	6.90E+02	1.99E+02	6.24E+02
CADMIUM	24:28	BDL	6.47E+01	3.45E+00	2.31E+01
CALCIUM	30:30	6.32E+03	6.23E+05	1.57E+05	5.14E+05
CHLORIDE	30:30	2.45E+03	1.23E+05	3.71E+04	8.67E+04
CHROMIUM	19:29	BDL	4.89E+03	1.50E+00	8.17E+01
COBALT	19:24	BDL	7.07E+01	4.59E-01	7.70E+00
COPPER	25:29	BDL	2.78E+02	2.27E+00	3.31E+01
DIMETHYL MERCURY	7:9	BDL	2.47E-03	5.61E-05	9.45E-04
FLUORINE	10:10	2.65E+01	2.16E+04	6.28E+02	4.50E+03
IRON	20:28	BDL	2.06E+04	2.24E+01	3.70E+03
LEAD	13:27	BDL	2.60E+02	BDL	1.49E+00
LITHIUM	22:24	BDL	6.94E+03	1.68E+02	2.36E+03
MAGNESIUM	28:30	BDL	1.88E+05	9.16E+03	6.19E+04
MANGANESE	25:30	BDL	4.17E+03	4.42E+01	1.43E+03
MERCURY	11:14	BDL	3.65E-02	1.74E-03	1.79E-02
METHYL MERCURY	8:9	BDL	3.39E-03	9.89E-05	9.12E-04

Constituent	Frequency of Detection (a) (b)	Minimum Concentration (ug/l)	Maximum Concentration (ug/l)	50th Percentile Concentration (ug/l)	90th Percentile Concentration (ug/l)
MOLYBDENUM	29:29	1.00E+02	3.99E+04	1.50E+03	9.65E+03
NICKEL	25:28	BDL	1.28E+02	6.66E+00	3.30E+01
NITRATE	8:9	BDL	4.56E+04	7.26E+01	1.59E+04
NITRATE + NITRITE	1:1	2.39E+03	2.39E+03	2.39E+03	2.39E+03
NITRITE	1:5	BDL	2.17E+02	BDL	1.30E+02
NITROGEN, KJELDAHL	1:1	3.00E+02	3.00E+02	3.00E+02	3.00E+02
PH	1:1	1.15E+04	1.15E+04	1.15E+04	1.15E+04
PH (FIELD)	27:27	6.08E+03	1.21E+04	9.10E+03	1.16E+04
PHOSPHATE	2:7	BDL	7.30E+01	BDL	6.95E+01
POTASSIUM	30:30	2.24E+03	2.55E+05	4.45E+04	1.39E+05
SELENIUM	26:27	BDL	1.75E+03	5.38E+01	2.43E+02
SILVER	6:26	BDL	1.74E+01	BDL	4.61E-01
SODIUM	30:30	1.75E+03	3.16E+06	9.91E+04	1.01E+06
STRONTIUM	28:28	3.00E+01	1.20E+04	2.05E+03	8.41E+03
SULFATE	29:29	8.90E+04	6.07E+06	1.30E+06	2.99E+06
THALLIUM	10:22	BDL	1.52E+02	BDL	1.33E+00
TIN	1:1	1.33E+02	1.33E+02	1.33E+02	1.33E+02
TITANIUM	1:1	3.27E+01	3.27E+01	3.27E+01	3.27E+01
TOTAL DISSOLVED SOLIDS	7:7	8.19E+05	2.98E+06	1.77E+06	2.85E+06
URANIUM	18:20	BDL	2.60E+03	2.86E+00	2.26E+01
VANADIUM	27:28	BDL	5.02E+03	1.06E+02	6.06E+02
ZINC	19:30	BDL	1.40E+02	2.58E+00	6.07E+01

Exhibit 404

E

TOXIC EQUIVALENCY FACTORS FOR DIOXINS AND DIOXIN-LIKE COMPOUNDS

		Toxic Equivalency Factor (TEF)	
Constituent	CAS Number	Human Health (a)	Fish (b)
2,3,7,8-TCDD	1746-01-6	1	1
1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	40321-76-4	1	1
1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	39227-28-6	0.1	0.5
1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	57653-85-7	0.1	0.01
1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	19408-74-3	0.1	0.01
1,2,3,4,6,7,8-Heptachlorodibenzo-P-Dioxin	35822-46-9	0.01	0.001
OCDD	3268-87-9	0.0003	0.0001
2,3,7,8-PentaCDDs	2378PentaCDDs	0	0
2,3,7,8-HexaCDDs	2378HexaCDDs	0	0
2,3,7,8-HeptaCDDs	2378HeptaCDDs	0	0
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	0.1	0.05
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	0.03	0.05
2,3,4,7,8-PeCDF	57117-31-4	0.3	0.5
1,2,3,4,7,8-HxCDF	70648-26-9	0.1	0.1
1,2,3,6,7,8-HxCDF	57117-44-9	0.1	0.1
1,2,3,7,8,9-HxCDF	72918-21-9	0.1	0.1
2,3,4,6,7,8-HxCDF	60851-34-5	0.1	0.1
1,2,3,4,6,7,8-HpCDF	67562-39-4	0.01	0.01
1,2,3,4,7,8,9-HpCDF	55673-89-7	0.01	0.01
OCDF	39001-02-0	0.0003	0.0001
2,3,7,8-HexaCDFs	2378HexaCDFs	0	0
2,3,7,8-HeptaCDFs	2378HeptaCDFs	0	0

Notes:
CAS - Chemical Abstracts Service.
TEF - Toxic Equivalency Factor.
(a) Van den Berg et al., 2006. The 2005 World Health Organization Re-evaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-like Compounds. Toxicological Sciences 93(2), 223-241.
(b) Van den Berg et al., 1998. Toxic Equivalency Factors (TEFs) for PCBs, PCDDs, PCDFs for Humans and Wildlife. Environmental Health Perspectives 106(12), 775-792.

Exhibit 404

Exhibit 404

Comp. 017394

F
HUMAN HEALTH RISK-BASED COMPARISON LEVELS

Notes on the following Table:

(a) USEPA Regional Screening Levels. USEPA, May, 2010.
(http://www.epa.gov/region09/superfund/prg/).

Note: Screening Levels for dioxin and furan congeners adjusted by the congener-specific toxic equivalency factor; see text and Appendix E.

(b) USEPA Regional Screening Levels. USEPA, April, 2009

CAS - Chemical Abstracts Service

µg/l - microgram per liter

CAS	Constituent	Synonym/Surrogate	Surrogate?	Tap Water Noncancer Comparison Level (ug/l) (a)	Tap Water Cancer Comparison Level (ug/l) (a)
71-55-6	1,1,1-TRICHLOROETHANE	TRICHLOROETHANE, 1,1,1-	No	9.10E+03	
79-34-5	1,1,2,2-TETRACHLOROETHANE	TETRACHLOROETHANE, 1,1,2,2-	No	1.50E+02	6.70E-02
79-00-5	1,1,2-TRICHLOROETHANE	TRICHLOROETHANE, 1,1,2-	No	1.50E+02	2.40E-01
75-34-3	1,1-DICHLOROETHANE	DICHLOROETHANE, 1,1-	No	7.30E+03	2.40E+00
75-35-4	1,1-DICHLOROETHYLENE	DICHLOROETHYLENE, 1,1-	No	3.40E+02	
87-61-6	1,2,3-TRICHLOROBENZENE	TRICHLOROBENZENE, 1,2,3-	No	2.90E+01	
96-18-4	1,2,3-TRICHLOROPROPANE	TRICHLOROPROPANE, 1,2,3-	No	6.20E-01	7.20E-04
120-82-1	1,2,4-TRICHLOROBENZENE	TRICHLOROBENZENE, 1,2,4-	No	4.10E+00	2.30E+00
95-63-6	1,2,4-TRIMETHYLBENZENE	TRIMETHYLBENZENE, 1,2,4-	No	1.50E+01	
96-12-8	1,2-DIBROMO-3-CHLOROPROPANE	DIBROMO-3-CHLOROPROPANE, 1,2-	No	3.90E-01	3.20E-04
106-93-4	1,2-DIBROMOETHANE	DIBROMOETHANE, 1,2-	No	1.60E+01	6.50E-03
95-50-1	1,2-DICHLOROBENZENE	DICHLOROBENZENE, 1,2-	No	3.70E+02	
107-06-2	1,2-DICHLOROETHANE	DICHLOROETHANE, 1,2-	No	6.40E+02	1.50E-01
540-59-0	1,2-DICHLOROETHENE	DICHLOROETHYLENE, 1,2- (MIXED ISOMERS)	No	3.30E+02	
78-87-5	1,2-DICHLOROPROPANE	DICHLOROPROPANE, 1,2-	No	8.30E+00	3.90E-01
156-60-5	1,2-TRANS-DICHLOROETHYLENE	DICHLOROETHYLENE, 1,2 TRANS	No	1.10E+02	
108-67-8	1,3,5-TRIMETHYLBENZENE	1,3,5-TRIMETHYLBENZENE	No	3.70E+02	
541-73-1	1,3-DICHLOROBENZENE	DICHLOROBENZENE, 1,4-	Yes	1.00E+03	4.30E-01

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CAS	Constituent	Synonym/Surrogate	Surrogate?	Tap Water Noncancer Comparison Level (ug/l) (a)	Tap Water Cancer Comparison Level (ug/l) (a)
142-28-9	1,3-DICHLOROPROPANE	DICHLOROPROPANE, 1,3-	No	7.30E+02	
106-46-7	1,4-DICHLOROBENZENE	DICHLOROBENZENE, 1,4-	No	1.00E+03	4.30E-01
123-91-1	1,4-DIOXANE	DIOXANE, 1,4-	No	3.70E+03	6.10E+00
35822-46-9	1234678-HPCDD	TCDD, 2,3,7,8-	Yes	3.70E-03	5.20E-05
67562-39-4	1234678-HPCDF	TCDD, 2,3,7,8-	Yes	3.70E-03	5.20E-05
57653-85-7	123678-HXCDD	TCDD, 2,3,7,8-	Yes	3.70E-04	5.20E-06
19408-74-3	123789-HXCDD	TCDD, 2,3,7,8-	Yes	3.70E-04	5.20E-06
93-76-5	2,4,5-T	TRICHLOROPHENOXYACETIC ACID, 2,4,5-	No	3.70E+02	
94-75-7	2,4-D	DICHLOROPHENOXY ACETIC ACID, 2,4-	No	3.70E+02	
94-82-6	2,4-DB	DICHLOROPHENOXY)BUTYRIC ACID, 4-(2,4-	No	2.90E+02	
3424-82-6	2,4-DDE	DDE, P,P-	Yes		2.00E-01
105-67-9	2,4-DIMETHYLPHENOL	DIMETHYLPHENOL, 2,4-	No	7.30E+02	
78-93-3	2-BUTANONE	METHYL ETHYL KETONE (2-BUTANONE)	No	7.10E+03	
95-49-8	2-CHLOROTOLUENE	CHLOROTOLUENE, O-	No	7.30E+02	
591-78-6	2-HEXANONE	HEXANONE, 2-	No	4.70E+01	
534-52-1	2-METHYL-4,6-DINITROPHENOL	DINITRO-O-CRESOL, 4,6-	No	2.90E+00	
91-57-6	2-METHYLNAPHTHALENE	METHYLNAPHTHALENE, 2-	No	1.50E+02	
95-48-7	2-METHYLPHENOL	CRESOL, O-	No	1.80E+03	

CAS	Constituent	Synonym/Surrogate	Surrogate?	Tap Water Noncancer Comparison Level (ug/l) (a)	Tap Water Cancer Comparison Level (ug/l) (a)
67-64-1	2-PROPANONE	ACETONE	No	2.20E+04	
72-55-9	4,4'-DDE	DDE, P,P'-	No		2.00E-01
50-29-3	4,4'-DDT	DDT	No	1.80E+01	2.00E-01
108-10-1	4-METHYL-2-PENTANONE	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	No	2.00E+03	
106-44-5	4-METHYLPHENOL	CRESOL, P-	No	1.80E+02	
83-32-9	ACENAPHTHENE	ACENAPHTHENE	No	2.20E+03	
208-96-8	ACENAPHTHYLENE	ACENAPHTHENE	Yes	2.20E+03	
75-05-8	ACETONITRILE	ACETONITRILE	No	1.30E+02	
98-86-2	ACETOPHENONE	ACETOPHENONE	No	3.70E+03	
107-02-8	ACROLEIN	ACROLEIN	No	4.20E-02	
107-13-1	ACRYLONITRILE	ACRYLONITRILE	No	4.20E+00	4.50E-02
15972-60-8	ALACHLOR	ALACHLOR	No	3.70E+02	1.20E+00
116-06-3	ALDICARB	ALDICARB	No	3.70E+01	
309-00-2	ALDRIN	ALDRIN	No	1.10E+00	4.00E-03
319-84-6	ALPHA-BHC	HEXACHLOROCYCLOHEXANE, ALPHA-	No	2.90E+02	1.10E-02
7429-90-5	ALUMINUM	ALUMINUM	No	3.70E+04	
57-12-5	AMENABLE CYANIDE	CYANIDE (CN-)	No	7.30E+02	
62-53-3	ANILINE	ANILINE	No	2.60E+02	1.20E+01

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CAS	Constituent	Synonym/Surrogate	Surrogate?	Tap Water Noncancer Comparison Level (ug/l) (a)	Tap Water Cancer Comparison Level (ug/l) (a)
120-12-7	ANTHRACENE	ANTHRACENE	No	1.10E+04	
7440-36-0	ANTIMONY	ANTIMONY (METALLIC)	No	1.50E+01	
12674-11-2	AROCLOR-1016	AROCLOR 1016	No	2.60E+00	9.60E-01
7440-38-2	ARSENIC	ARSENIC, INORGANIC	No	1.10E+01	4.50E-02
1912-24-9	ATRAZINE	ATRAZINE	No	1.30E+03	2.90E-01
7440-39-3	BARIUM	BARIUM	No	7.30E+03	
1861-40-1	BENFLURALIN	BENEFIN	No	1.10E+04	
71-43-2	BENZENE	BENZENE	No	4.40E+01	4.10E-01
205-99-2	BENZO(B)FLUORANTHENE	BENZO[B]FLUORANTHENE	No		2.90E-02
65-85-0	BENZOIC ACID	BENZOIC ACID	No	1.50E+05	
100-51-6	BENZYL ALCOHOL	BENZYL ALCOHOL	No	3.70E+03	
85-68-7	BENZYL BUTYL PHTHALATE	BUTYL BENZYL PHTHLATE	No	7.30E+03	3.50E+01
7440-41-7	BERYLLIUM	BERYLLIUM AND COMPOUNDS	No	7.30E+01	
319-85-7	BETA-BHC	HEXACHLOROCYCLOHEXANE, BETA-	No		3.70E-02
92-52-4	BIPHENYL	BIPHENYL, 1,1'-	No	1.80E+03	
117-81-7	BIS(2-ETHYLHEXYL)PHTHALATE	BIS(2-ETHYLHEXYL)PHTHALATE	No	7.30E+02	4.80E+00
542-88-1	BIS(CHLOROMETHYL) ETHER	BIS(CHLOROMETHYL)ETHER	No		6.20E-05
7440-42-8	BORON	BORON AND BORATES ONLY	No	7.30E+03	

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CAS	Constituent	Synonym/Surrogate	Surrogate?	Tap Water Noncancer Comparison Level (ug/l) (a)	Tap Water Cancer Comparison Level (ug/l) (a)
75-27-4	BROMODICHLOROMETHANE	BROMODICHLOROMETHANE	No	7.30E+02	1.20E-01
75-25-2	BROMOFORM	BROMOFORM	No	7.30E+02	8.50E+00
74-83-9	BROMOMETHANE	BROMOMETHANE	No	8.70E+00	
7440-43-9	CADMIUM	CADMIUM (WATER)	No	1.80E+01	
1563-66-2	CARBOFURAN	CARBOFURAN	No	1.80E+02	
75-15-0	CARBON DISULFIDE	CARBON DISULFIDE	No	1.00E+03	
56-23-5	CARBON TETRACHLORIDE	CARBON TETRACHLORIDE	No	8.60E+01	4.40E-01
12789-03-6	CHLORDANE	CHLORDANE	No	1.80E+01	1.90E-01
108-90-7	CHLOROBENZENE	CHLOROBENZENE	No	9.10E+01	
124-48-1	CHLORODIBROMOMETHANE	DIBROMOCHLOROMETHANE	No	7.30E+02	1.50E-01
75-00-3	CHLOROETHANE	ETHYL CHLORIDE	No	2.10E+04	
67-66-3	CHLOROFORM	CHLOROFORM	No	1.30E+02	1.90E-01
74-87-3	CHLOROMETHANE	CHLOROMETHANE	No	1.90E+02	
1897-45-6	CHLOROTHALONIL	CHLOROTHALONIL	No	5.50E+02	2.20E+01
7440-47-3	CHROMIUM	CHROMIUM (III) (INSOLUBLE SALTS)	Yes	5.50E+04	
18540-29-9	CHROMIUM, HEXAVALENT	CHROMIUM VI	No	1.10E+02	4.30E-02
156-59-2	CIS-1,2-DICHLOROETHENE	DICHLOROETHYLENE, 1,2-CIS-	No	3.70E+02	
7440-48-4	COBALT	COBALT	No	1.10E+01	

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CAS	Constituent	Synonym/Surrogate	Surrogate?	Tap Water Noncancer Comparison Level (ug/l) (a)	Tap Water Cancer Comparison Level (ug/l) (a)
7440-50-8	COPPER	COPPER	No	1.50E+03	
106-44-5	CRESOL, M + P	CRESOL, P-	No	1.80E+02	
1319-77-3	CRESOLS	CRESOLS	No	9.30E+02	
57-12-5	CYANIDE	CYANIDE (CN-)	No	7.30E+02	
319-86-8	DELTA-BHC	HEXACHLOROCYCLOHEXANE, BETA-	Yes		3.70E-02
2303-16-4	DIALLATE	DIALLATE	No		1.10E+00
333-41-5	DIAZINON	DIAZINON	No	2.60E+01	
74-95-3	DIBROMOMETHANE	DIBROMOMETHANE (METHYLENE BROMIDE)	No	6.20E+00	
1918-00-9	DICAMBA	DICAMBA	No	1.10E+03	
75-71-8	DICHLORODIFLUOROMETHANE	DICHLORODIFLUOROMETHANE	No	3.90E+02	
75-09-2	DICHLOROMETHANE	METHYLENE CHLORIDE	No	1.10E+03	4.60E+00
60-57-1	DIELDRIN	DIELDRIN	No	1.80E+00	4.20E-03
60-29-7	DIETHYL ETHER	ETHYL ETHER	No	7.30E+03	
84-66-2	DIETHYL PHTHALATE	DIETHYL PHTHALATE	No	2.90E+04	
60-51-5	DIMETHOATE	DIMETHOATE	No	7.30E+00	
DMM	DIMETHYL MERCURY	MERCURY (ELEMENTAL)	Yes	5.70E-01	
60-11-7	DIMETHYLAMINO AZOBENZENE	DIMETHYLAMINO AZOBENZENE [P-]	No		1.50E-02
84-74-2	DI-N-BUTYL PHTHALATE	DIBUTYL PHTHALATE	No	3.70E+03	

CAS	Constituent	Synonym/Surrogate	Surrogate?	Tap Water Noncancer Comparison Level (ug/l) (a)	Tap Water Cancer Comparison Level (ug/l) (a)
298-04-4	DISULFOTON	DISULFOTON	No	1.50E+00	
33213-65-9	ENDOSULFAN II	ENDOSULFAN	Yes	2.20E+02	
1031-07-8	ENDOSULFAN SULFATE	ENDOSULFAN	Yes	2.20E+02	
72-20-8	ENDRIN	ENDRIN	No	1.10E+01	
141-78-6	ETHYL ACETATE	ETHYL ACETATE	No	3.30E+04	
100-41-4	ETHYLBENZENE	ETHYLBENZENE	No	1.30E+03	1.50E+00
206-44-0	FLUORANTHENE	FLUORANTHENE	No	1.50E+03	
86-73-7	FLUORENE	FLUORENE	No	1.50E+03	
16984-48-8	FLUORIDE	FLUORINE (SOLUBLE FLUORIDE)	Yes	2.20E+03	
7782-41-4	FLUORINE	FLUORINE (SOLUBLE FLUORIDE)	No	2.20E+03	
76-44-8	HEPTACHLOR	HEPTACHLOR	No	1.80E+01	1.50E-02
1024-57-3	HEPTACHLOR EPOXIDE	HEPTACHLOR EPOXIDE	No	4.70E-01	7.40E-03
87-68-3	HEXACHLOROBUTADIENE	HEXACHLOROBUTADIENE	No	3.70E+01	8.60E-01
7553-56-2	IODINE	IODINE	No	3.70E+02	
7439-89-6	IRON	IRON	No	2.60E+04	
78-83-1	ISOBUTYL ALCOHOL	ISOBUTYL ALCOHOL	No	1.10E+04	
78-59-1	ISOPHORONE	ISOPHORONE	No	7.30E+03	7.10E+01
98-82-8	ISOPROPYLBENZENE	CUMENE	No	6.80E+02	

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CAS	Constituent	Synonym/Surrogate	Surrogate?	Tap Water Noncancer Comparison Level (ug/l) (a)	Tap Water Cancer Comparison Level (ug/l) (a)
7439-93-2	LITHIUM	LITHIUM	No	7.30E+01	
108-38-3	M&P-XYLENE	XYLENE, M-	No	1.20E+03	
7439-96-5	MANGANESE	MANGANESE (WATER)	No	8.80E+02	
94-74-6	MCPA	MCPA	No	1.80E+01	
93-65-2	MCPP	MCPP	No	3.70E+01	
108-39-4	M CRESOL (3-METHYLPHENOL)	CRESOL, M-	No	1.80E+03	
7439-97-6	MERCURY	MERCURY (ELEMENTAL)	No	5.70E-01	
22967-92-6	METHYL MERCURY	METHYL MERCURY	No	3.70E+00	
1634-04-4	METHYL-TERT-BUTYL ETHER	METHYL TERT-BUTYL ETHER (MTBE)	No	6.30E+03	1.20E+01
7439-98-7	MOLYBDENUM	MOLYBDENUM	No	1.80E+02	
108-38-3	M-XYLENE	XYLENE, M-	No	1.20E+03	
68-12-2	N,N-DIMETHYLFORMAMIDE	DIMETHYLFORMAMIDE	No	3.70E+03	
300-76-5	NALED	NALED	No	7.30E+01	
91-20-3	NAPHTHALENE	NAPHTHALENE	No	6.20E+00	1.40E-01
71-36-3	N-BUTANOL	BUTANOL, N-	No	3.70E+03	
7440-02-0	NICKEL	NICKEL SOLUBLE SALTS	No	7.30E+02	
14797-55-8	NITRATE	NITRATE	No	5.80E+04	
14797-65-0	NITRITE	NITRITE	No	3.70E+03	

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CAS	Constituent	Synonym/Surrogate	Surrogate?	Tap Water Noncancer Comparison Level (ug/l) (a)	Tap Water Cancer Comparison Level (ug/l) (a)
86-30-6	N-NITROSODIPHENYLAMINE	NITROSODIPHENYLAMINE, N-	No		1.40E+01
95-47-6	O+P XYLENE	XYLENE, O-	No	1.20E+03	
3268-87-9	OCDD	TCDD, 2,3,7,8-	Yes	1.23E-01	1.73E-03
95-53-4	O-TOLUIDINE	TOLUIDINE, P-	Yes		3.50E-01
95-47-6	O-XYLENE	XYLENE, O-	No	1.20E+03	
56-38-2	PARATHION	PARATHION	No	2.20E+02	
PCB	PCB, TOTAL	AROCLOR 1260	Yes		3.40E-02
106-43-4	P-CHLOROTOLUENE	CHLOROTOLUENE, P-	No	2.60E+03	
87-86-5	PENTACHLOROPHENOL	PENTACHLOROPHENOL	No	1.10E+03	5.60E-01
85-01-8	PHENANTHRENE	ANTHRACENE	Yes	1.10E+04	
108-95-2	PHENOL	PHENOL	No	1.10E+04	
108-95-2	PHENOLIC COMPOUND	PHENOL	No	1.10E+04	
TOTPHEN	PHENOLICS, TOTAL	PHENOL	Yes	1.10E+04	
1336-35-2	PHENOLS	PHENOL	Yes	1.10E+04	
ZZZ	PHOSPHORUS	PHOSPHORUS, WHITE	Yes	7.30E-01	
1918-16-7	PROPACHLOR	PROPACHLOR	No	4.70E+02	
129-00-0	PYRENE	PYRENE	No	1.10E+03	
110-86-1	PYRIDINE	PYRIDINE	No	3.70E+01	

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CAS	Constituent	Synonym/Surrogate	Surrogate?	Tap Water Noncancer Comparison Level (ug/l) (a)	Tap Water Cancer Comparison Level (ug/l) (a)
7782-49-2	SELENIUM	SELENIUM	No	1.80E+02	
7440-22-4	SILVER	SILVER	No	1.80E+02	
93-72-1	SILVEX (2,4,5-TP)	TRICHLOROPHENOXY) PROPIONIC ACID, 2(2,4,5-	No	2.90E+02	
7440-24-6	STRONTIUM	STRONTIUM, STABLE	No	2.20E+04	
100-42-5	STYRENE	STYRENE	No	1.60E+03	
127-18-4	TETRACHLOROETHENE	TETRACHLOROETHYLENE	No	2.20E+02	1.10E-01
7440-28-0	THALLIUM	THALLIUM (SOLUBLE SALTS) (B)	No	2.40E+00	
7440-31-5	TIN	TIN	No	2.20E+04	
108-88-3	TOLUENE	TOLUENE	No	2.30E+03	
108-95-2	TOTAL PHENOLS	PHENOL	No	1.10E+04	
10061-02-6	TRANS-1,3-DICHLORO-1-PROPENE	DICHLOROPROPENE, 1,3-	Yes	4.00E+01	4.30E-01
110-57-6	TRANS-1,4-DICHLORO-2-BUTENE	DICHLORO-2-BUTENE, TRANS-1,4-	No		1.20E-03
79-01-6	TRICHLOROETHENE	TRICHLOROETHYLENE	No		2.00E+00
75-69-4	TRICHLOROFLUOROMETHANE	TRICHLOROFLUOROMETHANE	No	1.30E+03	
7440-61-1	URANIUM	URANIUM (SOLUBLE SALTS)	No	1.10E+02	
7440-62-2	VANADIUM	VANADIUM & COMPOUNDS	No	1.80E+02	
108-05-4	VINYL ACETATE	VINYL ACETATE	No	4.10E+02	
75-01-4	VINYL CHLORIDE	VINYL CHLORIDE	No	7.20E+01	1.60E-02

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CAS	Constituent	Synonym/Surrogate	Surrogate?	Tap Water Noncancer Comparison Level (ug/l) (a)	Tap Water Cancer Comparison Level (ug/l) (a)
1330-20-7	XYLENE TOTAL	XYLENE, MIXTURE	No	2.00E+02	
106-42-3	XYLENE, P-	XYLENE, P-	No	1.20E+03	
7440-66-6	ZINC	ZINC (METALLIC)	No	1.10E+04	

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ECOLOGICAL RISK-BASED COMPARISON LEVELS

Notes on the following Table:

Ecological Screening Value represents the lowest value from the sources listed below.

1. USEPA. 2001. Supplemental Guidance to RAGS, Region 4 Bulletins, Ecological Risk Assessment (Draft), USEPA Region 4 Waste Management Division.
http://www.epa.gov/region4/waste/ots/ecolbul.htm

2. USEPA. 2003. USEPA Region 5 Ecological Screening Levels. Revision August 2003.
http://www.epa.gov/reg5rcra/ca/edql.htm

3. USEPA. 2008. Region III Biological Technical Assistance Group (BTAG) Freshwater Screening Benchmarks.
http://www.epa.gov/reg3hscd/risk/eco/btag/sbv/fw/screenbench.htm

4. USEPA. 2009. National Recommended Water Quality Criteria.
http://www.epa.gov/waterscience/criteria/wqctable/nrwqc-2009.pdf

CAS - Chemical Abstracts Service

µg/l - microgram per liter

Exhibit 404

Ecological Risk-Based Comparison Levels

CAS	Constituent	Surrogate Constituent	Surrogate?	Ecological Screening Value (ug/l)	Source
57-12-5	AMENABLE CYANIDE	-CYANIDE (CN-)	No	5.00E+00	[3]
100-02-7	4-NITROPHENOL	NITROPHENOL, 4-	No	6.00E+01	[3]
100-41-4	ETHYLBENZENE	ETHYLBENZENE	No	1.40E+01	[2]
100-42-5	STYRENE	STYRENE	No	3.20E+01	[2]
100-51-6	BENZYL ALCOHOL	BENZYL ALCOHOL	No	8.60E+00	[3]
10061-02-6	TRANS-1,3-DICHLORO-1-PROPENE	DICHLOROPROPENE, 1,3-	No	5.50E-02	[3]
1024-57-3	HEPTACHLOR EPOXIDE	HEPTACHLOR EPOXIDE	No	1.90E-03	[3]
1031-07-8	ENDOSULFAN SULFATE	ENDOSULFAN	Yes	2.00E-02	[3]
103-65-1	N-PROPYLBENZENE	PROPYLBENZENE, N-	No	1.28E+02	[3]
105-67-9	2,4-DIMETHYLPHENOL	DIMETHYLPHENOL, 2,4-	No	2.12E+01	[1]
106-44-5	4-METHYLPHENOL	CRESOL, P-	No	2.50E+01	[2]
106-46-7	1,4-DICHLOROBENZENE	DICHLOROBENZENE, 1,4-	No	9.40E+00	[2]
107-02-8	ACROLEIN	ACROLEIN	No	1.90E-01	[2]
107-06-2	1,2-DICHLOROETHANE	DICHLOROETHANE, 1,2-	No	1.00E+02	[3]
107-13-1	ACRYLONITRILE	ACRYLONITRILE	No	8.60E+01	[2]
108-05-4	VINYL ACETATE	VINYL ACETATE	No	1.60E+01	[3]
108-10-1	4-METHYL-2-PENTANONE	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	No	1.70E+02	[3]
108-38-3	M-XYLENE	XYLENE, M-	No	1.80E+00	[3]
108-39-4	M-CRESOL (3-METHYLPHENOL)	CRESOL, M-	No	8.20E+01	[2]
108-67-8	1,3,5-TRIMETHYLBENZENE	TRICHLOROBENZENE, 1,2,4-	Yes	2.40E+01	[4]
108-88-3	TOLUENE	TOLUENE	No	2.00E+00	[3]
108-90-7	CHLOROBENZENE	CHLOROBENZENE	No	1.30E+00	[3]
108-95-2	PHENOL	PHENOL	No	4.00E+00	[3]
108-95-2	PHENOLIC COMPOUND	PHENOL	Yes	4.00E+00	[3]
108-95-2	TOTAL PHENOLS	PHENOL	Yes	4.00E+00	[3]
110-86-1	PYRIDINE	PYRIDINE	No	2.36E+03	[3]
117-81-7	BIS(2-ETHYLHEXYL)PHTHALATE	BIS(2-ETHYLHEXYL)PHTHALATE	No	3.00E-01	[2]
117-84-0	DI-N-OCTYL PHTHALATE	DI-N-OCTYL PHTHALATE	No	2.20E+01	[3]
120-12-7	ANTHRACENE	-ANTHRACENE	No	1.20E-02	[3]

Exhibit 404

CAS	Constituent	Surrogate Constituent	Surrogate?	Ecological Screening Value (ug/l)	Source
120-82-1	1,2,4-TRICHLOROBENZENE	TRICHLOROBENZENE, 1,2,4-	No	2.40E+01	[3]
123-91-1	1,4-DIOXANE	DIOXANE, 1,4-	No	2.20E+04	[2]
12674-11-2	AROCLOR-1016	~AROCLOR 1016	No	7.40E-05	[3]
127-18-4	TETRACHLOROETHENE	TETRACHLOROETHYLENE	No	4.50E+01	[2]
129-00-0	PYRENE	~PYRENE	No	2.50E-02	[3]
131-11-3	DIMETHYL PHTHALATE	DIMETHYL PHTHALATE	No	3.30E+02	[1]
132-64-9	DIBENZOFURAN	DIBENZOFURAN	No	3.70E+00	[3]
1330-20-7	XYLENE TOTAL	XYLENE, MIXTURE	No	1.30E+01	[3]
1336-36-3	PHENOLS	PHENOL	No	4.00E+00	[3]
7439-89-6	IRON	IRON	No	3.00E+02	[3]
1563-66-2	CARBOFURAN	CARBOFURAN	No	1.80E+00	[3]
156-60-5	1,2-TRANS-DICHLOROETHYLENE	DICHLOROETHYLENE, 1,2-TRANS-	No	9.70E+02	[3]
1634-04-4	METHYL TERT-BUTYL ETHER	METHYL TERT-BUTYL ETHER (MTBE)	No	1.11E+04	[3]
16887-00-6	CHLORIDE	CHLORIDE	No	2.30E+05	[3,4]
16984-48-8	FLUORIDE	FLUORINE (SOLUBLE FLUORIDE)	Yes	2.12E+03	[3]
18540-29-9	CHROMIUM, HEXAVALENT	CHROMIUM VI (CHROMIC ACID MISTS)	No	1.10E+01	[4]
1912-24-9	ATRAZINE	ATRAZINE	No	1.80E+00	[3]
19408-74-3	123789-HXCDD	~TCDD, 2,3,7,8-	Yes	3.00E-09	[2]
205-99-2	BENZO(B)FLUORANTHENE	~BENZO[B]FLUORANTHENE	No	9.07E+00	[2]
206-44-0	FLUORANTHENE	~FLUORANTHENE	No	4.00E-02	[3]
208-96-8	ACENAPHTHYLENE	~ACENAPHTHENE	No	5.80E+00	[3]
298-04-4	DISULFOTON	DISULFOTON	No	4.02E-02	[2]
309-00-2	ALDRIN	ALDRIN	No	1.70E-02	[2]
319-84-6	ALPHA-BHC	HEXACHLOROCYCLOHEXANE, ALPHA-	No	1.24E+01	[2]
319-85-7	BETA-BHC	HEXACHLOROCYCLOHEXANE, BETA-	No	4.95E-01	[2]
319-86-8	DELTA-BHC	HEXACHLOROCYCLOHEXANE, BETA-	No	1.41E+02	[3]
3268-87-9	OCDD	~TCDD, 2,3,7,8-	Yes	3.00E-09	[2]
33213-65-9	ENDOSULFAN II	ENDOSULFAN	Yes	5.10E-02	[3]
333-41-5	DIAZINON	DIAZINON	No	4.30E-02	[3]

Ecological Risk-Based Comparison Levels

CAS	Constituent	Surrogate Constituent	Surrogate?	Ecological Screening Value (ug/l)	Source
3424-82-6	2,4-DDE	DDE, P,P'-	Yes	4.51E-09	[2]
35822-46-9	1234678-HPCDD	-TCDD, 2,3,7,8-	Yes	3.00E-09	[2]
50-29-3	4,4'-DDT	DDT	No	1.10E-05	[2]
534-52-1	2-METHYL-4,6-DINITROPHENOL	DINITRO-O-CRESOL, 4,6-	No	2.30E+01	[2]
540-59-0	1,2-DICHLOROETHENE	DICHLOROETHYLENE, 1,2- (MIXED ISOMERS)	Yes	5.90E+02	[3]
541-73-1	1,3-DICHLOROBENZENE	DICHLOROBENZENE, 1,4-	Yes	3.80E+01	[2]
56-23-5	CARBON TETRACHLORIDE	CARBON TETRACHLORIDE	No	1.33E+01	[3]
56-38-2	PARATHION	PARATHION	No	1.30E-02	[3]
57-12-5	CYANIDE	-CYANIDE (CN-)	No	5.00E+00	[3]
57653-85-7	123678-HXCDD	-TCDD, 2,3,7,8-	Yes	3.00E-09	[2]
12789-03-6	CHLORDANE	CHLORDANE	No	2.20E-03	[3]
591-78-6	2-HEXANONE	METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	No	9.90E+01	[3]
59-50-7	4-CHLORO-3-METHYLPHENOL	METHYLPHENOL, 4-CHLORO-3-	No	3.48E+01	[2]
60-11-7	DIMETHYLAMINO AZOBENZENE	DIMETHYLAMINO AZOBENZENE [P-]	No	1.65E+00	[2]
60-51-5	DIMETHOATE	DIMETHOATE	No	6.20E+00	[3]
60-57-1	DIELDRIN	DIELDRIN	No	7.10E-05	[2]
62-53-3	ANILINE	ANILINE	No	2.20E+00	[3]
643	AMMONIA, UNION	AMMONIA, UNION	No	1.90E+01	[3]
65-85-0	BENZOIC ACID	BENZOIC ACID	No	4.20E+01	[3]
67562-39-4	1234678-HPCDF	-TCDD, 2,3,7,8-	Yes	3.00E-09	[2]
67-63-0	ISO-PROPANOL	ISOPROPANOL	No	7.50E+00	[3]
67-64-1	2-PROPANONE	ACETONE	No	1.50E+03	[3]
67-66-3	CHLOROFORM	CHLOROFORM	No	1.80E+00	[3]
71-43-2	BENZENE	BENZENE	No	5.30E+01	[1]
71-55-6	1,1,1-TRICHLOROETHANE	TRICHLOROETHANE, 1,1,1-	No	1.10E+01	[3]
72-20-8	ENDRIN	ENDRIN	No	2.30E-03	[1]
72-55-9	4,4'-DDE	DDE, P,P'-	No	4.51E-09	[2]
7429-90-5	ALUMINUM	ALUMINUM	No	8.70E+01	[3]
7439-92-1	LEAD	-LEAD AND COMPOUNDS	No	1.17E+00	[2]

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CAS	Constituent	Surrogate Constituent	Surrogate?	Ecological Screening Value (ug/l)	Source
7439-93-2	LITHIUM	LITHIUM	No	1.40E+01	[3]
7439-95-4	MAGNESIUM	MAGNESIUM	No	8.20E+04	[3]
7439-96-5	MANGANESE	MANGANESE (WATER)	No	1.20E+02	[3]
7439-97-6	MERCURY	-MERCURY (ELEMENTAL)	No	1.30E-03	[2]
7439-98-7	MOLYBDENUM	MOLYBDENUM	No	7.30E+01	[3]
7440-02-0	NICKEL	NICKEL SOLUBLE SALTS	No	2.89E+01	[2]
7440-09-7	POTASSIUM	POTASSIUM	No	5.30E+04	[3]
7440-22-4	SILVER	SILVER	No	1.20E-02	[1]
7440-23-5	SODIUM	SODIUM	No	6.80E+05	[3]
7440-24-6	STRONTIUM	STRONTIUM, STABLE	No	1.50E+03	[3]
7440-28-0	THALLIUM	THALLIUM (SOLUBLE SALTS)	No	8.00E-01	[3]
7440-31-5	TIN	TIN	No	7.30E+01	[3]
7440-36-0	ANTIMONY	ANTIMONY (METALLIC)	No	3.00E+01	[3]
7440-38-2	ARSENIC	ARSENIC, INORGANIC	No	5.00E+00	[3]
7440-39-3	BARIUM	BARIUM	No	4.00E+00	[3]
7440-41-7	BERYLLIUM	BERYLLIUM AND COMPOUNDS	No	5.30E-01	[1]
7440-42-8	BORON	BORON AND BORATES ONLY	No	1.00E+00	[3]
7440-43-9	CADMIUM	CADMIUM (WATER)	No	1.50E-01	[2]
7440-47-3	CHROMIUM	CHROMIUM (III) (INSOLUBLE SALTS)	No	1.10E+01	[1,3,4]
7440-48-4	COBALT	COBALT	No	2.30E+01	[3]
7440-50-8	COPPER	COPPER	No	1.56E+00	[2]
7440-61-1	URANIUM	URANIUM (SOLUBLE SALTS)	No	2.60E+00	[3]
7440-62-2	VANADIUM	VANADIUM, METALLIC	No	1.20E+01	[2]
7440-66-6	ZINC	ZINC (METALLIC)	No	5.89E+01	[1]
7440-67-7	ZIRCONIUM	ZIRCONIUM	No	1.70E+01	[3]
7440-70-2	CALCIUM	CALCIUM	No	1.16E+05	[3]
7440-9-7	POTASSIUM K TOT	POTASSIUM K TOT	No	5.30E+04	[3]
74-83-9	BROMOMETHANE	BROMOMETHANE	No	1.50E+01	[2]
74-87-3	CHLOROMETHANE	CHLOROMETHANE	No	5.50E+00	[1]

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Ecological Risk-Based Comparison Levels

CAS	Constituent	Surrogate Constituent	Surrogate?	Ecological Screening Value (ug/l)	Source
75-01-4	VINYL CHLORIDE	VINYL CHLORIDE	No	9.30E+02	[3]
75-05-8	ACETONITRILE	ACETONITRILE	No	1.20E+04	[3]
75-09-2	DICHLOROMETHANE	METHYLENE CHLORIDE	No	9.81E+01	[3]
75-15-0	CARBON DISULFIDE	CARBON DISULFIDE	No	9.20E-01	[3]
75-25-2	BROMOFORM	BROMOFORM	No	2.30E+02	[2]
75-34-3	1,1-DICHLOROETHANE	DICHLOROETHANE, 1,1-	No	4.70E+01	[3]
75-35-4	1,1-DICHLOROETHYLENE	DICHLOROETHYLENE, 1,1-	No	2.50E+01	[3]
76-44-8	HEPTACHLOR	HEPTACHLOR	No	1.90E-03	[3]
7664-41-7	AMMONIA	AMMONIA	No	1.90E+01	[3]
7782-49-2	SELENIUM	SELENIUM	No	1.00E+00	[3]
7782-50-5	CHLORINE	CHLORINE	No	1.10E+01	[3]
7783-06-4	HYDROGEN SULFIDE	HYDROGEN SULFIDE	No	2.00E+00	[3]
78-59-1	ISOPHORONE	ISOPHORONE	No	9.20E+02	[2]
78-87-5	1,2-DICHLOROPROPANE	DICHLOROPROPANE, 1,2-	No	3.60E+02	[2]
78-93-3	2-BUTANONE	METHYL ETHYL KETONE (2-BUTANONE)	No	2.20E+03	[2]
79-00-5	1,1,2-TRICHLOROETHANE	TRICHLOROETHANE, 1,1,2-	No	5.00E+02	[2]
79-01-6	TRICHLOROETHENE	TRICHLOROETHYLENE	No	2.10E+01	[3]
79-34-5	1,1,2,2-TETRACHLOROETHANE	TETRACHLOROETHANE, 1,1,2,2-	No	2.40E+02	[1]
83-32-9	ACENAPHTHENE	-ACENAPHTHENE	no	5.80E+00	[3]
84-66-2	DIETHYL PHTHALATE	DIETHYL PHTHALATE	No	1.10E+02	[2]
84-74-2	DI-N-BUTYL PHTHALATE	DIBUTYL PHTHALATE	No	9.70E+00	[2]
85-01-8	PHENANTHRENE	-ANTHRACENE	Yes	4.00E-01	[3]
85-68-7	BENZYL BUTYL PHTHALATE	BUTYL BENZYL PHTHLATE	No	1.90E+01	[3]
86-30-6	N-NITROSODIPHENYLAMINE	NITROSODIPHENYLAMINE, N-	No	2.10E+02	[3]
86-73-7	FLUORENE	-FLUORENE	No	3.00E+00	[3]
87-61-6	1,2,3-TRICHLOROBENZENE	TRICHLOROBENZENE, 1,2,4-	Yes	8.00E+00	[3]
87-68-3	HEXACHLOROBUTADIENE	HEXACHLOROBUTADIENE	No	5.30E-02	[2]
87-86-5	PENTACHLOROPHENOL	PENTACHLOROPHENOL	No	5.00E-01	[3]
88-75-5	2-NITROPHENOL	NITROPHENOL, 2-	No	1.92E+03	[3]

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CAS	Constituent	Surrogate Constituent	Surrogate?	Ecological Screening Value (ug/l)	Source
91-20-3	NAPHTHALENE	--NAPHTHALENE	No	1.10E+00	[3]
91-57-6	2-METHYLNAPHTHALENE	--METHYLNAPHTHALENE, 2-	No	4.70E+00	[3]
92-52-4	BIPHENYL	BIPHENYL, 1,1'-	No	1.40E+01	[3]
93-72-1	SILVEX (2,4,5-TP)	TRICHLOROPHENOXY) PROPIONIC ACID, 2(2,4,5-	No	3.00E+01	[3]
93-76-5	2,4,5-T	TRICHLOROPHENOXYACETIC ACID, 2,4,5-	No	6.86E+02	[3]
94-75-7	2,4 D	DICHLOROPHENOXY ACETIC ACID, 2,4-	No	2.20E+02	[2]
95-48-7	2-METHYLPHENOL	CRESOL, O-	No	1.30E+01	[3]
95-50-1	1,2-DICHLOROBENZENE	DICHLOROBENZENE, 1,2-	No	7.00E-01	[3]
95-63-6	1,2,4-TRIMETHYLBENZENE	TRIMETHYLBENZENE, 1,2,4-	No	3.30E+01	[3]
98-82-8	ISOPROPYLBENZENE	CUMENE	No	2.60E+00	[3]
99-87-6	4-ISOPROPYLTOLUENE	ISOPROPYLTOLUENE, 4-	No	8.50E+01	[3]
106-44-5	CRESOL, M + P	CRESOL, P-	No	2.50E+01	[2]
108-38-3	M&P-XYLENE	XYLENE, M-	No	1.80E+00	[3]
PCB	PCB, TOTAL	--AROCLOR 1260	Yes	7.40E-05	[3]
TOTPHEN	PHENOLICS, TOTAL	PHENOL	No	4.00E+00	[3]

Exhibit 404

Exhibit 404

Comp. 017414

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HUMAN HEALTH CUMULATIVE RISK COMPARISON LEACH 2000 MSW DATABASE, 50TH PERCENTILE

Notes on the following Table:

(a) Frequency of Detection. Number of detects: Total number of data points based on site averages (i.e., each MSW landfill represents 1 site).

(b) LEACH 2000 has data for approximately 121 MSW landfills. Sample rounds for the landfills range from 1 to 34. To ensure that results from no single landfill dominate the evaluation, site averages were calculated for each constituent at each landfill. The frequency of detection and the percentiles were calculated based on the site averaged data.

(c) Comparison levels presented in Appendix F.

(d) Ratio of 50th percentile concentration to the comparison level. For potential carcinogens, the ratio has been multiplied by the target risk level for the comparison levels of 1.00E-06; for noncarcinogens, the ratio has been multiplied by the target hazard index of 1.

(e) Constituents that have comparison levels for potentially carcinogenic and noncarcinogenic effects are evaluated for both.

BDL - Below Detection Limit - reported where the result is based on a non-detected result

MSW - Municipal Solid Waste

µg/l - microgram per liter

Human Health Cumulative Risk Comparison LEACH 2000 MSW Database, 50th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	50th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 50th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
Potential Carcinogens (e)						
ARSENIC	90:107	84.11%	1.54E+01	4.50E-02	1.00E-06	3.41E-04
VINYL CHLORIDE	44:84	52.38%	7.73E-01	1.60E-02	1.00E-06	4.83E-05
NAPHTHALENE	37:60	61.67%	3.94E+00	1.40E-01	1.00E-06	2.82E-05
ETHYLBENZENE	86:99	86.87%	2.00E+01	1.50E+00	1.00E-06	1.33E-05
1,4-DICHLOROBENZENE	63:96	65.63%	2.55E+00	4.30E-01	1.00E-06	5.92E-06
BENZENE	70:99	70.71%	2.03E+00	4.10E-01	1.00E-06	4.94E-06
1234678-HPCDD	2:3	66.67%	1.03E-04	5.20E-05	1.00E-06	1.98E-06
OCDD	2:4	50.00%	2.69E-03	1.73E-03	1.00E-06	1.55E-06
DICHLOROMETHANE	58:73	79.45%	5.34E+00	4.80E+00	1.00E-06	1.11E-06
1,1-DICHLOROETHANE	36:60	60.00%	2.14E+00	2.40E+00	1.00E-06	8.90E-07
1,4-DIOXANE	3:6	50.00%	2.01E+00	6.10E+00	1.00E-06	3.29E-07
2,4-DDE	1:1	100.00%	3.33E-02	2.00E-01	1.00E-06	1.67E-07
METHYL-TERT-BUTYL ETHER	10:15	66.67%	2.00E+00	1.20E+01	1.00E-06	1.67E-07
CHROMIUM, HEXAVALENT	10.21	47.62%	BDL	4.30E-02	1.00E-06	BDL
TRANS-1,3-DICHLORO-1-PROPENE	3:60	5.00%	BDL	4.30E-01	1.00E-06	BDL
HEPTACHLOR EPOXIDE	2:33	6.06%	BDL	7.40E-03	1.00E-06	BDL
1,2-DIBROMOETHANE	1:48	2.08%	BDL	6.50E-03	1.00E-06	BDL
DELTA-BHC	1:30	3.33%	BDL	3.70E-02	1.00E-06	BDL
BETA-BHC	2:30	6.67%	BDL	3.70E-02	1.00E-06	BDL
ALPHA-BHC	3:30	10.00%	BDL	1.10E-02	1.00E-06	BDL
ALDRIN	3:32	9.38%	BDL	4.00E-03	1.00E-06	BDL
DIALLATE	1:12	8.33%	BDL	1.10E+00	1.00E-06	BDL
BENZO(B)FLUORANTHENE	1:33	3.03%	BDL	2.90E-02	1.00E-06	BDL
123789-HXCDD	1:3	33.33%	BDL	5.20E-06	1.00E-06	BDL
ATRAZINE	2:10	20.00%	BDL	2.90E-01	1.00E-06	BDL

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Human Health Cumulative Risk Comparison LEACH 2000 MSW Database, 50th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	50th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 50th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
1,2-DICHLOROETHANE	15:61	24.59%	BDL	1.50E-01	1.00E-06	BDL
BIS(2-ETHYLHEXYL)PHTHALATE	14:36	38.89%	BDL	4.80E+00	1.00E-06	BDL
ACRYLONITRILE	1:50	2.00%	BDL	4.50E-02	1.00E-06	BDL
TRANS-1,4-DICHLORO-2-BUTENE	2:35	5.71%	BDL	1.20E-03	1.00E-06	BDL
CARBON TETRACHLORIDE	1:64	1.56%	BDL	4.40E-01	1.00E-06	BDL
ALACHLOR	2:10	20.00%	BDL	1.20E+00	1.00E-06	BDL
TETRACHLOROETHENE	23:68	33.82%	BDL	1.10E-01	1.00E-06	BDL
AROCLOR-1016	3:12	25.00%	BDL	9.60E-01	1.00E-06	BDL
CHLORODIBROMOMETHANE	5:64	7.81%	BDL	1.50E-01	1.00E-06	BDL
1,2,4-TRICHLOROBENZENE	3:42	7.14%	BDL	2.30E+00	1.00E-06	BDL
CHLOROTHALONIL	1:5	20.00%	BDL	2.20E+01	1.00E-06	BDL
BROMODICHLOROMETHANE	6:66	9.09%	BDL	1.20E-01	1.00E-06	BDL
1,2,3-TRICHLOROPROPANE	1:45	2.22%	BDL	7.20E-04	1.00E-06	BDL
1,2-DIBROMO-3-CHLOROPROPANE	4:44	9.09%	BDL	3.20E-04	1.00E-06	BDL
O-TOLUIDINE	1:12	8.33%	BDL	3.50E-01	1.00E-06	BDL
PENTACHLOROPHENOL	1:43	2.33%	BDL	5.60E-01	1.00E-06	BDL
HEXACHLOROBUTADIENE	2:44	4.55%	BDL	8.60E-01	1.00E-06	BDL
N-NITROSODIPHENYLAMINE	2:33	6.06%	BDL	1.40E+01	1.00E-06	BDL
BENZYL BUTYL PHTHALATE	1:36	2.78%	BDL	3.50E+01	1.00E-06	BDL
1,1,2,2-TETRACHLOROETHANE	2:59	3.39%	BDL	6.70E-02	1.00E-06	BDL
TRICHLOROETHENE	29:71	40.85%	BDL	2.00E+00	1.00E-06	BDL
1,1,2-TRICHLOROETHANE	2:57	3.51%	BDL	2.40E-01	1.00E-06	BDL
1,2-DICHLOROPROPANE	10:60	16.67%	BDL	3.90E-01	1.00E-06	BDL
1,3-DICHLOROBENZENE	4:51	7.84%	BDL	4.30E-01	1.00E-06	BDL
HEPTACHLOR	1:33	3.03%	BDL	1.50E-02	1.00E-06	BDL
4,4'-DDT	3:32	9.38%	BDL	2.00E-01	1.00E-06	BDL

Human Health Cumulative Risk Comparison LEACH 2000 MSW Database, 50th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	50th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 50th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
BROMOFORM	5:64	7.81%	BDL	8.50E+00	1.00E-06	BDL
4,4'-DDE	1:30	3.33%	BDL	2.00E-01	1.00E-06	BDL
CHLOROFORM	17:72	23.61%	BDL	1.90E-01	1.00E-06	BDL
1234678-HPCDF	1:3	33.33%	BDL	5.20E-05	1.00E-06	BDL
ANILINE	1:11	9.09%	BDL	1.20E+01	1.00E-06	BDL
DIELDRIN	1:33	3.03%	BDL	4.20E-03	1.00E-06	BDL
DIMETHYLAMINO AZOBENZENE	1:12	8.33%	BDL	1.50E-02	1.00E-06	BDL
CHLORDANE	1:34	2.94%	BDL	1.90E-01	1.00E-06	BDL
123678-HXCDD	1:3	33.33%	BDL	5.20E-06	1.00E-06	BDL
PCB, TOTAL	1:4	25.00%	BDL	3.40E-02	1.00E-06	BDL
BIS(CHLOROMETHYL) ETHER	1:10	10.00%	BDL	6.20E-05	1.00E-06	BDL
ISOPHORONE	8:36	22.22%	BDL	7.10E+01	1.00E-06	BDL
Sum of Carcinogen Ratios:						4.48E-04
Noncarcinogens (e)						
MCPA	5:6	83.33%	1.08E+02	1.80E+01	1	6.03E+00
MANGANESE	57:57	100.00%	1.60E+03	8.80E+02	1	1.82E+00
ARSENIC	90:107	84.11%	1.54E+01	1.10E+01	1	1.40E+00
COBALT	45:60	75.00%	1.30E+01	1.10E+01	1	1.18E+00
MCPP	3:6	50.00%	2.63E+01	3.70E+01	1	7.12E-01
NAPHTHALENE	37:60	61.67%	3.94E+00	6.20E+00	1	6.36E-01
IRON	106:106	100.00%	1.63E+04	2.60E+04	1	6.28E-01
BORON	28:28	100.00%	3.05E+03	7.30E+03	1	4.17E-01
XYLENE TOTAL	72:79	91.14%	4.08E+01	2.00E+02	1	2.04E-01
ANTIMONY	39:68	57.35%	2.75E+00	1.50E+01	1	1.83E-01
FLUORIDE	36:37	97.30%	4.00E+02	2.20E+03	1	1.82E-01

Exhibit 404

Human Health Cumulative Risk Comparison LEACH 2000 MSW Database, 50th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	50th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 50th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
4-METHYLPHENOL	17:27	62.96%	2.90E+01	1.80E+02	1	1.61E-01
VANADIUM	49:63	77.78%	1.78E+01	1.80E+02	1	9.89E-02
DIAZINON	3:6	50.00%	2.45E+00	2.60E+01	1	9.42E-02
NICKEL	87:100	87.00%	6.00E+01	7.30E+02	1	8.22E-02
PHENOLIC COMPOUND	1:1	100.00%	7.93E+02	1.10E+04	1	7.20E-02
STRONTIUM	6:6	100.00%	1.25E+03	2.20E+04	1	5.69E-02
1,2,4-TRIMETHYLBENZENE	6:12	50.00%	7.27E-01	1.50E+01	1	4.85E-02
BARIUM	90:94	95.74%	3.38E+02	7.30E+03	1	4.62E 02
BENZENE	70:99	70.71%	2.03E+00	4.40E+01	1	4.61E-02
TOTAL PHENOLS	13:14	92.86%	4.78E+02	1.10E+04	1	4.34E-02
M&P-XYLENE	27:31	87.10%	5.17E+01	1.20E+03	1	4.31E-02
2-BUTANONE	64:75	85.33%	2.77E+02	7.10E+03	1	3.90E-02
PHENOLICS, TOTAL	17:17	100.00%	3.99E+02	1.10E+04	1	3.62E-02
1234678-HPCDD	2:3	66.67%	1.03E-04	3.70E-03	1	2.78E-02
2-PROPANONE	44:51	86.27%	5.03E+02	2.20E+04	1	2.28E-02
OCDD	2:4	50.00%	2.69E-03	1.23E-01	1	2.18E-02
PHENOLS	17:18	94.44%	2.03E+02	1.10E+04	1	1.85E-02
AMENABLE CYANIDE	1:1	100.00%	1.30E+01	7.30E+02	1	1.78E-02
ALUMINUM	25:25	100.00%	6.40E+02	3.70E+04	1	1.73E-02
ETHYLBENZENE	86:99	86.87%	2.00E+01	1.30E+03	1	1.54E-02
TOLUENE	89:97	91.75%	3.30E+01	2.30E+03	1	1.43E-02
O-XYLENE	28:34	82.35%	1.63E+01	1.20E+03	1	1.36E-02

Exhibit 404

Human Health Cumulative Risk Comparison LEACH 2000 MSW Database, 50th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	50th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 50th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
VINYL CHLORIDE	44:84	52.38%	7.73E-01	7.20E+01	1	1.07E 02
COPPER	69:92	75.00%	1.53E+01	1.50E+03	1	1.02E-02
ZINC	99:101	98.02%	1.03E+02	1.10E+04	1	9.40E-03
NITRATE	23:36	63.89%	3.89E+02	5.80E+04	1	6.70E-03
4-METHYL-2-PENTANONE	37:51	72.55%	1.25E+01	2.00E+03	1	6.25E-03
M-XYLENE	6:9	66.67%	6.90E+00	1.20E+03	1	5.75E-03
CHLOROBENZENE	49:90	54.44%	4.49E-01	9.10E+01	1	4.93E-03
DICHLOROMETHANE	58:73	79.45%	5.34E+00	1.10E+03	1	4.85E-03
CYANIDE	39:64	60.94%	2.43E+00	7.30E+02	1	3.33E-03
PHENOL	36:50	72.00%	2.85E+01	1.10E+04	1	2.59E-03
1,4-DICHLOROBENZENE	63:96	65.63%	2.55E+00	1.00E+03	1	2.55E-03
1,2-DICHLOROETHENE	8:16	50.00%	5.50E-01	3.30E+02	1	1.67E-03
CIS-1,2-DICHLOROETHENE	27:46	58.70%	5.92E-01	3.70E+02	1	1.60E-03
1,3,5-TRIMETHYLBENZENE	6:12	50.00%	2.73E-01	3.70E+02	1	7.37E-04
1,4-DIOXANE	3:6	50.00%	2.01E+00	3.70E+03	1	5.43E-04
CHROMIUM	81:103	78.64%	2.19E+01	5.50E+04	1	3.98E-04
METHYL-TERT-BUTYL ETHER	10:15	66.67%	2.00E+00	6.30E+03	1	3.17E-04
1,1-DICHLOROETHANE	36:60	60.00%	2.14E+00	7.30E+03	1	2.93E-04
TIN	12:23	52.17%	4.43E+00	2.20E+04	1	2.02E-04
DICAMBA	3:6	50.00%	1.43E-01	1.10E+03	1	1.30E-04
BENZOIC ACID	7:14	50.00%	2.75E-01	1.50E+05	1	1.83E-06
BENZYL ALCOHOL	2:18	11.11%	BDL	3.70E+03	1	BDL

Exhibit 404

Human Health Cumulative Risk Comparison LEACH 2000 MSW Database, 50th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	50th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 50th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
XYLENE, P-	1:5	20.00%	BDL	1.20E+03	1	BDL
2-METHYL-4,6-DINITROPHENOL	1:36	2.78%	BDL	2.90E+00	1	BDL
4,4'-DDT	3:32	9.38%	BDL	1.80E+01	1	BDL
PROPACHLOR	1:5	20.00%	BDL	4.70E+02	1	BDL
2,4-DIMETHYLPHENOL	14:40	35.00%	BDL	7.30E+02	1	BDL
STYRENE	26:60	43.33%	BDL	1.60E+03	1	BDL
123789-HXCDD	1:3	33.33%	BDL	3.70E-04	1	BDL
DISULFOTON	3:12	25.00%	BDL	1.50E+00	1	BDL
FLUORANTHENE	1:34	2.94%	BDL	1.50E+03	1	BDL
ALDRIN	3:32	9.38%	BDL	1.10E+00	1	BDL
ACENAPHTHYLENE	2:33	6.06%	BDL	2.20E+03	1	BDL
HEPTACHLOR EPOXIDE	2:33	6.06%	BDL	4.70E-01	1	BDL
ENDOSULFAN II	1:23	4.35%	BDL	2.20E+02	1	BDL
TRANS-1,3-DICHLORO-1-PROPE	3:60	5.00%	BDL	4.00E+01	1	BDL
ATRAZINE	2:10	20.00%	BDL	1.30E+03	1	BDL
ALPHA-BHC	3:30	10.00%	BDL	2.90E+02	1	BDL
ACROLEIN	2:32	6.25%	BDL	4.20E-02	1	BDL
NALED	1:5	20.00%	BDL	7.30E+01	1	BDL
ENDOSULFAN SULFATE	1:27	3.70%	BDL	2.20E+02	1	BDL
1,2-TRANS-DICHLOROETHYLEN	7:61	11.48%	BDL	1.10E+02	1	BDL
TETRACHLOROETHENE	23:68	33.82%	BDL	2.20E+02	1	BDL
PYRENE	1:33	3.03%	BDL	1.10E+03	1	BDL

Exhibit 404

Human Health Cumulative Risk Comparison LEACH 2000 MSW Database, 50th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	50th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 50th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
CRESOLS	1:3	33.33%	BDL	9.30E+02	1	BDL
CHLORODIBROMOMETHANE	5:64	7.81%	BDL	7.30E+02	1	BDL
1,2,4-TRICHLOROBENZENE	3:42	7.14%	BDL	4.10E+00	1	BDL
ANTHRACENE	1:34	2.94%	BDL	1.10E+04	1	BDL
1,3-DICHLOROPROPANE	1:60	1.67%	BDL	7.30E+02	1	BDL
BIS(2-ETHYLHEXYL)PHTHALATE	14:36	38.89%	BDL	7.30E+02	1	BDL
CARBOFURAN	2:5	40.00%	BDL	1.80E+02	1	BDL
CHROMIUM, HEXAVALENT	10:21	47.62%	BDL	1.10E+02	1	BDL
PYRIDINE	1:18	5.56%	BDL	3.70E+01	1	BDL
P-CHLOROTOLUENE	2:11	18.18%	BDL	2.60E+03	1	BDL
ALACHLOR	2:10	20.00%	BDL	3.70E+02	1	BDL
M-CRESOL (3-METHYLPHENOL)	1:13	7.69%	BDL	1.80E+03	1	BDL
VINYL ACETATE	2:46	4.35%	BDL	4.10E+02	1	BDL
ACRYLONITRILE	1:50	2.00%	BDL	4.20E+00	1	BDL
1,2-DICHLOROETHANE	15:61	24.59%	BDL	6.40E+02	1	BDL
AROCLOR-1016	3:12	25.00%	BDL	2.60E+00	1	BDL
1,2-DIBROMOETHANE	1:48	2.08%	BDL	1.80E+01	1	BDL
ETHYL ACETATE	2:5	40.00%	BDL	3.30E+04	1	BDL
BENFLURALIN	1:5	20.00%	BDL	1.10E+04	1	BDL
CHLOROTHALONIL	1:5	20.00%	BDL	5.50E+02	1	BDL
ALDICARB	1:5	20.00%	BDL	3.70E+01	1	BDL
1,1,2-TRICHLOROETHANE	2:57	3.51%	BDL	1.50E+02	1	BDL

Exhibit 404

Human Health Cumulative Risk Comparison LEACH 2000 MSW Database, 50th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	50th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 50th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
TRICHLOROFLUOROMETHANE	14:60	23.33%	BDL	1.30E+03	1	BDL
FLUORENE	4:36	11.11%	BDL	1.50E+03	1	BDL
BENZYL BUTYL PHTHALATE	1:36	2.78%	BDL	7.30E+03	1	BDL
PHENANTHRENE	6:38	15.79%	BDL	1.10E+04	1	BDL
DI-N-BUTYL PHTHALATE	9:39	23.08%	BDL	3.70E+03	1	BDL
DIETHYL PHTHALATE	13:39	33.33%	BDL	2.90E+04	1	BDL
HEXACHLOROBUTADIENE	2:44	4.55%	BDL	3.70E+01	1	BDL
1,1,2,2-TETRACHLOROETHANE	2:59	3.39%	BDL	1.50E+02	1	BDL
PENTACHLOROPHENOL	1:43	2.33%	BDL	1.10E+03	1	BDL
1,2-DICHLOROPROPANE	10:60	16.67%	BDL	8.30E+00	1	BDL
ISOBUTYL ALCOHOL	6:16	37.50%	BDL	1.10E+04	1	BDL
ISOPHORONE	8:36	22.22%	BDL	7.30E+03	1	BDL
SELENIUM	35:83	42.17%	BDL	1.80E+02	1	BDL
HEPTACHLOR	1:33	3.03%	BDL	1.80E+01	1	BDL
CHLOROFORM	17:72	23.61%	BDL	1.30E+02	1	BDL
ACENAPHTHENE	5:35	14.29%	BDL	2.20E+03	1	BDL
2-METHYLPHENOL	7:28	25.00%	BDL	1.80E+03	1	BDL
O+P XYLENE	2:5	40.00%	BDL	1.20E+03	1	BDL
CRESOL, M + P	3:7	42.86%	BDL	1.80E+02	1	BDL
ACETOPHENONE	3:12	25.00%	BDL	3.70E+03	1	BDL
ISOPROPYLBENZENE	3:13	23.08%	BDL	6.80E+02	1	BDL
1,2,3-TRICHLOROPROPANE	1:45	2.22%	BDL	6.20E-01	1	BDL

Exhibit 404

Human Health Cumulative Risk Comparison LEACH 2000 MSW Database, 50th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	50th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 50th Percentile Concentration; Comparison Level, Adjusted for Risk Level (d)
1,2-DIBROMO-3-CHLOROPROPA	4:44	9.09%	BDL	3.90E-01	1	BDL
1,2,3-TRICHLOROBENZENE	1:19	5.26%	BDL	2.90E+01	1	BDL
2-CHLOROTOLUENE	2:12	16.67%	BDL	7.30E+02	1	BDL
IODINE	1:5	20.00%	BDL	3.70E+02	1	BDL
2,4-DB	1:6	16.67%	BDL	2.90E+02	1	BDL
2,4-D	7:24	29.17%	BDL	3.70E+02	1	BDL
2,4,5-T	4:11	36.36%	BDL	3.70E+02	1	BDL
SILVEX (2,4,5-TP)	5:22	22.73%	BDL	2.90E+02	1	BDL
BIPHENYL	1:6	16.67%	BDL	1.80E+03	1	BDL
2-METHYLNAPHTHALENE	1:20	5.00%	BDL	1.50E+02	1	BDL
1,2-DICHLOROBENZENE	19:70	27.14%	BDL	3.70E+02	1	BDL
DIMETHOATE	2:12	16.67%	BDL	7.30E+00	1	BDL
DICHLORODIFLUOROMETHANE	13:37	35.14%	BDL	3.90E+02	1	BDL
1,1,1-TRICHLOROETHANE	30:70	42.86%	BDL	9.10E+03	1	BDL
N-BUTANOL	2:5	40.00%	BDL	3.70E+03	1	BDL
NITRITE	5:12	41.67%	BDL	3.70E+03	1	BDL
N,N-DIMETHYLFORMAMIDE	2:5	40.00%	BDL	3.70E+03	1	BDL
1234678-HPCDF	1:3	33.33%	BDL	3.70E-03	1	BDL
LITHIUM	2:5	40.00%	BDL	7.30E+01	1	BDL
DIELDRIN	1:33	3.03%	BDL	1.80E+00	1	BDL
MERCURY	27:76	35.53%	BDL	5.70E-01	1	BDL
DIETHYL ETHER	3:7	42.86%	BDL	7.30E+03	1	BDL

Exhibit 404

Human Health Cumulative Risk Comparison LEACH 2000 MSW Database, 50th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	50th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 50th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
2-HEXANONE	14:49	28.57%	BDL	4.70E+01	1	BDL
CHLORDANE	1:34	2.94%	BDL	1.80E+01	1	BDL
123678-HXCDD	1:3	33.33%	BDL	3.70E-04	1	BDL
PARATHION	1:16	6.25%	BDL	2.20E+02	1	BDL
CARBON TETRACHLORIDE	1:64	1.56%	BDL	8.60E+01	1	BDL
ANILINE	1:11	9.09%	BDL	2.60E+02	1	BDL
BROMOMETHANE	6:63	9.52%	BDL	8.70E+00	1	BDL
1,1-DICHLOROETHYLENE	9:65	13.85%	BDL	3.40E+02	1	BDL
BROMODICHLOROMETHANE	6:66	9.09%	BDL	7.30E+02	1	BDL
BROMOFORM	5:64	7.81%	BDL	7.30E+02	1	BDL
CARBON DISULFIDE	7:48	14.58%	BDL	1.00E+03	1	BDL
ACETONITRILE	3:7	42.86%	BDL	1.30E+02	1	BDL
CHLOROETHANE	33:70	47.14%	BDL	2.10E+04	1	BDL
ENDRIN	1:33	3.03%	BDL	1.10E+01	1	BDL
CHLOROMETHANE	13:67	19.40%	BDL	1.90E+02	1	BDL
1,3-DICHLOROBENZENE	4:51	7.84%	BDL	1.00E+03	1	BDL
URANIUM	1:5	20.00%	BDL	1.10E+02	1	BDL
CADMIUM	45:92	48.91%	BDL	1.80E+01	1	BDL
BERYLLIUM	14:55	25.45%	BDL	7.30E+01	1	BDL
THALLIUM	17:54	31.48%	BDL	2.40E+00	1	BDL
SILVER	32:78	41.03%	BDL	1.80E+02	1	BDL
MOLYBDENUM	6:13	46.15%	BDL	1.80E+02	1	BDL

Exhibit 404

Human Health Cumulative Risk Comparison LEACH 2000 MSW Database, 50th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	50th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 50th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
DIBROMOMETHANE	1:44	2.27%	BDL	8.20E+00	1	BDL
Sum of Noncarcinogen Ratios:						1.45E+01

Exhibit 404

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HUMAN HEALTH CUMULATIVE RISK COMPARISON LEACH 2000 MSW DATABASE, 90TH PERCENTILE

Notes on the following Table:

(a) Frequency of Detection. Number of detects: Total number of data points based on site averages (i.e., each MSW landfill represents 1 site).

(b) LEACH 2000 has data for approximately 121 MSW landfills. Sample rounds for the landfills range from 1 to 34. To ensure that results from no single landfill dominate the evaluation, site averages were calculated for each constituent at each landfill. The frequency of detection and the percentiles were calculated based on the site averaged data.

(c) Comparison levels presented in Appendix F.

(d) Ratio of 90^{th} percentile concentration to the comparison level. For potential carcinogens, the ratio has been multiplied by the target risk level for the comparison levels of 1.00E-06; for noncarcinogens, the ratio has been multiplied by the target hazard index of 1.

(e) Constituents that have comparison levels for potentially carcinogenic and noncarcinogenic effects are evaluated for both.

BDL - Below Detection Limit - reported where the result is based on a non-detected result

MSW - Municipal Solid Waste

µg/l - microgram per liter

Exhibit 404

Human Health Cumulative Risk Comparison LEACH 2000 MSW Database, 90th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	90th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 90th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
Potential Carcinogens (e)						
BIS(CHLOROMETHYL) ETHER	1:10	10.00%	2.50E-01	6.20E-05	1.00E-06	4.03E-03
ARSENIC	90:107	84.11%	6.92E+01	4.50E-02	1.00E-06	1.54E-03
CHROMIUM, HEXAVALENT	10:21	47.62%	2.93E+01	4.30E-02	1.00E-06	6.80E-04
VINYL CHLORIDE	44:84	52.38%	6.33E+00	1.60E-02	1.00E-06	3.95E-04
NAPHTHALENE	37:60	61.67%	1.86E+01	1.40E-01	1.00E-06	1.33E-04
1234678-HPCDD	2:3	66.67%	4.12E-03	5.20E-05	1.00E-06	7.92E-05
DICHLOROMETHANE	58:73	79.45%	2.66E+02	4.80E+00	1.00E-06	5.53E-05
AROCLOR-1016	3:12	25.00%	4.12E+01	9.60E-01	1.00E-06	4.30E-05
1,4-DICHLOROBENZENE	63:96	65.63%	1.64E+01	4.30E-01	1.00E-06	3.80E-05
123789-HXCDD	1:3	33.33%	1.85E-04	5.20E-06	1.00E-06	3.57E-05
ETHYLBENZENE	86:99	86.87%	5.11E+01	1.50E+00	1.00E-06	3.41E-05
OCDD	2:4	50.00%	5.76E-02	1.73E-03	1.00E-06	3.32E-05
CHLOROFORM	17:72	23.61%	5.89E+00	1.90E-01	1.00E-06	3.10E-05
TETRACHLOROETHENE	23:68	33.82%	3.15E+00	1.10E-01	1.00E-06	2.86E-05
1,4-DIOXANE	3:6	50.00%	1.69E+02	6.10E+00	1.00E-06	2.77E-05
BENZENE	70:99	70.71%	9.58E+00	4.10E-01	1.00E-06	2.34E-05
1,1-DICHLOROETHANE	36:60	60.00%	4.83E+01	2.40E+00	1.00E-06	2.01E-05
123678-HXCDD	1:3	33.33%	6.96E-05	5.20E-06	1.00E-06	1.34E-05
PCB, TOTAL	1:4	25.00%	3.25E-01	3.40E-02	1.00E-06	9.55E-06
METHYL-TERT-BUTYL ETHER	10:15	66.67%	1.04E+02	1.20E+01	1.00E-06	8.70E-06
1,2-DICHLOROETHANE	15:61	24.59%	7.60E-01	1.50E-01	1.00E-06	5.07E-06
BIS(2-ETHYLHEXYL)PHTHALATE	14:36	38.89%	1.63E+01	4.80E+00	1.00E-06	3.39E-06

Exhibit 404

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	90th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 90th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
TRICHLOROETHENE	29:71	40.85%	5.50E+00	2.00E+00	1.00E-06	2.75E-06
ATRAZINE	2:10	20.00%	5.38E-01	2.90E-01	1.00E-06	1.86E-06
1,2-DICHLOROPROPANE	10:60	16.67%	3.01E-01	3.90E-01	1.00E-06	7.73E-07
1234678-HPCDF	1:3	33.33%	2.24E-05	5.20E-05	1.00E-06	4.31E-07
2,4-DDE	1:1	100.00%	3.33E-02	2.00E-01	1.00E-06	1.67E-07
ALACHLOR	2:10	20.00%	1.83E-01	1.20E+00	1.00E-06	1.52E-07
ISOPHORONE	8:36	22.22%	2.44E+00	7.10E+01	1.00E-06	3.43E-08
ALPHA-BHC	3:30	10.00%	3.50E-05	1.10E-02	1.00E-06	3.18E-09
CHLOROTHALONIL	1:5	20.00%	4.20E-02	2.20E+01	1.00E-06	1.91E-09
CHLORODIBROMOMETHANE	5:64	7.81%	BDL	1.50E-01	1.00E-06	BDL
TRANS-1,4-DICHLORO-2-BUTENE	2:35	5.71%	BDL	1.20E-03	1.00E-06	BDL
ACRYLONITRILE	1:50	2.00%	BDL	4.50E-02	1.00E-06	BDL
1,2,4-TRICHLOROBENZENE	3:42	7.14%	BDL	2.30E+00	1.00E-06	BDL
HEPTACHLOR EPOXIDE	2:33	6.06%	BDL	7.40E-03	1.00E-06	BDL
1,2-DIBROMOETHANE	1:48	2.08%	BDL	6.50E-03	1.00E-06	BDL
BENZO(B)FLUORANTHENE	1:33	3.03%	BDL	2.90E-02	1.00E-06	BDL
DIALLATE	1:12	8.33%	BDL	1.10E+00	1.00E-06	BDL
TRANS-1,3-DICHLORO-1-PROPENE	3:60	5.00%	BDL	4.30E-01	1.00E-06	BDL
BROMOFORM	5:64	7.81%	BDL	8.50E+00	1.00E-06	BDL
1,2,3-TRICHLOROPROPANE	1:45	2.22%	BDL	7.20E-04	1.00E-06	BDL
1,2-DIBROMO-3-CHLOROPROPANE	4:44	9.09%	BDL	3.20E-04	1.00E-06	BDL
O-TOLUIDINE	1:12	8.33%	BDL	3.50E-01	1.00E-06	BDL
PENTACHLOROPHENOL	1:43	2.33%	BDL	5.60E-01	1.00E-06	BDL

Exhibit 404

Human Health Cumulative Risk Comparison LEACH 2000 MSW Database, 90th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	90th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 90th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
HEXACHLOROBUTADIENE	2:44	4.55%	BDL	8.60E-01	1.00E-06	BDL
N-NITROSODIPHENYLAMINE	2:33	6.06%	BDL	1.40E+01	1.00E-06	BDL
BENZYL BUTYL PHTHALATE	1:36	2.78%	BDL	3.50E+01	1.00E-06	BDL
1,1,2,2-TETRACHLOROETHANE	2:59	3.39%	BDL	6.70E-02	1.00E-06	BDL
1,1,2-TRICHLOROETHANE	2:57	3.51%	BDL	2.40E-01	1.00E-06	BDL
1,3-DICHLOROBENZENE	4:51	7.84%	BDL	4.30E-01	1.00E-06	BDL
BROMODICHLOROMETHANE	6:66	9.09%	BDL	1.20E-01	1.00E-06	BDL
ALDRIN	3:32	9.38%	BDL	4.00E-03	1.00E-06	BDL
4,4'-DDE	1:30	3.33%	BDL	2.00E-01	1.00E-06	BDL
ANILINE	1:11	9.09%	BDL	1.20E+01	1.00E-06	BDL
DIELDRIN	1:33	3.03%	BDL	4.20E-03	1.00E-06	BDL
DIMETHYLAMINO AZOBENZENE	1:12	8.33%	BDL	1.50E-02	1.00E-06	BDL
CHLORDANE	1:34	2.94%	BDL	1.90E-01	1.00E-06	BDL
CARBON TETRACHLORIDE	1:64	1.56%	BDL	4.40E-01	1.00E-06	BDL
4,4'-DDT	3:32	9.38%	BDL	2.00E-01	1.00E-06	BDL
DELTA-BHC	1:30	3.33%	BDL	3.70E-02	1.00E-06	BDL
BETA-BHC	2:30	6.67%	BDL	3.70E-02	1.00E-06	BDL
HEPTACHLOR	1:33	3.03%	BDL	1.50E-02	1.00E-06	BDL
Sum of Carcinogen Ratios:						7.27E-03
Noncarcinogens (e)						
MANGANESE	67:67	100.00%	1.84E+04	8.80E+02	1	2.10E+01
IODINE	1:5	20.00%	7.69E+03	3.70E+02	1	2.08E+01
AROCLOR-1016	3:12	25.00%	4.12E+01	2.60E+00	1	1.59E+01
MCPA	5:6	83.33%	2.25E+02	1.80E+01	1	1.25E+01

Exhibit 404

Human Health Cumulative Risk Comparison LEACH 2000 MSW Database, 90th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	90th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 90th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
CRESOL, M + P	3:7	42.86%	1.92E+03	1.80E+02	1	1.07E+01
MCPP	3:6	50.00%	2.36E+02	3.70E+01	1	6.38E+00
ARSENIC	90:107	84.11%	6.92E+01	1.10E+01	1	6.29E+00
4-METHYLPHENOL	17:27	62.96%	9.94E+02	1.80E+02	1	5.52E+00
COBALT	45:60	75.00%	5.92E+01	1.10E+01	1	5.38E+00
IRON	106:106	100.00%	1.31E+05	2.60E+04	1	5.04E+00
DISULFOTON	3:12	25.00%	6.91E+00	1.50E+00	1	4.61E+00
NAPHTHALENE	37:60	61.67%	1.86E+01	6.20E+00	1	3.00E+00
LITHIUM	2:5	40.00%	2.01E+02	7.30E+01	1	2.75E+00
THALLIUM	17:54	31.48%	5.97E+00	2.40E+00	1	2.49E+00
BORON	28:28	100.00%	1.31E+04	7.30E+03	1	1.79E+00
2-BUTANONE	64:75	85.33%	8.89E+03	7.10E+03	1	1.25E+00
MERCURY	27:76	35.53%	6.53E-01	5.70E-01	1	1.15E+00
1234678-HPCDD	2:3	66.67%	4.12E-03	3.70E-03	1	1.11E+00
FLUORIDE	36:37	97.30%	2.35E+03	2.20E+03	1	1.07E+00
ANTIMONY	39:68	57.35%	1.57E+01	1.50E+01	1	1.05E+00
1,2,4-TRIMETHYLBENZENE	6:12	50.00%	1.22E+01	1.50E+01	1	8.13E-01
TOTAL PHENOLS	13:14	92.86%	8.85E+03	1.10E+04	1	8.04E-01
URANIUM	1:5	20.00%	7.89E+01	1.10E+02	1	7.17E-01
VANADIUM	49:63	77.78%	1.25E+02	1.80E+02	1	6.93E-01
ALUMINUM	25:25	100.00%	2.48E+04	3.70E+04	1	6.71E-01
XYLENE TOTAL	72:79	91.14%	1.19E+02	2.00E+02	1	5.97E-01
CADMIUM	45:92	48.91%	1.04E+01	1.80E+01	1	5.75E-01
123789-HXCDD	1:3	33.33%	1.86E-04	3.70E-04	1	5.02E-01
OCDD	2:4	50.00%	5.76E-02	1.23E-01	1	4.67E-01
ACETONITRILE	3:7	42.86%	5.99E+01	1.30E+02	1	4.61E-01

Exhibit 404

Human Health Cumulative Risk Comparison LEACH 2000 MSW Database, 90th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	90th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 90th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
2-PROPANONE	44:51	86.27%	9.15E+03	2.20E+04	1	4.16E-01
ISOBUTYL ALCOHOL	6:16	37.50%	3.82E+03	1.10E+04	1	3.47E-01
DIAZINON	3:6	50.00%	8.68E+00	2.60E+01	1	3.34E-01
NICKEL	87:100	87.00%	2.25E+02	7.30E+02	1	3.08E-01
CHROMIUM, HEXAVALENT	10:21	47.62%	2.93E+01	1.10E+02	1	2.66E-01
DICHLOROMETHANE	58:73	79.45%	2.66E+02	1.10E+03	1	2.41E-01
2-HEXANONE	14:49	28.57%	1.05E+01	4.70E+01	1	2.23E-01
BENZENE	70:99	70.71%	9.58E+00	4.40E+01	1	2.18E-01
CYANIDE	39:64	60.94%	1.52E+02	7.30E+02	1	2.08E-01
BARIUM	90:94	95.74%	1.48E+03	7.30E+03	1	2.03E-01
4-METHYL-2-PENTANONE	37:51	72.55%	3.90E+02	2.00E+03	1	1.95E-01
MOLYBDENUM	6:13	46.15%	3.43E+01	1.80E+02	1	1.90E-01
123678-HXCDD	1:3	33.33%	6.96E-05	3.70E-04	1	1.88E-01
PHENOLICS, TOTAL	17:17	100.00%	2.06E+03	1.10E+04	1	1.87E-01
BENZOIC ACID	7:14	50.00%	2.60E+04	1.50E+05	1	1.74E-01
N,N-DIMETHYLFORMAMIDE	2:5	40.00%	6.08E+02	3.70E+03	1	1.64E-01
TOLUENE	89:97	91.75%	3.46E+02	2.30E+03	1	1.50E-01
PHENOLS	17:18	94.44%	1.61E+03	1.10E+04	1	1.46E-01
N-BUTANOL	2:5	40.00%	5.07E+02	3.70E+03	1	1.37E-01
M&P-XYLENE	27:31	87.10%	1.50E+02	1.20E+03	1	1.25E-01
DIMETHOATE	2:12	16.67%	8.79E-01	7.30E+00	1	1.20E-01
M-XYLENE	6:9	66.67%	1.42E+02	1.20E+03	1	1.18E-01
STRONTIUM	6:6	100.00%	2.01E+03	2.20E+04	1	9.15E-02
ZINC	99:101	98.02%	9.95E+02	1.10E+04	1	9.05E-02
SELENIUM	35:83	42.17%	1.60E+01	1.80E+02	1	8.89E-02
VINYL CHLORIDE	44:84	52.38%	6.33E+00	7.20E+01	1	8.79E-02

Exhibit 404

Human Health Cumulative Risk Comparison LEACH 2000 MSW Database, 90th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	90th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 90th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
CRESOLS	1:3	33.33%	8.00E+01	9.30E+02	1	8.60E-02
NITRITE	5:12	41.67%	3.04E+02	3.70E+03	1	8.21E-02
CHLOROBENZENE	49:90	54.44%	6.97E+00	9.10E+01	1	7.66E-02
NITRATE	23:36	63.89%	4.31E+03	5.80E+04	1	7.43E-02
PHENOLIC COMPOUND	1:1	100.00%	7.93E+02	1.10E+04	1	7.20E-02
COPPER	69:92	75.00%	8.93E+01	1.50E+03	1	5.96E-02
BERYLLIUM	14:55	25.45%	4.22E+00	7.30E+01	1	5.78E-02
SILVER	32:78	41.03%	1.03E+01	1.80E+02	1	5.72E-02
O-XYLENE	28:34	82.35%	6.53E+01	1.20E+03	1	5.44E-02
PHENOL	36:50	72.00%	5.51E+02	1.10E+04	1	5.00E-02
CIS-1,2-DICHLOROETHENE	27:46	58.70%	1.76E+01	3.70E+02	1	4.75E-02
1,4-DIOXANE	3:6	50.00%	1.69E+02	3.70E+03	1	4.56E-02
CHLOROFORM	17:72	23.61%	5.89E+00	1.30E+02	1	4.53E-02
ETHYLBENZENE	86:99	86.87%	5.11E+01	1.30E+03	1	3.93E-02
O+P XYLENE	2:5	40.00%	4.48E+01	1.20E+03	1	3.73E-02
1,2-DICHLOROPROPANE	10:60	16.67%	3.01E-01	8.30E+00	1	3.63E-02
BIPHENYL	1:6	16.67%	5.00E+01	1.80E+03	1	2.78E-02
BIS(2-ETHYLHEXYL)PHTHALATE	14:36	38.89%	1.63E+01	7.30E+02	1	2.23E-02
DICHLORODIFLUOROMETHANE	13:37	35.14%	7.76E+00	3.90E+02	1	1.99E-02
AMENABLE CYANIDE	1:1	100.00%	1.30E+01	7.30E+02	1	1.78E-02
XYLENE, P-	1:5	20.00%	2.09E+01	1.20E+03	1	1.74E-02
METHYL-TERT-BUTYL ETHER	10:15	66.67%	1.04E+02	6.30E+03	1	1.66E-02
NALED	1:5	20.00%	1.20E+00	7.30E+01	1	1.64E-02
1,4-DICHLOROBENZENE	63:96	65.63%	1.64E+01	1.00E+03	1	1.64E-02
1,3,5-TRIMETHYLBENZENE	6:12	50.00%	5.78E+00	3.70E+02	1	1.56E-02
TIN	12:23	52.17%	3.36E+02	2.20E+04	1	1.53E-02

Exhibit 404

Human Health Cumulative Risk Comparison LEACH 2000 MSW Database, 90th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	90th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 90th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
TETRACHLOROETHENE	23:68	33.82%	3.15E+00	2.20E+02	1	1.43E-02
1,2-DICHLOROETHENE	8:16	50.00%	4.58E+00	3.30E+02	1	1.39E-02
2,4-D	7:24	29.17%	4.70E+00	3.70E+02	1	1.27E-02
2-METHYLPHENOL	7:28	25.00%	2.27E+01	1.80E+03	1	1.26E-02
2,4-DB	1:6	16.67%	3.54E+00	2.90E+02	1	1.22E-02
DIETHYL ETHER	3:7	42.86%	8.55E+01	7.30E+03	1	1.17E-02
SILVEX (2,4,5-TP)	5:22	22.73%	2.81E+00	2.90E+02	1	9.68E-03
CHLOROMETHANE	13:67	19.40%	1.80E+00	1.90E+02	1	9.50E-03
CARBOFURAN	2:5	40.00%	1.54E+00	1.80E+02	1	8.58E-03
ETHYL ACETATE	2:5	40.00%	2.26E+02	3.30E+04	1	6.83E-03
ALDICARB	1:5	20.00%	2.45E-01	3.70E+01	1	6.63E-03
1,1-DICHLOROETHANE	36:60	60.00%	4.83E+01	7.30E+03	1	6.62E-03
1234678-HPCDF	1:3	33.33%	2.24E-05	3.70E-03	1	6.05E-03
ACETOPHENONE	3:12	25.00%	2.00E+01	3.70E+03	1	5.40E-03
ISOPROPYLBENZENE	3:13	23.08%	2.98E+00	6.80E+02	1	4.39E-03
2,4-DIMETHYLPHENOL	14:40	35.00%	3.08E+00	7.30E+02	1	4.22E-03
1,2-DICHLOROBENZENE	19:70	27.14%	1.35E+00	3.70E+02	1	3.65E-03
STYRENE	26:60	43.33%	5.37E+00	1.60E+03	1	3.36E-03
TRICHLOROFLUOROMETHANE	14:60	23.33%	3.68E+00	1.30E+03	1	2.83E-03
CHROMIUM	81:103	78.64%	1.23E+02	5.50E+04	1	2.23E-03
1,1-DICHLOROETHYLENE	9:65	13.85%	7.14E-01	3.40E+02	1	2.10E-03
1,1,1-TRICHLOROETHANE	30:70	42.86%	1.50E+01	9.10E+03	1	1.65E-03
2,4,5-T	4:11	36.36%	5.50E-01	3.70E+02	1	1.49E-03
PROPACHLOR	1:5	20.00%	5.70E-01	4.70E+02	1	1.21E-03
1,2-DICHLOROETHANE	15:61	24.59%	7.60E-01	6.40E+02	1	1.19E-03
DI-N-BUTYL PHTHALATE	9:39	23.08%	2.09E+00	3.70E+03	1	5.66E-04

Exhibit 404

Human Health Cumulative Risk Comparison LEACH 2000 MSW Database, 90th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	90th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 90th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
CHLOROETHANE	33:70	47.14%	1.07E+01	2.10E+04	1	5.10E-04
ALACHLOR	2:10	20.00%	1.83E-01	3.70E+02	1	4.94E-04
DICAMBA	3:6	50.00%	5.25E-01	1.10E+03	1	4.77E-04
2-CHLOROTOLUENE	2:12	16.67%	3.38E-01	7.30E+02	1	4.62E-04
ATRAZINE	2:10	20.00%	5.38E-01	1.30E+03	1	4.14E-04
ISOPHORONE	8:36	22.22%	2.44E+00	7.30E+03	1	3.34E-04
DIETHYL PHTHALATE	13:39	33.33%	8.28E+00	2.90E+04	1	2.86E-04
CARBON DISULFIDE	7:48	14.58%	2.63E-01	1.00E+03	1	2.63E-04
ACENAPHTHENE	5:35	14.29%	4.33E-01	2.20E+03	1	1.97E-04
1,2-TRANS-DICHLOROETHYLEN	7:61	11.48%	2.00E-02	1.10E+02	1	1.82E-04
BENZYL ALCOHOL	2:18	11.11%	5.70E-01	3.70E+03	1	1.54E-04
FLUORENE	4:36	11.11%	1.95E-01	1.50E+03	1	1.30E-04
CHLOROTHALONIL	1:5	20.00%	4.20E-02	5.50E+02	1	7.64E-05
P-CHLOROTOLUENE	2:11	18.18%	1.11E-01	2.60E+03	1	4.27E-05
PHENANTHRENE	6:38	15.79%	3.19E-01	1.10E+04	1	2.90E-05
BENFLURALIN	1:5	20.00%	1.25E-01	1.10E+04	1	1.13E-05
ALPHA-BHC	3:30	10.00%	3.50E-05	2.90E+02	1	1.21E-07
1,1,2-TRICHLOROETHANE	2:57	3.51%	BDL	1.50E+02	1	BDL
PENTACHLOROPHENOL	1:43	2.33%	BDL	1.10E+03	1	BDL
HEXACHLOROBUTADIENE	2:44	4.55%	BDL	3.70E+01	1	BDL
VINYL ACETATE	2:46	4.35%	BDL	4.10E+02	1	BDL
ACRYLONITRILE	1:50	2.00%	BDL	4.20E+00	1	BDL
1,2,3-TRICHLOROBENZENE	1:19	5.26%	BDL	2.90E+01	1	BDL
ACROLEIN	2:32	6.25%	BDL	4.20E-02	1	BDL
1,2-DIBROMOETHANE	1:48	2.08%	BDL	1.80E+01	1	BDL
ENDRIN	1:33	3.03%	BDL	1.10E+01	1	BDL

Exhibit 404

Human Health Cumulative Risk Comparison LEACH 2000 MSW Database, 90th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	90th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 90th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
ALDRIN	3:32	9.38%	BDL	1.10E+00	1	BDL
1,1,2,2-TETRACHLOROETHANE	2:59	3.39%	BDL	1.50E+02	1	BDL
ANILINE	1:11	9.09%	BDL	2.60E+02	1	BDL
HEPTACHLOR	1:33	3.03%	BDL	1.80E+01	1	BDL
ENDOSULFAN SULFATE	1:27	3.70%	BDL	2.20E+02	1	BDL
HEPTACHLOR EPOXIDE	2:33	6.06%	BDL	4.70E-01	1	BDL
TRANS-1,3-DICHLORO-1-PROPE	3:60	5.00%	BDL	4.00E+01	1	BDL
BROMOMETHANE	6:63	9.52%	BDL	8.70E+00	1	BDL
DIBROMOMETHANE	1:44	2.27%	BDL	8.20E+00	1	BDL
BROMODICHLOROMETHANE	6:66	9.09%	BDL	7.30E+02	1	BDL
BENZYL BUTYL PHTHALATE	1:36	2.78%	BDL	7.30E+03	1	BDL
ANTHRACENE	1:34	2.94%	BDL	1.10E+04	1	BDL
1,3-DICHLOROPROPANE	1:60	1.67%	BDL	7.30E+02	1	BDL
1,2-DIBROMO-3-CHLOROPROPA	4:44	9.09%	BDL	3.90E-01	1	BDL
FLUORANTHENE	1:34	2.94%	BDL	1.50E+03	1	BDL
ACENAPHTHYLENE	2:33	6.06%	BDL	2.20E+03	1	BDL
PYRENE	1:33	3.03%	BDL	1.10E+03	1	BDL
BROMOFORM	5:64	7.81%	BDL	7.30E+02	1	BDL
ENDOSULFAN II	1:23	4.35%	BDL	2.20E+02	1	BDL
CHLORODIBROMOMETHANE	5:64	7.81%	BDL	7.30E+02	1	BDL
M-CRESOL (3-METHYLPHENOL)	1:13	7.69%	BDL	1.80E+03	1	BDL
1,2,4-TRICHLOROBENZENE	3:42	7.14%	BDL	4.10E+00	1	BDL
2-METHYLNAPHTHALENE	1:20	5.00%	BDL	1.50E+02	1	BDL
2-METHYL-4,6-DINITROPHENOL	1:36	2.78%	BDL	2.90E+00	1	BDL
1,3-DICHLOROBENZENE	4:51	7.84%	BDL	1.00E+03	1	BDL
PYRIDINE	1:18	5.56%	BDL	3.70E+01	1	BDL

Exhibit 404

Human Health Cumulative Risk Comparison LEACH 2000 MSW Database, 90th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	90th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 90th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
CARBON TETRACHLORIDE	1:64	1.56%	BDL	8.60E+01	1	BDL
PARATHION	1:16	6.25%	BDL	2.20E+02	1	BDL
CHLORDANE	1:34	2.94%	BDL	1.80E+01	1	BDL
DIELDRIN	1:33	3.03%	BDL	1.80E+00	1	BDL
1,2,3-TRICHLOROPROPANE	1:45	2.22%	BDL	6.20E-01	1	BDL
4,4'-DDT	3:32	9.38%	BDL	1.80E+01	1	BDL
Sum of Noncarcinogen Ratios:						1.42E+02

Exhibit 404

Exhibit 404

Comp. 017438

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HUMAN HEALTH CUMULATIVE RISK COMPARISON EPRI CCP DATABASE, 50TH PERCENTILE

Notes on the following Table:

(a) Frequency of Detection. Number of detects: Total number of data points, where each landfill/impoundment represents one data point based on site averages.

(b) The CCP leachate database has data for approximately 30 landfills/impoundments. Sample rounds range from 1 to 54 for each site. To ensure that results from no single site dominate the evaluation, site averages were calculated for each constituent at each site. The frequency of detection and the percentiles were calculated based on the site averaged data.

(c) Comparison levels presented in Appendix F.

(d) Ratio of 50^{th} percentile concentration to the comparison level. For potential carcinogens, the ratio has been multiplied by the target risk level for the comparison levels of 1.00E-06; for noncarcinogens, the ratio has been multiplied by the target hazard index of 1.

(e) Constituents that have comparison levels for potentially carcinogenic and noncarcinogenic effects are evaluated for both.

BDL - Below Detection Limit - reported where the result is based on a non-detected result

CCP – Coal Combustion Product

µg/l - microgram per liter

Human Health Cumulative Risk Comparison EPRI CCP Database, 50th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	50th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 50th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
Potential Carcinogens (e)						
ARSENIC	28:28	100.00%	5.56E+01	4.50E-02	1.00E-06	1.23E-03
Sum of Carcinogen Ratios:						1.23E-03
Noncarcinogens (e)						
MOLYBDENUM	29:29	100.00%	1.50E+03	1.80E+02	1	8.33E+00
ARSENIC	28:28	100.00%	5.56E+01	1.10E+01	1	5.05E+00
LITHIUM	22:24	91.67%	1.68E+02	7.30E+01	1	2.30E+00
BORON	28:30	93.33%	6.35E+03	7.30E+03	1	8.70E-01
VANADIUM	27:28	96.43%	1.06E+02	1.80E+02	1	5.87E-01
SELENIUM	26:27	96.30%	5.38E+01	1.80E+02	1	2.99E-01
FLUORINE	10:10	100.00%	6.28E+02	2.20E+03	1	2.86E-01
CADMIUM	24:28	85.71%	3.45E+00	1.80E+01	1	1.92E-01
ANTIMONY	21:22	95.45%	1.69E+00	1.50E+01	1	1.12E-01
STRONTIUM	28:28	100.00%	2.05E+03	2.20E+04	1	9.32E-02
MANGANESE	25:30	83.33%	4.42E+01	8.80E+02	1	5.02E-02
COBALT	19:24	79.17%	4.59E-01	1.10E+01	1	4.17E-02
URANIUM	18:20	90.00%	2.86E+00	1.10E+02	1	2.60E-02
NICKEL	25:28	89.29%	6.66E+00	7.30E+02	1	9.12E-03
BARIUM	28:29	96.55%	6.29E+01	7.30E+03	1	8.62E-03
ALUMINUM	25:28	89.29%	2.65E+02	3.70E+04	1	7.16E-03
TIN	1:1	100.00%	1.33E+02	2.20E+04	1	6.06E-03
MERCURY	11:14	78.57%	1.74E-03	5.70E-01	1	3.05E-03
COPPER	25:29	86.21%	2.27E+00	1.50E+03	1	1.51E-03

Exhibit 404

Comp. 017440

Human Health Cumulative Risk Comparison EPRI CCP Database, 50th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	50th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 50th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
NITRATE	8:9	88.89%	7.26E+01	5.80E+04	1	1.25E-03
IRON	20:28	71.43%	2.24E+01	2.60E+04	1	8.61E-04
ZINC	19:30	63.33%	2.58E+00	1.10E+04	1	2.35E-04
DIMETHYL MERCURY	7:9	77.78%	5.51E-05	5.70E-01	1	9.67E-05
CHROMIUM	19:29	65.52%	1.50E+00	5.50E+04	1	2.73E-05
METHYL MERCURY	8:9	88.89%	9.89E-05	3.70E+00	1	2.67E-05
THALLIUM	10:22	45.45%	BDL	2.40E+00	1	BDL
SILVER	6:26	23.08%	BDL	1.80E+02	1	BDL
NITRITE	1:5	20.00%	BDL	3.70E+03	1	BDL
BERYLLIUM	1:23	4.35%	BDL	7.30E+01	1	BDL
Sum of Noncarcinogen Ratios:						**1.83E+01**

Exhibit 404

Comp. 017442

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HUMAN HEALTH CUMULATIVE RISK COMPARISON EPRI CCP DATABASE, 90TH PERCENTILE

Notes on the following Table:

(a) Frequency of Detection. Number of detects: Total number of data points, where each landfill/impoundment represents one data point based on site averages.

(b) The CCP leachate database has data for approximately 30 landfills/impoundments. Sample rounds range from 1 to 54 for each site. To ensure that results from no single site dominate the evaluation, site averages were calculated for each constituent at each site. The frequency of detection and the percentiles were calculated based on the site averaged data.

(c) Comparison levels presented in Appendix F.

(d) Ratio of 90^{th} percentile concentration to the comparison level. For potential carcinogens, the ratio has been multiplied by the target risk level for the comparison levels of 1.00E-06; for noncarcinogens, the ratio has been multiplied by the target hazard index of 1.

(e) Constituents that have comparison levels for potentially carcinogenic and noncarcinogenic effects are evaluated for both.

BDL - Below Detection Limit - reported where the result is based on a non-detected result

CCP – Coal Combustion Product

µg/l - microgram per liter

Human Health Cumulative Risk Comparison EPRI CCP Database, 90th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	90th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 90th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
Potential Carcinogens (e)						
ARSENIC	28:28	100.00%	2.79E+02	4.50E-02	1.00E-06	6.20E-03
Sum of Carcinogen Ratios:						**6.20E-03**
Noncarcinogens (e)						
MOLYBDENUM	29:29	100.00%	9.65E+03	1.80E+02	1	5.36E+01
LITHIUM	22:24	91.67%	2.36E+03	7.30E+01	1	3.24E+01
ARSENIC	28:28	100.00%	2.79E+02	1.10E+01	1	2.54E+01
BORON	28:30	93.33%	6.50E+04	7.30E+03	1	8.91E+00
VANADIUM	27:28	96.43%	6.06E+02	1.80E+02	1	3.37E+00
FLUORINE	10:10	100.00%	4.50E+03	2.20E+03	1	2.04E+00
MANGANESE	25:30	83.33%	1.43E+03	8.80E+02	1	1.62E+00
SELENIUM	26:27	96.30%	2.43E+02	1.80E+02	1	1.35E+00
CADMIUM	24:28	85.71%	2.31E+01	1.80E+01	1	1.29E+00
COBALT	19:24	79.17%	7.70E+00	1.10E+01	1	7.00E-01
ANTIMONY	21:22	95.45%	8.46E+00	1.50E+01	1	5.64E-01
THALLIUM	10:22	45.45%	1.33E+00	2.40E+00	1	5.54E-01
ALUMINUM	25:28	89.29%	1.25E+04	3.70E+04	1	3.38E-01
STRONTIUM	28:28	100.00%	6.41E+03	2.20E+04	1	2.91E-01
NITRATE	8:9	88.89%	1.59E+04	5.80E+04	1	2.75E-01
URANIUM	18:20	90.00%	2.26E+01	1.10E+02	1	2.06E-01
IRON	20:28	71.43%	3.70E+03	2.60E+04	1	1.42E-01
NICKEL	25:28	89.29%	3.30E+01	7.30E+02	1	4.65E-02
NITRITE	1:5	20.00%	1.30E+02	3.70E+03	1	3.51E-02

Human Health Cumulative Risk Comparison EPRI CCP Database, 90th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	90th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 90th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
MERCURY	11:14	78.57%	1.79E-02	5.70E-01	1	3.15E-02
BARIUM	28:29	96.55%	1.77E+02	7.30E+03	1	2.42E 02
COPPER	25:29	86.21%	3.31E+01	1.50E+03	1	2.21E-02
TIN	1:1	100.00%	1.33E+02	2.20E+04	1	6.06E-03
ZINC	19:30	63.33%	6.07E+01	1.10E+04	1	5.52E-03
SILVER	6:26	23.08%	4.61E-01	1.80E+02	1	2.56E-03
DIMETHYL MERCURY	7:9	77.78%	9.45E-04	5.70E-01	1	1.66E-03
CHROMIUM	19:29	65.52%	8.17E+01	5.50E+04	1	1.48E-03
METHYL MERCURY	8:9	88.89%	9.12E-04	3.70E+00	1	2.47E-04
BERYLLIUM	1:23	4.35%	BDL	7.30E+01	1	BDL
Sum of Noncarcinogen Ratios						1.33E+02

Exhibit 404

Comp. 017446

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ECOLOGICAL CUMULATIVE RISK COMPARISON LEACH 2000 MSW DATABASE, 50TH PERCENTILE

Notes on the following Table:

(a) Frequency of Detection. Number of detects: Total number of data points based on site averages (i.e., each MSW landfill represents 1 site).

(b) LEACH 2000 has data for approximately 121 MSW landfills. Sample rounds for the landfills range from 1 to 34. To ensure that results from no single landfill dominate the evaluation, site averages were calculated for each constituent at each landfill. The frequency of detection and the percentiles were calculated based on the site averaged data.

(c) Comparison levels presented in Appendix G.

(d) Ratio of 50^{th} percentile concentration to the comparison level.

BDL - Below Detection Limit - reported where the result is based on a non-detected result

MSW - Municipal Solid Waste

µg/l - microgram per liter

Ecological Cumulative Risk Comparison LEACH 2000 MSW Database, 50th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	50th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 50th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
2,4-DDE	1:1	100.00%	3.33E-02	4.51E-09	1	7.39E+06
AMMONIA	51:52	98.08%	1.23E+05	1.90E+01	1	6.46E+03
BORON	28:28	100.00%	3.05E+03	1.60E+00	1	1.90E+03
HYDROG SULFIDE	4:4	100.00%	3.64E+03	2.00E+00	1	1.82E+03
ISO-PROPANOL	5:7	71.43%	4.97E+03	7.50E+00	1	6.62E+02
PHENOLIC COMPOUND	1:1	100.00%	7.93E+02	4.00E+00	1	1.98E+02
TOTAL PHENOLS	13:14	92.86%	4.78E+02	4.00E+00	1	1.19E+02
PHENOLICS, TOTAL	17:17	100.00%	3.99E+02	4.00E+00	1	9.97E+01
OCDD	2:4	50.00%	2.69E-03	3.00E-05	1	8.97E+01
BARIUM	90:94	95.74%	3.38E+02	4.00E+00	1	8.44E+01
DIAZINON	3:6	50.00%	2.45E+00	4.30E-02	1	5.70E+01
IRON	106:106	100.00%	1.63E+04	3.00E+02	1	5.44E+01
PHENOLS	17:18	94.44%	2.03E+02	4.00E+00	1	5.07E+01
1234678-HPCDD	2:3	66.67%	1.03E-04	3.00E-06	1	3.43E+01
M&P-XYLENE	27:31	87.10%	5.17E+01	1.80E+00	1	2.87E+01
AMMONIA, UNION	6:6	100.00%	4.50E+02	1.90E+01	1	2.37E+01
CHLORINE	1:1	100.00%	2.60E+02	1.10E+01	1	2.36E+01
TOLUENE	89:97	91.75%	3.30E+01	2.00E+00	1	1.65E+01
MANGANESE	67:67	100.00%	1.60E+03	1.20E+02	1	1.33E+01
COPPER	69:92	75.00%	1.53E+01	1.58E+00	1	9.65E+00
ALUMINUM	25:25	100.00%	6.40E+02	8.70E+01	1	7.36E+00
PHENOL	36:50	72.00%	2.85E+01	4.00E+00	1	7.13E+00
POTASSIUM K TOT	7:7	100.00%	2.70E+05	5.30E+04	1	5.09E+00
M-XYLENE	6:9	66.67%	6.90E+00	1.80E+00	1	3.83E+00
NAPHTHALENE	37:60	61.67%	3.94E+00	1.10E+00	1	3.59E+00
XYLENE TOTAL	72:79	91.14%	4.08E+01	1.30E+01	1	3.13E+00
ARSENIC	90:107	84.11%	1.54E+01	5.00E+00	1	3.07E+00
CHLORIDE	101:103	98.06%	6.93E+05	2.30E+05	1	3.01E+00
AMENABLE CYANIDE	1:1	100.00%	1.30E+01	5.00E+00	1	2.60E+00
NICKEL	87:100	87.00%	6.00E+01	2.89E+01	1	2.08E+00

Exhibit 404

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	50th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 50th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
POTASSIUM	46:46	100.00%	1.04E+05	5.30E+04	1	1.96E+00
LEAD	66:102	64.71%	2.22E+00	1.17E+00	1	1.90E+00
ZINC	99:101	98.02%	1.03E+02	5.89E+01	1	1.76E+00
CALCIUM	57:58	98.28%	2.03E+05	1.16E+05	1	1.75E+00
VANADIUM	49:63	77.78%	1.78E+01	1.20E+01	1	1.48E+00
ETHYLBENZENE	86:99	86.87%	2.00E+01	1.40E+01	1	1.43E+00
MAGNESIUM	57:57	100.00%	9.71E+04	8.20E+04	1	1.18E+00
4-METHYLPHENOL	17:27	62.96%	2.90E+01	2.50E+01	1	1.16E+00
STRONTIUM	6:6	100.00%	1.25E+03	1.50E+03	1	8.34E-01
SODIUM	100:101	99.01%	5.15E+05	6.80E+05	1	7.57E-01
COBALT	45:60	75.00%	1.30E+01	2.30E+01	1	5.65E-01
CYANIDE	39:64	60.94%	2.43E+00	5.00E+00	1	4.86E-01
CHLOROBENZENE	49:90	54.44%	4.49E-01	1.30E+00	1	3.45E-01
2-PROPANONE	44:51	86.27%	5.03E+02	1.50E+03	1	3.35E-01
CHROMIUM	81:103	78.64%	2.19E+01	7.40E+01	1	2.96E-01
1,4-DICHLOROBENZENE	63:96	65.63%	2.55E+00	9.40E+00	1	2.71E-01
FLUORIDE	36:37	97.30%	4.00E+02	2.12E+03	1	1.89E-01
2-BUTANONE	64:75	85.33%	2.77E+02	2.20E+03	1	1.26E-01
ANTIMONY	39:68	57.35%	2.75E+00	3.00E+01	1	9.17E-02
4-METHYL-2-PENTANONE	37:51	72.55%	1.25E+01	1.70E+02	1	7.35E-02
TIN	12:23	52.17%	4.43E+00	7.30E+01	1	6.07E-02
DICHLOROMETHANE	58:73	79.45%	5.34E+00	9.81E+01	1	5.44E-02
1,1-DICHLOROETHANE	36:60	60.00%	2.14E+00	4.70E+01	1	4.55E-02
BENZENE	70:99	70.71%	2.03E+00	5.30E+01	1	3.82E-02
1,2,4-TRIMETHYLBENZENE	6:12	50.00%	7.27E-01	3.30E+01	1	2.20E-02
4-ISOPROPYLTOLUENE	8:15	53.33%	9.21E-01	8.50E+01	1	1.08E-02
1,3,5-TRIMETHYLBENZENE	6:12	50.00%	2.73E-01	3.00E+01	1	9.09E-03
BENZOIC ACID	7:14	50.00%	2.75E-01	4.20E+01	1	6.55E-03
1,2-DICHLOROETHENE	8:16	50.00%	5.50E-01	5.90E+02	1	9.32E-04
VINYL CHLORIDE	44:84	52.38%	7.73E-01	9.30E+02	1	8.31E-04

Ecological Cumulative Risk Comparison LEACH 2000 MSW Database, 50th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	50th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 50th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
METHYL-TERT-BUTYL ETHER	10:15	66.67%	2.00E+00	1.11E+04	1	1.81E-04
1,4-DIOXANE	3:6	50.00%	2.01E+00	2.20E+04	1	9.13E-05
SILVEX (2,4,5-TP)	5:22	22.73%	BDL	3.00E+01	1	BDL
DIBENZOFURAN	1:20	5.00%	BDL	3.70E+00	1	BDL
DIMETHYL PHTHALATE	3:36	8.33%	BDL	3.30E+02	1	BDL
PYRENE	1:33	3.03%	BDL	2.50E-02	1	BDL
TETRACHLOROETHENE	23:68	33.82%	BDL	4.50E+01	1	BDL
AROCLOR-1016	3:12	25.00%	BDL	7.40E-05	1	BDL
2,4,5-T	4:11	36.36%	BDL	6.86E+02	1	BDL
BIPHENYL	1:6	16.67%	BDL	1.40E+01	1	BDL
CARBOFURAN	2:5	40.00%	BDL	1.80E+00	1	BDL
2-METHYLNAPHTHALENE	1:20	5.00%	BDL	4.70E+00	1	BDL
2-METHYLPHENOL	7:28	25.00%	BDL	1.30E+01	1	BDL
CHROMIUM, HEXAVALENT	10:21	47.62%	BDL	1.10E+01	1	BDL
ATRAZINE	2:10	20.00%	BDL	1.80E+00	1	BDL
123789-HXCDD	1:3	33.33%	BDL	3.00E-07	1	BDL
BENZO(B)FLUORANTHENE	1:33	3.03%	BDL	9.07E+00	1	BDL
FLUORANTHENE	1:34	2.94%	BDL	4.00E-02	1	BDL
ACENAPHTHYLENE	2:33	6.06%	BDL	5.80E+00	1	BDL
DISULFOTON	3:12	25.00%	BDL	4.02E-02	1	BDL
ALDRIN	3:32	9.38%	BDL	1.70E-02	1	BDL
1,2-TRANS-DICHLOROETHYLENE	7:61	11.48%	BDL	9.70E+02	1	BDL
ACRYLONITRILE	1:50	2.00%	BDL	6.60E+01	1	BDL
4-NITROPHENOL	1:38	2.63%	BDL	6.00E+01	1	BDL
PCB, TOTAL	1:4	25.00%	BDL	7.40E-05	1	BDL
STYRENE	26:60	43.33%	BDL	3.20E+01	1	BDL
BENZYL ALCOHOL	2:18	11.11%	BDL	8.60E+00	1	BDL
TRANS-1,3-DICHLORO-1-PROPENE	3:60	5.00%	BDL	5.50E-02	1	BDL
HEPTACHLOR EPOXIDE	2:33	6.06%	BDL	1.90E-03	1	BDL
ENDOSULFAN SULFATE	1:27	3.70%	BDL	2.00E-02	1	BDL

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	50th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 50th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
N-PROPYLBENZENE	4:13	30.77%	BDL	1.28E+02	1	BDL
2,4-DIMETHYLPHENOL	14:40	35.00%	BDL	2.12E+01	1	BDL
CRESOL, M + P	3:7	42.86%	BDL	2.50E+01	1	BDL
PYRIDINE	1:18	5.56%	BDL	2.38E+03	1	BDL
1,2-DICHLOROETHANE	15:61	24.59%	BDL	1.00E+02	1	BDL
1,2,4-TRICHLOROBENZENE	3:42	7.14%	BDL	2.40E+01	1	BDL
VINYL ACETATE	2:46	4.35%	BDL	1.60E+01	1	BDL
M-CRESOL (3-METHYLPHENOL)	1:13	7.69%	BDL	6.20E+01	1	BDL
ISOPROPYLBENZENE	3:13	23.08%	BDL	2.60E+00	1	BDL
1,2-DICHLOROBENZENE	19:70	27.14%	BDL	7.00E-01	1	BDL
HEXACHLOROBUTADIENE	2:44	4.55%	BDL	5.30E-02	1	BDL
2,4-D	7:24	29.17%	BDL	2.20E+02	1	BDL
ALPHA-BHC	3:30	10.00%	BDL	1.24E+01	1	BDL
BIS(2-ETHYLHEXYL)PHTHALATE	14:36	38.89%	BDL	3.00E-01	1	BDL
DI-N-OCTYL PHTHALATE	1:33	3.03%	BDL	2.20E+01	1	BDL
ANTHRACENE	1:34	2.94%	BDL	1.20E-02	1	BDL
ACROLEIN	2:32	6.25%	BDL	1.90E-01	1	BDL
THALLIUM	17:54	31.48%	BDL	8.00E-01	1	BDL
4,4'-DDE	1:30	3.33%	BDL	4.51E-09	1	BDL
DIETHYL PHTHALATE	13:39	33.33%	BDL	1.10E+02	1	BDL
ACENAPHTHENE	5:35	14.29%	BDL	5.80E+00	1	BDL
LITHIUM	2:5	40.00%	BDL	1.40E+01	1	BDL
1,1,2,2-TETRACHLOROETHANE	2:59	3.39%	BDL	2.40E+02	1	BDL
TRICHLOROETHENE	29:71	40.85%	BDL	2.10E+01	1	BDL
MERCURY	27:76	35.53%	BDL	1.30E-03	1	BDL
MOLYBDENUM	6:13	46.15%	BDL	7.30E+01	1	BDL
1,1,2-TRICHLOROETHANE	2:57	3.51%	BDL	5.00E+02	1	BDL
SILVER	32:78	41.03%	BDL	1.20E-02	1	BDL
ENDOSULFAN II	1:23	4.35%	BDL	5.10E-02	1	BDL
ISOPHORONE	8:36	22.22%	BDL	9.20E+02	1	BDL

Ecological Cumulative Risk Comparison LEACH 2000 MSW Database, 50th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	50th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 50th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
DI-N-BUTYL PHTHALATE	9:39	23.08%	BDL	9.40E+00	1	BDL
SELENIUM	35:83	42.17%	BDL	1.00E+00	1	BDL
HEPTACHLOR	1:33	3.03%	BDL	1.90E-03	1	BDL
BERYLLIUM	14:55	25.45%	BDL	5.30E-01	1	BDL
1,1-DICHLOROETHYLENE	9:65	13.85%	BDL	2.50E+01	1	BDL
CADMIUM	45:92	48.91%	BDL	1.50E-01	1	BDL
BROMOFORM	5:64	7.81%	BDL	2.30E+02	1	BDL
URANIUM	1:5	20.00%	BDL	2.60E+00	1	BDL
CARBON DISULFIDE	7:48	14.58%	BDL	9.20E-01	1	BDL
ZIRCONIUM	2:5	40.00%	BDL	1.70E+01	1	BDL
ACETONITRILE	3:7	42.86%	BDL	1.20E+04	1	BDL
BROMOMETHANE	6:63	9.52%	BDL	1.60E+01	1	BDL
1,2-DICHLOROPROPANE	10:60	16.67%	BDL	3.60E+02	1	BDL
CHLORDANE	1:34	2.94%	BDL	2.20E-03	1	BDL
DELTA-BHC	1:30	3.33%	BDL	1.41E+02	1	BDL
2-NITROPHENOL	2:38	5.26%	BDL	1.92E+03	1	BDL
CHLOROFORM	17:72	23.61%	BDL	1.80E+00	1	BDL
PENTACHLOROPHENOL	1:43	2.33%	BDL	5.00E-01	1	BDL
CHLOROMETHANE	13:67	19.40%	BDL	5.50E+03	1	BDL
1,2,3-TRICHLOROBENZENE	1:19	5.26%	BDL	8.00E+00	1	BDL
4,4'-DDT	3:32	9.38%	BDL	1.10E-05	1	BDL
2-METHYL-4,6-DINITROPHENOL	1:36	2.78%	BDL	2.30E+00	1	BDL
1,3-DICHLOROBENZENE	4:51	7.84%	BDL	3.80E+01	1	BDL
CARBON TETRACHLORIDE	1:64	1.56%	BDL	1.33E+01	1	BDL
PARATHION	1:16	6.25%	BDL	1.30E-02	1	BDL
ENDRIN	1:33	3.03%	BDL	2.30E-03	1	BDL
123678-HXCDD	1:3	33.33%	BDL	3.00E-07	1	BDL
1,1,1-TRICHLOROETHANE	30:70	42.86%	BDL	1.10E+01	1	BDL
2-HEXANONE	14:49	28.57%	BDL	9.90E+01	1	BDL
4-CHLORO-3-METHYLPHENOL	1:34	2.94%	BDL	3.48E+01	1	BDL

Exhibit 404

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	50th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 50th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
DIMETHYLAMINO AZOBENZENE	1:12	8.33%	BDL	1.65E+00	1	BDL
DIMETHOATE	2:12	16.67%	BDL	6.20E+00	1	BDL
DIELDRIN	1:33	3.03%	BDL	7.10E-05	1	BDL
ANILINE	1:11	9.09%	BDL	2.20E+00	1	BDL
N-NITROSODIPHENYLAMINE	2:33	6.06%	BDL	2.10E+02	1	BDL
1234678-HPCDF	1:3	33.33%	BDL	3.00E-07	1	BDL
BENZYL BUTYL PHTHALATE	1:36	2.78%	BDL	1.90E+01	1	BDL
PHENANTHRENE	6:38	15.79%	BDL	4.00E-01	1	BDL
BETA-BHC	2:30	6.67%	BDL	4.95E-01	1	BDL
FLUORENE	4:36	11.11%	BDL	3.00E+00	1	BDL
Sum of Ratios:						7.40E+06

Exhibit 404

Comp. 017454

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ECOLOGICAL CUMULATIVE RISK COMPARISON LEACH 2000 MSW DATABASE, 90TH PERCENTILE

Notes on the following Table:

(a) Frequency of Detection. Number of detects: Total number of data points based on site averages (i.e., each MSW landfill represents 1 site).

(b) LEACH 2000 has data for approximately 121 MSW landfills. Sample rounds for the landfills range from 1 to 34. To ensure that results from no single landfill dominate the evaluation, site averages were calculated for each constituent at each landfill. The frequency of detection and the percentiles were calculated based on the site averaged data.

(c) Comparison levels presented in Appendix G.

(d) Ratio of 90^{th} percentile concentration to the comparison level.

BDL - Below Detection Limit - reported where the result is based on a non-detected result

MSW - Municipal Solid Waste

µg/l - microgram per liter

Ecological Cumulative Risk Comparison LEACH 2000 MSW Database, 90th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	90th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 90th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
2,4-DDE	1:1	100.00%	3.33E-02	4.51E-09	1	7.39E+06
AROCLOR-1016	3:12	25.00%	4.12E+01	7.40E-05	1	5.57E+05
AMMONIA	51:52	98.08%	5.27E+05	1.90E+01	1	2.77E+04
HYDROG SULFIDE	4:4	100.00%	1.68E+04	2.00E+00	1	8.39E+03
BORON	28:28	100.00%	1.31E+04	1.60E+00	1	8.19E+03
PCB, TOTAL	1:4	25.00%	3.25E-01	7.40E-05	1	4.39E+03
TOTAL PHENOLS	13:14	92.86%	8.85E+03	4.00E+00	1	2.21E+03
ISO-PROPANOL	5:7	71.43%	1.59E+04	7.50E+00	1	2.13E+03
OCDD	2:4	50.00%	5.76E-02	3.00E-05	1	1.92E+03
1234678-HPCDD	2:3	66.67%	4.12E-03	3.00E-06	1	1.37E+03
SILVER	32:78	41.03%	1.03E+01	1.20E-02	1	8.58E+02
BENZOIC ACID	7:14	50.00%	2.60E+04	4.20E+01	1	6.20E+02
123789-HXCDD	1:3	33.33%	1.86E-04	3.00E-07	1	6.19E+02
PHENOLICS, TOTAL	17:17	100.00%	2.06E+03	4.00E+00	1	5.15E+02
MERCURY	27:76	35.53%	6.53E-01	1.30E-03	1	5.03E+02
IRON	106:106	100.00%	1.31E+05	3.00E+02	1	4.37E+02
PHENOLS	17:18	94.44%	1.61E+03	4.00E+00	1	4.02E+02
BARIUM	90:94	95.74%	1.48E+03	4.00E+00	1	3.70E+02
ALUMINUM	25:25	100.00%	2.48E+04	8.70E+01	1	2.85E+02
123678-HXCDD	1:3	33.33%	6.96E-05	3.00E-07	1	2.32E+02
DIAZINON	3:6	50.00%	8.68E+00	4.30E-02	1	2.02E+02
PHENOLIC COMPOUND	1:1	100.00%	7.93E+02	4.00E+00	1	1.98E+02
TOLUENE	89:97	91.75%	3.46E+02	2.00E+00	1	1.73E+02
DISULFOTON	3:12	25.00%	6.91E+00	4.02E-02	1	1.72E+02
MANGANESE	67:67	100.00%	1.84E+04	1.20E+02	1	1.54E+02
PHENOL	36:50	72.00%	5.51E+02	4.00E+00	1	1.38E+02
AMMONIA, UNION	6:6	100.00%	2.54E+03	1.90E+01	1	1.34E+02
M&P-XYLENE	27:31	87.10%	1.50E+02	1.80E+00	1	8.33E+01
M-XYLENE	6:9	66.67%	1.42E+02	1.80E+00	1	7.89E+01
CRESOL, M + P	3:7	42.86%	1.92E+03	2.50E+01	1	7.67E+01

Exhibit 404

Ecological Cumulative Risk Comparison LEACH 2000 MSW Database, 90th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	90th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 90th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
1234678-HPCDF	1:3	33.33%	2.24E-05	3.00E-07	1	7.47E+01
CADMIUM	45:92	48.91%	1.04E+01	1.50E-01	1	6.90E+01
COPPER	69:92	75.00%	8.93E+01	1.58E+00	1	5.65E+01
BIS(2-ETHYLHEXYL)PHTHALATE	14:36	38.89%	1.63E+01	3.00E-01	1	5.42E+01
4-METHYLPHENOL	17:27	62.96%	9.94E+02	2.50E+01	1	3.98E+01
LEAD	66:102	64.71%	4.18E+01	1.17E+00	1	3.57E+01
URANIUM	1:5	20.00%	7.89E+01	2.60E+00	1	3.03E+01
CYANIDE	39:64	60.94%	1.52E+02	5.00E+00	1	3.03E+01
CHLORINE	1:1	100.00%	2.60E+02	1.10E+01	1	2.36E+01
ZINC	99:101	98.02%	9.95E+02	5.89E+01	1	1.69E+01
NAPHTHALENE	37:60	61.67%	1.86E+01	1.10E+00	1	1.69E+01
SELENIUM	35:83	42.17%	1.60E+01	1.00E+00	1	1.60E+01
POTASSIUM	46:46	100.00%	8.35E+05	5.30E+04	1	1.57E+01
LITHIUM	2:5	40.00%	2.01E+02	1.40E+01	1	1.43E+01
ARSENIC	90:107	84.11%	6.92E+01	5.00E+00	1	1.38E+01
CHLORIDE	101:103	98.06%	2.87E+06	2.30E+05	1	1.25E+01
VANADIUM	49:63	77.78%	1.25E+02	1.20E+01	1	1.04E+01
XYLENE TOTAL	72:79	91.14%	1.19E+02	1.30E+01	1	9.18E+00
POTASSIUM K TOT	7:7	100.00%	4.54E+05	5.30E+04	1	8.57E+00
BERYLLIUM	14:55	25.45%	4.22E+00	5.30E-01	1	7.96E+00
NICKEL	87:100	87.00%	2.25E+02	2.89E+01	1	7.79E+00
THALLIUM	17:54	31.48%	5.97E+00	8.00E-01	1	7.46E+00
2-PROPANONE	44:51	86.27%	9.15E+03	1.50E+03	1	6.10E+00
CHLOROBENZENE	49:90	54.44%	6.97E+00	1.30E+00	1	5.36E+00
TIN	12:23	52.17%	3.36E+02	7.30E+01	1	4.60E+00
2-BUTANONE	64:75	85.33%	8.89E+03	2.20E+03	1	4.04E+00
CALCIUM	57:58	98.28%	4.47E+05	1.16E+05	1	3.85E+00
ETHYLBENZENE	86:99	86.87%	5.11E+01	1.40E+01	1	3.65E+00
BIPHENYL	1:6	16.67%	5.00E+01	1.40E+01	1	3.57E+00
CHLOROFORM	17:72	23.61%	5.89E+00	1.80E+00	1	3.27E+00

Ecological Cumulative Risk Comparison LEACH 2000 MSW Database, 90th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	90th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 90th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
SODIUM	100:101	99.01%	1.97E+06	6.80E+05	1	2.90E+00
DICHLOROMETHANE	58:73	79.45%	2.66E+02	9.81E+01	1	2.71E+00
CHROMIUM, HEXAVALENT	10:21	47.62%	2.93E+01	1.10E+01	1	2.66E+00
AMENABLE CYANIDE	1:1	100.00%	1.30E+01	5.00E+00	1	2.60E+00
COBALT	45:60	75.00%	5.92E+01	2.30E+01	1	2.57E+00
ZIRCONIUM	2:5	40.00%	4.24E+01	1.70E+01	1	2.49E+00
MAGNESIUM	57:57	100.00%	1.93E+05	8.20E+04	1	2.36E+00
4-METHYL-2-PENTANONE	37:51	72.55%	3.90E+02	1.70E+02	1	2.29E+00
1,2-DICHLOROBENZENE	19:70	27.14%	1.35E+00	7.00E-01	1	1.93E+00
2-METHYLPHENOL	7:28	25.00%	2.27E+01	1.30E+01	1	1.74E+00
1,4-DICHLOROBENZENE	63:96	65.63%	1.64E+01	9.40E+00	1	1.74E+00
CHROMIUM	81:103	78.64%	1.23E+02	7.40E+01	1	1.66E+00
1,1,1-TRICHLOROETHANE	30:70	42.86%	1.50E+01	1.10E+01	1	1.36E+00
STRONTIUM	6:6	100.00%	2.01E+03	1.50E+03	1	1.34E+00
ISOPROPYLBENZENE	3:13	23.08%	2.98E+00	2.60E+00	1	1.15E+00
FLUORIDE	36:37	97.30%	2.35E+03	2.12E+03	1	1.11E+00
1,1-DICHLOROETHANE	36:60	60.00%	4.83E+01	4.70E+01	1	1.03E+00
CARBOFURAN	2:5	40.00%	1.54E+00	1.80E+00	1	8.58E-01
PHENANTHRENE	6:38	15.79%	3.19E-01	4.00E-01	1	7.98E-01
ANTIMONY	39:68	57.35%	1.57E+01	3.00E+01	1	5.23E-01
MOLYBDENUM	6:13	46.15%	3.43E+01	7.30E+01	1	4.70E-01
1,2,4-TRIMETHYLBENZENE	6:12	50.00%	1.22E+01	3.30E+01	1	3.69E-01
ATRAZINE	2:10	20.00%	5.38E-01	1.80E+00	1	2.99E-01
CARBON DISULFIDE	7:48	14.58%	2.63E-01	9.20E-01	1	2.86E-01
TRICHLOROETHENE	29:71	40.85%	5.50E+00	2.10E+01	1	2.62E-01
DI-N-BUTYL PHTHALATE	9:39	23.08%	2.09E+00	9.40E+00	1	2.23E-01
1,3,5-TRIMETHYLBENZENE	6:12	50.00%	5.78E+00	3.00E+01	1	1.93E-01
BENZENE	70:99	70.71%	9.58E+00	5.30E+01	1	1.81E-01
STYRENE	26:60	43.33%	5.37E+00	3.20E+01	1	1.68E-01
2,4-DIMETHYLPHENOL	14:40	35.00%	3.08E+00	2.12E+01	1	1.45E-01

Exhibit 404

Comp. 017458

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	90th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 90th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
DIMETHOATE	2:12	16.67%	8.79E-01	6.20E+00	1	1.42E-01
2-HEXANONE	14:49	28.57%	1.05E+01	9.90E+01	1	1.06E-01
SILVEX (2,4,5-TP)	5:22	22.73%	2.81E+00	3.00E+01	1	9.36E-02
4-ISOPROPYLTOLUENE	8:15	53.33%	7.19E+00	8.50E+01	1	8.46E-02
DIETHYL PHTHALATE	13:39	33.33%	8.28E+00	1.10E+02	1	7.53E-02
ACENAPHTHENE	5:35	14.29%	4.33E-01	5.80E+00	1	7.47E-02
TETRACHLOROETHENE	23:68	33.82%	3.15E+00	4.50E+01	1	7.00E-02
BENZYL ALCOHOL	2:18	11.11%	5.70E-01	8.60E+00	1	6.63E-02
FLUORENE	4:36	11.11%	1.95E-01	3.00E+00	1	6.50E-02
1,1-DICHLOROETHYLENE	9:65	13.85%	7.14E-01	2.50E+01	1	2.86E-02
2,4-D	7:24	29.17%	4.70E+00	2.20E+02	1	2.14E-02
N-PROPYLBENZENE	4:13	30.77%	1.31E+00	1.28E+02	1	1.03E-02
METHYL-TERT-BUTYL ETHER	10:15	66.67%	1.04E+02	1.11E+04	1	9.43E-03
1,2-DICHLOROETHENE	8:16	50.00%	4.58E+00	5.90E+02	1	7.77E-03
1,4-DIOXANE	3:6	50.00%	1.69E+02	2.20E+04	1	7.67E-03
1,2-DICHLOROETHANE	15:61	24.59%	7.60E-01	1.00E+02	1	7.60E-03
VINYL CHLORIDE	44:84	52.38%	6.33E+00	9.30E+02	1	6.80E-03
ACETONITRILE	3:7	42.86%	5.99E+01	1.20E+04	1	4.99E-03
ISOPHORONE	8:36	22.22%	2.44E+00	9.20E+02	1	2.65E-03
1,2-DICHLOROPROPANE	10:60	16.67%	3.01E-01	3.60E+02	1	8.37E-04
2,4,5-T	4:11	36.36%	5.50E-01	6.86E+02	1	8.02E-04
CHLOROMETHANE	13:67	19.40%	1.80E+00	5.50E+03	1	3.28E-04
1,2-TRANS-DICHLOROETHYLENE	7:61	11.48%	2.00E-02	9.70E+02	1	2.06E-05
ALPHA-BHC	3:30	10.00%	3.50E-05	1.24E+01	1	2.82E-06
ACRYLONITRILE	1:50	2.00%	BDL	6.60E+01	1	BDL
4-NITROPHENOL	1:38	2.63%	BDL	8.00E+01	1	BDL
VINYL ACETATE	2:46	4.35%	BDL	1.60E+01	1	BDL
1,2,4-TRICHLOROBENZENE	3:42	7.14%	BDL	2.40E+01	1	BDL
M-CRESOL (3-METHYLPHENOL)	1:13	7.69%	BDL	6.20E+01	1	BDL
ENDOSULFAN SULFATE	1:27	3.70%	BDL	2.00E-02	1	BDL

Ecological Cumulative Risk Comparison LEACH 2000 MSW Database, 90th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	90th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 90th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
HEPTACHLOR EPOXIDE	2:33	6.06%	BDL	1.90E-03	1	BDL
DI-N-OCTYL PHTHALATE	1:33	3.03%	BDL	2.20E+01	1	BDL
PYRIDINE	1:18	5.56%	BDL	2.38E+03	1	BDL
TRANS-1,3-DICHLORO-1-PROPENE	3:60	5.00%	BDL	5.50E-02	1	BDL
ACROLEIN	2:32	6.25%	BDL	1.90E-01	1	BDL
ANTHRACENE	1:34	2.94%	BDL	1.20E-02	1	BDL
1,1,2,2-TETRACHLOROETHANE	2:59	3.39%	BDL	2.40E+02	1	BDL
BETA-BHC	2:30	6.67%	BDL	4.95E-01	1	BDL
CARBON TETRACHLORIDE	1:64	1.56%	BDL	1.33E+01	1	BDL
PARATHION	1:16	6.25%	BDL	1.30E-02	1	BDL
CHLORDANE	1:34	2.94%	BDL	2.20E-03	1	BDL
4-CHLORO-3-METHYLPHENOL	1:34	2.94%	BDL	3.48E+01	1	BDL
DIMETHYLAMINO AZOBENZENE	1:12	8.33%	BDL	1.55E+00	1	BDL
2-METHYL-4,6-DINITROPHENOL	1:36	2.78%	BDL	2.30E+00	1	BDL
ANILINE	1:11	9.09%	BDL	2.20E+00	1	BDL
4,4'-DDT	3:32	9.38%	BDL	1.10E-05	1	BDL
1,1,2-TRICHLOROETHANE	2:57	3.51%	BDL	5.00E+02	1	BDL
ENDRIN	1:33	3.03%	BDL	2.30E-03	1	BDL
4,4'-DDE	1:30	3.33%	BDL	4.51E-09	1	BDL
HEPTACHLOR	1:33	3.03%	BDL	1.90E-03	1	BDL
BROMOFORM	5:64	7.81%	BDL	2.30E+02	1	BDL
BROMOMETHANE	6:63	9.52%	BDL	1.60E+01	1	BDL
DIELDRIN	1:33	3.03%	BDL	7.10E-05	1	BDL
ACENAPHTHYLENE	2:33	6.06%	BDL	5.80E+00	1	BDL
DIMETHYL PHTHALATE	3:36	8.33%	BDL	3.30E+02	1	BDL
DIBENZOFURAN	1:20	5.00%	BDL	3.70E+00	1	BDL
2-METHYLNAPHTHALENE	1:20	5.00%	BDL	4.70E+00	1	BDL
2-NITROPHENOL	2:38	5.26%	BDL	1.92E+03	1	BDL
PENTACHLOROPHENOL	1:43	2.33%	BDL	5.00E-01	1	BDL
HEXACHLOROBUTADIENE	2:44	4.55%	BDL	5.30E-02	1	BDL

Exhibit 404

Ecological Cumulative Risk Comparison LEACH 2000 MSW Database, 90th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	90th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 90th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
1,3-DICHLOROBENZENE	4:51	7.84%	BDL	3.80E+01	1	BDL
FLUORANTHENE	1:34	2.94%	BDL	4.00E-02	1	BDL
PYRENE	1:33	3.03%	BDL	2.50E-02	1	BDL
1,2,3-TRICHLOROBENZENE	1:19	5.26%	BDL	8.00E+00	1	BDL
ALDRIN	3:32	9.38%	BDL	1.70E-02	1	BDL
DELTA-BHC	1:30	3.33%	BDL	1.41E+02	1	BDL
ENDOSULFAN II	1:23	4.35%	BDL	5.10E-02	1	BDL
N-NITROSODIPHENYLAMINE	2:33	6.06%	BDL	2.10E+02	1	BDL
BENZYL BUTYL PHTHALATE	1:36	2.78%	BDL	1.90E+01	1	BDL
BENZO(B)FLUORANTHENE	1:33	3.03%	BDL	9.07E+00	1	BDL
Sum of Ratios:						8.01E+06

Exhibit 404

Comp. 017462

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ECOLOGICAL CUMULATIVE RISK COMPARISON EPRI CCP DATABASE, 50TH PERCENTILE

Notes on the following Table:

(a) Frequency of Detection. Number of detects: Total number of data points based on site averages (i.e., each MSW landfill represents 1 site).

(b) The CCP leachate database has data for approximately 30 landfills/impoundments. Sample rounds range from 1 to 54 for each site. To ensure that results from no single site dominate the evaluation, site averages were calculated for each constituent at each site. The frequency of detection and the percentiles were calculated based on the site averaged data.

(c) Comparison levels presented on Appendix G.

(d) Ratio of 50^{th} percentile concentration to the comparison level.

BDL - Below Detection Limit - reported where the result is based on a non-detected result

CCP - Coal Combustion Product

µg/l - microgram per liter

Ecological Cumulative Risk Comparison EPRI CCP Database, 50th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	50th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 50th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
BORON	28:30	93.33%	6.35E+03	1.60E+00	1	3.97E+03
AMMONIA	3:3	100.00%	2.73E+03	1.90E+01	1	1.44E+02
SELENIUM	26:27	96.30%	5.38E+01	1.00E+00	1	5.38E+01
CADMIUM	24:28	85.71%	3.45E+00	1.50E-01	1	2.30E+01
AMMONIA, UNIONIZED	2:2	100.00%	4.35E+02	1.90E+01	1	2.29E+01
MOLYBDENUM	29:29	100.00%	1.50E+03	7.30E+01	1	2.05E+01
BARIUM	28:29	96.55%	6.29E+01	4.00E+00	1	1.57E+01
LITHIUM	22:24	91.67%	1.68E+02	1.40E+01	1	1.20E+01
ARSENIC	28:28	100.00%	5.56E+01	5.00E+00	1	1.11E+01
VANADIUM	27:28	96.43%	1.06E+02	1.20E+01	1	8.80E+00
ALUMINUM	25:28	89.29%	2.65E+02	8.70E+01	1	3.05E+00
TIN	1:1	100.00%	1.33E+02	7.30E+01	1	1.83E+00
COPPER	25:29	86.21%	2.27E+00	1.58E+00	1	1.44E+00
STRONTIUM	28:28	100.00%	2.05E+03	1.50E+03	1	1.37E+00
CALCIUM	30:30	100.00%	1.57E+05	1.16E+05	1	1.35E+00
MERCURY	11:14	78.57%	1.74E-03	1.30E-03	1	1.34E+00
URANIUM	18:20	90.00%	2.86E+00	2.60E+00	1	1.10E+00
POTASSIUM	30:30	100.00%	4.45E+04	5.30E+04	1	8.40E-01
FLUORINE	10:10	100.00%	6.28E+02	1.08E+03	1	5.82E-01
MANGANESE	25:30	83.33%	4.42E+01	1.20E+02	1	3.68E-01
NICKEL	25:28	89.29%	6.66E+00	2.89E+01	1	2.30E-01
CHLORIDE	30:30	100.00%	3.71E+04	2.30E+05	1	1.61E-01
SODIUM	30:30	100.00%	9.91E+04	6.80E+05	1	1.46E-01
MAGNESIUM	28:30	93.33%	9.16E+03	8.20E+04	1	1.12E-01
IRON	20:28	71.43%	2.24E+01	3.00E+02	1	7.46E-02
ANTIMONY	21:22	95.45%	1.69E+00	3.00E+01	1	5.62E-02
ZINC	19:30	63.33%	2.58E+00	5.89E+01	1	4.38E-02
METHYL MERCURY	8:9	88.89%	9.89E-05	2.46E-03	1	4.02E-02
DIMETHYL MERCURY	7:9	77.78%	5.51E-05	2.46E-03	1	2.24E-02
CHROMIUM	19:29	65.52%	1.50E+00	7.40E+01	1	2.03E-02

Exhibit 404

Comp. 017464

Ecological Cumulative Risk Comparison EPRI CCP Database, 50th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	50th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 50th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
COBALT	19:24	79.17%	4.59E-01	2.30E+01	1	1.99E-02
THALLIUM	10:22	45.45%	BDL	8.00E-01	1	BDL
BERYLLIUM	1:23	4.35%	BDL	5.30E-01	1	BDL
LEAD	13:27	48.15%	BDL	1.17E+00	1	BDL
SILVER	6:26	23.08%	BDL	1.20E-02	1	BDL
Sum of Ratios:						4.30E+03

Exhibit 404

Comp. 017466

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ECOLOGICAL CUMULATIVE RISK COMPARISON EPRI CCP DATABASE, 90TH PERCENTILE

Notes on the following Table:

(a) Frequency of Detection. Number of detects: Total number of data points based on site averages (i.e., each MSW landfill represents 1 site).

(b) The CCP leachate database has data for approximately 30 landfills/impoundments. Sample rounds range from 1 to 54 for each site. To ensure that results from no single site dominate the evaluation, site averages were calculated for each constituent at each site. The frequency of detection and the percentiles were calculated based on the site averaged data.

(c) Comparison levels presented on Appendix G.

(d) Ratio of 90^{th} percentile concentration to the comparison level.

BDL - Below Detection Limit - reported where the result is based on a non-detected result

CCP - Coal Combustion Product

µg/l - microgram per liter

Ecological Cumulative Risk Comparison EPRI CCP Database, 90th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	90th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 90th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
BORON	28:30	93.33%	6.50E+04	1.60E+00	1	4.07E+04
SELENIUM	26:27	96.30%	2.43E+02	1.00E+00	1	2.43E+02
LITHIUM	22:24	91.67%	2.36E+03	1.40E+01	1	1.69E+02
CADMIUM	24:28	85.71%	2.31E+01	1.50E-01	1	1.54E+02
AMMONIA	3:3	100.00%	2.89E+03	1.90E+01	1	1.52E+02
ALUMINUM	25:28	89.29%	1.25E+04	8.70E+01	1	1.44E+02
MOLYBDENUM	29:29	100.00%	9.65E+03	7.30E+01	1	1.32E+02
ARSENIC	28:28	100.00%	2.79E+02	5.00E+00	1	5.58E+01
VANADIUM	27:28	96.43%	6.06E+02	1.20E+01	1	5.05E+01
BARIUM	28:29	96.55%	1.77E+02	4.00E+00	1	4.42E+01
SILVER	6:26	23.08%	4.61E-01	1.20E-02	1	3.85E+01
AMMONIA, UNIONIZED	2:2	100.00%	6.55E+02	1.90E+01	1	3.45E+01
COPPER	25:29	86.21%	3.31E+01	1.58E+00	1	2.09E+01
MERCURY	11:14	78.57%	1.79E-02	1.30E-03	1	1.38E+01
IRON	20:28	71.43%	3.70E+03	3.00E+02	1	1.23E+01
MANGANESE	25:30	83.33%	1.43E+03	1.20E+02	1	1.19E+01
URANIUM	18:20	90.00%	2.26E+01	2.60E+00	1	8.70E+00
CALCIUM	30:30	100.00%	5.14E+05	1.16E+05	1	4.43E+00
STRONTIUM	28:28	100.00%	6.41E+03	1.50E+03	1	4.27E+00
FLUORINE	10:10	100.00%	4.50E+03	1.08E+03	1	4.16E+00
POTASSIUM	30:30	100.00%	1.39E+05	5.30E+04	1	2.62E+00
TIN	1:1	100.00%	1.33E+02	7.30E+01	1	1.83E+00
THALLIUM	10:22	45.45%	1.33E+00	8.00E-01	1	1.66E+00
SODIUM	30:30	100.00%	1.01E+06	6.80E+05	1	1.48E+00
LEAD	13:27	48.15%	1.49E+00	1.17E+00	1	1.27E+00
NICKEL	25:28	89.29%	3.39E+01	2.89E+01	1	1.17E+00

Exhibit 404

Comp. 017468

Ecological Cumulative Risk Comparison EPRI CCP Database, 90th Percentile

Constituent	Frequency of Detection (a) (b)	% Detected Site Avg	90th Percentile Concentration (ug/l)	Comparison Level (ug/l) (c)	Risk Level Used to Calculate the Comparison Level	Ratio of 90th Percentile Concentration: Comparison Level, Adjusted for Risk Level (d)
CHROMIUM	19:29	65.52%	8.17E+01	7.40E+01	1	1.10E+00
ZINC	19:30	63.33%	6.07E+01	5.89E+01	1	1.03E+00
MAGNESIUM	28:30	93.33%	6.19E+04	8.20E+04	1	7.55E-01
DIMETHYL MERCURY	7:9	77.78%	9.45E-04	2.46E-03	1	3.84E-01
CHLORIDE	30:30	100.00%	8.67E+04	2.30E+05	1	3.77E-01
METHYL MERCURY	8:9	88.89%	9.12E-04	2.46E-03	1	3.71E-01
COBALT	19:24	79.17%	7.70E+00	2.30E+01	1	3.35E-01
ANTIMONY	21:22	95.45%	8.46E+00	3.00E+01	1	2.82E-01
BERYLLIUM	1:23	4.35%	BDL	5.30E-01	1	BDL
Sum of Ratios:						4.20E+04

Exhibit 404

Comp. 017470

Exhibit 404

Comp. 017471

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3420 Hillview Avenue, Palo Alto, California 94304-1338 • PO Box 10412, Palo Alto, California 94303-0813 USA
800.313.3774 • 650.855.2121 • askepri@epri.com • www.epri.com

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Comp. 017472