APPENDIX XI

RISK ASSESSMENT REPORT

FOR

SIEMENS INDUSTRY, INC.

PARKER REACTIVATION FACILITY

PARKER, ARIZONA

Revision 1
April 2012

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Summary of Documents

The risk assessment was performed according to a USEPA-approved Risk Assessment Workplan developed in 2003, updated by agreement with the USEPA to include elements of more recent 2005 USEPA guidance for risk assessments of waste combustion facilities. The USEPA approvals were received prior to the initiation of this study which included evaluations of potential human health and ecological risks associated with both furnace stack air emissions and fugitive air emissions from spent carbon unloading. At USEPA's request, the assessment also included evaluations of potential risks associated with exposure to the facility's effluent discharge to the Colorado River Sewage System Joint Venture (CRSSJV) publicly owned sewage treatment plant and with exposure to airborne chemicals in the workplace at the facility. The risk assessment for this project is presented in two documents. The first document is the *Draft Risk Assessment for the Siemens Water Technologies Corp. Carbon Reactivation Facility in Parker, Arizona* which was submitted to USEPA on July 30, 2007. The second document is the *Response To USEPA Region IX Comments on the Draft Siemens Water Technologies Corp. Carbon Regeneration Facility Risk Assessment* which was submitted to USEPA on March 13, 2008, to respond to comments on the draft risk assessment that were received from the Agency in late 2007.

In conclusion, the risk assessment demonstrates that, using conservative assumptions:

- the potential risks associated with air emissions from the Siemens Water Technologies Corp. carbon reactivation furnace and from spent carbon unloading are below regulatory and other target risk levels for both human health and ecological receptors;

- the incremental contribution of the facility effluent on the CRSSJV wastewater treatment plant discharge and the Main Drain does not pose unacceptable risks to either aquatic life or human health; and

- modeled on-site air concentrations due to fugitive emissions during spent carbon unloading at the facility, and measured worker breathing zone concentrations, do not exceed occupational exposure limits.

EXECUTIVE SUMMARY

SIEMENS WATER TECHNOLOGIES CORP.
CARBON REGENERATION FACILITY RISK ASSESSMENT
PARKER, ARIZONA

Prepared by:
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March 13, 2008

EXECUTIVE SUMMARY
RISK ASSESSMENT FOR THE SIEMENS WATER TECHNOLOGIES CORP. CARBON REACTIVATION FACILITY IN PARKER, ARIZONA

The Siemens Water Technologies Corp. facility (SWT facility) is a carbon reactivation plant located within the 269,000 acre Colorado River Indian Tribes (CRIT) Reservation just outside of the Town of Parker in La Paz County, Arizona. The facility is located in an industrial park established by CRIT on Tribal land and is operated pursuant to a lease between the company and CRIT. The facility reactivates spent carbon which has been previously used to remove pollutants from water and air. The spent carbon is reactivated by heating it to very high temperatures under controlled conditions in a carbon reactivation furnace. The newly reactivated carbon is then reused as an activated carbon product.

A human health and ecological risk assessment of the facility was conducted as part of the facility's permitting activities for the carbon reactivation furnace under the Resource Conservation and Recovery Act permitting regulations at 40 CFR §270.10. A risk assessment is a scientific study that is used to help evaluate risks associated with exposure to chemicals in the environment. This risk assessment represents one of the final steps in a process that has extended over a seven year period beginning with the U.S. Environmental Protection Agency's (USEPA's) request to develop a Risk Assessment Workplan. The risk assessment was conducted by a team of scientists and engineers from independent consulting firms with expertise in risk assessment, toxicology, environmental engineering and air dispersion modeling.

This risk assessment was performed according to a USEPA-approved Risk Assessment Workplan ("Workplan") developed in 2003, updated by agreement with the USEPA to include elements of more recent 2005 USEPA guidance for risk assessments of waste combustion facilities. The USEPA approvals were received prior to the initiation of this study which included evaluations of potential human health and ecological risks associated with both furnace stack air emissions and fugitive air emissions from spent carbon unloading. At USEPA's request, the assessment also included evaluations of potential risks associated with exposure to the facility's effluent discharge to the Colorado River Sewage System Joint Venture (CRSSJV) publicly owned sewage treatment plant and with exposure to airborne chemicals in the workplace at the facility.

The risk assessment for this project is presented in two documents. The first document is the *Draft Risk Assessment for the Siemens Water Technologies Corp. Carbon Reactivation Facility in Parker, Arizona* which was submitted to USEPA on July 30, 2007. The second document is the *Response To USEPA Region IX Comments on the Draft Siemens Water Technologies Corp. Carbon Regeneration Facility Risk Assessment* which was submitted to USEPA on March 13, 2008, to respond to comments on the draft risk assessment that were received from the Agency in late 2007.

The risk assessment used a large amount of site-specific data, including but not limited to:

- comprehensive testing of emissions from the furnace stack, with analysis for site-specific chemicals of potential concern;
- data on spent carbon characteristics, the facility configuration, and facility operations;
- local land use and demographic information;
- water resources data available from the U.S. Geological Survey and the U.S. Bureau of Reclamation; and
- meteorological data from Parker, Arizona.

In the absence of site-specific information, health-protective default values recommended by the USEPA were used. Chemical-specific toxicological data and chemical properties for the compounds selected for evaluation were obtained from the USEPA or from other public health agencies, organizations or databases primarily recommended by the USEPA. In addition, many mathematical models developed by the USEPA and presented in the Agency's guidance documents were applied to perform the risk assessment calculations. Overall, the models and input data used in the risk assessment are expected to provide conservative (i.e., health protective) estimates of potential risks.

Potential risks from stack emissions into the air were evaluated for over 170 compounds selected for detailed assessment based on a comprehensive performance demonstration test (PDT) approved in advance by the USEPA and conducted at the facility by an independent testing firm. The PDT involved several days of stack gas sampling and sophisticated chemical analysis. The list of chemicals selected for evaluation included compounds that were detected in stack emissions and also over 80 compounds that were not detected but were included in the calculations as a conservative measure to ensure that risks would not be underestimated. Stack emission rates for the selected compounds were calculated based on either PDT results, proposed permit limits or, for a few chemicals, long-term average chemical feed rates and a conservative value for the furnace's destruction and removal efficiency. Potential risks from fugitive air emissions were evaluated for 23 compounds selected for evaluation based on their concentrations in spent carbon, the number of deliveries and amounts delivered to the facility, chemical toxicity, and volatility. Air dispersion and deposition modeling was conducted using a model developed and approved by the USEPA to allow calculation of chemical concentrations in air and deposition rates onto the earth's surface within a 154 square mile study area surrounding the facility. The mathematical equations used to calculate the fate and transport of each chemical in the environment, environmental concentrations for each chemical, and human exposures and risks, were based on current USEPA guidance and solved using the Industrial Risk Assessment Program software.

Human Health Risk Assessment

The stack emissions human health risk assessment calculated exposures for several different types of individuals who could hypothetically be exposed to emissions from the plant: adult and child residents, adult and child farmers, adults and children assumed to eat fish caught from the Colorado River or the Main Drain, and a nursing infant. In risk assessment terminology, these groups of individuals are known as "receptors". Each adult or child receptor was assumed to be exposed through a variety of pathways (e.g., the adult farmer receptor was assumed to be exposed via inhalation, soil ingestion, homegrown produce ingestion, and ingestion of home-raised or locally-raised beef, pork, poultry, and eggs). Each adult receptor was also conservatively assumed to be the mother of a breast-fed infant with the potential for transmission of chemicals from the mother through nursing. The fugitive emissions human health risk assessment evaluated inhalation exposures for adult and child residents, and adult and child farmers.

A variety of risk evaluations were performed in the human health risk assessment, as summarized below:

- Chronic long-term excess lifetime cancer risks from stack emissions were lower than USEPA's combustion risk assessment target level of $1x10^{-5}$ (one in 100,000) over a 70-year lifetime when all compounds were included. The excess lifetime cancer risks were reduced to 30 or more times lower than the target risk level when just one compound (that was not detected in the stack gases and has not been received at the facility in spent carbon) was

removed from the analysis. Excess lifetime cancer risks due to inhalation of fugitive emissions were at least 200 times below the USEPA target risk level. When excess lifetime cancer risks from both stack and fugitive emissions are considered together, the cancer risk estimate remains below the USEPA target risk level.

- An analysis of chronic long-term non-cancer effects from exposure to stack and fugitive emissions showed that adverse chronic non-cancer effects would not occur. Calculated exposures were at least five times lower for stack emissions, and 250 times lower for fugitive emissions, than the conservative non-cancer target level of 0.25 used by USEPA for combustion sources.

- An analysis of short-term acute inhalation exposures showed that adverse acute effects would not occur at assessed residential locations and also at maximum impact points beyond the facility boundary as a result of both stack and fugitive emissions.

- The calculated air and soil concentrations for residential receptors were determined to be below conservatively-derived preliminary remediation goals that have been developed by USEPA Region 9.

Ecological Risk Assessment

An ecological risk assessment was also conducted to evaluate potential effects of stack emissions on selected representative ecological receptors within the facility area. The ecological analysis evaluated potential impacts to wildlife that was considered to be at greatest risk based on habitat use, exposure potential, ecological significance, and population status. The habitat types that were considered consisted of creosote bush scrub, agricultural areas, riparian corridors and backwaters, the Colorado River, and the Main Drain. The species selected for evaluation consisted of aquatic life, plants, the badger, Gambel's quail, the great horned owl, the burrowing owl, the southwestern willow flycatcher, the double-crested cormorant, the Yuma clapper rail and mule deer. Potential risks were evaluated by comparing calculated concentrations or exposures to toxicity reference values (TRVs) derived to be protective of these receptor groups. The TRVs were obtained from a variety of sources, including the USEPA, the State of Arizona, ecological databases and the published literature.

The calculated environmental concentrations and exposures to animals and birds were not only below the TRVs but also below the conservative ecological target risk level specified by USEPA Region 9 for this project (i.e., a hazard index value of 0.25). These site-specific results indicate that adverse ecological effects from exposure to stack emissions are not expected to occur for the evaluated receptors. Concentrations in surface water and sediment were found to be more than 800 times lower than the 0.25 target hazard index level. Concentrations in plants ranged from just below the 0.25 target level to more than 400 times lower than the 0.25 target level. Exposures to selected bird species were found to be at least five times lower than the 0.25 target level. Finally, exposures to the evaluated mammal species were determined to be at least 5,000 times below the 0.25 target level.

Wastewater Discharge from the Facility to the Wastewater Treatment Plant

The risk assessment also evaluated the potential incremental impact of the facility's wastewater effluent on chemical concentrations discharged from the publicly owned treatment plant into the Main Drain. The analysis also evaluated potential fish tissue concentrations and associated potential human health fish ingestion risks in the Main Drain downstream of the treatment plant's discharge point. This

evaluation focused on 19 compounds selected based on measurements obtained from the facility's effluent discharge.

This evaluation showed that the incremental contribution of the facility's effluent on the treatment plant discharge and the Main Drain does not pose unacceptable risks to either aquatic life or human health. The modeled discharge concentrations were below or equivalent to the most stringent applicable state water quality standards and criteria and the treatment plant's discharge permit limits for all evaluated compounds. Semi-annual toxicity tests performed on the treatment plant's discharge since 2000 have consistently shown no toxicity to aquatic organisms. Additionally, potential risks due to ingestion of fish caught from the Main Drain associated with the incremental contribution of the SWT facility effluent were all below USEPA target risk levels for both cancer and non-cancer effects.

Evaluation of Fugitive Emissions in the Workplace

The risk assessment included an evaluation of workplace air concentrations associated with spent carbon unloading using methods consistent with those adopted by the U.S. Occupational Safety and Health Administration and the National Institute of Occupational Safety and Health. This analysis compared modeled on-site ambient air concentrations for the 23 selected compounds due to fugitive emissions, and measured industrial hygiene worker breathing zone concentrations, to workplace permissible exposure limits. The workplace evaluation indicated that modeled ambient air concentrations due to fugitive emissions during spent carbon unloading, and measured worker breathing zone concentrations, did not exceed occupational exposure limits within the property boundary.

Conclusion

In conclusion, the risk assessment demonstrates that, using conservative assumptions:

- the potential risks associated with air emissions from the Siemens Water Technologies Corp. carbon reactivation furnace and from spent carbon unloading are below regulatory and other target risk levels for both human health and ecological receptors;

- the incremental contribution of the facility effluent on the CRSSJV wastewater treatment plant discharge and the Main Drain does not pose unacceptable risks to either aquatic life or human health; and

- modeled on-site air concentrations due to fugitive emissions during spent carbon unloading at the facility, and measured worker breathing zone concentrations, do not exceed occupational exposure limits.

DRAFT
RISK ASSESSMENT FOR THE SIEMENS WATER TECHNOLOGIES CORP. CARBON REACTIVATION FACILITY PARKER, ARIZONA

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July 30, 2007

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APPENDICES

LIST OF ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AEGL	Acute exposure guideline level
AIHA	American Industrial Hygiene Council
APC	Air pollution control equipment
AZMET	Arizona Meteorological Network
ATSDR	Agency for Toxic Substances and Disease Registry
CALEPA	California Environmental Protection Agency
CFM	Cubic feet per minute
CRIT	Colorado River Indian Tribes
CRSSJV	Colorado River Sewage System Joint Venture
DRE	Destruction and removal efficiency
E	Exponent in the presentation of numerical results (e.g., 3E-4 = $3x10^{-4}$)
HEAST	USEPA Health Effects Assessment Summary Tables
HHRAP	Human Health Risk Assessment Protocol published in 2005 by USEPA
IH	Industrial hygiene
IRAP	Industrial Risk Assessment Program
IRIS	USEPA Integrated Risk Information System
ISCST3	Industrial Source Complex Short-Term 3 air model
NAAQS	National Ambient Air Quality Standard
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NIOSH	National Institute on Occupational Safety and Health
NPDES	National Pollutant Discharge Elimination System
NWS	National Weather Service
OSHA	Occupational Safety and Health Administration
PCDDs/PCDFs	Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzo furans
PDT	Performance Demonstration Test
PEL	Permissible exposure limit
PM	Particulate matter
PM10	Particulate matter less than 10 microns in diameter
PM2.5	Particulate matter less than 2.5 microns in diameter
POTW	Publicly owned treatment works
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
REL	Acute inhalation reference exposure level
RfC	Inhalation reference concentrations
RfD	Non-cancer reference dose
PRG	Preliminary remediation goals
QA	Quality assurance
SWT	Siemens Water Technologies Corp.
TEF	Toxic equivalency factors
TEQs	Toxic equivalents
2,3,7,8-TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin

LIST OF ABBREVIATIONS (Continued)

2,3,7,8-TCDF	2,3,7,8-Tetrachlorodibenzofuran
TIC	Tentatively identified compound
TOE	Total organic emissions
TWA	Time-weighted-average
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
VOC	Volatile organic compound
WHO	World Health Organization
WQS	Water quality standards

EXECUTIVE SUMMARY

The Siemens Water Technologies Corp. facility (SWT facility) is a carbon reactivation plant located within the 269,000 acre Colorado River Indian Tribes ("CRIT") Reservation just outside of the Town of Parker in La Paz County, Arizona. The facility is located in an industrial park established by CRIT on Tribal land and is operated pursuant to a lease between the company and CRIT. The facility reactivates spent carbon which has been previously used to remove pollutants from water and air. The spent carbon is reactivated by heating it to very high temperatures under controlled conditions in a carbon reactivation furnace. The newly reactivated carbon product is then reused as an activated carbon product.

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The risk assessment used a large amount of site-specific data, including but not limited to:

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- data on spent carbon characteristics, the facility configuration, and facility operations;
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A variety of risk evaluations were performed in the human health risk assessment, as summarized below:

- Chronic long-term excess lifetime cancer risks from stack emissions were found to be at least five times lower than the USEPA's combustion risk assessment target level of $1x10^{-5}$ (one in 100,000) over a 70-year lifetime when all compounds were included. The excess lifetime cancer risks were reduced to 50 or more times lower than the target risk level when just one compound (that was not detected in the stack gases and has not been received at the facility in spent carbon) was removed from the analysis. Excess lifetime cancer risks due to inhalation of fugitive emissions were at least 200 times below the USEPA target risk level. The excess lifetime cancer risks would remain below the USEPA target risk level even if stack and fugitive emissions were considered together.

- Chronic long-term non-cancer effects from exposure to stack and fugitive emissions were predicted not to occur with a large margin of safety. Calculated exposures were at least 25 times lower and 250 times lower, respectively, than the conservative non-cancer target level used by USEPA for combustion sources, which is a hazard index value of 0.25.

- An analysis of short-term acute inhalation exposures showed that adverse acute effects would not occur with a large margin of safety at assessed residential locations and also at maximum impact points beyond the facility boundary.

- The calculated air and soil concentrations for residential receptors were determined to be below conservatively-derived preliminary remediation goals that have been developed by USEPA Region 9.

Ecological Risk Assessment

An ecological risk assessment was also conducted to evaluate potential effects of stack emissions on selected representative ecological receptors within the facility area. The ecological analysis evaluated potential impacts to wildlife that was considered to be at greatest risk based on habitat use, exposure potential, ecological significance, and population status. The habitat types that were considered consisted of creosote bush scrub, agricultural areas, riparian corridors and backwaters, the Colorado River, and the Main Drain. The species selected for evaluation consisted of aquatic life, plants, the badger, Gambel's quail, the great horned owl, the burrowing owl, the southwestern willow flycatcher, the double-crested cormorant, the Yuma clapper rail and mule deer. Potential risks were evaluated by comparing calculated concentrations or exposures to toxicity reference values (TRVs) derived to be protective of these receptor groups. The TRVs were obtained from a variety of sources, including the USEPA, the State of Arizona, ecological databases and the published literature.

The calculated environmental concentrations and exposures to animals and birds were not only below the TRVs but also below the conservative ecological target risk level specified by USEPA Region 9 for this project (i.e., a hazard index value of 0.25). These results indicate that adverse ecological effects from exposure to stack emissions are not expected to occur for the evaluated receptors. Concentrations in surface water and sediment were

found to be more than 800 times lower than the 0.25 target hazard index level. Concentrations in plants ranged from just below the 0.25 target level to more than 400 times lower than the 0.25 target level. Exposures to selected bird species were found to be at least five times lower than the 0.25 target level. Finally, exposures to the evaluated mammal species were determined to be at least 5,000 times below the 0.25 target level.

Wastewater Discharge from the Facility to the Wastewater Treatment Plant

The risk assessment also evaluated the potential incremental impact of the facility's wastewater effluent on chemical concentrations discharged from the publicly owned treatment plant into the Main Drain. The analysis also evaluated potential fish tissue concentrations and associated potential human health fish ingestion risks in the Main Drain downstream of the treatment plant's discharge point. This evaluation focused on 19 compounds selected based on measurements obtained from the facility's effluent discharge.

This evaluation showed that the incremental contribution of the facility's effluent on the treatment plant discharge and the Main Drain does not pose unacceptable risks to either aquatic life or human health. The modeled discharge concentrations were below or equivalent to the most stringent applicable state water quality standards and criteria and the treatment plant's discharge permit limits for all evaluated compounds. Semi-annual toxicity tests performed on the treatment plant's discharge since 2000 have consistently shown no toxicity to aquatic organisms. Additionally, potential risks due to ingestion of fish caught from the Main Drain associated with the incremental contribution of the SWT facility effluent were all below USEPA target risk levels for both cancer and non-cancer effects.

Worker Evaluation of Fugitive Emissions

The risk assessment included an evaluation of workplace air concentrations associated with spent carbon unloading using methods consistent with those adopted by the U.S. Occupational Safety and Health Administration and the National Institute of Occupational Safety and Health. This analysis compared modeled on-site ambient air concentrations for the 21 selected compounds due to fugitive emissions, to workplace permissible exposure limits. The worker evaluation indicated that ambient air concentrations due to fugitive emissions during spent carbon unloading would not exceed occupational exposure limits within the property boundary. These results were supported by many years of industrial hygiene measurements, which have predominantly shown air concentrations of regulated chemicals to be either below quantitation limits or typically 100 or more times below the occupational standards and criteria.

Conclusion

In conclusion, the risk assessment presented in this document demonstrates that, using conservative assumptions, the potential risks associated with air emissions from the Siemens Water Technologies Corp. carbon reactivation furnace and from spent carbon unloading are below regulatory and other target risk levels for both human health and ecological receptors. Additionally, the incremental contribution of the facility effluent on

the wastewater treatment plant discharge and the Main Drain does not pose unacceptable risks to either aquatic life or human health. Finally, fugitive emissions during spent carbon unloading do not exceed occupational exposure limits in ambient air at the facility.

RISK ASSESSMENT

1.0 INTRODUCTION

The Siemens Water Technologies Corp. facility (SWT facility) is a carbon reactivation plant located within the 269,000 acre Colorado River Indian Tribes (CRIT) Reservation in La Paz County, Arizona. The facility, formerly known as Westates Carbon-Arizona, Inc., is located just outside the Town of Parker in an industrial park owned by CRIT and is operated pursuant to a lease between the company and CRIT. The facility reactivates spent carbon, which has been previously used to remove pollutants from water and gases by heating it to very high temperatures under controlled conditions. The newly reactivated carbon product is then reused as an activated carbon product.

Activated carbon is used in treatment equipment to remove impurities from water, air and food. For example, activated carbon is widely used as a component of air pollution control systems (Cooper and Alley 2002). For carbon systems to remain effective, the carbon must be replaced regularly. Once carbon begins to approach its capacity to adsorb or filter impurities, it is recycled. Applications for activated carbon systems include improving the taste and quality of drinking water, treating industrial wastewater, purifying materials used in production processes (including foods and medicines), controlling air emissions, and decontaminating groundwater at environmental cleanup sites.

Spent carbon arrives at the facility in a variety of containers, including barrels, drums, bulk truck units and bulk bags. Spent carbon is accepted from a variety of sources, many of which are Fortune 500 companies as well as state and federal agencies, including the U.S. Environmental Protection Agency (USEPA). On average, as of the date of this study, about two-thirds of the spent carbon received at the facility is not classified as a hazardous waste under the U.S. Resource Conservation and Recovery Act (RCRA). The remaining one-third is classified as a hazardous waste because it has been used to treat materials that are classified as hazardous under RCRA (e.g., air and water at environmental cleanup sites that has been treated with spent carbon).

This document presents a human health and ecological risk assessment for the facility. A risk assessment is a scientific study that can help evaluate risks associated with exposure to chemicals in the environment. This risk assessment was conducted as one component in the facility's RCRA permitting process. It is one of the final steps in a process that has extended over a seven year period beginning with the USEPA's request to develop a Risk Assessment Workplan in 2001.

The risk assessment was conducted by a team of scientists and engineers with expertise in risk assessment, toxicology, environmental engineering and air dispersion modeling. CPF Associates, Inc. began working on this project in 2001, and prepared the Risk Assessment Workplan as well as this risk assessment. CPF is a Washington, D.C.-based scientific and health consulting firm with expertise in performing risk assessments for a variety of different types of waste treatment technologies, including combustion facilities. CPF also provided project management over all contractors and consultants who contributed to the risk assessment. Focus Environmental, Inc. provided the emission rates used in this risk

assessment, and engineering expertise related to facility operations. Focus has provided engineering and environmental services to SWT over the duration of this project, including both managing the Performance Demonstration Test at the facility and preparing the recent RCRA Part B permit application. Focus provides environmental engineering and regulatory compliance services, and has extensive expertise in the engineering and testing of combustion facilities. ToxServices, Inc. assisted with the compilation of human health toxicological criteria and performed quality assurance of risk assessment calculations and inputs. ToxServices is a scientific consulting firm with expertise and experience in providing toxicology, regulatory, and risk assessment consulting services to certification and testing laboratories, private industry, and the federal government. Air dispersion and deposition modeling was performed by TRC. TRC provides environmental permitting, engineering, and compliance testing services for energy-related companies as well as a wide range of industrial clients in the U.S. and internationally, and possesses expertise in the development, application and evaluation of air modeling for a wide variety of emission sources. MACTEC assisted in the performance of the ecological risk assessment. MACTEC is a consulting firm that provides engineering, environmental and remedial construction services to public and private clients worldwide, and possesses in-depth expertise in ecological and habitat evaluations and the performance of ecological risk assessments.

Biographies of the study participants are provided in Appendix A. All of the above study participants are independent of Siemens Water Technologies Corp.

1.1 Project History

In 1990 and 1991, the SWT facility (then known as Westates Carbon-Arizona, Inc.) negotiated a lease agreement with CRIT and obtained the necessary permits to locate the facility in an industrial park on the CRIT Reservation. Before construction began, an environmental assessment was completed and a "Finding of No Significant Impact" was approved by the Bureau of Indian Affairs. The facility's RCRA Part A permit application was submitted in August 1991, in accordance with RCRA requirements. The facility has been operating since August 1992 under a variety of regulatory programs, including the Part A interim status regulations at 40 CFR Part 265 and USEPA regulations under the Clean Air Act's Benzene National Emission Standards for Hazardous Air Pollutants (NESHAPs) (Subpart FF of 40 CFR Part 61). The facility is also subject to regulations issued by the Occupational Safety and Health Administration (OSHA).

A RCRA Part B permit application was originally submitted to USEPA in November 1995 that discussed an existing carbon reactivation furnace (RF-1) and a future carbon reactivation furnace (RF-2). In February 2007, an amended Part B application was submitted to USEPA for RF-2, since the older furnace (RF-1) had been shut down (Focus 2007).

To provide a historical context for this project, a chronology of risk assessment actions and other related events leading up to this report is provided below:

- August 2001: USEPA Region 9 requested that SWT prepare a performance demonstration test (PDT) plan and a risk assessment workplan as part of the process for completing its review of the RCRA facility permit application (USEPA 2001a). The review of this permit application is being conducted in accordance with the requirements for a Miscellaneous Unit under Subpart X of 40 CFR Part 264. In its August letter, USEPA identified a variety of requirements for the risk assessment workplan and the human health and ecological risk assessments.[1]

- November 2001: A site visit to the facility and facility area was conducted by CPF.

- January 2002: Meetings were held with SWT, USEPA, CRIT, CPF and Focus.

- January and April 2002: Additional site visits were conducted.

- April 2002: An open house providing information about the SWT facility, the PDT, and the risk assessment process was held in Parker.

- June 2002: The first version of the Working Draft Risk Assessment Workplan ("Workplan") was submitted to USEPA (CPF 2002).

- March 2003: Comments on the Workplan were received from USEPA (USEPA 2003a).

- May 2003: A revised Workplan was submitted to USEPA incorporating USEPA's comments (CPF 2003a).

- September 2003: Additional comments on the Workplan were received from USEPA (USEPA 2003b).

- November 2003: The Workplan was finalized and submitted to USEPA (CPF 2003b).

- November 2003: The Performance Demonstration Test (PDT) Plan for the carbon reactivation furnace was submitted to USEPA (Focus 2003).

- March 2005: USEPA provided conditional approval of the Workplan and the PDT Plan (USEPA 2005a).

- March 2006: The PDT, which included measurement of stack emissions during facility operations, was conducted at the facility by Focus.

- June 2006: The PDT report was submitted to USEPA (Focus 2006).

[1] Risk assessments conducted for combustion sources to date have rarely included a full-scale ecological risk assessment such as that requested by USEPA for this project.

- February 2007: The facility's revised and updated RCRA Part B permit application was submitted to USEPA (Focus 2007).

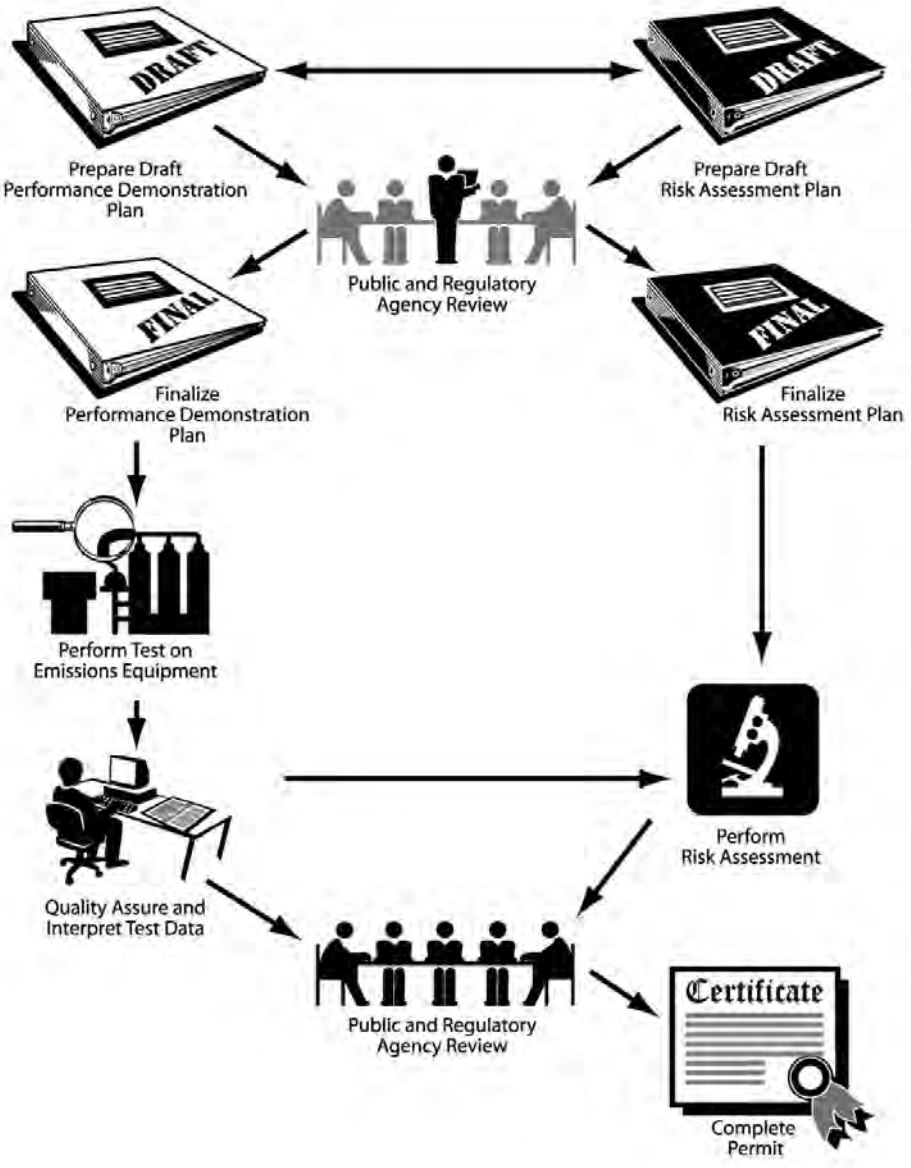
- April 2007: USEPA provided approval to use the PDT air emissions test data in the risk assessment and to perform the risk assessment calculations using the Industrial Risk Assessment Program (IRAP) software (USEPA 2007a).

As suggested in the chronology, the risk assessment and PDT are closely inter-related elements in the RCRA permit process. The relationship between these two activities is shown in Figure 1.

During the preparation of the Workplan, review and input was solicited not only from USEPA Region 9, but also from CRIT and other stakeholders. Many comments were received during this process and were incorporated into the final Workplan. In addition, USEPA conducted public outreach for this project and held consultations with CRIT (USEPA 2005c). For example, in January 2004, USEPA issued a public notice in the Parker Pioneer and mailed a notice to the facility's stakeholder mailing list inviting public comment on the Workplan. As part of this effort, copies of the Workplan were placed in the Parker Public Library and the CRIT Library in Parker (USEPA 2004d).

Figure 1-1

Flow Chart of the Facility RCRA Permit Process for the Performance Demonstration Test and the Risk Assessment



1.2 The Risk Assessment Process

The 2003 Risk Assessment Workplan provided a critical roadmap that was followed during the conduct of this risk assessment. The Workplan described the approaches that would be used to perform the facility risk assessment and it included detailed instructions on a wide variety of risk assessment elements (for example, methods for selecting chemicals for evaluation, performance of air dispersion and deposition modeling, and compilation of toxicological criteria). The Workplan was previously submitted to and approved by USEPA, and can be provided upon request.

In the several years since the Workplan was prepared, there have been some changes to USEPA risk assessment guidance and methods, most notably USEPA's publication in 2005 of a revised Human Health Risk Assessment Protocol (HHRAP) for Hazardous Waste Combustion Facilities. This guidance incorporates many important updates to USEPA's methods, particularly revisions to the fate and transport modeling equations and chemical-specific input parameters. To reflect this newer information, the risk assessment relied to a large extent on the more recent 2005 HHRAP. To facilitate consistency with the 2005 guidance, and as approved in advance by USEPA (2007a), a publicly available software program called IRAP, programmed by Lakes Environmental specifically to reflect USEPA's 2005 HHRAP, was used to perform most of the risk assessment calculations. This software has been widely used in the U.S. (e.g., most USEPA Regions and several states) and among its benefits are reliance on quality-assured programmed calculations, readily available USEPA-specified chemical-specific data, and the ability to address the large number of compounds required to be evaluated in this project. The IRAP program only includes the approaches specifically provided in HHRAP, however, and thus it is limited in its ability to address non-routine risk assessment elements. As a result, while the Workplan provided the primary roadmap for this project, in some cases modifications were made both to reflect HHRAP and to accommodate the capabilities of the IRAP program. This approach was approved for this project in advance by USEPA (2007a).

The Workplan also described a process for requesting site-specific information from CRIT for consideration in the risk assessment. SWT followed this procedure as required. Where information was not received or not available, this project relied on site-specific information available at the time the risk assessment was performed (e.g., information from published reports, publicly accessible information on the internet, contacts with local officials and site visits).

Overall, this risk assessment analyzed specific sets of assumptions that are, collectively, expected to overestimate potential risks. The risk assessment, therefore, calculates the potential for risks to occur under specific assumptions and does not calculate actual human health or ecological impacts.

1.3 Report Organization

The remainder of this document presents the risk assessment of the facility. The following topics are covered:

- A brief introduction to the facility area
- An overview of the risk assessment process
- Presentation of the human health risk assessment
- Presentation of the ecological risk assessment
- A brief summary of quality assurance procedures
- A listing of references cited in this document
- Appendices with supporting information

2.0 FACILITY AND AREA DESCRIPTION

The Workplan provided a detailed discussion of both the facility vicinity and facility operations. Additionally, the RCRA Part B permit application (Focus 2007) provides a comprehensive discussion of the facility including, for example, equipment and operations, and health and safety procedures. Rather than repeat this information here, the reader is referred to the Workplan and the RCRA Part B application which can be provided upon request. For general reference, a few of the figures from the Workplan are shown below, specifically Figure 2-1 which shows the facility location, Figure 2-2 which presents a map of the CRIT Reservation, Figure 2-3 which presents photographs of the facility area and surrounding landscape, Figure 2-4 which is an aerial photograph of the facility, and Figure 2-5 which illustrates a habitat map for the facility area.

Figure 2-1
Facility Location

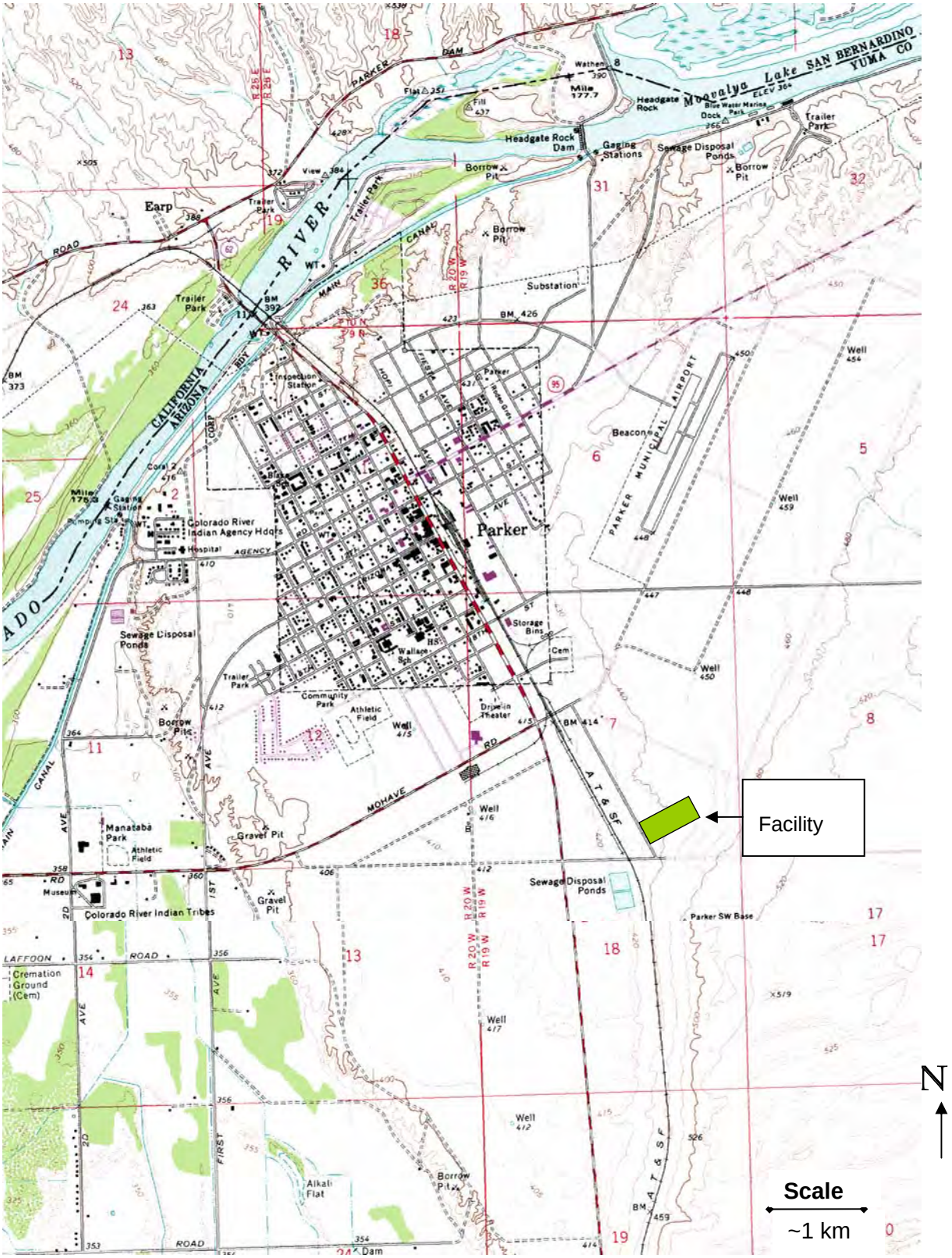


Figure 2-2

Colorado River Indian Tribes Reservation Map

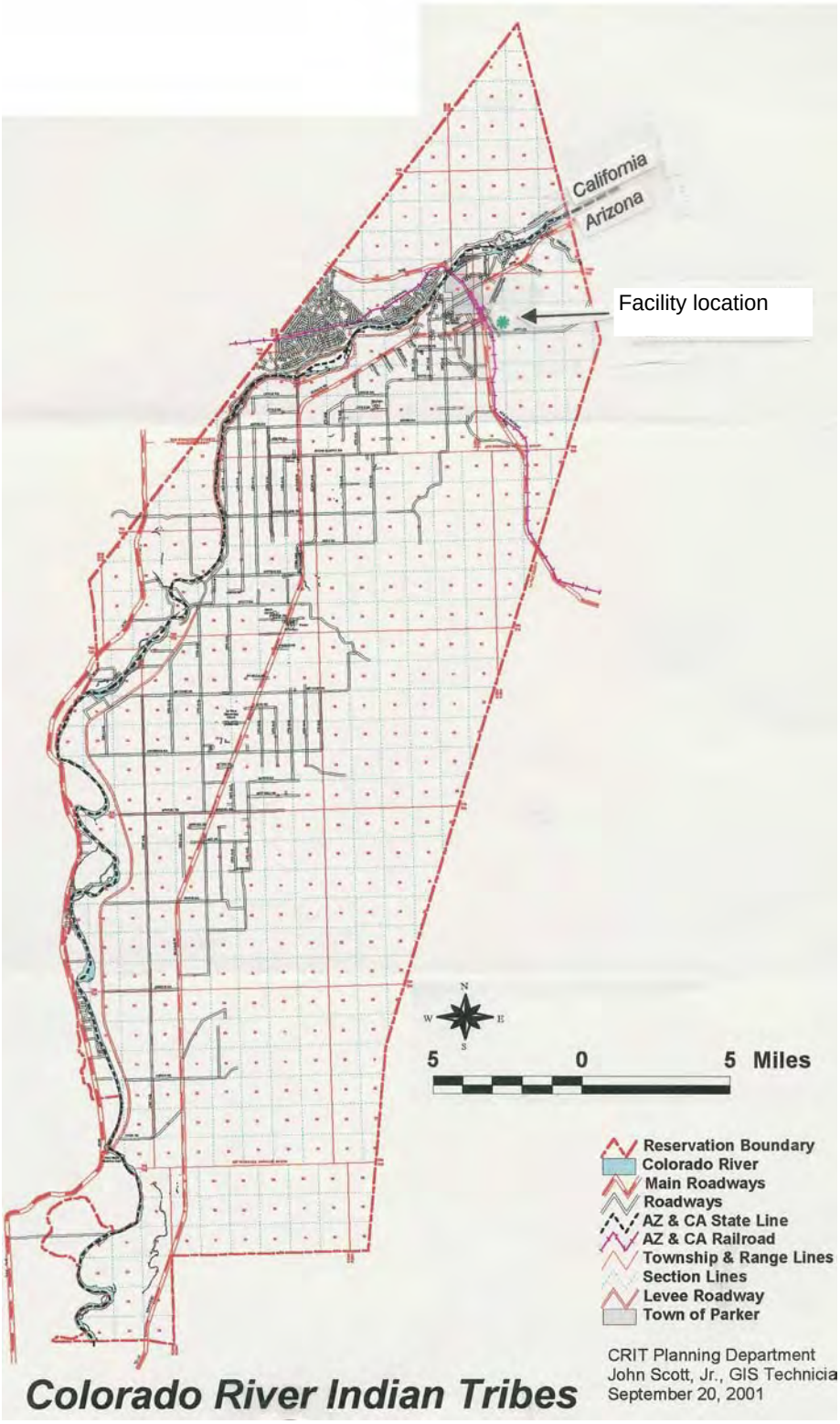
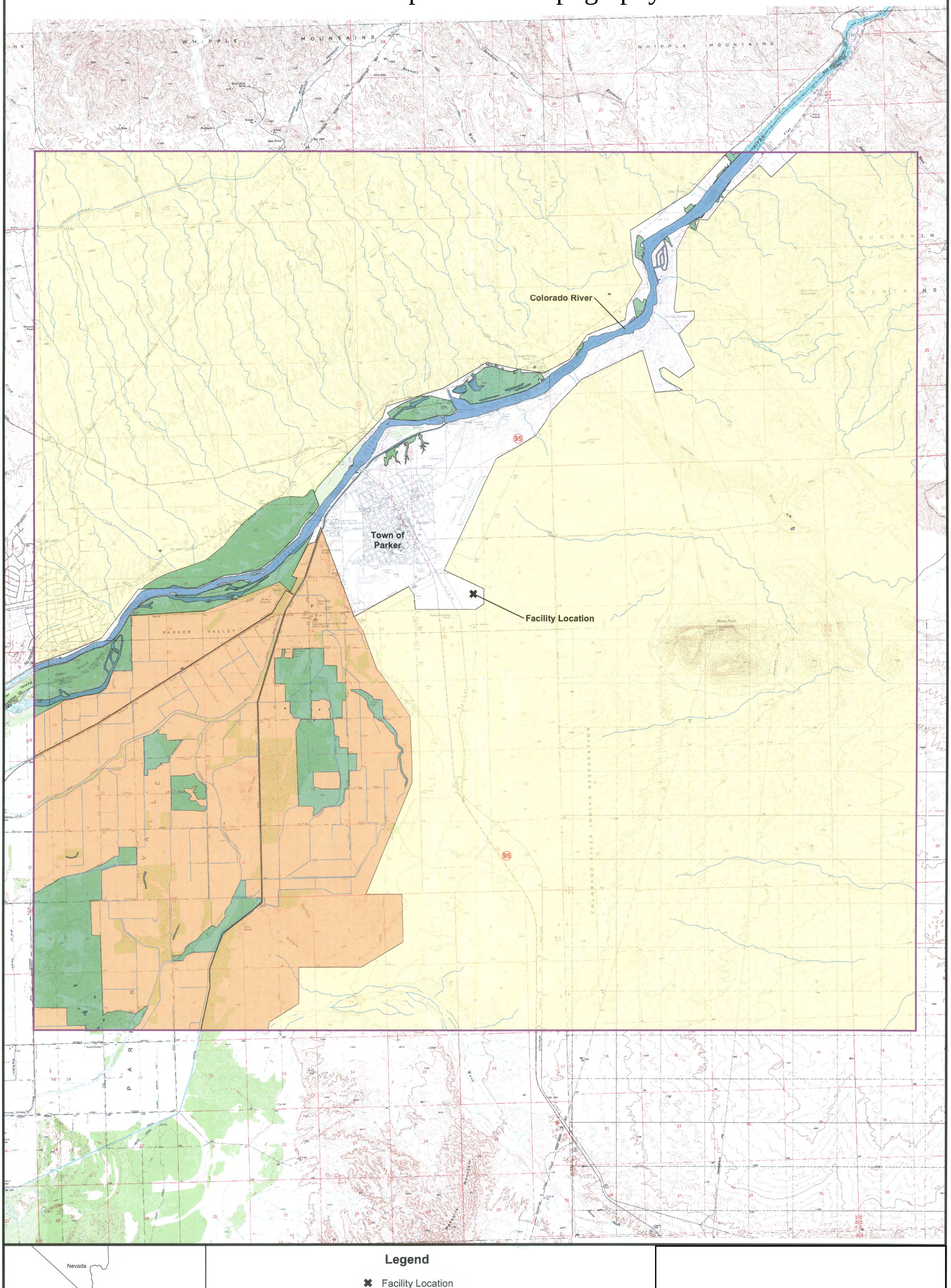


Figure 2-3
Landscape in the Facility Area

Figure 2-4
Aerial View of the Facility

Figure 2-5
Habitat Map - USGS Topography



3.0 RISK ASSESSMENT OVERVIEW

This remainder of this report summarizes the methods used to conduct the human health and ecological risk assessment, and presents the risk assessment results. As noted in the Workplan, the human health and ecological portions of the risk assessment share some common elements. These common elements are chemical emission rates, air dispersion and deposition modeling and fate and transport modeling used to calculate exposure concentrations in environmental media such as soil, plants and surface water. Elements that are unique to each analysis include the inputs and methods used to calculate exposures and chemical-specific toxicity criteria.

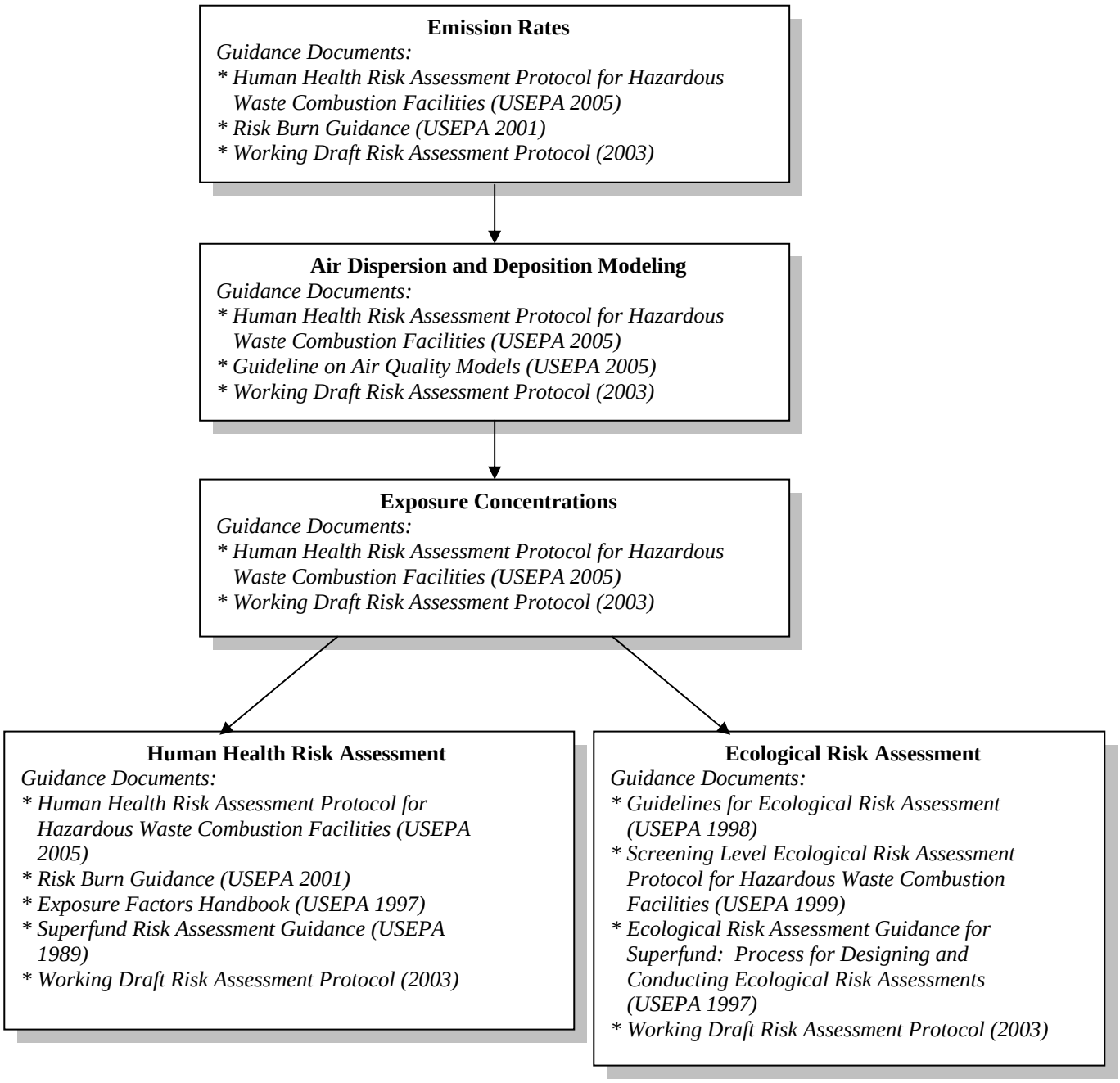
The human health and ecological portions of the risk assessment relied on a variety of regulatory guidance documents in addition to the methods described in the Workplan, as shown in Figure 3-1. In addition to relying on these guidance documents, the risk assessment used a large amount of site-specific data, including but not limited to:

- comprehensive testing of emissions from the furnace stack, with analysis for site-specific chemicals of potential concern
- data on spent carbon characteristics, the facility configuration, and facility operations
- local land use and demographic information
- water resources data available from the U.S. Geological Survey and the U.S. Bureau of Reclamation
- meteorological data from Parker, Arizona.

The basis for each site-specific value used in the analysis is provided in this report. In the absence of site-specific information, health-protective default values recommended by the USEPA were used.

Figure 3-1

Overview of Risk Assessment Process and Guidance Documents



4.0 HUMAN HEALTH RISK ASSESSMENT

This section presents the human health risk assessment for the carbon reactivation facility. The key steps in this assessment, consistent with USEPA guidance and the U.S. National Academy of Sciences, consist of:

- Hazard Identification
- Exposure Assessment
- Risk Characterization
- Discussion of Uncertainties

Figure 4-1 provides a flow chart of the human health risk assessment process for stack and fugitive emissions, each step of which is described below. It should be noted that all of the algorithms used to calculate environmental concentrations, exposures and potential risks associated with stack and fugitive air emissions beyond the property boundary were based entirely on HHRAP, and implemented using the IRAP software. In addition, separate discussions are provided below to address several issues identified for supplemental consideration by USEPA Region 9 or raised by the community during the Workplan development stage of this project, specifically evaluation of potential risks from exposure to airborne chemicals in the workplace from fugitive emissions and evaluation of the potential contribution of the facility's effluent on discharges from the Colorado River Sewage System Joint Venture (CRSSJV) sewage treatment plant.

4.1 Hazard Identification

The Hazard Identification presents the selection of chemicals for evaluation as well as the toxicity data for each selected chemical. This section focuses on the selection of compounds for the stack emissions risk assessment. Selection of compounds for the fugitive emissions analysis is presented later in this report (Section 4.3.2).

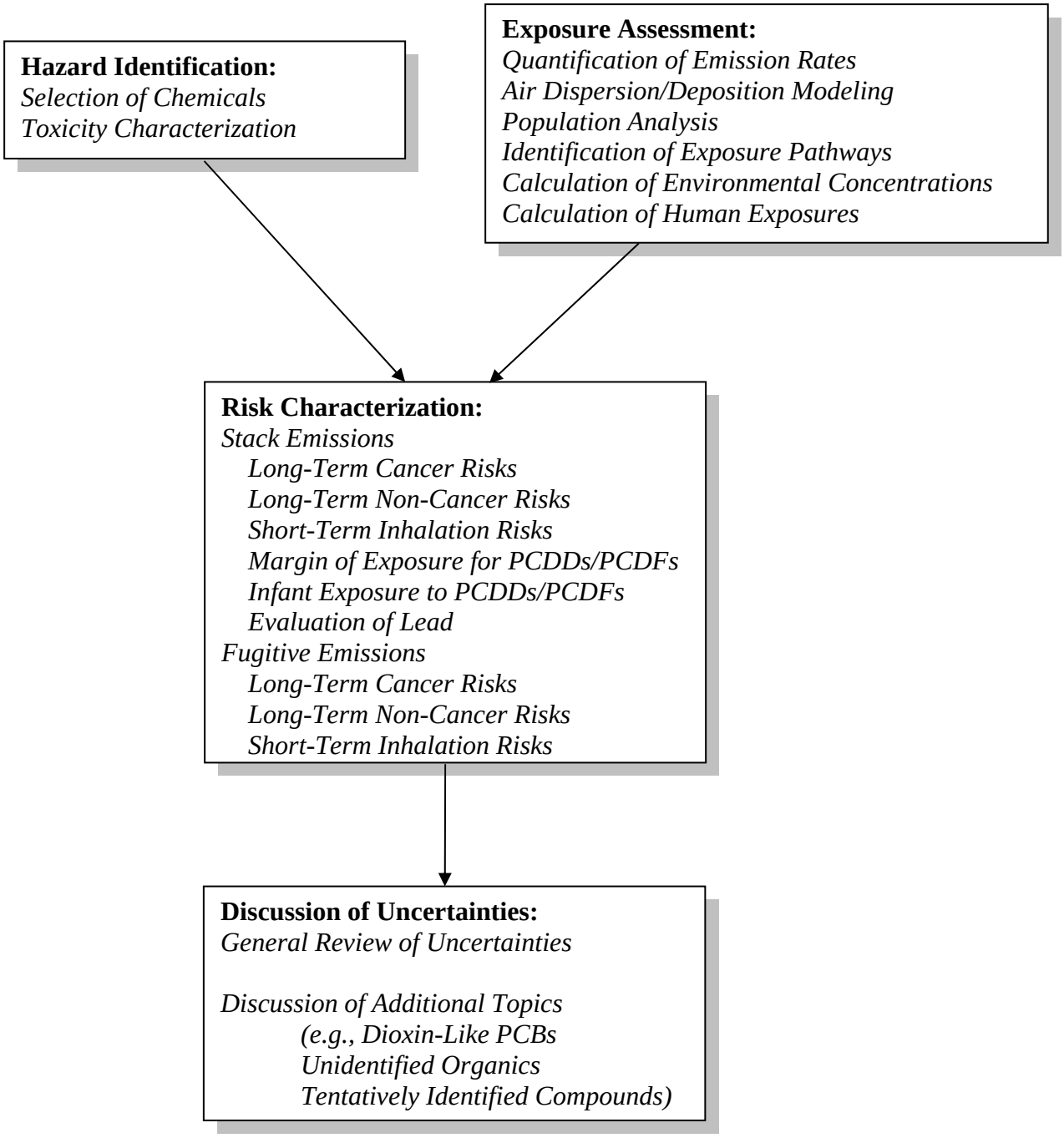
4.1.1 Selection of Chemicals of Potential Concern for Stack Emissions

The approach for selecting chemicals of potential concern (COPC) for quantitative evaluation in the human health risk assessment of stack air emissions was outlined in the Workplan. This approach specified that chemicals would be selected based on a variety of factors:

- Compounds would be selected from the list of constituents analyzed for during the PDT. As requested by USEPA, compounds analyzed for but not detected in the PDT were included in the evaluation, in addition to detected compounds. The PDT was approved in advance by the USEPA and conducted in March 2006 by an independent testing firm. It included comprehensive testing of the facility for site-specific chemicals of potential concern under operating conditions intended to overestimate emissions. The results of the PDT are presented in a comprehensive report prepared by Focus (2006).

Figure 4-1

Flow Chart of the Human Health Risk Assessment Process for the Carbon Reactivation Facility



- Tentatively identified compounds (TICs) in the PDT results would be considered for inclusion as chemicals for detailed evaluation.[2]

- Compounds that could potentially be present in spent carbon, even if they were not analyzed for during the PDT, would be considered for evaluation. A list of compounds that could be in spent carbon was compiled in the Workplan.

Application of this selection approach resulted in the identification of over 225 compounds for detailed evaluation in the human health risk assessment, including more than 100 compounds that were not detected in the PDT and also all detected TICs. Table 4.1-1 summarizes the list of selected compounds and indicates the basis for each compound's inclusion in the risk assessment.

4.1.2 Toxicity Characterization

The toxicity characterization followed the methods laid out in the Workplan, as described below.

4.1.2.1 Chronic Health Effects Criteria

The toxicity data used to evaluate chronic, long-term risks includes oral cancer slope factors and inhalation unit risk factors for predicting excess lifetime cancer risks and oral reference doses (RfDs) and inhalation reference concentrations (RfCs) for predicting the potential for long-term non-cancer effects. These toxicity data were compiled for each selected compound either directly from HHRAP's chemical-specific database (which is included in the IRAP software) or from the toxicity data sources recommended by HHRAP. Appendix B presents the chronic toxicity data compiled for compounds not already addressed in HHRAP that were used in the calculation of potential risks. Of the more than 200 compounds selected for evaluation, chronic toxicological criteria were not available from USEPA's recommended sources for 49 compounds. These compounds are discussed in the uncertainty section of this risk assessment.

As noted in the Workplan and HHRAP, mixtures of PCDDs/PCDFs were evaluated using toxic equivalency factors (TEFs) which relate the toxicity of each 2,3,7,8-congener to the toxicity of 2,3,7,8-TCDD, the most well-studied and most toxic congener among the PCDDs/PCDFs.[3] In this system, the TEF for 2,3,7,8-TCDD is 1.0 and the other congeners have TEF values ranging from 1.0 to 0.00001. For example, the TEF for 2,3,7,8-TCDF is 0.1, which means that the potential toxicity of 2,3,7,8-TCDF is considered to be 10 times

[2] A TIC is a compound that is not specifically targeted for an analysis but which is detected. This means that while it can be seen in a laboratory analysis, its identity and concentration cannot be determined with certainty without further analytical investigation.

[3] Polychlorinated dioxins and furans are a class of chemicals known as polychlorinated dibenzodioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), sometimes referred to as dioxins and furans. There are 75 PCDDs and 135 PCDFs, with each individual compound referred to as a congener. Only 7 of the 75 PCDD congeners and 10 of the 135 PCDFs are considered to be toxic; these are compounds with chlorine molecule substitutions at the 2, 3, 7, and 8 positions on the compound. In this document, the mixture of polychlorinated dioxins and furans are referred to as "PCDDs/PCDFs".

lower than that for 2,3,7,8-TCDD. To apply the TEF concept, the TEF of each congener present in a mixture is multiplied by its respective concentration or exposure and the products are summed to obtain the total TCDD toxic equivalents (TEQs) of the mixture. The TEFs are incorporated into the IRAP software consistent with USEPA (2005b) specifications.

4.1.2.2 Acute Health Effects Criteria

In addition to long-term toxicity data, the potential for short-term acute effects from stack emissions to air were evaluated using acute reference air concentrations. These concentrations, representing the short-term level in air above which adverse effects may occur, are provided in HHRAP and programmed into the IRAP software for many compounds. For compounds not addressed in HHRAP, acute reference air concentrations were derived from the published literature following HHRAP guidance. Appendix B presents the acute inhalation toxicity data compiled for compounds not already addressed in HHRAP. Among the more than 200 compounds selected for consideration in this study, 17 did not have acute inhalation toxicity criteria. Compounds without human health toxicity criteria are discussed in the uncertainty section of this study.

4.2 Stack Emissions Exposure Assessment

The next major step in the risk assessment is the stack emissions exposure assessment, which consists of the following elements:

- Quantification of stack air emissions
- Air dispersion and deposition modeling
- Population analysis
- Identification of exposure pathways
- Evaluation of environmental concentrations
- Calculation of human exposures

These elements of the exposure assessment were discussed in the Workplan and are described below.

4.2.1 Stack Emission Rates

4.2.1.1 Long-Term Emission Rates

One of the most important inputs to a combustion source exposure assessment is the chemical emission rate. Emission rates should reflect releases associated with actual facility operations, however, in this risk assessment assumptions were made that were designed to be more conservative than actual facility operating conditions. These assumptions included using PDT test results, which were measured under operating conditions intended to overestimate actual facility emissions, using proposed permit limits for compounds which had lower measured levels from the PDT, and including many compounds that were not detected in the PDT. As a result, the emission rates used in this assessment are expected to overestimate potential risks as compared to actual facility emissions.

The stack emission rates were calculated by Focus and are listed in Table 4.2-1 along with an indication of the basis for each value. In general, as noted above, emission rates were based on either the PDT results, proposed permit limits or, for a few chemicals that could be present in spent carbon but were not measured during the PDT, long-term average chemical feed rates and a conservative destruction and removal efficiency (DRE) of 99.99%.[4] Emission rates derived from the PDT measurements were calculated as described in the Workplan, based on the arithmetic average of results across the three test runs and using one-half the detection limit for non-detect results, consistent with standard risk assessment practice. Emission rates for the combustion gases sulfur dioxide and nitrogen dioxide were based on results from a miniburn test conducted in April 2005 since these were not measured during the PDT. Appendix C presents the detailed PDT test results used by Focus to calculate emission rates for this risk assessment.

Emission rates for mercury were identified in the PDT for three forms of mercury - particulate phase divalent mercury, vapor phase divalent mercury and vapor phase elemental mercury - as required for the USEPA (2005b) risk calculations. The speciation of mercury was determined by analyzing the separate components of the mercury sampling train. As recommended in USEPA (2001c), it was assumed that the particulate matter and front half rinse results represented divalent particulate mercury, the acidified impinger solution result represented divalent vapor phase mercury, and the potassium permanganate solution result represented elemental vapor mercury. The PDT results indicated a mercury breakdown for the stack emissions as 0.5% particulate phase divalent mercury, 19.8% vapor phase divalent mercury and 79.7% vapor phase elemental mercury.

4.2.1.2 Upset Scaling Factors

As discussed in the Workplan, consistent with USEPA (2005b) guidance, upset conditions were considered in this risk assessment. This was to be accomplished by adjusting the stack emission rates upwards by an upset scaling factor according to the equation below:

$$ER_{RA} = ER_{SE} * USF \qquad \text{(Equation 4-1)}$$

where

ER_{RA} = emission rate for input to risk assessment (g/sec),
ER_{SE} = emission rate based on stack emissions (g/sec), and
USF = upset scaling factor (unitless).

A scaling factor was developed using data provided by SWT for the carbon reactivation facility. SWT identified upset conditions that have the potential to affect stack emission rates, and compiled data on historical upsets at the facility that occurred for these conditions during 2001 and 2002. Based on the upset data, which are summarized in Table 4.2-2, the scaling factor was calculated according to HHRAP methods to be 1.02. The HHRAP method for deriving the scaling factor assumes that emissions increase by a factor of 10 for the

[4] The DREs measured in the PDT averaged more than 99.997% (Focus 2006).

percentage of operating time under upset conditions. The factor of 10 was based on a default approach for nonhazardous waste incinerators presented by the California Air Resources Board (1990) in which emissions were assumed to increase by a factor of 10 during upsets. The 1.02 scaling factor calculated for this project has a negligible numerical impact on the long-term stack emission rates, and thus the emission rates already shown in Table 4.2-1 were used, without adjustment according to Equation 4-1, to characterize long-term stack emissions.

As noted in the Workplan, the upset scaling factor does not reflect startup or shutdown conditions for the reactivation furnace stack because, under these conditions, emissions associated with spent carbon will not occur. During startup, there is no spent carbon in the reactivation furnace. Startup procedures involve increasing the temperature of the reactivation furnace and afterburner over a period of roughly 33 hours using natural gas only. Spent carbon is not introduced into the multiple hearth furnace until temperatures have reached their required levels. As a result, upset emissions associated with spent carbon do not occur during start up conditions. Shut down procedures involve shutting off spent carbon feed to the furnace and waiting until all spent carbon has been cleared from all hearths before starting to cool down the furnace. The amount of time needed to clear the furnace hearths of spent carbon is approximately 42 minutes. After all spent carbon is cleared from the furnace, temperatures in the furnace are slowly lowered to ambient temperature over a period of roughly 32 hours. Since the required high temperatures are maintained in the furnace, and the air pollution control equipment is continuously operated until all spent carbon is cleared, upset emissions associated with spent carbon do not occur during normal shut down conditions.

4.2.1.3 Short-Term Emission Rates

In addition to long-term emission rates, short-term emission rates were also considered in the acute inhalation risk analysis. The short-term emission rates were intended to reflect a one-hour period of time rather than a long-term, multi-year time period. Two sets of short-term emission rates were evaluated, one assuming no upset condition occurs during the one-hour period evaluated, and the other assuming an upset does occur during that one hour. The set of emission rates shown in Table 4.2-1 were used to calculate inhalation risks for the non-upset acute analysis. The risks associated with the upset condition were then calculated by increasing the acute results for the non-upset condition by a factor of 10, which assumes that an upset occurs for the entire 1-hour period evaluated.

4.2.2 Air Dispersion and Deposition Modeling

Air dispersion and deposition modeling is required in order to calculate chemical concentrations and ultimately human exposures from stack emissions. This modeling was performed according to a protocol included in the Workplan. The air dispersion model used was the most recent version of the Industrial Source Complex Short-Term model available from the USEPA (ISCST3, Version 02035). This model was developed and approved by USEPA. The remainder of this section summarizes the modeling performed using ISCST3 for this project. Appendix D describes the modeling work in greater detail.

The general application of modeling results in the risk assessment is outlined in Table 4.2-3 and, as described in the Workplan, was organized as follows:

- Long-term chronic risks were calculated using annual average modeling results. Annual average ambient air concentrations and annual average deposition rates were used to calculate concentrations in a variety of environmental media relevant to the risk assessment, with calculations performed using the IRAP software which incorporates USEPA (2005b) methods.

- Short-term acute inhalation risks were calculated using 1-hour average modeling results, also using the IRAP software.

Facility and meteorological input data used in the modeling are described in Appendix D. Facility-specific inputs were based on actual operating data (e.g., stack height, exhaust gas temperature, exhaust gas exit velocity) while meteorological inputs were based on surface air data collected by the Arizona Meteorological Network (AZMET) in Parker and upper air data (e.g., mixing heights) obtained from measurements collected at the National Weather Service (NWS) station at Flagstaff Pulliam Airport.

Both dry and wet deposition are important components in the facility's risk assessment. The risk assessment therefore considered four possible sources of deposition, consistent with USEPA (2005b) guidance:

- Dry deposition of particles,
- Wet deposition of particles,
- Dry deposition of gases, and
- Wet deposition of gases.

Wet and dry deposition modeling of particles requires information on the size distribution of emitted particles from the stack. The particle size distribution was based on test data collected from the facility stack during the PDT (see Appendix D). Consistent with USEPA (2005b) guidance, the particle size distribution was treated in two different ways in the ISCST3 model. A mass-weighted particle size distribution was used to represent emissions of metals (except mercury) that would form particles in the reactivation unit combustion area. A surface area-weighted size distribution was used to reflect organic compounds and mercury that most likely exit the combustion area as gases and then adsorb onto the surface of already-formed particles.

As outlined in USEPA (2005b) guidance, the ISCST3 model runs provided nine different types of outputs that were used in the risk calculations, as follows:

- Ambient air concentrations of mass-weighted particles
- Ambient air concentrations of surface area-weighted particles
- Ambient air concentrations of gases
- Dry deposition of mass-weighted particles

- Dry deposition of surface area-weighted particles
- Wet deposition of mass-weighted particles
- Wet deposition of surface area-weighted particles
- Dry deposition of gases
- Wet deposition of gases

These air and deposition modeling results were calculated across the modeling domain study area indicated in the Workplan, a 20 km-by-20 km square study area (154 square miles) with the facility stack at its center (see Figure 4-2). Modeling results were calculated at each of more than 4,000 receptor grid points beyond the facility property boundary within the modeling domain. A fine receptor grid was used with grid points evenly spaced at 100 m (328 foot) intervals out to 3 km from the facility. A coarse grid was used from 3 km to 10 km, with points evenly spaced at 500 m (1,600 foot) intervals. A description of the receptor grids is also provided in Appendix D.

The air dispersion and deposition modeling was performed using a unitized (1 g/sec) emission rate. The model outputs are thus referred to as "unitized" values, expressed in units of $\mu g/m^3$ per 1 g/sec for air concentrations and g/m^2-year per 1 g/sec for deposition rates. Chemical-specific concentrations and deposition rates may be obtained by multiplying the unitized results by the chemical-specific emission rates, a standard risk assessment step that occurs in the IRAP software.

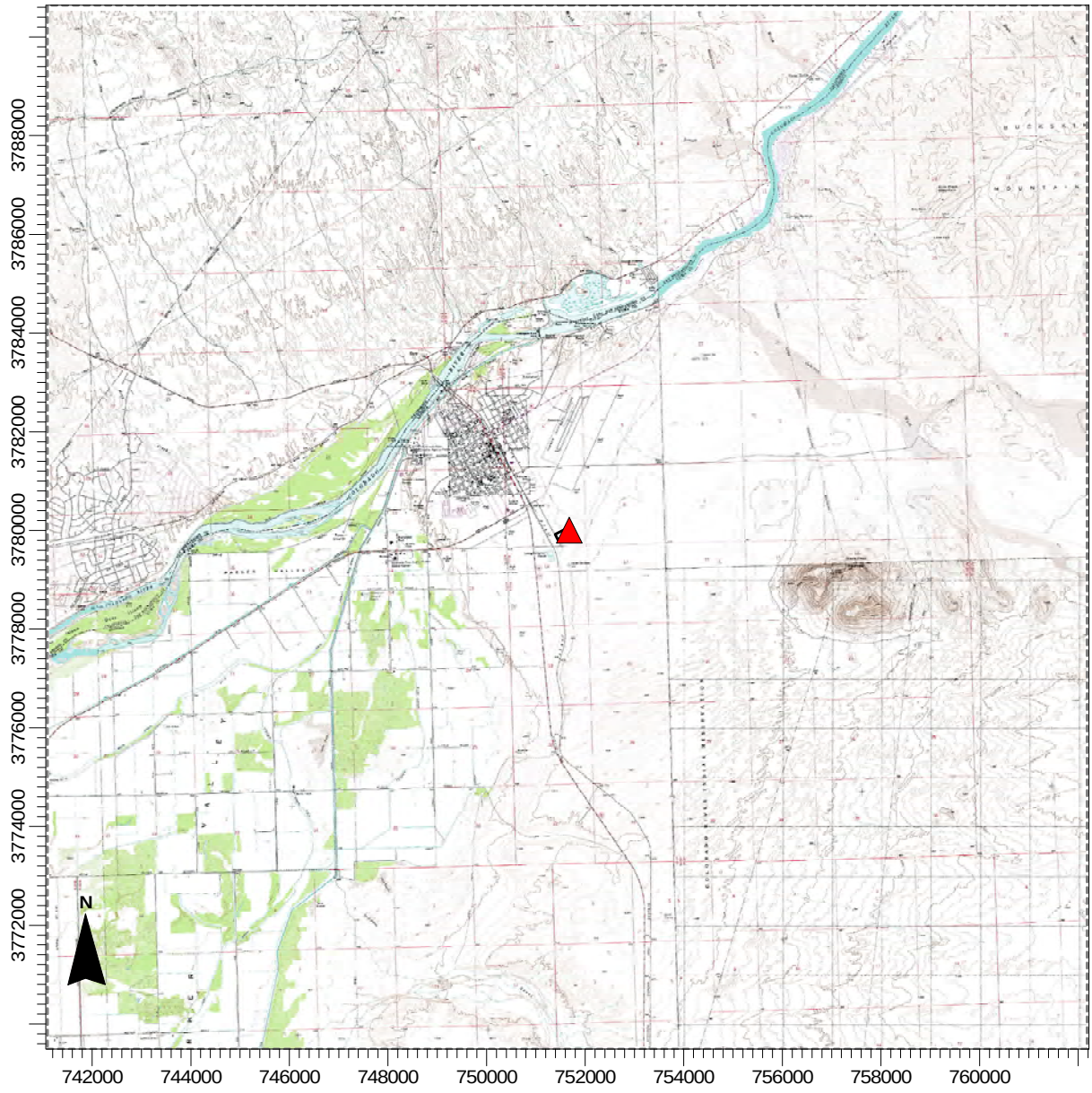
The annual average unitized modeling results for this project are illustrated in several isopleth[5] figures provided in Appendix E, with one figure for each of the different types of air concentrations and for each of the different dry deposition model outputs (i.e., vapor, particle mass weighted, and particle surface area weighted). An evaluation of the unitized modeling results showed that roughly 99% of the total wet plus dry deposition at any given receptor point was due to dry deposition, which is not surprising in an area that receives less than 6 inches of rain per year. Isopleths of unitized wet deposition rates were, therefore, not prepared, not only because of the negligible contribution of wet deposition to the total deposition rates, but also because the unitized wet deposition rates were too small to be plotted using the IRAP software.

Several specific receptor locations were identified for evaluation in the risk assessment by examining the unitized modeling results across specified types of land use areas. For example, annual average air concentrations and deposition rates were used to evaluate long-term chronic risks for residential assessment locations. Accordingly, the annual average unitized modeling results within areas currently used for residential assessment purposes within the Town of Parker and within the CRIT Reservation area with access to irrigation water were examined, and the maximum annual average impact locations in both areas were selected for detailed evaluation. One-hour average air concentrations were used to evaluate short-term acute inhalation risks in residential areas, at locations used for other purposes (e.g., commercial), and also undeveloped areas. Thus, the 1-hour average unitized modeling results were also examined to identify maximum impact locations within residential areas of

[5] An isopleth is a line that connects points of equal amounts of a quantity, such as an air concentration or a deposition rate.

Figure 4-2

Siemens Water Technologies Corp. Carbon Reactivation Facility, Parker, Arizona
Risk Assessment Study Area



Note: The x and y axes display UTM coordinates (universal tranverse mercatur grid system coordinates) in meters.

SCALE: 1:129,086

0 4 km

IRAP-h View - Lakes Environmental Software

the Town of Parker and the CRIT Reservation area with access to irrigation water, at locations used for non-residential purposes, and at the maximum impact point beyond the property boundary. Table 4.2-4 lists all of the receptor point locations selected for evaluation for both the chronic and acute stack emissions risk assessment. Figure 4-3 shows these locations overlain on a topographical map of the area.

4.2.3 Population Analysis

The next step in the exposure assessment involved identifying populations in the facility area through demographic and land use data, and information on population activity patterns. Local information was obtained for this project through site visits, contacts with local officials, published reports, and publicly available local descriptive information on the internet.[6]

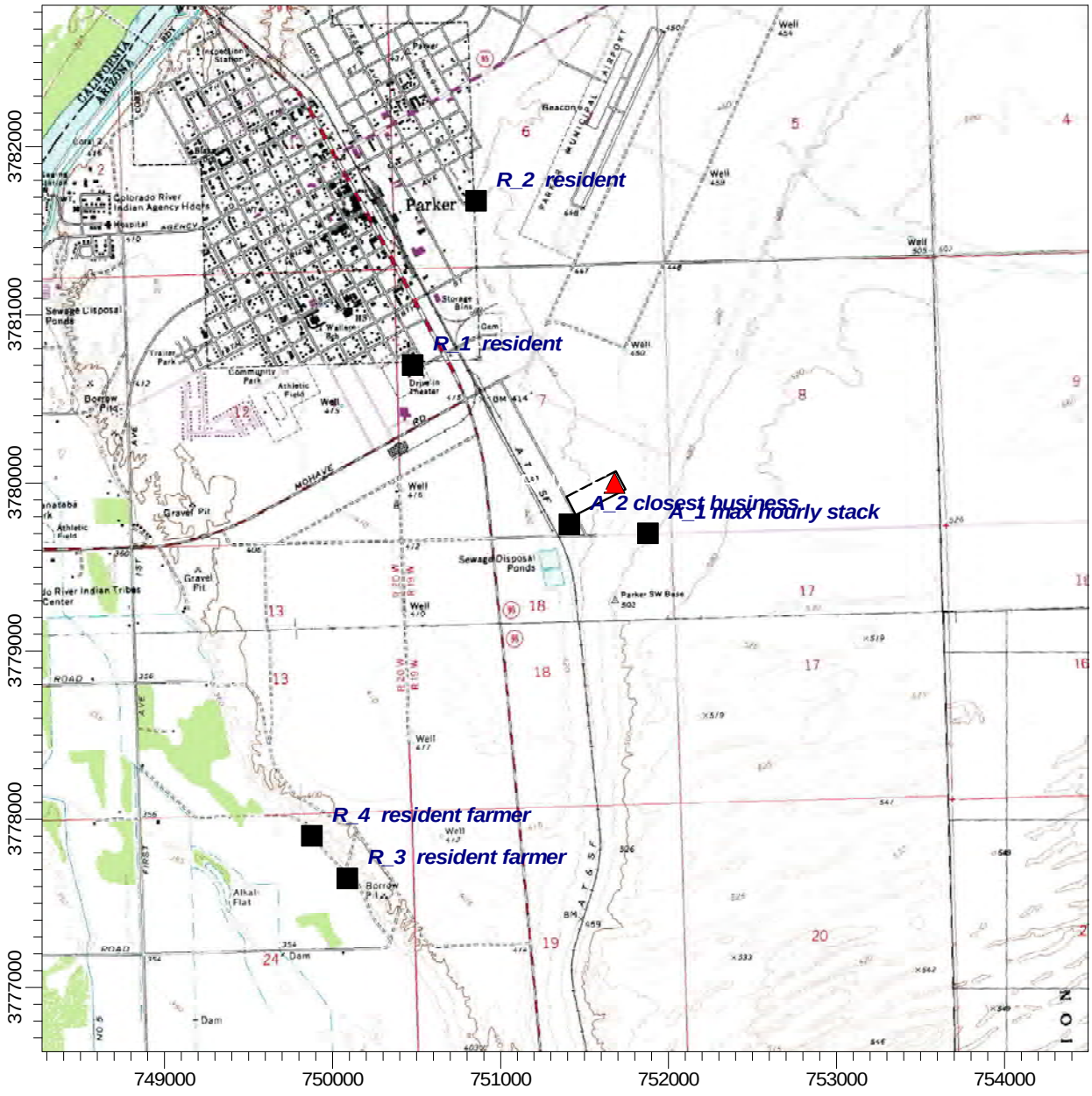
4.2.4 Identification of Exposure Pathways

The next exposure assessment step was the selection of a set of exposure pathways for evaluation in the risk assessment. This list of pathways was selected based on site-specific information on land use, USEPA (2005b) default exposure pathways, USEPA's (2001a) request that the risk assessment consider exposure due to subsistence fishing, hunting and agriculture, and the available options programmed into the IRAP software.

A variety of local information regarding home produce gardens and locally raised animals was received from the La Paz County Agricultural Extension Office (Masters 2007). A few residents in the facility area may raise the following types of animals – beef cattle, pigs, chickens, lamb and goat. Some of these animals are raised by children as part of the local 4H program, and these animals are required to be sold rather than used as a household food source. There are no large beef farms within the modeling domain, dairy cows are not raised at all in the local area, and there are no commercial animal slaughter facilities in the Parker area. Based on communications with colleagues, Masters (2007) estimated that at most 10% of a resident's diet of animal products would be obtained from locally raised animals. For residents who might butcher their own locally raised animals, it was estimated that no more than 20% of a person's annual animal products diet would come from locally raised animals. Some residents in the study area cultivate home gardens, but because of the dry, hot climate, there is only a limited portion of the year during which produce may be grown. Based on communications with colleagues, Masters (2007) estimated that no more than 20% of a person's annual produce ingestion was likely to be obtained from homegrown produce in the project study area.

[6] Local sources of information relied on for the project included, but were not limited to: USGS (2005, 2006a, 2006b, 2007), Williams (2007a, 2007b), Tunnel (2007), Jones (2007), Weiss (2007a, 2007b), Addiego (2007), SCS (1986), Milliken (2007), USBR (2007), USDOI (2000), AZDC (2005), and Masters (2007).

Figure 4-3
Receptor Point Locations Evaluated in the Stack Emissions Risk Assessment



COMMENTS:	COMPANY NAME:	
	MODELER:	
	SCALE: 1:37,982 0 1 km	
	DATE:	PROJECT NO.:

IRAP-h View - Lakes Environmental Software

Fishing occurs in the facility area, but details on where people routinely fish, how often people fish, and how much locally caught fish is ingested were not available at the time this project was performed.[7] Hunting also occurs in the facility area for a variety of animals, including mule deer.[8]

Another important factor affecting the selection of exposure pathways was the capabilities of the IRAP software, which directly reflects HHRAP methods. The IRAP software is programmed with all of USEPA's default exposure pathways which consist of inhalation of air, and ingestion of soil, produce, beef, chicken, eggs, fish, dairy milk, and pork.

Based on the available information at the time this assessment was performed in conjunction with the options available in the IRAP software, all of the USEPA (2005b) default exposure pathways except for dairy milk ingestion were retained for evaluation. Potential exposures associated with ingestion of venison, lamb and goat meat were evaluated in the uncertainties section of this report.

Table 4.2-5 identifies the exposure pathways and receptors that were selected for quantitative evaluation in this risk assessment using the IRAP software. As can be seen, this assessment addressed exposures to several different types of individuals (referred to as "receptors") who could hypothetically be exposed to stack air emissions from the facility: adult and child residents, adult and child farmers, adults and children assumed to eat fish caught from the Colorado River or the Main Drain, and a nursing infant conservatively assumed to be the child of each of the adult receptors, with the potential for transmission of chemicals from mother's breast milk.

4.2.5 Calculation of Environmental Concentrations

The next step in the exposure assessment was the calculation of chemical concentrations in each environmental medium of interest. These are referred to as exposure point concentrations. For example, concentrations were calculated in soil, homegrown produce, fish, animal products, and human breast milk. All the equations used to calculate environmental concentrations were based on HHRAP and are programmed into the IRAP software.

Many input parameters are required in order to calculate environmental concentrations using the USEPA (2005b) fate and transport modeling equations. These include numerous chemical-physical properties describing each compound and its behavior in the environment. Although USEPA (2005b) identified these properties for over 200 compounds in HHRAP (and all are included in IRAP), there were many additional compounds selected for evaluation in this risk assessment, based on the PDT results, for which these same types of chemical-physical properties needed to be compiled. Appendix F presents the properties that were compiled for these additional compounds and a listing of data sources for each value.

[7] www.azgfd.gov/h_f/where_fish_southwest.shtml.
[8] www.azgfd.gov/h_f/hunting_units_43a.shtml and hunting_units_44a.shtml.

A variety of environmental parameters that are not chemical-specific are also needed to calculate environmental concentrations (e.g., rainfall, waterbody characteristics, animal feed ingestion rates). These parameters were, in most cases, based on USEPA-specified default values. A few of the inputs are required to be site-specific and these were obtained or derived from locally-available information. In addition, the default values for some of the inputs were refined with site-specific information where possible. Table 4.2-6 summarizes the site-specific input parameters used to calculate environmental concentrations in this risk assessment, along with the basis for each value. Other than these site-specific values, all other inputs were based on USEPA's (2005b) recommended default values.

The risk assessment calculated environmental concentrations for a variety of hypothetical receptors in the facility area. As noted above in Table 4.2-4, several receptor point locations identified from the unitized ISTST3 modeling results were evaluated. The default methods used to calculate environmental concentrations for these receptor points were extremely conservative, in that the calculations implausibly assume homegrown produce, home-raised animals and the animal's locally-obtained feed all come from a single receptor point, rather than averaged across the acreage necessary to grow large quantities of produce or crops, and to raise animals. These hypothetical receptor scenarios were complemented by the addition of four area-based residential receptors. Two of these area-based receptors were evaluated using as inputs unitized modeling results averaged across the Town of Parker and across the CRIT Reservation area with access to irrigation water and within the modeling domain (i.e., the receptors were not located at any single point). Similarly, the unitized modeling results averaged across waterbody and watershed areas for the Main Drain and the Colorado River within the modeling domain were used to evaluate two fish ingestion pathway receptors. These two waterbodies were selected based on input received from local officials and USEPA Region 9 during the Workplan preparation period of this project, although the extent of fishing in the Main Drain may be extremely limited (Masters 2007). Table 4.2-7 summarizes all the receptors evaluated in the stack emissions risk assessment, including both receptors located at specific points as well as receptors evaluated based on area-wide modeling results.

4.2.6 Calculation of Human Exposures

The last exposure assessment step is the calculation of human exposures in the facility area for each pathway. These calculations relied on the methods laid out in USEPA (2005b), which are programmed into the IRAP software. The types of information used to calculate exposures include rates of exposure for each pathway (e.g., food ingestion rates, soil ingestion rates), the fraction of ingestion of particular food types from locally-raised produce or animal products, and data on body weight, exposure frequency (i.e., days/year exposed) and exposure duration (i.e., total years exposed). As noted above, the exposure rates addressed both children and adults, consistent with current USEPA (2005b) guidance. A few of the exposure parameters were refined based on site-specific information received from Masters (2007), specifically the fraction of homegrown produce ingested by a resident was assumed to be 20% and the fraction of home-raised beef, pork, poultry and eggs ingested by a farmer was assumed to be 20%. All other exposure parameters were based on USEPA health-protective default values, including the default assumption of subsistence fishing.

4.3 Fugitive Emissions Exposure Assessment

This section of the report includes an exposure assessment of potential fugitive air emissions associated with the carbon reactivation facility. The Workplan described a variety of processes involving spent carbon at the facility that have the potential for fugitive particulate and volatile organic compound (VOC) emissions. The reader is referred to Section 4.3.1 of the Workplan for this discussion. In general, potential fugitive emissions from activities involving spent carbon are reduced through standard work practices, facility design, and air pollution control (APC) devices. At no time other than during unloading is spent carbon exposed directly to the ambient environment. In addition, the intrinsic highly adsorptive nature of spent carbon results in very low partitioning of contaminants from the carbon to the atmosphere.

4.3.1 Potential Fugitive Emission Source Selected for Evaluation

Based on the review of the potential for fugitive air emissions from activities involving spent carbon presented in the Workplan, the activity expected to have the highest potential impacts associated with fugitive air emissions from spent carbon was identified for evaluation in this study. This activity is spent carbon unloading at the outdoor hopper (H-1). The outdoor hopper is an enclosed three-walled building with a fixed roof located on a concrete containment area. It has heavy long plastic sheeting on the front where spent carbon is unloaded. The hopper has an air exhaust system which filters collected air from inside the structure through a fabric filter baghouse and carbon adsorption system. A hand-held water spray system is also used at H-1 during unloading if needed to minimize potential dust emissions from dry spent carbon and to facilitate transfer of the spent carbon from the hopper through the piping system to the spent carbon storage tanks.

Based on data collected at the facility from 2005 and 2006, between 82%-86% of the spent carbon received at the facility annually is unloaded into the outdoor hopper from a variety of different bulk container types (e.g., roll-off containers, slurry trucks). The remainder is unloaded indoors inside the spent carbon storage and warehouse building into hopper H-2 (e.g., drums, supersacks). Hopper H-2 is also equipped with an air exhaust system, which directs collected air to the same baghouse and carbon adsorber as the outdoor hopper.

There are two general types of spent carbon received at the facility: wet carbon (referred to as “aqua carbon”) which has been used for water treatment and is roughly 50% moisture content by weight, and dry carbon (referred to as “vapor carbon”) which has been used for air treatment and is roughly 10% moisture content by weight. Data from 2005 and 2006 show that approximately 42%-46% of the spent carbon unloaded at the outdoor hopper is wet while about 54%-58% of the unloaded spent carbon is dry.

4.3.2 Selection of Chemicals for Evaluation

The next step in the fugitive emissions analysis was the selection of chemicals of potential concern to be evaluated. This selection process considered data on each compound's concentration in spent carbon, the frequency and magnitude of spent carbon deliveries

containing both volatile and inorganic compounds, each organic compound's tendency to volatilize into ambient air during unloading, and the potential toxicity of the compound. Table 4.3-1 presents a summary of this information for those compounds received in spent carbon at the facility from 2003-2006, based on the facility's Toxics Release Inventory reporting.[9]

The compounds listed in Table 4.3-1 were then ranked for a variety of factors that could be associated with potential risks in order to select chemicals of potential concern. Compounds were ranked in the following categories:

- Number of deliveries over the 4-year 2003-2006 period
- Total pounds delivered over the 4-year 2003-2006 period
- Potential volatility (based on concentration and Henry's law constant)
- Potential for acute inhalation health effects (based on chemical concentration and acute reference air concentration),
- Potential for chronic non-cancer health effects (based on chemical concentration and chronic inhalation reference air concentration),
- Potential for chronic cancer risks (based on chemical concentration and inhalation cancer unit risk factor)
- Identification of compounds that are known human carcinogens

Compounds were selected for evaluation for the fugitive emissions analysis if they ranked in the top five of any category or are classified as a known human carcinogen by the USEPA, the International Agency for Research on Cancer, or the U.S. National Toxicology Program. The top five ranking results, as well as the 21 selected compounds of potential concern for detailed evaluation, are shown in Table 4.3-2.

4.3.3 Calculation of Fugitive Emission Rates

Calculation of emission rates is the next step after the selection of chemicals for evaluation. In this study, fugitive air emission rates were calculated using mathematical modeling. The emission rates are combined with air dispersion modeling results to calculate potential ambient air concentrations, and associated inhalation risks. This section describes the emission modeling methods for both fugitive organic vapors as well as dusts and inorganic compounds that may be present in dust. The fugitive emission modeling did not take into account the air exhaust system employed at the outdoor hopper, an approach that is expected to overestimate potential emission rates.

4.3.3.1 Fugitive Organic Vapor Emissions

Organic compound emissions during spent carbon unloading at the outdoor hopper were calculated using two mathematical modeling methods developed for USEPA (USEPA 1997, 2004a). Conceptually the approach was based on a pore space gas model developed to

[9] The Toxics Release Inventory (TRI) Report for 2003-2006 was provided to CPF by M. McCue, Director of Plant Operations, Siemens Water Technologies Corp. May 2007.

calculate organic emissions from dumping of petroleum-contaminated soil onto piles (this model was developed by Radian for USEPA 1997). The Radian model calculates an emission rate by assuming that a portion of the chemical concentration within the air-filled pore space of the dumped material is released to the atmosphere during unloading.

Two sets of calculations were performed to address the two different types of spent carbon unloaded at the outdoor hopper (i.e., aqua carbon and vapor carbon). These types of spent carbon were evaluated separately because their characteristics vary (e.g., moisture content, types of containers unloaded).

Chemical concentrations within the air-filled pore space of spent carbon were calculated using a method outlined by USEPA (2004a), based on work by Johnson et al. (1990) and Johnson and Ettinger (1991), which mathematically partitions the total concentration of a compound into sorbed, aqueous, and vapor phases. The partitioning is modeled by taking into account chemical-specific properties as well as properties of the material, as follows:

$$C_s = \frac{\left(H'^{*}C_{sp} * BD\right)}{\left(Ew + Koc * foc * BD + H'^{*}Ea\right)} \qquad \text{(Equation 4-2)}$$

where

C_s	=	chemical concentration in air-filled pore spaces (g/cm^3),
H’	=	Henry’s law constant (unitless),
C_{sp}	=	concentration in spent carbon (g/g),
BD	=	bulk density (g/cm^3),
Ew	=	water-filled porosity of spent carbon (unitless),
Koc	=	organic carbon:water partition coefficient (cm^3/g),
foc	=	fraction organic carbon in spent carbon (unitless), and
Ea	=	air-filled porosity of spent carbon (unitless).

Chemical emission rates associated with spent carbon unloading at the outdoor hopper during the workday were then calculated based on the Radian model methodology (USEPA 1997) as follows:

$$ER = \frac{\left(C_s * Vol * HR * Exc\right)}{AT} \qquad \text{(Equation 4-3)}$$

where

ER	=	chemical emission rate (g/sec),
Vol	=	volume of air pore space within spent carbon per hour during unloading (cm^3/hr),
HR	=	hours unloading per workday (4 hrs),
Exc	=	pore gas to atmosphere exchange constant (unitless), and
AT	=	averaging time (25,200 seconds per 7-hour period between

7 AM – 2 PM when unloading activities occur).[10]

The volume of air within spent carbon during an unloading event was calculated as follows:

$$Vol = \frac{(Ea * Q * 1{,}000)}{BD} \qquad \text{(Equation 4-4)}$$

where

Vol	=	volume of air pore space within spent carbon per hour during unloading (cm^3/hr),
Q	=	amount of spent carbon unloaded per unloading event per hour (kg/hr), and
1,000	=	conversion factor (1,000 g/kg).

The amount of spent carbon unloaded per hour (Q) was calculated based on data specific to this facility, including an analysis of spent carbon containers' capacities, approximate unloading times per container type, and the average amount of spent carbon, by container type and container capacity, unloaded during 2005 and 2006. The amount unloaded per unloading event per hour was calculated as follows:

$$Q = \frac{Mass_{sp}}{Hrs_{sp}} \qquad \text{(Equation 4-5)}$$

where

$Mass_{sp}$	=	average mass of spent carbon unloaded per event (2,975 kg aqua spent carbon or 1,783 kg vapor spent carbon), and
Hrs_{sp}	=	average unloading duration per container (0.77 hours for aqua spent carbon containers or 0.55 hours for vapor spent carbon containers).

The scenario-specific input parameters for these modeling equations are presented in Table 4.3-3. The values for these parameters were based on spent carbon data from the facility, where available, or from the published literature (e.g., Kleineidam et al. 2002). Note that several of the parameter values vary for the two different types of spent carbon unloaded at the outdoor hopper (vapor or aqua spent carbon). Table 4.3-4 presents the chemical-specific input parameters used in the modeling equations to calculate emission rates. Table 4.3-5 presents the calculated organic compound chemical emission rates for each selected chemical of potential concern.

[10] Personal communication with M. McCue, Director of Plant Operations, May 7, 2007.

4.3.3.2 Fugitive Dust and Inorganic Compound Emissions

Emission rates of dust and inorganic compounds during spent carbon unloading were calculated using a screening-level emission factor equation presented by USEPA (2006) that calculates dust emission rates from batch drop operations. This model was developed based on test results for a variety of materials used in a variety of industries, such as the coal and quarrying industries. The fraction of particles less than 75 microns in diameter (known as "silt content" in soil science) in the tested materials ranged from 0.44%-19%. Analyses of dry spent carbon from the facility show a silt content of roughly 0.5% (i.e., passing through a 200-mesh sieve screen).[11] This means that spent carbon has a silt content at the low end of the range of tested materials used to develop the USEPA emissions model, and thus it is likely to have a lower potential to generate dust emissions than the model predicts. As a result, the dust emission rates calculated using USEPA's emission factor are likely to be overestimated.

Dust emission rates were calculated only for vapor spent carbon unloaded at the outdoor hopper, since dust emissions will not occur during unloading of the water-saturated aqua carbon. In addition to total dust emissions, emission rates for different particle size categories were calculated using USEPA's default particle size multipliers. The particle sizes evaluated were selected for consistency with comparison benchmark particulate matter concentrations that are available. Accordingly, emission rates for inhalable particles less than or equal to 10 microns (i.e., PM10) were calculated for comparability to the National Ambient Air Quality Standards (NAAQS) set under the Clean Air Act and workplace exposure limits. Emission rates for PM2.5 were also calculated for comparability to the PM2.5 NAAQS.

The emission factor equation presented by USEPA (2006) is as follows:

$$E = (k * 0.0016)\frac{\left(\frac{U}{2.2}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}} \qquad \text{(Equation 4-6)}$$

where

E	=	emission factor (kg particulate matter/megagram batch drop material),
K	=	USEPA default particle size multiplier (0.35 for PM10, 0.053 for PM2.5),
U	=	mean wind speed (2.38 m/sec, based on Parker, AZ data), and
M	=	material moisture content (10% for vapor spent carbon).

The particulate matter emission rate was then calculated as follows:

[11] Spent carbon analytical report provided by Siemens Water Technologies Corp., Activated Carbon Laboratory, Los Angeles, CA. July 17, 2007.

$$ER_{PM} = E * Q * conv \qquad \text{(Equation 4-7)}$$

ER_{PM} = emission rate of particulate matter (g/sec),
Q = amount of spent carbon unloaded per unloading event per hour (kg/hr), and
conv = conversion factor (megagram/1,000 kg * 1,000 g/kg * hr/3,600 sec).

Chemical-specific emission rates for inorganic compounds were then calculated by multiplying the particulate matter emission rate by the chemical concentration in the vapor spent carbon, as follows:

$$ER_{cpd} = ER_{PM10} * C_{sp} \qquad \text{(Equation 4-8)}$$

ER_{cpd} = inorganic compound emission rate (g/sec),
ER_{PM10} = emission rate of PM10 particles (g/sec), and
C_{sp} = concentration in spent carbon (g/g).[12]

Inorganic compound emission rates were calculated from the inhalable PM10 particle size category emission rate (i.e., ER_{PM10}) for comparability to occupational exposure limits and for the inhalation risk assessment.

The scenario-specific input parameters and calculated dust emission rates are presented in Table 4.3-6. Table 4.3-7 presents the calculated inorganic compound chemical emission rates for each selected chemical of potential concern.

4.3.4 Air Dispersion Modeling for Fugitive Emissions

Air dispersion modeling was conducted using the ISCST3 model to calculate ambient air concentrations associated with fugitive emissions during spent carbon unloading. Appendix D describes the details of the modeling performed for the fugitive emissions source. As described in the Workplan, fugitive emissions from the hopper were treated in ISCST3 as a volume source, with dimensions defined by the hopper building, and were modeled using a unitized (i.e., 1 g/sec) emission rate. The emission source was assumed to be "on" every day for the 7-hour period during 7 AM - 2 PM, based on the period of time during typical facility operations that spent carbon may be unloaded at the outdoor hopper.[13] The meteorological data used to model the fugitive emissions source were identical to the data used to model dispersion of stack emissions (e.g., 2001-2005 Arizona Meteorological Network data from Parker). The set of off-site receptor grid points used for stack emissions modeling was also applied for the fugitive emissions modeling.

The ISCST3 model calculated unitized annual average modeling results (to evaluate chronic long-term risks) and 1-hour average modeling results (to evaluate short-term acute inhalation

[12] For the inorganic compounds evaluated, total spent carbon concentrations were assumed to reasonably reflect the concentrations that would be solely associated with the solid phase.
[13] Personal communication with M. McCue, Director of Plant Operations, May 7, 2007.

risks) at all of the modeled off-site receptor locations beyond the property boundary. Since the modeling was performed using a unitized emission rate, the resulting ISCST3 air concentrations were expressed in units of $\mu g/m^3$ per 1 g/sec. Chemical-specific concentrations were then calculated using the IRAP software by multiplying the unitized results by the chemical-specific emission rates.

The specific locations addressed in the fugitive emissions risk assessment were identified by examining the unitized ISCST3 modeling results across specified types of land use areas. The annual average unitized modeling results within areas currently used for residential assessment purposes within the Town of Parker and within the CRIT Reservation with access to irrigation water were examined, and the maximum annual average impact locations in both areas were selected for detailed evaluation. The 1-hour average unitized modeling results were examined to identify maximum impact locations within residential assessment areas of the Town of Parker and the CRIT Reservation with access to irrigation water, at locations used for non-residential purposes, and at the maximum impact point beyond the property boundary. In addition to these locations, the receptor locations selected earlier for the stack emissions risk assessment were also evaluated. Table 4.3-8 lists all of the receptor point locations selected for evaluation for both the chronic and acute fugitive emissions inhalation risk assessment. Figure 4-4 shows these locations overlain on a topographical map of the area.

4.3.5 Identification of Exposure Pathways

The next step in the fugitive emissions analysis was the selection of exposure pathways for evaluation. As explained in the Workplan, the most important exposure pathway for this type of emissions source is direct inhalation and, accordingly, this risk assessment focused on the inhalation pathway of exposure.

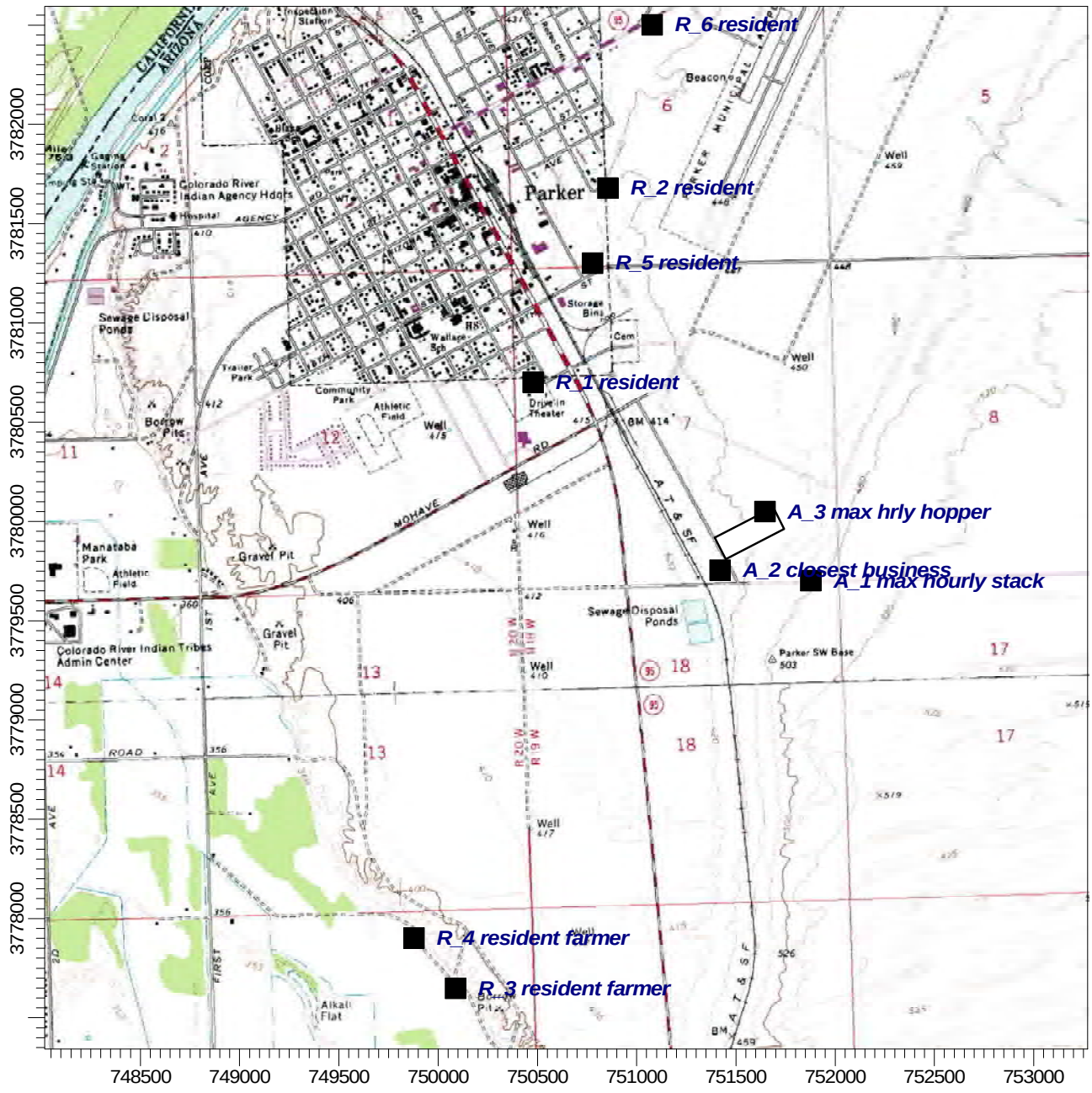
4.3.6 Calculation of Environmental Concentrations

Chemical concentrations in ambient air were calculated, as described above, by multiplying the unitized results by the chemical-specific emission rates. This calculation was performed using the IRAP software for all the selected inorganic and organic compounds at the evaluated receptor locations. The organic compound emission rates used in this calculation were, however, based only on the vapor carbon values; since these emission rates were higher than for aqua spent carbon, this will tend to overestimate air concentrations and associated risks.

4.3.7 Calculation of Human Exposures

Inhalation exposures were calculated using the IRAP software. These calculations rely on the modeled ambient air concentrations, inhalation rates, and data on body weight, exposure frequency (i.e., days/year exposed) and exposure duration (i.e., total years exposed). Exposures due to inhalation were calculated using the HHRAP default assumptions for both an adult and a child.

Figure 4-4
Receptor Point Locations Evaluated in the
Fugitive Emissions Risk Assessment



COMMENTS:	COMPANY NAME:	
	MODELER:	
	SCALE: 1:32,047 0 1 km	
	DATE:	PROJECT NO.:

IRAP-h View - Lakes Environmental Software

4.4 Risk Characterization

This section of the report presents the risk characterization, in which potential risks associated with both stack and fugitive emissions are addressed. As described earlier, the stack emissions risk assessment was a multiple exposure pathway analysis, whereas the fugitive emissions risk assessment addressed only the inhalation pathway of exposure.

4.4.1 Stack Emissions

4.4.1.1 Chronic Long-Term Risks

Chronic long-term risks associated with stack emissions were calculated according to the HHRAP methods and using the IRAP software to perform the calculations. Both excess lifetime cancer risks and the potential for non-cancer effects were evaluated. This was accomplished by combining exposures with toxicity values for cancer and non-cancer effects.

Excess Lifetime Cancer Risks

Cancer risks reflect the upper bound probability that an individual may develop cancer over a 70-year lifetime under the assumed exposure conditions. The risks are referred to as "upper bound" because they are unlikely to be underestimated and, in fact, may range from as low as zero to the upper bound value. Cancer risks were calculated, by the IRAP program, separately for each chemical and summed across chemicals for each exposure pathway. Risks were also added across pathways for hypothetical population groups that were evaluated (e.g., adult and child resident, adult and child farmer). The cancer risks were evaluated relative to the USEPA (1998a) target risk level of 1E-5 (which is equivalent to $1x10^{-5}$). A cancer risk of $1x10^{-5}$ means that an individual could have, at most, a one in 100,000 chance of developing cancer over a 70-year lifetime under the evaluated exposure conditions. In comparison, each person in the U.S. has a background risk of developing cancer over a lifetime of about one in three.

The excess lifetime cancer risks are shown in Table 4.4-1. The detailed results for each exposure pathway and receptor are provided in Appendix G. As can be seen in this table, results are presented for the following three groups of evaluated chemicals:

- *Group 1 - All detected compounds.* This group includes 95 compounds that were detected in the PDT in addition to several compounds that were not measured during the PDT but which were evaluated based on emission rates derived from feed rates.
- *Group 2 - All evaluated compounds, both detects and compounds that were not detected, except for benzidine.* This group includes 177 compounds, 82 of which were not detected in the PDT. This group does not include benzidine which was not detected in the PDT in stack gases and for which there is no evidence from waste profile reports and analytical spent carbon data that it has ever been accepted

in spent carbon received at the facility. [14] Benzidine was singled out because it was found to be a significant risk driver, accounting for more than 95% of the total cancer risk when included in the risk calculations.

- *Group 3 - All evaluated compounds.* This group includes 178 compounds, of which 83 were not detected in the PDT, including benzidine.

The risks are also presented for three general categories of human receptors who could hypothetically be exposed to stack air emissions:

- *Resident receptors.* These receptors include residential assessment locations in the Town of Parker and assume exposure occurs via inhalation, soil ingestion and homegrown produce ingestion.
- *Farmer receptors.* These receptors include residential assessment locations assumed to have access to irrigation water and assume exposure occurs via inhalation, soil ingestion, homegrown produce ingestion, and ingestion of home- or locally-raised beef, poultry, eggs, and pork.
- *Fish ingestion.* These receptors are assumed to fish in either the Main Drain or the Colorado River with exposures occurring only as a result of fish ingestion. These risks may be added to any of the evaluated residential receptors.

The additional (i.e., excess) lifetime cancer risks for Group 1, all detected compounds, ranged from 4E-9 (four in one billion) for the fish ingestion pathway, to 8E-8 (eight in one hundred million) for resident receptor R_2. These results were more than 100 times lower than the 1E-5 target cancer risk level.

The risk results for Group 2, all detected and non-detected compounds except benzidine, were slightly increased above Group 1, while still well below the target level. Excess lifetime cancer risks calculated for Group 2 ranged from 4E-9 (four in one billion) for the fish ingestion pathway, to 2E-7 (two in ten million), again for resident receptor R_2. These results are 50 or more times lower than the 1E-5 target cancer risk level.

For Group 3, which added the non-detected compound benzidine to the risk calculations, excess lifetime cancer risks increased for all the residential receptors but did not change for the fish ingestion pathway. The highest cancer risk result was 2E-6 (two in one million) for the resident receptor R_2, five times below the 1E-5 target cancer risk level. As noted above, when benzidine was included in the risk calculations for the resident and farmer receptors, it accounted for more than 95% of the total cancer risks, even though this compound was not detected in the PDT, and there is no evidence from waste profile reports and analytical spent carbon data that it has ever been accepted in spent carbon received at the facility. If fish ingestion risks were added to the evaluated resident and farmer receptor results, all the excess lifetime cancer risks would still remained below the target risk of 1E-5.

[14] Benzidine was used in the past mostly to produce dyes, however, it has not been produced for sale in the U.S. since the mid-1970's. Major U.S. dye companies no longer make benzidine-based dyes, and benzidine is no longer used in medical laboratories or in the rubber or plastics industries (ATSDR 2001).

Although all the calculated excess lifetime cancer risks were below the target level, the results were examined to identify the dominant compounds accounting for the majority of the risks. This evaluation focused on Group 1 (all detected compounds) and Group 2 (all compounds except benzidine) because, as noted above, benzidine was not detected in the PDT but dominated the risk assessment results when included in the calculations. The dominant compounds affecting these risk assessment results are described below:

- For the resident receptors, the dominant compound in Group 1 was cadmium, accounting for over 75% of the total risk mostly due to direct inhalation. Cadmium was conservatively evaluated in this risk assessment using an emission rate based on a proposed permit limit that was more than 30 times higher than the emission rate measured during the PDT. This means that the risks calculated for cadmium in this analysis are expected to be overestimated due to the emission rate by at least a factor of 30.

- For the farmer receptors, the dominant Group 1 compounds were cadmium and PCDDs/PCDFs, accounting for roughly 40% and 57% of the total risks, respectively. The most important exposure pathway for PCDDs/PCDFs was beef ingestion. PCDDs/PCDFs also accounted for almost all of the calculated fish ingestion cancer risks. As with cadmium, PCDDs/PCDFs were evaluated in this risk assessment using emission rates based on a proposed permit limit. The measured PCDD/PCDF emission rates during the PDT, which was performed using spiked feed to maximize the production of combustion by-products such as PCDDs/PCDFs, were roughly four times lower than the values used in this risk assessment. Even with emission rates conservatively based on proposed permit limits, the cancer risks due to stack emissions for all detected compounds were well below the target risk level of 1E-5.

- The dominant compounds in Group 2 for the resident receptors included cadmium in addition to arsenic and beryllium, primarily due to inhalation exposure. Arsenic and beryllium were not detected in the PDT but were evaluated in the risk assessment using emission rates based on permit limits. The use of permit limits as a basis for emission rates for cadmium, arsenic and beryllium is expected to greatly overestimate potential risks, by more than an order of magnitude.

- For the farmer receptors, the dominant compounds in Group 2 still included cadmium and PCDDs/PCDFs, in addition to arsenic and beryllium. PCDDs/PCDFs continued to account for almost all of the calculated fish ingestion risks.

Potential Non-Cancer Effects

The potential for non-cancer health effects was evaluated by comparing calculated exposures with non-cancer oral reference doses (RfDs) and inhalation reference concentrations (RfCs), consistent with USEPA (2005b). A hazard quotient was calculated for each chemical, using the IRAP program, by dividing its exposure by its reference dose or reference air concentration. The hazard quotients for each pathway were added across all chemicals, as an initial evaluation step, regardless of the type of health effect endpoint, to produce what is called a hazard index. Hazard index results were evaluated against the USEPA (1998a)

target level of 0.25. This target hazard index level is quite conservative; in many other environmental regulatory programs the target hazard index level is 1.0.

A hazard index summed across all compounds, not taking into account the type of health effects associated with each compound, is a conservative first step in evaluating the potential for non-cancer effects. If the hazard index for all compounds is above a value of one (1), this indicates that the hazard index values should be recalculated for groups of compounds having similar types of health effects or the hazard quotient values for those compounds producing a hazard index above one should be examined in more detail. If the hazard index for compounds with similar types of health effects is below one, then adverse health effects are not expected to occur. Even if the hazard index for compounds with similar types of health effects is above one, this does not automatically mean that adverse health effects will occur (for example, because of the safety factors that are incorporated in the non-cancer reference doses and reference air concentrations). Rather, this type of result means that there is an increased chance that health effects might occur. In this case, further research should be conducted to evaluate the potential for public health effects.

The non-cancer hazard index values for stack emissions (summed across all compounds regardless of type of health effect) are shown in Table 4.4-1. These values ranged from 0.003 to 0.01, were essentially the same for all three groups of compounds (Groups 1, 2 and 3), and were 25 or more times lower than the target level of 0.25. If the hazard index results were recalculated for groups of compounds having similar types of health effects, rather than all compounds, the resulting values would be even lower and still well below the target level.

The dominant compounds affecting the hazard index results were chlorine, for the resident and farmer receptors, mostly due to inhalation, and methyl mercury for the fish ingestion pathway. Chlorine was evaluated in this risk assessment using an emission rate based on a proposed permit limit that was much higher than the results measured during the PDT. The permit limit-based chlorine emission rate was roughly 20 times higher than the emission rate measured in the PDT, even though many chlorine-containing compounds were spiked into the feed during the PDT. Similarly, mercury was evaluated in this risk assessment using a permit limit-based emission rate that was about 15 times higher than the measured PDT emission rate. These results indicate that the non-cancer results due to stack emissions were not only below the target level using emission rates conservatively based on proposed permit limits, but would be even lower if measured PDT emission rates were used.

Summary

These results show that additional lifetime cancer risks from long-term exposure to stack emissions are well below regulatory target risk levels and that non-cancer health effects are not expected to occur from long-term exposures to stack emissions in residential areas near to the reactivation facility.

4.4.1.2 Margin of Exposure for PCDDs/PCDFs

The USEPA has not developed a non-cancer reference dose for PCDDs/PCDFs. As an alternative, a margin of exposure approach developed by USEPA was applied to compare the calculated doses in the risk assessment to typical background U.S. exposure levels (USEPA 2005b). This analysis is consistent with USEPA's (2001a) request that a margin of exposure analysis be conducted to assess PCDDs/PCDFs. Following the USEPA (2005b) protocol, in this analysis, the maximum PCDD/PCDF toxic equivalent (TEQ) average daily dose predicted for an adult receptor in the risk assessment associated with stack emissions was compared to a typical background level of 1 pg TEQs/kg-day. This analysis showed that the highest calculated average daily PCDD/PCDF TEQ dose to an adult (3E-4 pg/kg-day for farmer receptor R_3) was well below the typical background level.

4.4.1.3 Infant Exposure to PCDDs/PCDFs

The USEPA has not developed risk assessment methods to quantitatively evaluate the potential risks to a breast-fed infant from exposure to PCDDs/PCDFs. In this study, infant exposures to PCDDs/PCDFs were evaluated as an adjunct to the adult exposure scenarios evaluated for stack emissions. Hypothetical infant exposures were evaluated following the approach presented in USEPA (2005b), which is programmed into the IRAP software. In this method, the average daily dose to PCDDs/PCDFs, expressed as 2,3,7,8-TCDD toxic equivalents (TEQs), from breast milk ingestion is calculated and then compared to a comparison background level for a nursing infant. The comparison level used in this analysis was an average infant intake level of 60 pg/kg-day for 2,3,7,8-TCDD TEQs based on USEPA (2005b). It is very important to recognize, however, that the method specified for use in this risk assessment is a default regulatory approach; it does not reflect actual knowledge of the potential health effects, if any, of short-term exposure via breast-milk ingestion on an infant.

The calculated average daily doses from breast milk ingestion are shown in Table 4.4-2 for each adult receptor evaluated. These doses ranged from 0.0002 - 0.002 pg TEQs/kg-day, more than 10,000 times lower than the target intake level. These results indicate that potential exposure to PCDDs/PCDFs by a nursing infant would be far below background levels.

4.4.1.4 Acute Short-Term Risks

Facility Operating Conditions Under Non-Upset Conditions

The potential for short-term acute inhalation risks associated with stack emissions was also evaluated in the risk assessment, consistent with USEPA (2005b) methods. This was accomplished using the IRAP software, by comparing modeled short-term, 1-hour average air concentrations with the acute reference air concentrations in a manner similar to the evaluation of non-cancer risks. The evaluation addressed not only the maximum impact point for hourly concentrations beyond the facility boundary, but also receptors located in residential and non-residential land use areas.

The air concentrations used to evaluate acute risks were conservatively based on the highest 1-hour average air concentration calculated for each specified receptor location and compound out of a total of 43,800 hours evaluated by the ISCST3 model (i.e., 5 years of hourly meteorological data from 2001-2005 from Parker were used). The concentrations for the remaining 43,799 hours were lower than those used in this analysis.

An acute hazard quotient was calculated in the IRAP program by dividing each chemical's modeled 1-hour average air concentration by its acute reference concentration. Quotients below one are not expected to result in health effects. Quotients above one indicate an increased chance that mild transient adverse health effects might occur (e.g., eye irritation) or a clearly defined objectionable odor associated with the specific compound being evaluated might be noticed, although these may still be unlikely to occur because safety factors are incorporated in the acute reference air concentrations.

Table 4.4-3 summarizes the results of the acute inhalation analysis using the stack emission rates shown in Table 4.2-1. The detailed results are provided in Appendix H. As the summary table shows, the hazard quotients, which were calculated for each chemical individually, ranged from less than 1E-10 to 0.08. These values were all well below the target level of one, by factors of 12 or more times. If the hazard quotients for the individual compounds were added together for groups of compounds having similar types of health effects (e.g., respiratory), the combined results would still be well below a target level of one.

Upset Conditions

Acute inhalation risks were also evaluated assuming an upset condition occurred for 1 hour at the facility, during which emissions were assumed to increase by ten times as recommended in HHRAP. As noted earlier, the factor of 10 increase is based on a 15-year old conservative regulatory default assumption for nonhazardous waste combustors. The potential acute hazard quotients under this scenario would be ten times higher than those shown in Table 4.4-3, with values ranging from <1E-10 to a maximum of 0.8 occurring at the maximum 1-hour average impact point (i.e., location A_1 where there is no residential or commercial land use). If the hazard quotients for the individual compounds were added together for groups of compounds having similar types of health effects (e.g., respiratory), the combined results would still be below a target level of one.

The highest hazard quotients for all evaluated receptor locations under upset conditions were due to arsenic, nitrogen dioxide, chlorine, and sulfur dioxide, with values at the maximum impact point (A_1) of 0.8 for arsenic, 0.4 for nitrogen dioxide, 0.09 for chlorine, and 0.07 for sulfur dioxide, and at the closest business location (A_2) of 0.2 for arsenic, 0.4 for nitrogen dioxide, 0.09 for chlorine and 0.07 for sulfur dioxide. The results for arsenic and chlorine were calculated using emission rates based on proposed permit limits that were much higher than the results measured during the PDT. The measured arsenic emission rate from the PDT was over 30 times lower than the emission rate used in this risk assessment, while the measured chlorine emission rate was roughly 20 times lower than the emission rate used in this risk assessment (and chlorine was spiked into the feed during the PDT). These differences in evaluated versus measured emission rates indicate that the acute hazard

quotients for arsenic and chlorine under both non-upset and upset conditions, are expected to be overestimated by more than a factor of 10.

The acute toxicity criteria for the compounds with the highest hazard quotients were all based on acute reference exposure levels from the California Environmental Protection Agency, which lists mild respiratory irritation as the health effects endpoint for chlorine, nitrogen dioxide and sulfur dioxide and lists reproductive/developmental effects (based on reduced fetal weight in mice) for arsenic. Hazard quotients may be added together to evaluate potential risks for multiple compounds, but only for groups of compounds having similar health effects endpoints. In this case, the sum of all hazard quotients grouped for compounds with similar health effects endpoints remains below the target level of 1.0.

Summary

These results indicate that short-term health effects are not expected to occur in areas near to the reactivation facility as a result of inhalation exposure to stack emissions, either under conservatively evaluated long-term conditions or under hypothetical upset conditions..

4.4.1.5 Evaluation of Lead

USEPA (2005b) recommends that lead be evaluated in a combustion source risk assessment initially by comparison with a soil benchmark level of 400 mg/kg in soil. If the calculated soil concentration exceeds the benchmark, USEPA recommends that additional evaluation of potential blood lead levels be performed using the Integrated Uptake Biokinetic Model (IEUBK). In this study, the lead soil concentrations at the evaluated receptor locations, due to stack emissions, were calculated to range from 6E-6 mg/kg to 3E-4 mg/kg, more than one million times lower than USEPA's target level, indicating that no further evaluation of lead was warranted.

4.4.1.6 Comparison to Risk-Based Standards and Criteria

Consistent with the Workplan, the risk assessment also compared the calculated environmental concentrations to available standards and criteria. Specifically, the highest annual average modeled air concentrations associated with stack emissions at a residential receptor were compared with the NAAQS and USEPA Region 9 risk-based preliminary remediation goals (PRGs). Similarly, the maximum annual soil concentrations modeled at a residential assessment receptor were compared with USEPA Region 9 risk-based PRGs for residential soil. Concentrations calculated in surface water were also compared to ambient water quality criteria in the ecological risk assessment section of this report.

The results of this comparison, presented in Appendix I, showed that all the modeled air concentrations were far below both the NAAQS and the very conservatively derived risk-based PRGs. The modeled soil concentrations were also found to be far below the risk-based residential soil PRGs.

4.4.2 Fugitive Emissions

4.4.2.1 Chronic Long-Term Risks

Chronic long-term risks associated with fugitive emissions during spent carbon unloading were calculated by combining the inhalation exposures with toxicity values for cancer and non-cancer effects according to the HHRAP methods described in USEPA (2005b), using the IRAP software to perform the calculations. This methodology is the same as that described above for evaluating chronic risks from stack emissions. The fugitive emissions analysis evaluated only the inhalation pathway of exposure, as described above in the selection of pathways section.

The results of the chronic inhalation risk assessment for both cancer risks and non-cancer health effects are shown in Table 4.4-4. The detailed results for each compound evaluated are provided in Appendix J. The additional (i.e., excess) lifetime cancer risks ranged from 2E-9 (two in one billion) to 5E-8 (five in one hundred million); these results were 200 or more times lower than the 1E-5 target cancer risk level. The non-cancer hazard index values (summed across all compounds regardless of type of health effect) ranged from 0.0004 to 0.001; these values were 250 or more times lower than the target level of 0.25. If the hazard index results were calculated for groups of compounds having similar types of health effects, rather than all compounds, the resulting values would be even lower and still well below the target level of 0.25. If the fugitive emissions risk results were added to those calculated for stack emissions, the combined results would still be below both the cancer and non-cancer target risk levels.

These results show that additional lifetime cancer risks in residential assessment areas near the reactivation facility, from long-term inhalation exposure to fugitive emissions from spent carbon unloading, individually or in combination with risks from stack emissions, are well below the regulatory target cancer risk level. Similarly, the results show that non-cancer health effects are not expected to occur from long-term inhalation exposure to fugitive emissions in residential assessment areas near the reactivation facility, individually or in combination with stack emissions.

4.4.2.2 Acute Short-Term Risks

The potential for short-term acute inhalation risks associated with fugitive emissions was also evaluated in the risk assessment. This was accomplished by comparing predicted short-term, 1-hour average air concentrations with acute reference air concentrations. The methodology described above for evaluating acute risks from stack emissions was also used to evaluate fugitive emissions.

Table 4.4-5 summarizes the results of the acute inhalation analysis for fugitive emissions. The detailed results for the selected chemicals are provided in Appendix K. As this table shows, the hazard quotients, which were calculated for each chemical individually, ranged from less than 1E-9 to 0.02 at the maximum off-site impact point (A_3). These values were all well below the target level of one, by factors of 50 or more times. If the hazard quotients for the individual compounds were added together for groups of compounds having similar

types of health effects (e.g., respiratory), the combined results would be even lower, and still well below a target level of one. Moreover, if the acute results from fugitive and stack emissions for compounds emitted from both sources were added together at the evaluated receptor locations, the results would still be well below the target level.

These results indicate that short-term health effects are not expected to occur in areas near to the reactivation facility as a result of inhalation exposure to fugitive emissions during spent carbon unloading at the outdoor hopper, individually or in combination with risks from stack emissions.

4.4.2.3 Evaluation of Particulate Matter

The potential for health effects to occur as a result of fugitive particulate matter emissions was also evaluated. This analysis compared maximum off-site particulate matter (PM) concentrations to the NAAQS for PM10 and PM2.5. NAAQS are established by USEPA for criteria pollutants, including PM10 and PM2.5, and impose ambient air quality concentration standards which are determined by USEPA to be protective of public health with an adequate margin of safety. The current PM10 NAAQS is a 24-hour average of 150 $\mu g/m^3$, while the current PM2.5 NAAQS includes both a 24-hour average of 35 $\mu g/m^3$ and an annual average of 15 $\mu g/m^3$.

The maximum off-site annual average concentration of PM2.5 was calculated by multiplying the PM2.5 emission rate (see Section 4.3.3.2) by the maximum off-site unitized annual average concentration (which occurred at the property boundary where there is no residence). The resulting annual average concentration was 2.5E-3 $\mu g/m^3$, more than 6,000 times lower than the NAAQS. Maximum off-site 24-hour average PM10 and PM2.5 concentrations were calculated by multiplying the emission rates by the maximum off-site unitized 1-hour average air concentration (which also occurred at the property boundary), and also by a scaling factor of 0.4 to convert from a maximum 1-hour concentration to a maximum 24-hour concentration (USEPA 1992). The resulting PM10 and PM2.5 maximum 24-hour average concentrations were 0.6 $\mu g/m^3$ and 0.09 $\mu g/m^3$, respectively, 250 or more times lower than their respective NAAQS. This evaluation indicates that potential off-site impacts of particulate matter emissions associated with spent carbon unloading at the outdoor hopper will be protective of human health.

4.4.2.4 Comparison to Risk-Based Standards and Criteria

This part of the risk assessment compares the calculated ambient air concentrations associated with fugitive emissions to available standards and criteria. Specifically, the highest annual average modeled air concentrations at a residential assessment receptor were compared with NAAQS and USEPA Region 9 risk-based PRGs. The results of this comparison, presented in Appendix L, showed that all the modeled air concentrations were below both the applicable NAAQS and the very conservatively derived risk-based PRGs.

4.4.3 Wastewater Discharge from the Facility to the Joint Venture

4.4.3.1 Introduction

Wastewater discharged from the reactivation facility is transported via an underground pipe to the Colorado River Sewage System Joint Venture (CRSSJV) publicly owned treatment works (POTW). The reactivation facility effluent is regulated under an industrial wastewater discharge permit granted to SWT from the CRSSJV in accordance with the Clean Water Act.

The CRSSJV is a primary wastewater treatment plant that serves both the Town of Parker and the Colorado River Indian Tribes, a service population of approximately 5,000 people (USEPA 2001b). Roughly 18% of the water entering the POTW originates from the reactivation facility. Flow rate data from 2006 show a discharge rate from the POTW of about 709,000 gallons of water per day, with the reactivation facility contributing roughly 129,000 gallons per day to this amount. The remaining water entering the POTW comes from other businesses (e.g., Custom Metal Finishing, as indicated in USEPA 2001c) and households in the service area. The CRSSJV discharges the treated water to the Main Drain discharge canal, which begins slightly upstream of the CRSSJV discharge point and travels more than 10 miles in a south-southwesterly direction through the CRIT Reservation before discharging into the Colorado River. The amount of water flowing through the Main Drain substantially increases as it moves downstream due to the addition of water overflow from irrigation canals and seepage from adjacent agricultural land.

The CRSSJV performs semi-annual priority pollutant sampling of its discharge water, in addition to daily sampling for a variety of constituents, including metals, biological oxygen demand, pH and total suspended solids. Chronic aquatic toxicity tests are also conducted using raw CRSSJV effluent every 6 months on water fleas and fathead minnows.

4.4.3.2 Evaluation of Reactivation Facility Discharge

As requested by USEPA and described in the Workplan, a screening-level modeling analysis was conducted to evaluate the potential incremental contribution of the reactivation facility's effluent on chemical concentrations discharged from the CRSSJV into the Main Drain.

The incremental concentrations at the CRSSJV discharge were calculated using mathematical modeling. The calculated incremental concentrations were then compared to ambient water quality criteria in conjunction with a review of the CRSSJV semi-annual effluent toxicity testing results. In addition, potential fish tissue concentrations and associated potential human health fish ingestion risks were evaluated in the Main Drain at a location downstream of the CRSSJV discharge point where fishing was assumed to occur.

4.4.3.3 Evaluation of Reactivation Facility Incremental Impact to CRSSJV Discharge

Incremental chemical concentrations in the CRSSJV discharge due to effluent from the carbon reactivation facility were calculated in a series of six steps which are discussed below:

- Compile chemical concentrations in effluent and select compounds for evaluation
- Calculate total, dissolved and particulate concentrations in facility effluent
- Calculate incremental facility concentrations resulting from treatment at the CRSSJV
- Repartition concentrations at outfall between total, dissolved and particulate phases
- Compile ambient water quality standards and criteria for selected compounds
- Compare incremental facility concentrations to water quality standards

Compile Chemical Concentrations in Effluent and Select Compounds for Evaluation

Measurements of compounds in the reactivation facility effluent were compiled using data collected over the past two years (2005-2006) and provided to CPF by SWT.[15] Table 4.4-6 presents the data that were compiled.

All detected compounds, even if detected only once, were selected for evaluation. For these 19 detected compounds, the minimum and maximum detected levels were identified. Average concentrations were also calculated if there were at least three detected sample concentrations and the majority of reported results were detects. Table 4.4-6 indicates the compounds selected for analysis and the summary concentration data for each compound.

Calculate Total, Dissolved and Particulate Concentrations in Facility Effluent

The concentrations of each compound in the facility effluent in dissolved and particulate phases were calculated from the total measured concentrations according to a screening-level model provided by USEPA (1985):

$$C_{dissolved} = \frac{C_{total}}{[1+(K_{dsw} * TSS * 1E-6)]} \qquad \text{(Equation 4-9)}$$

and

$$C_{particulate} = C_{total} - C_{dissolved} \qquad \text{(Equation 4-10)}$$

where

$C_{dissolved}$	= dissolved concentration in water (µg/L),
C_{total}	= total concentration in water (µg/L),
$C_{particulate}$	= chemical concentration on suspended solids in water (µg/L),
Kdsw	= suspended solids:water partition coefficient (L/kg),
TSS	= total suspended solids concentration (7 mg/L; average in facility effluent), and
1E-6	= conversion factor.

[15] Data provided by M. McCue, Director of Plant Operations, Siemens Water Technologies Corp. May 2007.

The suspended solids:water partition coefficients were identified from recommended USEPA sources (USEPA 2005b, USEPA 2004b, USEPA 1996, and Baes et al. 1984). The partition coefficient was selected taking into account the average pH in the reactivation facility effluent (8.1) for those compounds for which the partition coefficient is pH-dependent (arsenic, barium, cadmium, chromium III and selenium), as described in USEPA's Soil Screening Guidance (USEPA 1996).

The results of these calculations are shown in Table 4.4-7. As indicated in this table, these calculations were performed using two sets of effluent concentrations in order to allow evaluation of both acute and chronic water quality impacts. The maximum single measured value (24-hour or less composite measurement) was conservatively used to model short-term concentrations for comparison to acute criteria or standards. The average concentration was used to model longer-term concentrations for comparison to chronic criteria or standards. Note that long-term concentrations could not be calculated for a number of compounds due to the large percentage of results that were non-detects.

Calculate Incremental Facility Concentrations Resulting From Water Treatment

The change in facility-related concentrations at the CRSSJV was calculated using a mass balance approach, taking into account both the effect of water treatment (particulate and organics removal) and the effect of water flow into the CRSSJV from other sources, as follows:

$$C_{CRSSJVoutfall} = C_{effluent} * (1 - RE) * Q_{facilityeffluent} / Q_{CRSSJVoutfall} \qquad \text{(Equation 4-11)}$$

where

$C_{CRSSJV\ outfall}$ = incremental concentration at CRSSJV outfall (μg/L),
$C_{effluent}$ = concentration in facility effluent (μg/L),
RE = removal efficiency (98%),
$Q_{facility\ effluent}$ = water flow rate into CRSSJV (129,465 gpd), and
$Q_{CRSSJV\ outfall}$ = water flow rate at CRSSJV outfall (708,541 gpd).

The removal efficiency at the CRSSJV was determined from the treatment plant's discharge records for 2005 which showed 98% removal of biological oxygen demand (BOD) and 98% removal of suspended solids. Annual average flow rates for the reactivation facility effluent and the CRSSJV were determined from measurements collected at both locations throughout 2006. As noted above, incremental concentrations at the CRSSJV outfall were calculated separately using short-term and long-term reactivation facility effluent concentrations. Table 4.4-8 presents the calculated concentrations at the CRSSJV outfall due to the incremental contribution from the reactivation facility's effluent.

Repartition Concentrations at Outfall Between Total, Dissolved and Particulate Phases

The concentrations of each compound in the CRSSJV outfall, due to the reactivation facility effluent, were repartitioned between dissolved and particulate phases using the same methodology shown above. The total concentrations in the CRSSJV outfall due to the reactivation facility effluent were calculated by summing the dissolved and particulate phase results shown in Table 4.4-8. These total concentrations were then repartitioned between dissolved and particulate phases taking into account the average pH and suspended solids levels measured at the CRSSJV outfall (7.0 and 3 mg/L, respectively). The resulting concentrations, presented separately for acute and chronic evaluation, are shown in Table 4.4-9.

Compile Ambient Water Quality Standards and Criteria For Selected Compounds

The next step in this evaluation involved compiling Arizona ambient water quality standards (WQS) and the CRSSJV discharge limits for the selected compounds. Arizona WQS for the Colorado River were assumed to be applicable to the CRSSJV outfall, based on similar treatment by USEPA in the CRSSJV's National Pollutant Discharge Elimination System (NPDES) permit. Table 4.4-10 presents the applicable standards and criteria for the selected compounds.

Compare Incremental Reactivation Facility Concentrations to Water Quality Standards

Table 4.4-11 presents the comparison of modeled incremental facility-related concentrations at the CRSSJV outfall to available water quality standards. The results of this screening-level effluent modeling analysis showed that the modeled concentrations in the CRSSJV discharge associated with the reactivation facility effluent were below the most stringent applicable State water quality standards and criteria and the CRSSJV discharge permit limits for all evaluated compounds except selenium. The modeled short-term selenium concentration was below the most stringent acute WQS, however, the modeled long-term average selenium concentration (2.4 μg/L) was marginally above the most stringent chronic criterion (Arizona's chronic WQS of 2 μg/L; the current USEPA ambient water quality criterion for selenium is 5 μg/L). This small difference is well within the bounds of uncertainty associated with the screening-level modeling evaluation and indicates that the modeled result is essentially equivalent to the WQS. Note that the calculated concentration at the outfall was based on the average concentration of selenium in the reactivation facility effluent over the past two years, whereas the effluent concentrations appear to be decreasing over time.

4.4.3.4 CRSSJV Effluent Toxicity Testing

The modeling results described above can be put into context by examining chronic toxicity testing results from the CRSSJV, which provide a more direct evaluation of potential aquatic toxicity of the treatment plant's discharge. Chronic toxicity testing is required to be performed semi-annually on effluent from the CRSSJV. These tests are conducted in January and July, each representing six (6) days of flow-weighted effluent composite samples. Test organisms are the water flea, *Ceriodaphnia dubia* and the fathead minnow,

Pimphales promelas. Toxicity endpoints are survival and reproduction for *C. dubia* and survival and growth for *P. promelas*. The tests are conducted according to USEPA protocols (USEPA 2002a, 2002b) and include the full range of quality assurance required by the guidelines. Among the many tests conducted from 2001 through 2006, there has been no statistically significant difference between control samples and samples with 100% effluent. On the basis of these tests, it may be concluded that the whole effluent from the CRSSJV possesses no toxicity to aquatic organisms.

4.4.3.5 Potential Fish Ingestion Risks for the Main Drain

The uptake of chemicals from the Main Drain into fish and associated potential human health risks from fish ingestion were also addressed, as requested by USEPA. The compounds evaluated in the fish ingestion risk analysis were those for which average concentrations were calculated at the CRSSJV outfall, due to the incremental contribution from the reactivation facility's effluent. The fish ingestion pathway was evaluated at a downstream location on the Main Drain where fishing may occur and where water flow rate measurements are routinely collected by the U.S. Geological Survey (USGS). In December 2001, USEPA's Region 9 GIS Center prepared a map for a public meeting that displayed three fishing locations on the Main Drain (about 7, 12, and 15.5 miles downstream of the CRSSJV outfall) (USEPA 2001c). The evaluated location in this study was the middle location, which was the only one of the three with detailed water flow rate and drainage canal dimension data (USGS Station # 9428508).

The methods specified in HHRAP were used to calculate fish tissue concentrations, fish ingestion intakes by people assumed to regularly eat fish caught from the Main Drain, and potential excess lifetime cancer risks and the potential for non-cancer health effects. Potential exposures and risks were evaluated for both an adult and a child assumed to regularly ingest fish caught from the Main Drain. In the absence of site-specific data, it was conservatively assumed that 100% of the fish eaten by a person every year for many years would be caught only from the Main Drain (i.e., USEPA's HHRAP default assumption for a subsistence fisher receptor).

Two modifications to USEPA's default methods were incorporated into the calculations to reflect more refined information. USEPA's default selenium bioconcentration factor included in HHRAP was updated to reflect more recent information which shows that diet is an important route of selenium exposure to fish (USEPA 2004c). Older concepts of selenium bioaccumulation assumed that uptake occurred primarily from water. Accordingly, a bioaccumulation factor (BAF) based on field studies (409 L/kg) was developed to reflect the importance of diet to selenium uptake to fish.[16] In addition, the fish ingestion intake for arsenic was adjusted to reflect the fraction of arsenic present in the inorganic form in fish, since most arsenic in fish is present in the non-toxic organic form

[16] The bioaccumulation factor (BAF) for selenium used in both the stack emissions risk assessment and in this calculation was based on the geometric mean of 12 values reported in dry tissue weight from field studies (USEPA 2004c), adjusted to wet tissue weight following USEPA's HHRAP methodology (assuming a fish moisture content of 0.8 per USEPA (1999) Ecological Risk Screening Protocol). The resulting BAF was 409 (L/kg wet weight). This compares with USEPA's HHRAP default value of 129 (L/kg wet weight), which was based on the geometric mean of 12 laboratory values.

(ATSDR 2005). Field measurements of arsenic in freshwater fish show the fraction inorganic as 0.01-0.125 (ATSDR 2003, USEPA 2003c). The State of Arizona uses a fraction of 0.1 for inorganic arsenic in calculating the State ambient water quality criterion for arsenic for fish consumption.[17] In this analysis, the Arizona value of 0.1 was thus used to adjust the fish ingestion arsenic intakes.

Table 4.4-12 presents the results of the Main Drain fish ingestion risk analysis, and shows all of the input parameters, and exposure and risk calculation equations that were used. Both the excess lifetime cancer risks and the non-cancer hazard quotient values were below USEPA's target health benchmarks. The excess lifetime cancer risks were calculated to be 3E-7 for an adult subsistence fisherman and 4E-8 for a child subsistence fisherman, both assumed to obtain 100% of the fish ingested solely from the Main Drain. These results are 30 or more times below USEPA's target cancer risk level of 1E-5. The compound accounting for essentially all of the cancer risk was arsenic, based on a calculated dissolved concentration in the Main Drain of 0.033 μg/L which is more than 50 times lower than background levels in the Colorado River in the Parker area.[18] The total hazard index values, based on the sum of all hazard quotients regardless of their potentially differing health effects endpoints, were 1E-2 for both an adult and a child, more than 20 times lower than USEPA's target level of 0.25 and 100 times lower than the more common regulatory target level of 1.0.

4.4.3.6 Summary

Based on the evaluation presented above, it can be concluded that the incremental contribution of the facility effluent on the CRSSJV outfall and the Main Drain does not pose unacceptable risks to either aquatic life or human health. The modeled concentrations in the CRSSJV discharge associated with the reactivation facility effluent are below the most stringent applicable State water quality standards and criteria and the CRSSJV discharge permit limits for all evaluated compounds except selenium. The modeled short-term selenium concentration was below the most stringent acute water quality standard (WQS), however, the modeled long-term average selenium concentration (2.4 μg/L) was marginally above the most stringent chronic criterion (Arizona's chronic WQS of 2 μg/L; the current USEPA ambient water quality criterion for selenium is 5 μg/L). This small difference is well within the bounds of uncertainty associated with the screening-level modeling evaluation and indicates that the modeled result is essentially equivalent to the WQS. More importantly, semi-annual toxicity tests performed on the CRSSJV effluent have consistently shown no toxicity to aquatic organisms. Additionally, potential risks due to ingestion of fish caught from the Main Drain associated with the incremental contribution of the facility effluent were all below USEPA target risk levels for both cancer and non-cancer effects.

[17] Personal communication. Email from S. Pawlowski, Arizona Department of Environmental Quality, to S. Foster, CPF Associates, Inc. May 29, 2007.

[18] The average dissolved arsenic concentration measured in the Colorado River below Parker Dam is 2.1 ug/L, based on 2000-2005 data from USGS Station #09427520.

4.4.4 Worker Health and Safety Evaluation

As indicated in the Workplan, a risk analysis was conducted using methods consistent with those adopted by OSHA and NIOSH in which workplace air concentrations were compared to workplace permissible exposure limits. The worker analysis focused on spent carbon unloading at the outdoor hopper, the activity expected to have the highest potential impacts associated with fugitive air emissions from spent carbon (as described in the review of activities presented in the Workplan). This activity was evaluated using both modeled on-site air concentrations and available employee industrial hygiene air measurements.

It should be noted, however, that the facility has a well-developed worker health and safety program operating in compliance with OSHA. This program includes training, medical monitoring, industrial hygiene sampling and use of personal protective equipment. For further information on worker health and safety at the facility, the reader is referred to the detailed discussion provided in Section 4.4.4 of the Workplan and the discussion of the personnel training program and procedures used to prevent hazards at the facility in the RCRA Part B permit application (Focus 2007).

4.4.4.1 Modeled On-Site Concentrations

Ambient air concentrations for the worker scenario were calculated using the emission rates already described above for the fugitive emissions source in conjunction with ISCST3 modeling results. The dispersion modeling of this emission source was identical to that described above for stack emissions with two modifications. First, the ISCST3 air dispersion model was run for a set of on-site receptor locations (rather than off-site receptors), evenly spaced at 50 foot increments, to evaluate the on-site occupational scenario. Second, 8-hour average unitized modeling results were calculated (instead of annual and 1-hour averages) in order to evaluate concentrations relative to 8-hour average occupational exposure limits. Appendix D describes the air dispersion modeling in more detail.

The maximum 8-hour average modeling result occurred at the location closest to the hopper (about 10 m or 33 feet north of the hopper) for all five years of modeled meteorological data (2001-2005 datasets). The 8-hour average unit concentrations at this location ranged from 8,586 ug/m^3 per 1 g/sec (2001 meteorological data) to 16,426 ug/m^3 per 1 g/sec (2003 meteorological data). All other 8-hour average concentrations were lower than these maximum values. Chemical-specific concentrations on site were then calculated by multiplying the unitized maximum result (16,426 ug/m^3 per 1 g/sec) by the chemical-specific emission rates. The fugitive emission rates, and the methods used to calculate them, were presented earlier in this report.

4.4.4.2 Evaluation of Modeled Air Concentrations

Table 4.4-13 lists the modeled maximum 8-hour average air concentrations on site for the fugitive emissions source and compares these concentrations to available occupational 8-hour average exposure limits. The occupational exposure limits included Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs), National

Institute on Occupational Safety and Health (NIOSH) reference exposure limits (RELs) and, if NIOSH RELs were not available, American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit values (TLVs).

As can be seen from Table 4.4-13, the modeled on-site maximum 8-hour average air concentrations for the evaluated chemicals were all below the available occupational exposure limits. The modeled concentrations were from 5 to more than 1,000,000 times lower than the corresponding occupational exposure limits. If the results were evaluated collectively, by summing the ratios of concentration to exposure limit across all compounds, the combined results would still be below the exposure limits. The highest result, having modeled concentrations 5-50 times lower than its occupational exposure limit, was for 1,3-butadiene, a compound that was present in only one delivery over the 4-year 2003-2006 period.

Potential on-site concentrations of total and respirable dust were also calculated and compared to occupational exposure limits. The calculated maximum 8-hour average total dust concentration was 2.8E-3 mg/m^3, well below the available occupational exposure limits for total dust identified by OSHA and ACGIH (15 mg/m^3 and 10 mg/m^3, respectively). The calculated maximum 8-hour average respirable dust concentration (based on PM10) was 9.6E-4 mg/m^3, also well below the available occupational exposure limits for respirable dust identified by OSHA and ACGIH (5 mg/m^3 and 3 mg/m^3, respectively).

4.4.4.3 Industrial Hygiene Monitoring

Industrial hygiene (IH) monitoring is conducted each year for a wide variety of organic compounds and dust in air to ensure that adequate personal protective equipment is being used at the facility. The annual IH surveys monitor workplace breathing zone concentrations of organic compounds and particulate matter among workers employed in a variety of tasks at the facility, for example workers unloading and sampling spent carbon containers, lab technicians and facility assistant managers. The results of annual IH surveys for the past 14 years, from 1993 through 2006, found that the air concentrations of regulated chemicals were either below quantitation limits or typically 100 or more times below occupational permissible exposure limits (PELs). The only exception occurred during the December 1999 IH survey when a spent carbon load containing a high level of benzene (roughly 60,000 ppm in spent carbon) was being unloaded at the outdoor hopper H-2. Three of the five personal samples collected during this survey, all from inside the hopper building, had time-weighted-average (TWA) benzene levels equal to or just above the PEL, ranging from 1.0 to 2.2 parts per million in air (ppm) versus the PEL of 1 ppm. The samples were collected from individuals who were working inside the hopper during the spent carbon unloading and who were wearing personal protective equipment, including respirators, in accordance with the facility's worker protection program. Results for the other 15 organic compounds tested during the December 1999 IH survey were all either below the quantification limit or more than 100 times below their corresponding PELs. Benzene results from all other IH air samples collected during the 1993-2006 period were either below the detection limit or well below the PEL.

4.4.4.4 Conclusions

These results indicate that fugitive air emissions during spent carbon unloading at the outdoor hopper, the activity for which potential impacts associated with fugitive emissions from spent carbon are expected to be highest, would not exceed occupational exposure limits in ambient air within the property boundary. These results are supported by many years of industrial hygiene measurements which have consistently shown air concentrations of regulated chemicals, excluding a few samples collected inside the hopper structure, either below quantitation limits or typically 100 or more times below the occupational PELs.

4.5 Discussion of Uncertainties

All risk assessments involve the use of assumptions, judgment and incomplete data to varying degrees. This results in uncertainty in the final estimates of risk. In accordance with standard risk assessment practice, this section of the analysis presents discussions of key uncertainties affecting the risk assessment.

4.5.1 General Review of Uncertainties

The results of any risk assessment inherently reflect uncertainty because of the many complexities involved in the analysis. This risk assessment, for example, involved the integration of many steps, each of which is characterized by some uncertainty. These steps included the following:

- Calculation of chemical emission rates
- Modeling of potential air concentrations and deposition rates associated with chemical emissions
- Calculation of chemical concentrations in the environment (e.g., soil, beef, produce, and fish) using mathematical models in conjunction with many chemical/physical properties and assumed or site-specific information about the environment in the facility area
- Calculation of potential exposures to humans through multiple pathways using a combination of default and site-specific exposure parameters
- Calculation of potential risks using toxicity information derived in some instances from human data but predominantly derived by extrapolation from experimental data produced in animal studies

There are four types of uncertainty generally associated with a risk assessment, as described in HHRAP and based on Finkel (1990):

- Variable uncertainty
- Model uncertainty
- Decision-rule uncertainty
- Variability

Variable uncertainty results from uncertainties in the parameter values used in equations in the risk assessment. These uncertainties may stem from measurement, random or systematic errors associated with the numerical values assigned to input parameters. Variable uncertainty may be reducible through additional research or analysis (i.e., better data). Uncertain variables in a risk assessment include chemical-specific input parameters (e.g., biotransfer factors, cancer slope factors), and parameters describing the physical environment (e.g., characteristics of surface water bodies).

Model uncertainty is associated with models used in the risk assessment. The types of models incorporated into risk assessments include animal models used as surrogates for testing the human toxicity of chemicals, dose-response models used to develop chemical toxicity criteria, chemical property models used to calculate chemical-physical properties for the selected compounds, and fate and transport mathematical models used to calculate environmental concentrations of chemicals (e.g., HHRAP equations, ISCST3). Model uncertainty can stem from use of surrogate variables, excluded variables, abnormal conditions, and incorrect model structure.

Decision-rule uncertainty relates to uncertainties stemming from decisions applied in the risk assessment, including methods used to select chemicals for detailed evaluation, the decision to use USEPA default values in the analysis, the decision to use site-specific information to develop input parameters where information was available, and the decision to use USEPA-specified toxicity criteria to evaluate cancer and non-cancer risks.

Variability is related to variations in physical and biological processes, such as the natural differences in how much people weigh or how much they eat. Variability cannot be reduced by doing additional research but it can be addressed by incorporating information on the range of values that might be present in a population. In this risk assessment, many single point values were used for parameters that are known to vary across the population, and most of these were USEPA default values. Although this means that the risk results do not reflect variability in the population, when considered together the single point values, particularly USEPA's defaults, are expected to be more likely to overestimate risks than underestimate risks.

Table 4.5-1 summarizes some of the key elements of uncertainty associated with this analysis and also indicates whether each is expected to underestimate and/or overestimate potential risks. Discussions are also provided below for some additional topics and assumptions relevant to the risk assessment.

The risk assessment results presented earlier in this report reflect the combination of these potential sources of uncertainty. Collectively, however, the assumptions used in this assessment are considered more likely to overestimate risks than underestimate them.

4.5.2 Calculation of Emission Rates

Chemicals that have not been detected in emissions are sometimes included in combustion source risk assessments to ensure that risks are not underestimated. In this assessment, compounds that were not detected were included at the request of USEPA and, as described

in the Workplan, they were evaluated using the common risk assessment practice of assuming they were present at a concentration equivalent to one-half of the reported detection limit. It is, however, uncommon, if not unprecedented, for a combustion source risk assessment to evaluate as many compounds, both detected and not detected, as were considered in this study. The calculation of risk results for over 80 compounds that were not detected adds uncertainty to this study, because these compounds may not actually be present in stack emissions. Overall, the inclusion of so many compounds, including many that were not detected, is considered likely to overestimate risks and unlikely to underestimate risks.

As described in the Workplan, chemical emission rates based on PDT measurements were based on average values across the three test runs. USEPA requested that risks also be considered using emission rates based on the maximum out of the three test runs. This change is only relevant for compounds that were detected in the PDT and for which emission rates were based on PDT results. As noted earlier in this report, the dominant compounds affecting the stack emissions risk assessment results were all evaluated at proposed permit limits, and not based on PDT results (i.e., PCDDs/PCDFs, cadmium, mercury, and chlorine). This alone suggests that the risks would not likely be affected even if maximum emission rates were used instead of averages. Additionally, the emission rates based on PDT results and used in the quantitative risk assessment were compared to the maximum single test run results to determine the potential effect on the calculated risks. This comparison, which was conducted for compounds with emission rates based on PDT measurements, showed that the differences between the average and maximum PDT emission rates ranged from a factor of 1.0 (i.e., no change) to no more than a factor of 3.0. These relatively small differences for compounds that were not risk drivers indicate that the overall risk assessment results would not change if maximum PDT-based emission rates were used rather than averages.

4.5.3 Chemical Concentrations in Spent Carbon

The Workplan indicated that the risk assessment would include a discussion of the representativeness of the spent carbon used during the PDT relative to long-term operating conditions. This issue was examined by developing a profile of the mass-weighted average composition of various organic constituents and metals in the spent carbon received at the facility, based on 2003 through 2006 Toxics Release Inventory (TRI) data. In addition, analytical results from the PDT feed carbon for metals, volatile organics, and semi-volatile organics were averaged across the three test runs and compared to the mass-weighted average carbon profile. The results showed that the concentration of many of the compounds on the PDT feed carbon corresponded well with the mass-weighted average composition based on the TRI data, while other compounds were present on the PDT carbon at concentrations either significantly above or below the mass-weighted average carbon values. For two of the compounds in spent carbon that accounted for the majority of the calculated risks, cadmium and methyl mercury (assessed using elemental mercury in carbon), the concentrations in the PDT feed were higher than the average composition concentrations calculated from the long-term TRI data.

The variation in results from the comparison of the mass-weighted average composition based on the TRI data with the PDT carbon is not unexpected, since the spent carbon fed during the PDT was comprised of the carbon available at the time of testing, and no attempt had been made prior to the test (due primarily to space limitations) to stockpile any particular carbon from specific sources. It was for this very reason that the PDT included the spiking of the feed carbon with principal organic hazardous constituents (POHCs), metals, and a suite of organic surrogate compounds which were believed to represent various classes of compounds and which would likely produce a broad range of combustion by-products and very conservative emissions (i.e., expected to be greater than under typical operating conditions with typical spent carbon).

4.5.4 Examination of Dioxin-Like PCBs

Measurements of specific PCB congeners, compounds believed to have "dioxin-like" properties, were collected during the PDT (Focus 2006). [19] The purpose of this section of the risk assessment is to present an evaluation of the potential impact of the measured dioxin-like PCB congener emissions on the risk assessment results.

The World Health Organization (WHO 1998) has developed toxic equivalency factors (TEFs) for certain dioxin-like PCBs that relate the potential toxicity of each dioxin-like PCB to that of 2,3,7,8-TCDD. For example, the PCB congener 3,4,3',4'-tetrachlorobiphenyl has been assigned a TEF of 0.0001 by WHO, which means that this PCB compound is believed to be 10,000 times less toxic than TCDD. These TEFs, which are also summarized in HHRAP, were used to calculate potential excess lifetime cancer risks for dioxin-like PCBs.

The approach used to perform this evaluation involved several steps. First, emission rates of dioxin-like PCBs based on the PDT were compiled. Second, the potential lifetime average daily dose for each dioxin-like PCB was calculated by multiplying the lifetime average daily dose already calculated for total PCBs by the ratio of the measured PDT emission rate for the dioxin-like PCB divided by the emission rate for total PCBs. The total PCB lifetime average daily dose was based on the receptor and exposure pathway that was found to dominate the risk results for PCDDs/PCDFs (ingestion of fish caught from the Main Drain by an adult). This provided the most conservative indication of the potential impact of dioxin-like PCBs on the risk assessment. The average daily dose for each dioxin-like PCB was then multiplied by its WHO TEF to calculate the TCDD toxic equivalent (TEQ) dose for each dioxin-like PCB. After this, the sum of all the dioxin-like PCB TEQ doses was calculated. Finally, the cancer slope factor for TCDD was multiplied by the total dioxin-like PCB TEQ dose to calculate the associated potential excess lifetime cancer risk. Table 4.5-2 presents the calculations performed for each of these steps.

The resulting excess lifetime cancer risk associated with dioxin-like PCBs was 4.3E-9. This potential risk is eight times lower than the cancer risk already calculated for the fish ingestion pathway for PCDDs/PCDFs (3.6E-8) and negligibly affects the overall results of this risk assessment.

[19] A PCB congener is a single unique chemical compound in the PCB category. There are 209 PCB congeners, of which 12 are considered by USEPA to be dioxin-like compounds.

There are a variety of uncertainties that are associated with this analysis. For example, the assumption that a dioxin-like PCB compound's potency is directly proportional to the potency of 2,3,7,8-TCDD and that this relationship can be quantified based on a TEF. This analysis is also uncertain because it does not account for the differing physicochemical properties of the PCBs that can affect their environmental fate and transport. In addition, many of the PDT test results for dioxin-like PCBs, and PCB homologue groups, were so low that method blank results were significant in relation to the actual sample results, however, no blank corrections were made. Further, a number of the analytical results for these compounds had to be estimated by the laboratory in a manner that is most likely to give an upper bound result (i.e., flagged as an estimated maximum possible concentration). This means that the PDT test results, and the associated dioxin-like PCB excess lifetime cancer risks, are likely to be overestimated.

4.5.5 Total Organic Emissions

This risk assessment evaluated a very large number of specific chemical compounds, and determined not only that the risk results were below target risk levels, but also that over 97% of the cancer risks were due to two compounds (cadmium and PCDDs/PCDFs evaluated as TEQs) and over 91% of the chronic noncancer hazard quotients were due to two other compounds (chlorine and methyl mercury) when all detected compounds were evaluated. When all compounds except for one that was not detected (benzidine) were evaluated, roughly 80% or more of the cancer risks were due to four compounds (cadmium, PCDDs/PCDFs, arsenic and beryllium) and over 85% of the chronic noncancer hazard quotients were due to two other compounds (chlorine and methyl mercury). All of these risk-driving compounds were evaluated at proposed permit limits and two were not detected in PDT stack emissions (arsenic and beryllium).

The dominance of a few compounds on the risk assessment results suggests that other compounds that may be present in stack emissions but which were not quantitatively evaluated in the risk assessment are unlikely to affect the calculated risk results and would not change the overall conclusions of this risk assessment. In order to evaluate this uncertainty further, this section discusses the potential impacts of total organic emissions on the risk assessment results.

During the PDT, total organic emissions were measured for total volatile organic compounds, total semi-volatile organic compounds and total non-volatile organic compounds (Focus 2006). These data were used to derive a total organic emissions (TOE) factor to determine the extent to which emissions of organic compounds not specifically evaluated in the risk assessment might affect the overall risk results. The TOE factor is defined as the ratio of the total organic compound emission rate divided by the sum of the emission rates for organic compounds quantitatively evaluated in the risk assessment. Current methods recommended by USEPA were used to derive this factor, though it should

be noted that there are very important uncertainties associated with this practice (USEPA 2005b). In this particular case, a TOE factor of 10 was calculated.[20]

The potential increase in risks associated with the TOE factor was evaluated by examining the excess lifetime cancer risks for the two receptors with the highest cancer risk results (resident receptor R_2 and farmer receptor R_3). The TOE factor was taken into account by assuming that the toxicity of the unidentified organics was the same as the toxicity of all organics that were evaluated, except PCDDs/PCDFs which are in a class by themselves with respect to potential toxicity. The excess lifetime cancer risks for resident receptor R_2 increased by a factor of 1.2 when all detected compounds were considered and a factor of 1.4 when all compounds except benzidine were included (i.e., revised total cancer risks of 9E-8 and 3E-7, respectively). The excess lifetime cancer risks for the farmer receptor R_3 were not affected when all detected compounds were considered and increased by a factor of 1.2 when all compounds except benzidine were included (i.e., an unchanged total cancer risk of 5E-8 and a revised risk of 1E-7, respectively). These results show that total organic emissions that were not evaluated had a negligible effect on the risks already calculated in this report, resulted in risks still well below USEPA target risk levels, and would not change the overall conclusions of this analysis.

4.5.6 Tentatively Identified Compounds and Compounds Without Human Health Toxicity Criteria

Tentatively identified compounds (TICs) in stack emissions were evaluated as part of the PDT. A description of the methods used to identify TICs is provided in the PDT test report (Focus 2006). In general, these methods focused on identifying those TICs present in the largest amounts in the collected stack samples and for which a chemical-specific identification could be made with confidence. In the PDT, 12 compounds were identified as TICs and all of these were selected for consideration in the detailed quantitative risk analysis.

USEPA-approved human health toxicity criteria were, however, not available for the TIC compounds as well as a number of other organics. Of the more than 200 compounds that were selected for detailed evaluation in this risk assessment, a total of 49 did not have chronic toxicity criteria and 17 did not have acute toxicity criteria either in HHRAP or in sources recommended by HHRAP. These compounds are listed in Table 4.5-3, with an indication of whether chronic and/or acute toxicity criteria were lacking.

The potential impact of TICs and other compounds without toxicity criteria on the risk assessment results was addressed by the TOE evaluation presented above. The TOE factor incorporates not only all of the compounds shown in Table 4.5-3 but also other unidentified organics that may potentially be present in stack emissions. The TOE evaluation showed that the overall conclusions of this analysis would not change even if these compounds had been able to be quantitatively evaluated in the risk assessment.

[20] TOE factor = (TOE emission rate from PDT of 7.63E-3 g/sec) / (sum of emission rates of quantitatively evaluated compounds with chronic toxicity criteria of 7.87E-4 g/sec) = 9.7.

4.5.7 Evaluation of Irrigation Water Use

The IRAP software is not programmed to include inputs from irrigation water in calculating soil concentrations within an area. Soil concentrations were used in this assessment not only to calculate risks from soil ingestion, but also as inputs to the calculation of concentrations in other environmental media (e.g., produce, animals). The effect of this programming limitation was evaluated by comparing the chemical loading to agricultural area soil within the farmer receptor area that was included in IRAP (i.e., residential areas with access to irrigation water and within the modeling domain) to the chemical loading estimated to be due to irrigation water used over the same area. The chemical loading to soil addressed in HHRAP, and programmed into IRAP, reflects inputs due to direct deposition onto the ground surface. The loading was calculated based on a compound's emission rate, the unitized deposition modeling results, the fraction of the compound present in vapor and particulate phases, and the area across which deposition occurs. The loading due to irrigation was calculated based on the compound's concentration in irrigation water and the amount of water applied to the same area.

Irrigation water for the CRIT Reservation is withdrawn from the Colorado River above Headgate Rock Dam in Parker. For the purposes of this comparison, concentrations in irrigation water were assumed to be equivalent to those calculated by the IRAP software for the Colorado River within the modeling domain. The loadings to soil in the agricultural area within the modeling domain due to deposition (evaluated in IRAP) and due to irrigation water use were evaluated for three compounds with different characteristics to represent the range of possible differences in loadings. The three compounds were nickel, an inorganic with a fraction vapor of 0, methylene chloride, a volatile organic compound with a fraction vapor of 1.0, and PCBs (treated as Aroclor 1254), with a fraction vapor of 0.993. The results of the calculations for these three compounds showed that the loadings due to the use of irrigation water on soil were well below those already addressed in IRAP due to direct deposition, ranging from 65 times lower for PCBs to over 850 times lower for methylene chloride and nickel. These results indicate that the risks calculated for farmer receptors would not change if chemical loadings due to irrigation water use were included.

4.5.8 Selection of Meat Exposure Pathways

In this risk assessment, ingestion of several types of animal products was evaluated, consisting of beef, chicken, eggs, and pork. Some people in the facility area may, however, raise and eat goat and lamb (Masters 2007), and some may hunt for animals, including mule deer. Because the IRAP program does not include input parameters necessary to evaluate these pathways, they were not included in the quantitative calculations. As a result, an evaluation was conducted to estimate the extent to which risks might be underestimated by not including these exposure pathways.

This evaluation focused on the compound accounting for the majority of risks from the beef ingestion pathway, which was PCDDs/PCDFs with an excess lifetime cancer risk of roughly 2E-8 for the farmer receptor R_3. The total excess lifetime cancer risk for the farmer

receptor R_3 across all evaluated pathways and all detected compounds was 5E-8.[21] PCDD/PCDF concentrations in beef were calculated using biotransfer coefficients that are proportional to the fat content of beef (HHRAP default for beef is 19%). The potential for PCDD/PCDF uptake into goat, lamb and venison was evaluated, relative to beef, by identifying the fat content of each of these animal meats (2.3%, 23% and 2.4%, respectively).[22] The differences in fat content indicate that PCDD/PCDF concentrations could be about eight times lower in venison and goat, and about the same in lamb, compared to beef. If fat on processed lamb is trimmed to a greater extent than beef, then concentrations in lamb could be lower than calculated in beef. Assuming that people eat the same amount of each of these meats as beef, the excess lifetime cancer risk for ingestion of all four meat types was calculated by adjusting the beef ingestion pathway risk. This adjustment conservatively assumed that a farmer would ingest not only locally-raised beef, but also locally-raised lamb and goat, and locally-caught deer. The resulting cancer risk was 4.5E-8,[23] approximately two times higher than the beef risk, which would produce a total cancer risk for farmer receptor R_3 of roughly 8E-8. These results are still well below the target cancer risk of 1E-5, indicating that the overall risk assessment results would not be affected by including these additional meat ingestion pathways.

4.5.9 Evaluation of Subsistence Exposure Pathways

In the Workplan development phase of this project, USEPA (2001a) requested that the risk assessment address exposure due to subsistence hunting, agriculture and gathering of plants for cultural practices. This section discusses the potential impact on risks associated with subsistence agriculture and subsistence hunting. Potential risks associated with use of plants for cultural practices was not addressed in this report because the information request process outlined by CRIT for this project specified that confidential tribal practices would be assessed separately by CRIT.

Potential risks associated with subsistence agriculture, which was assumed to apply to both ingestion of homegrown produce as well as home-raised or locally-raised animal meats, were evaluated by assuming that 100% of the produce and animal meats ingested by a resident would be homegrown or locally-raised. As noted earlier in this report, the local Agricultural Extension Agent, with input from colleagues, estimated that residents in the area may ingest, at most, 20% of their produce and animal products from home-raised or locally-raised sources (Masters 2007).

Potential risks under the hypothetical subsistence agriculture scenario were evaluated for all compounds, both detected and not detected, except for benzidine (i.e., Group 2 compounds, see Section 4.4.1.1). Risks were calculated, by re-running the IRAP software, for the resident receptor and the farmer receptor with the highest excess lifetime cancer risks presented earlier in this report (i.e., 2E-7 for resident receptor R_2 and 9E-8 for the farmer

[21] Of the total 5E-8 cancer risk, 58% was due to PCDDs/PCDFs of which 90% was due to beef ingestion. The other dominant compound was cadmium, accounting for 41% of the total, of which 83% was due to inhalation.
[22] U.S. Department of Agriculture Nutrient Database, Release 19. 2006. http://riley.nal.usda.gov/NDL.
[23] Approximated adjusted excess lifetime cancer risk = beef risk 2E-8 + lamb risk 2E-8 + goat risk 2E-8/8 + venison risk 2E-8/8 = 4.5E-8.

receptor R_3). The total excess lifetime cancer risks across all evaluated pathways combined for this subsistence scenario increased by a factor of 1.5, to 3E-7, for the resident receptor R_2, and by a factor of 2.2, to 2E-7, for farmer receptor R_3. These recalculated risks were more than 30 times below the USEPA target cancer risk level of 1E-5, indicating that consideration of a subsistence agriculture scenario would not change the overall results of this risk assessment.

Potential risks for a hypothethical subsistence hunting scenario were evaluated by analogy to the risk results for the beef ingestion pathway for farmer receptor R_3, assuming venison was the subsistence hunted food. As noted above, the risks for farmer receptor R_3, assuming 100% of all produce and animal meats ingested were from local or home sources, was calculated to be 2E-7. The dominant pathway contributing to this result was ingestion of beef (cancer risk of 1.3E-7) and the dominant compounds contributing to the beef risk were PCDDs/PCDFs (cancer risk of 1.2E-7). The analogous cancer risk from PCDDs/PCDFs for 100% ingestion of venison was then calculated to be roughly 1.5E-8, based on the fact that venison has roughly eight times less fat than beef (19% fat in beef / 2.4% fat in venison).[24] Conservatively assuming that all compounds other than PCDDs/PCDFs transfer to venison to the same extent as beef gives a total subsistence venison ingestion cancer risk across all compounds (except benzidine) of roughly 2.5E-8. This result is lower than the risk from 100% beef ingestion and well below USEPA's target risk level, indicating that potential risks from subsistence hunting would not alter the overall findings of this risk assessment.

4.5.10 Evaluation of Facility Effluent on the CRSSJV POTW

The incremental contribution of the facility effluent on chemical concentrations in the CRSSJV outfall and downstream in the Main Drain was evaluated using screening-level mathematical models which introduce uncertainty into this evaluation. Site-specific data were used in the calculations where possible to reduce uncertainty. The available site-specific data included: measurements of chemical concentrations in the facility effluent; measured water flow rates, pH levels and suspended solids levels in the facility effluent and the CRSSJV outfall; and measured water flow rates downstream in the Main Drain.

The analysis focused on a location on the Main Drain downstream of the CRSSJV where detailed water flow measurements and drainage ditch dimension data are collected and publicly available, and where fishing is believed to occur. Detailed local information on fishing behaviors was not available at the time this analysis was conducted and, as a result, it was conservatively assumed that 100% of the fish a person eats (i.e., every fish meal per year for many years) would be obtained solely from the one evaluated location on the Main Drain. This assumption is likely to over-estimate potential risks because people probably fish at a variety of locations, possibly along the Main Drain, possibly in other drains in irrigated areas, and/or in the Colorado River. The location that was evaluated in this analysis was considered likely to reasonably reflect potential risks for a person assumed to fish only from the Main Drain and at the fishing locations identified by USEPA (2001c). At

[24] Approximated risk = 100% PCDD/PCDF beef ingestion risk of 1.2E-7 * (2.4% fat in venison / 19% fat in beef) = 1.5E-8.

more distant locations than that evaluated, Main Drain water flow rates will be higher (and potential fish tissue concentrations lower) while at closer locations, water flow rates will be lower (and potential fish tissue concentrations higher). Chemical concentrations in fish tissue were calculated using a simplified fish uptake mathematical model and primarily using default fish biotransfer values provided in HHRAP, an approach which may over- or under-estimate fish tissue levels.

5.0 ECOLOGICAL RISK ASSESSMENT

An ecological risk assessment was conducted to determine the potential effects of modeled stack air emissions on ecological receptors within the study area. The overall approach was based on the approved Workplan which was developed from USEPA's Guidelines for Ecological Risk Assessment (USEPA 1998b) and USEPA's Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities ("Screening Level Protocol") (USEPA 1999).

As described in the Workplan, this ecological risk assessment was designed to present a screening-level assessment focused on the potential effects of stack emissions on selected representative ecological receptors within the facility area considered to be at greatest risk. It was not intended to be an exhaustive evaluation of wildlife species that may be present or to evaluate all possible ecological receptors or exposure pathways.

5.1 Problem Formulation

Problem formulation is the process by which the receptors, endpoints, and pathways which become the focus of the ecological risk assessment are identified. The foundation of problem formulation is an understanding of the predicted relationships between ecological entities and the chemicals to which they may be exposed. From this foundation, the particular receptors and endpoints to be the focus of the assessment are defined.

The problem formulation step of this project was described in the Workplan. In summary, the problem formulation process resulted in the identification of habitat types considered in the risk assessment, as well as the selection of representative ecological receptors for detailed analysis. The habitat types that were considered consisted of creosote bush scrub, agricultural areas, riparian corridors and backwaters, the Colorado River, and the Main Drain. The receptor species or groups selected for evaluation consisted of aquatic life, plants, the badger, Gambel's quail, the great horned owl, the burrowing owl, the southwestern willow flycatcher, the double-crested cormorant, the Yuma clapper rail and mule deer. Table 5.1-1 summarizes the receptor species and pathways for each habitat type that were selected for evaluation in this risk assessment.

For terrestrial receptors, the assessment endpoint was maintenance of long-term health and reproductive capacity of these populations. The measures of effect (measurement endpoints) for these receptors were alteration of reproduction and survival for wildlife and alteration of survival and growth for plants. For aquatic life, the assessment endpoint was maintenance of species abundance and diversity within the study area aquatic community. The measures of effect were alterations of growth, reproduction, or survival in individual species, or changes in community structure, abundance, or diversity in benthic communities. For endangered or threatened species which were selected as receptors (i.e. Yuma clapper rail), the assessment endpoint was reproduction and survival of individual organisms, rather than the population, as specified by USEPA (2003a).

5.2 Risk Analysis Method

Ecological risks were evaluated using a predictive hazard quotient (HQ) approach. In this approach, exposures were calculated for each receptor species or group and then compared to receptor group toxicity reference values (TRVs). This section describes the selection of compounds for the ecological risk assessment, then presents a toxicity assessment, an exposure assessment, an analysis of potential risks, and a discussion of uncertainties.

5.2.1 Selection of Chemicals for Evaluation

Chemicals of potential concern (COPCs) were selected for consideration in the risk assessment in Section 4.1.1 of this report. These compounds were selected based on the results of the PDT and based on their potential to be present in spent carbon.

Starting with the comprehensive COPC list from Section 4.1.1 of more than 225 compounds, available TRVs were identified both from USEPA's 1999 Screening Level Protocol and by referring to the toxicological data sources listed in the Workplan. Compounds for which TRVs were available were quantitatively evaluated in the ecological risk assessment. Compounds without TRVs from the referenced data sources were discussed qualitatively in the uncertainties section.

5.2.2 Toxicity Assessment

A variety of toxicological data sources were consulted to identify TRVs for each selected receptor. TRVs are the estimated dose or exposure level at which no adverse effects are expected to occur. In general, TRVs were obtained from USEPA's Screening Level Protocol or, in the absence of data from this report, from standards, criteria, guidance, or ecological benchmarks from the data sources listed in the Workplan.[25] Consistent with the selected receptor species and groups, available TRVs were compiled for birds, mammals, plants, and aquatic life (surface water and sediment). The TRVs for terrestrial wildlife were based on toxicity studies in which effects on reproduction or survival are measured, since these endpoints are relevant to an assessment of population level effects. For aquatic life, TRVs were based on toxicity studies that examine alterations in growth, reproduction, or survival in individual species, or changes in community structure, abundance, or diversity in benthic species.

As noted in the Workplan, PCDDs/PCDFs were evaluated using a TRV based on 2,3,7,8-TCDD and TEFs for fish and wildlife. These TEFs, which are listed in the Workplan, were applied to express PCDD/PCDF concentrations or doses as 2,3,7,8-TCDD toxic equivalents (TEQs). The TEQs were then summed to calculate the total concentration or dose of 2,3,7,8-TCDD equivalents for each receptor species or group. More information describing the evaluation of PCDD/PCDF mixtures is provided in Appendix M.

[25] CEPA (2002), AZDEQ (2003), USEPA (1996b, 1999, 2003d, 2005d, 2007b), Sample et al. (1996), Schafer et al. (1983), Schafer and Bowles (1985), EC (2000), Efroymson et al. 1997), Mayer and Ellersieck (1986), NOAA (2006), and MacDonald (2000).

5.2.3 Exposure Assessment

Exposures were calculated for each of the selected receptors in each of the selected habitats described above. Exposure point concentrations (EPCs) for environmental media (i.e., sediment, surface water, plants and soil) were calculated using the mathematical equations presented in HHRAP, and implemented using the IRAP software. The air dispersion, deposition, and fate and transport modeling conducted to support the human health risk assessment was also used in the ecological risk assessment to calculate the annual average EPC of each chemical in each habitat as a result of stack emissions. The EPCs were evaluated, either in direct comparisons with TRVs for terrestrial plant receptors and aquatic community receptors, or as inputs to food chain calculations for specific mammalian and avian receptors.

Exposures of selected mammalian and avian receptors were expressed as dosages (mg/kg bw) using food chain models conducted according to the methods recommended in the Screening Level Protocol. The food items and environmental media considered in the food chain analysis for each mammalian and avian receptor are shown in Table 5.2-1. Exposure factors for each receptor (e.g., amount and types of food ingested) were then compiled from the published literature for the specific receptors evaluated in this study, as shown in Table 5.2-2. A discussion of the food chain calculation methods is provided in Appendix M.

Chemical concentrations in food items evaluated in the food chain analyses were obtained either from the IRAP software output (i.e., plant and fish tissue concentrations) or calculated from environmental media concentrations using bioaccumulation factors to estimate tissue concentrations in prey items (i.e., invertebrates and small mammals). The bioaccumulation factors were obtained from values compiled by USEPA in the Screening Level Protocol where available. For compounds not addressed specifically in the Screening Level Protocol, the bioaccumulation factors were derived following the methods outlined in the Screening Level Protocol. One modification to the default bioaccumulation factors in the Screening Level Protocol was made for PCDDs/PCDFs for the Yuma clapper rail. The bioaccumulation factors for invertebrates, the food source for the Yuma clapper rail, that were used in the food chain evaluation for this receptor were developed by USEPA to be generically representative of benthic invertebrates. A detailed assessment of prey of the Yuma Clapper Rail in Arizona and California by the U.S. Fish and Wildlife Service (USFWS 2000) found, however, that the bird's primary prey is crayfish and small fish. Analyses of the stomach contents of 16 Yuma clapper rails collected in the Colorado River area above Laguna Dam[26] found that 94.7% (by volume) of the contents was comprised of crayfish (USFWS 2000). Rather than rely on USEPA's default sediment-to-benthic invertebrate bioconcentration factors (BCFs) for PCDDs/PCDFs, which are based on a 1978 non-specific regression equation (Southworth et al. 1978), recently published literature was reviewed to identify a sediment-to-benthic invertebrate BCF specific to crayfish based on experimental data for the Yuma Clapper Rail food chain analysis (Currie et al. 2000). Appendix M provides additional discussion of the bioaccumulation factors used in the food chain analyses.

[26] Laguna Dam is located about 13 miles northeast of Yuma, Arizona and about 100 miles south of Parker, Arizona.

5.2.4 Risk Estimation and Description

The potential for ecological risks was quantified using an HQ approach in which exposures were compared to receptor-specific TRVs. An HQ is the ratio of predicted exposure to predicted toxicity. In general, hazard quotients less than 1 indicate that adverse effects from chemical-specific exposures are unlikely, whereas hazard quotients greater than one indicate adverse effects are possible. As directed by USEPA Region 9 (USEPA 2003a) during the Workplan development, this screening-level assessment used an HQ threshold of 0.25, rather than 1.0, to initially characterize the potential for risks.

Potential cumulative toxicity was assessed by summing the HQs for all chemicals, regardless of differences in the mechanism of action of the various compounds, to calculate a hazard index (HI). To be consistent with USEPA Region 9 guidance, the very conservative 0.25 target level was also applied to the HI as an initial step. Most other USEPA regions and states use a target level of 1.0 for evaluating HQ and HI results in ecological risk assessments.

If an HI for all compounds is above 1.0, or above 0.25, this does not mean that adverse ecological effects will occur (for example, because of the safety factors that are incorporated in the TRVs). Rather it indicates that HI values should be recalculated for groups of compounds that act via a similar mechanism of action or the hazard quotient values for those compounds producing an HI above a target level should be examined in more detail. If the HI for compounds with similar mechanisms of action is below 1.0, then adverse health effects are not expected to occur. Even if the HI for compounds with similar mechanisms of action is above 1.0, this does not automatically mean that adverse health effects will occur; rather, this type of result means that there is an increased chance that adverse ecological effects might occur. In this case, further research should be conducted to evaluate the potential for ecological effects.

A summary of all the HI values calculated for receptor species or groups, for all the evaluated habitat areas, is presented in Table 5.2-3. The detailed chemical-specific results are provided in Appendix M. The cumulative HI values were not only below a target of 1.0, but also below the very conservative 0.25 ecological target risk level specified by USEPA Region 9 for this project. Concentrations in surface water and sediment were found to be more than 800 times lower than the 0.25 target hazard index level. Concentrations in plants ranged from just below the 0.25 target level to more than 400 times lower than the 0.25 target level. Exposures to selected bird species were found to be at least five times lower than the 0.25 target level. Finally, exposures to the evaluated mammal species were determined to be at least 5,000 times below the 0.25 target level. These results indicate that adverse ecological effects from exposure to stack emissions are not expected to occur for the evaluated receptors.

Although the results were all below the very conservative 0.25 USEPA Region 9 target level, the data were examined to identify those compounds with the highest HQ results. The highest HQ result was calculated for plants in the creosote bush scrub area, based entirely on one compound which was thallium (HQ=0.18). Thallium was not detected in the PDT and was not detected in any monthly composite spent carbon samples tested from 2003 through

June 2006. It was evaluated in the risk assessment using a stack emission rate derived from its reported detection limit in the PDT. In addition, the TRV for thallium identified in the Screening Level Protocol and used in this analysis incorporates an uncertainty factor of 100. These factors all indicate that the results for thallium are expected to be overestimated. The next highest HQ results were calculated for the double-crested cormorant in the Main Drain exposure area (HQ=0.05) and for the southwestern willow flycatcher in the riparian corridor area (HQ=0.03). These results, while at least five times below a 0.25 target level and 20 times below the more commonly used target level of 1.0, were due to one compound, methyl mercury. As described earlier in the human health risk assessment section of this report, mercury was evaluated in this risk assessment using a permit limit-based emission rate that was about 15 times higher than the measured PDT emission rate. This means that the ecological risk assessment results would be 15 times lower if measured emission rates were used in this analysis.

5.2.5 Discussion of Uncertainties

This section discusses uncertainties associated with the data, calculations, and assumptions specific to the ecological risk assessment. Awareness of important uncertainties involved in the risk assessment is critical to interpreting and understanding the potential risks calculated in this analysis.

5.2.5.1 Selection of Compounds for Detailed Evaluation

Many of the compounds identified for consideration in the ecological risk assessment did not have TRVs available from the data sources consulted (see above), and thus were not quantitatively evaluated. The number of TRVs that were available ranged from about 30 TRVs for birds to roughly 80 TRVs for surface water. This uncertainty could potentially under-estimate ecological risks. On the other hand, the chemicals with TRVs included those compounds generally considered to be of most concern to ecological receptors, such as PCDDs/PCDFs and other compounds with a high bioaccumulation potential, as well as selected inorganic compounds and methyl mercury.

5.2.5.2 Food Chain Models

The food chain model incorporated conservative assumptions in calculating potential exposures which is expected to overestimate potential risks. The screening level risk calculation incorporated the following conservative (i.e., protective) assumptions: a bioavailability from all ingested items of 100%, a body weight based on the low end of the receptor's weight range which results in higher calculated food ingestion rates, an exposure period assumed to occur during the most sensitive receptor life stage, the assumption that each individual species in a community or class-specific guild would be equally exposed, the assumption that 100% of ingested food items and environmental media were potentially contaminated, and the assumption that receptors spend their entire life cycles in the evaluated local habitat areas. The collective impact of these assumptions is expected to be an overestimation of potential exposures and associated risks.

Dietary parameters used in the food chain calculations (e.g., body weight, food intake rate, sediment ingestion rates) were based on literature values. For example, based on the scientific literature, it was assumed that the great horned owl's diet would consist entirely of small mammals, specifically the white-footed mouse. It was also assumed that chemical concentrations modeled in small mammals would be representative of concentrations found in any of the other prey items owls typically consume. It was further assumed that the environmental media concentrations were not high enough to affect viability of the prey populations or viability of vegetation, thus impacting the availability of food. In reality, there will be considerable variability in prey and foraging habits, which could add uncertainty to the ecological risk assessment, and may under- or over-estimate risk.

5.2.5.3 Exposure Point Concentrations

The ecological risk calculations relied on maximum annual concentrations associated with stack emissions, thereby conservatively assuming that the each receptor was exposed to the highest annual concentrations over their full life cycle. This assumption may overestimate potential exposures and associated risks.

Plant concentrations were used in the food chain analyses to represent potential concentrations in foods that may be eaten by the herbivores, Gambel's quail and mule deer. The plant concentrations output from the IRAP software based on the USEPA guidance and used in the calculations were for homegrown produce, rather than the specific plant types that may be ingested by these receptors. This may introduce some uncertainty into the exposure point concentrations. For example, differences in plant yields may affect chemical concentrations calculated in plants due to direct deposition, since these concentrations, as calculated by HHRAP methods, are inversely proportional to plant yields. Thus the lower plant yields characteristic of plants that may be ingested by the quail and mule deer, relative to produce, could possibly result in higher plant concentrations than were used in the food chain analyses. This approach could potentially underestimate food chain exposures and associated risks. The HQ results for Gambel's quail and mule deer, however, were more than 2,000 times below the target level, indicating that this uncertainty will not alter the overall risk assessment results.

Fish tissue concentrations used in the food chain analysis for the cormorant were calculated from the IRAP software for fish at the top of the aquatic food web (i.e., trophic level 4 fish). This approach may overestimate concentrations in fish species ingested by the cormorant since the cormorant will commonly feed on invertebrates and a wide variety of fish from varying trophic levels.

USEPA Region 9 requested that the ecological risk assessment discuss the influence of monsoons on chemical fate and transport. The monsoon season in southern Arizona usually occurs from roughly mid-June through mid-September and is associated with elevated humidity, a reversal of cyclonic wind patterns and severe thunderstorms that are often accompanied by strong winds and short periods of blowing dust.[27] Over the 15-year period

[27] www.wrh.noaa.gov/psr/general/monsoon/; http://www.public.asu.edu/~aunjs/asuclim_files/azclim.doc; www.ag.arizona.edu/maricopa/garden/html/weather/monsoon.htm;

from 1993-2007, seven thunderstorm and high wind events were recorded by the National Weather Service in Parker and all of these occurred between late June and late August.[28] The chemical fate and transport modeling methods provided by USEPA for combustion source risk assessments, and which were applied in this ecological risk assessment calculate long-term exposure point concentrations to be consistent with the TRVs, and cannot address the short-term impacts associated with brief climate events such as monsoons. This adds uncertainty to the risk assessment results. For example, during a monsoon, stack emissions will be dispersed in the air to a much greater extent than modeled in this study, short periods of intense rainfall could produce higher water flow rates than modeled in this study, and surface soil could become suspended and redistributed during periods of high winds. In general, environmental conditions that enhance mixing such as monsoons are considered more likely to reduce rather than increase potential long-term environmental concentrations due to stack emissions. This uncertainty could only be addressed through very refined site-specific modeling.

5.2.5.4 Toxicity Reference Values

Toxicity reference values for the selected species and communities were based on default values identified by USEPA in the Screening Level Protocol or obtained from standards, criteria, databases or literature noted in the Workplan or recommended by USEPA (1999). In general, TRVs are a major source of uncertainty in an ecological risk assessment. The results of different studies from which TRVs may be obtained often vary by several orders of magnitude, depending on various forms of the chemical, test species, and test endpoints. The sensitivity of receptors in the exposure areas may be different than the sensitivity of species used in tests reported in the literature. Assumptions about the similarity of the chemical speciation between laboratory tests and site conditions must also be made in the absence of speciation analyses. This is a source of uncertainty, since toxicity may vary with the form of the chemical in the environment. Thus, the actual toxicities of chemicals evaluated in this ecological risk assessment could be higher or lower than indicated by the TRVs. On the other hand, many of the TRVs used in this analysis incorporate uncertainty factors which provide an added margin of safety.

5.2.5.5 Dioxin-Like PCBs

The potential impact of emissions of dioxin-like dioxin-like PCBs on the ecological risk results was evaluated using PCB toxic equivalency factors (TEFs) for fish, birds and wildlife developed by the World Health Organization (WHO 1998). The emission rate of each dioxin-like PCB from the PDT was multiplied by the WHO TEFs to calculate the toxic equivalent (TEQ) emission rate for each dioxin-like PCB. These TEQ emission rates were then summed to provide a total TEQ emission rate for all dioxin-like PCBs combined. The resulting total dioxin-like PCB TEQ emission rates using the fish, bird and wildlife TEFs were all determined to be well below the total PCDD/PCDF TEQ emission rate evaluated in the risk assessment, by at least a factor of 35. Since the highest PCDD/PCDF hazard quotient based on the PCDD/PCDF emissions was calculated to be more than 80 times

[28] http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms

below the conservative 0.25 target level, these findings demonstrate that dioxin-like PCBs would not result in risks to fish, birds or wildlife.

5.2.5.6 Desert Tortoise

The desert tortoise receptor was selected for evaluation in the ecological risk assessment, as described in the Workplan, but no TRVs were identified from a search of available toxicity data sources for tortoises or turtles. As a result, potential risks to the desert tortoise are evaluated in this section, by qualitatively discussing factors relevant to the health status of the desert tortoise and the potential for these factors to be adversely affected by SWT facility stack emissions.

As described by the Nevada Fish and Wildlife Service, "Based on more than 40 years of data, we know that tortoises are directly and indirectly impacted by natural as well as human-caused activities. These threats include disease, predation, expanding development, off-highway vehicles, invasion of non-native grasses and weeds, fire, collection, poachers, sheep & cattle grazing, mining, and drought. At this point, there is not one threat that seems to impact tortoises more than another. It is, rather, an accumulation of threats that are taking a toll. Drought, disease, predation, mining, grazing, and off-highway vehicles all impact tortoises." [29]

TRVs are not available for the desert tortoise or any (even remotely related) reptilian species for the compounds considered in this study. Desert tortoises are herbivorous feeding on grasses, herbs, cacti, and some shrubs. Previous research performed by CPF (Chrostowski and Durda 1991) showed that the primary impact of environmental pollution on the desert tortoise was through phytotoxicity that diminished the availability of forage plants. To the extent that this risk assessment shows no impact of stack emissions on plants in general, there is not likely to be an impact on the desert tortoise.

[29] http://www.fws.gov/nevada/desert_tortoise/dt_threats.html

6.0 QUALITY ASSURANCE PROCEDURES

Risk assessments use data from many different sources in numerous mathematical equations. A multiple-chemical, multiple-pathway combustion source risk assessment, such as this one, generally includes thousands of individual calculations using dozens of input parameters. As a result, a quality assurance (QA) program is an important element in the risk assessment process.

For this project, the QA program included evaluation of input data for accuracy and traceability, documentation of the study process, retention of documents containing data and calculations, and independent QA of calculations by trained scientists who did not conduct the aspects of work they reviewed.

The fate and transport modeling, and exposure and risk assessment calculations for stack and fugitive air emissions, which accounted for the bulk of this study, were performed using the IRAP software. The IRAP software, which was created by Lakes Environmental based on USEPA's HHRAP methodology, relies on quality-assured programmed calculations which incorporate USEPA-specified chemical-specific data and USEPA default input parameters. The program was originally tested and verified in conjunction with USEPA, and the current 2005 version has also been independently verified by Lakes. This software has been widely used in the U.S. (e.g., most USEPA Regions and several states).

Additional QA was conducted for calculations that were independent of the IRAP program (e.g., chemical emission rates, evaluation of wastewater discharge from the facility to the Joint Venture, and QA of inputs entered into the IRAP program). The QA effort for the air dispersion and deposition modeling included an independent review of the input parameters (e.g., building dimensions, emission source input parameters), selected model options, conversions from English to Metric units, and model output files.

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TABLES

Table 4.1-1
List of Selected Chemicals for Detailed Evaluation in the Stack Emissions Risk Assessment

Constituent	CAS NO.	Potentially Present in Spent Carbon (a) (√ /N)	PDT Methods: Included in Stack Sampling Analysis (√ / X) (c)	PDT Results: Detected in Stack Samples (Y/ND/--)	Spiked During PDT (√) (% total feed from spiked material) (d)	Selected as Chemical for Evaluation (√ /N)
Inorganic Compounds						
Aluminum	7429-90-5	N	√	Y		√
Antimony	7440-36-0	√	√	ND		√
Arsenic	7440-38-2	√	√	ND		√
Barium	7440-39-3	√	√	Y		√
Beryllium	7440-41-7	√	√	ND		√
Cadmium	7440-43-9	√	√	Y		√
Chromium (III)	7440-47-3	√	√	Y	√ (96%)	√
Chromium VI (Cr6+)	18540-29-9	√	√	Y		√
Cobalt	7440-48-4	√	√	ND		√
Copper	7440-50-8	√	√	Y		√
Lead [(b)]	7439-92-1	√	√	Y	√ (97%)	√
Manganese	7439-96-5	√	√	Y		√
Mercury (divalent)	7487-94-7	√	√	Y		√
Mercury (elemental)	7439-97-6	√	√	Y		√
Mercury (methyl)	22967-92-6	N	X	-- compound created after emission)		√
Nickel	7440-02-0	√	√	Y		√
Selenium	7782-49-2	√	√	Y		√
Silver	7440-22-4	√	√	Y		√
Thallium	7440-28-0	√	√	ND		√
Vanadium	7440-62-2	√	√	ND		√
Zinc	7440-66-6	√	√	Y		√
Organic Compounds						
1,1,1-Trichloroethane	71-55-6	√	√	ND		√
1,1,2,2-Tetrachloroethane	79-34-5	√	√	ND		√
1,1,2-Trichloroethane	79-00-5	√	√	ND		√
1,1-Dichloroethane	75-34-3	√	√	ND		√
1,1-Dichloroethene	75-35-4	√	√	ND		√
1,1-Dichloropropene	563-58-6	NC	√+	ND		√
1,2,3-Trichlorobenzene	87-61-6	NC	√+	ND		√
1,2,3-Trichloropropane	96-18-4	√	√	ND		√
1,2,4-Trichlorobenzene	120-82-1	N	√	ND		√
1,2,4-Trimethylbenzene	95-63-6	√	√ (TIC)	ND		√
1,2-Dibromo-3-chloropropane	96-12-8	N	√	ND		√
1,2-Dibromoethane (ethylene dibromide)	106-93-4	√	√	ND		√
1,2-Dichlorobenzene	95-50-1	√	√	ND		√
1,2-Dichloroethane	107-06-2	√	√	Y		√
1,2-Dichloroethene	540-59-0	√	√	-- (data provided for cis- and trans-isomers)		N (evaluated separately as the individual isomers)
1,2-Dichloroethene (cis)	156-59-2	√	√	Y (*)		√
1,2-Dichloroethene (trans)	156-60-5	√	√	ND		√
1,2-Dichloropropane	78-87-5	√	√	ND		√
1,2-Diphenylhydrazine	122-66-7	NC	√+	ND		√
1,3,5-Trimethylbenzene	108-67-8	NC	√+	ND		√
1,3-Dichlorobenzene	541-73-1	√	√	ND		√
1,3-Dichloropropane	142-28-9	NC	√+	ND		√
1,3-Dichloropropene (cis)	10061-01-5	NC	√+	ND		√

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1,3-Dichloropropene (trans)	10061-02-6	NC	√+	ND		√
1,3-Dinitrobenzene	99-65-0	N	√	ND		√
1,4-Dichlorobenzene	106-46-7	√	√	ND		√
1-Butanol	71-36-3	√	√ (TIC)	--		N (not reported in spent carbon during 1997-2007)
1-Hexane (n-hexane)	110-54-3	√	√ (TIC)	--		√
2,2'-oxybis (1-Chloropropane)	108-60-1	N	√	ND		√
2,2-Dichloropropane	594-20-7	NC	√+	ND		√
2,3,4,6-Tetrachlorophenol	58-90-2	√	√ (TIC)	--		N (not reported in spent carbon during 1997-2007)
2,4,5-Trichlorophenol	95-95-4	N	√	ND		√
2,4,6-Trichlorophenol	88-06-2	N	√	ND		√
2,4-Dichlorophenol	120-83-2	N	√	ND		√
2,4-Dimethylphenol	105-67-9	N	√	ND		√
2,4-Dinitrophenol	51-28-5	N	√	ND		√
2,4-Dinitrotoluene	121-14-2	N	√	ND		√
2,5-Dimethylfuran	625-86-5	NC	√+	Y (TIC)		√
2,5-Dimethylheptane	2216-30-0	NC	√+	Y (TIC)		√
2,5-Dione, 3-hexene	17559-81-8	NC	√+	Y (TIC)		√
2,6-Dinitrotoluene	606-20-2	N	√	ND		√
2-Butanol	78-92-2	√	X	--		N (not reported in spent carbon during 1997-2007)
2-Butanone (methyl ethyl ketone)	78-93-3	N	√	ND		√
2-Butoxyethanol	111-76-2	√	X	--		N (not reported in spent carbon during 1997-2007)
2-Chloronaphthalene	91-58-7	N	√	ND		√
2-Chlorophenol	95-57-8	N	√	ND		√
2-Chlorotoluene	95-49-8	NC	√+	ND		√
2-Ethyl-1-methylbenzene	611-14-3	√	√ (TIC)	--		N (not reported in spent carbon during 1997-2007)
2-Hexanone	591-78-6	N	√	ND		√
2-Methoxy-1-propanol	1589-47-5	√	X	--		N (not reported in spent carbon during 1997-2007)
2-Methyl octane	3221-61-2	NC	√+	Y (TIC)		√
2-Nitroaniline	88-74-4	N	√	ND		√
2-Nitrophenol	88-75-5	N	√	ND		√
3,3'-Dichlorobenzidine	91-94-1	N	√	ND		√
3-Ethyl benzaldehyde	34246-54-3	NC	√+	Y (TIC)		√
3-Hexen-2-one	763-93-9	NC	√+	Y (TIC)		√
3-Nitroaniline	99-09-2	N	√	ND		√

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3-Penten-2-one (ethylidene acetone)	625-33-2	NC	√+	Y (TIC)		√
3-Penten-2-one, 4-methyl	141-79-7	NC	√+	Y (TIC)		√
4,4'-DDD	72-54-8	N	√	Y (*, COL)		√
4,4'-DDE	72-55-9	N	√	Y (*)		√
4,4'-DDT	50-29-3	N	√	Y (*, COL)		√
4,6-Dinitro-2-methylphenol	534-52-1	N	√	ND		√
4-Bromophenyl-phenyl ether	101-55-3	N	√	ND		√
4-Chloro-3-methylphenol	59-50-7	N	√	ND		√
4-Chloroaniline	106-47-8	N	√	ND		√
4-Chlorophenyl-phenyl ether	7005-72-3	N	√	ND		√
4-Chlorotoluene	106-43-4	NC	√+	ND		√
4-Ethyl benzaldehyde	4748-78-1	NC	√+	Y (TIC)		√
4-Ethyl-1-methylbenzene	622-96-8	√	√ (TIC)	--		N (not reported in spent carbon during 1997-2007)
4-Nitroaniline	100-01-6	N	√	ND		√
4-Nitrophenol	100-02-7	N	√	ND		√
9-Octadecenamide (oleamide)	301-02-0	NC	√+	Y (TIC)		√
Acenaphthene	83-32-9	√	√	Y (B)		√
Acenaphthylene	208-96-8	√	√	Y		√
Acetone	67-64-1	√	√	Y (B)		√
Acetophenone	98-86-2	NC	√+	Y		√
Acrylic Acid	79-10-7	√	X	--		√
Acrylonitrile	107-13-1	√	√	ND		√
Aldrin	309-00-2	√	√	ND		√
Aniline	62-53-3	√	√	ND		√
Anthracene	120-12-7	N	√	Y		√
Benzaldehyde	100-52-7	NC	√+	Y		√
Benzene	71-43-2	√	√	Y		√
Benzidine	92-87-5	NC	√+	ND		√
Benzo(a)Anthracene	56-55-3	√	√	Y		√
Benzo(a)pyrene	50-32-8	N	√	Y (B)		√
Benzo(b)fluoranthene	205-99-2	√	√	Y (B)		√
Benzo(e)pyrene	192-97-2	N	√	Y (B)		√
Benzo(g,h,i)perylene	191-24-2	N	√	Y		√
Benzo(k)fluoranthene	207-08-9	N	√	Y		√
Benzoic Acid	65-85-0	N	√	ND		√
Benzoic acid, methyl ester (methyl benzoate)	93-58-3	NC	√+	Y (TIC)		√
Benzonitrile	100-47-0	NC	√+	ND		√
Benzyl alcohol	100-51-6	N	√	ND		√
BHC, alpha (α-hexachlorocyclohexane)	319-84-6	N	√	Y (*)		√
BHC, beta (β-hexachlorocyclohexane)	319-85-7	N	√	Y (COL)		√
BHC, delta (δ-hexachlorocyclohexane)	319-86-8	√	√	Y (COL)		√
BHC, gamma (Lindane; γ-hexachlorocyclohexane)	58-89-9	N	√	ND		√

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Bis(2-chloroethoxy) methane	111-91-1	N	√	ND		√
Bis-(2-chloroethyl) ether	111-44-4	N	√	ND		√
Bis(2-ethylhexyl) phthalate	117-81-7	N	√	Y		√
Bromobenzene	108-86-1	NC	√+	ND		√
Bromochloromethane	74-97-5	N	√	ND		√
Bromodichloromethane	75-27-46	√	√	Y		√
Bromoform (tribromomethane)	75-25-2	N	√	Y		√
Bromomethane	74-83-9	N	√	Y (B)		√
Butane	106-97-8	√	√	--		N (not reported in spent carbon during 1997-2007)
Butyl Acetate	123-86-4	√	X	--		N (not reported in spent carbon during 1997-2007)
Butylbenzene, n-	104-51-8	NC	√+	ND		√
Butylbenzene, sec	135-98-8	NC	√+	ND		√
Butylbenzene, tert	98-06-6	NC	√+	ND		√
Butylbenzylphthalate	85-68-7	N	√	ND		√
Carbazole	86-74-8	NC	√+	ND		√
Carbon Disulfide	75-15-0	N	√	Y		√
Carbon Tetrachloride	56-23-5	√	√	Y		√
Chlordane - mixed isomers	57-74-9	N	√	-- (data provided for individual isomers)		√ (evaluated based on the sum of results for individual isomers)
Chlordane, cis (α-chlordane)	5103-71-9	N	√	Y (*, COL)		N (evaluated as mixed chlordane)
Chlordane, trans (β-chlordane)	5103-74-2	N	√	ND		N (evaluated as mixed chlordane)
Chlorine	7782-50-5	N	√	Y	√ (from several compounds)	√
Chlorobenzene	108-90-7	√	√	Y (E)	√ (>99%)	√
Chlorobenzilate	510-15-6	N	√	Y (*, COL)		√
Chlorodibromomethane	124-48-1	N	√	Y		√
Chloroethane	75-00-3	√	√	ND		√
Chloroform	67-66-3	√	√	Y		√
Chloromethane	74-87-3	√	√	Y		√
Chrysene	218-01-9	√	√	Y (B)		√
Cresol	1319-77-3	√	√	-- (data provided for o- and m&p-cresols)		N (evaluated separately as the individual isomers)
Cresol, m&p (3-/4-Methylphenol)	108-39-4 & 106-44-5	√	√	ND		√
Cresol, o- (2-Methylphenol)	95-48-7	√	√	ND		√
Cumene (Isopropylbenzene)	98-82-8	√	√ (TIC)	Y (*)		√

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Diallate	2303-16-4	N	√	ND		√
Dibenzo(a,h)anthracene	53-70-3	N	√	ND		√
Dibenzofuran	132-64-9	√	√	ND		√
Dibromomethane	74-95-3	N	√	ND		√
Dichlorodifluoromethane	75-71-8	N	√	Y		√
Dicyclopentadiene	77-73-6	√	√ (TIC)	--		N (not reported in spent carbon during 1997-2007)
Dieldrin	60-57-1	N	√	ND		√
Diethyl phthalate	84-66-2	N	√	ND		√
Dimethylphthalate	131-11-3	N	√	ND		√
Di-n-butylphthalate	84-74-2	N	√	ND		√
Di-n-octyl phthalate	117-84-0	N	√	ND		√
Dioxane (1,4)	123-91-1	√	√	--		√
Diphenylamine	122-39-4	N	√	ND		√
Endosulfan I	959-98-8	N	√	ND		√
Endosulfan II	33213-65-9	N	√	Y (*, COL)		√
Endosulfan sulfate	1031-07-8	N	√	ND		√
Endrin	72-20-8	N	√	ND		√
Endrin aldehyde	7421-93-4	N	√	Y (B, COL)		√
Endrin ketone	53494-70-5	N	√	ND		√
Ethanol	64-17-5	√	X	--		N (not reported in spent carbon during 1997-2007)
Ethyl Acetate	141-78-6	√	X	--		N (not reported in spent carbon during 1997-2007)
Ethylbenzene	100-41-4	√	√	Y		√
Ethylene Glycol	107-21-1	√	X	--		√
Fluoranthene	206-44-0	√	√	Y (B)		√
Fluorene	86-73-7	N	√	Y (B)		√
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	76-13-1	√	√	ND		√
Heptachlor	76-44-8	N	√	Y (COL)		√
Heptachlor epoxide	1024-57-3	N	√	Y (COL)		√
Hexachlorobenzene	118-74-1	N	√	ND		√
Hexachlorobutadiene	87-68-3	N	√	ND		√
Hexachlorocyclo-pentadiene	77-47-4	N	√	ND		√
Hexachloroethane	67-72-1	N	√	ND		√
Hydrogen chloride	7647-01-0	N	√	Y	√ (from several compounds)	√
Indeno(1,2,3-cd)pyrene	193-39-5	N	√	Y (B)		√
Iodomethane	74-88-4	N	√	Y (B)		√
Isobutane	75-28-5	√	X	--		N (not reported in spent carbon during 1997-2007)

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Isodrin	465-73-6	N	√	--		N (not reported in spent carbon during 1997-2007; not in spent carbon)
Isopar C		√	X	--		N (not reported in spent carbon during 1997-2007)
Isophorone	78-59-1	N	√	ND		√
Isopropyl Alcohol	67-63-0	√	X	--		N (not reported in spent carbon during 1997-2007)
Isopropyl toluene, p-	99-87-6	NC	√+	ND		√
Methanol	67-56-1	√	X	--		N (not reported in spent carbon during 2003-2006)
Methoxychlor	72-43-5	√	√	ND		√
Methyl Isobutyl ketone (4-methyl-2-pentanone)	108-10-1	√	X	Y (*)		√
Methyl methacrylate	80-62-6	√	√ (TIC)	--		√
methyl tert-butyl ether	1634-04-4	√	X	--		√
Methylene chloride	75-09-2	√	√	Y	√ (>99%)	√
Methylnaphthalene	1321-94-4	√	√	-- (data provided for 2-methyl naphthalene)		N (2-methylnaphthalene was evaluated)
Methylnaphthalene, 2-	91-57-6	√	√	Y (B)		√
Naphthalene	91-20-3	√	√	Y (B)	√ (>99%)	√
Nitrobenzene	98-95-3	√	√	ND		√
N-nitrosodimethylamine	62-44-2	N	√	ND		√
N-Nitroso-di-n-propylamine	621-64-7	N	√	ND		√
N-Nitrosodiphenylamine	86-30-6	N	√	ND		√
Pentachlorobenzene	608-93-5	N	√	ND		√
Pentachloronitrobenzene	82-68-8	N	√	ND		√
Pentachlorophenol	87-86-5	√	√	ND		√
Perylene	198-55-0	N	√	Y (*, B)		√
Phenanthrene	85-01-8	√	√	Y (*, B)		√
Phenol	108-95-2	√	√	ND		√
Phosphine imide, P,P,P-triphenyl	2240-47-3	NC	√+	Y (TIC)		√
Polychlorinated biphenyls	1336-36-3	√	√	Y		√
Propylbenzene, n-	103-65-1	√	√ (TIC)	ND		√
Propylene glycol monomethyl ether acetate	107-98-2	√	X	--		N (not reported in spent carbon during 1997-2007)
Propylene oxide	75-56-9	√	X	--		√
Pyrene	129-00-0	N	√	Y (B)		√
Pyridine	110-86-1	NC	√+	ND		√
Styrene	100-42-5	√	√	ND		√

Table 4.1-1
List of Selected Chemicals for Detailed Evaluation in the Stack Emissions Risk Assessment

Constituent	CAS NO.	Potentially Present in Spent Carbon (a) (√ /N)	PDT Methods: Included in Stack Sampling Analysis (√ / X) (c)	PDT Results: Detected in Stack Samples (Y/ND/--)	Spiked During PDT (√) (% total feed from spiked material) (d)	Selected as Chemical for Evaluation (√ /N)
Tetrachlorobenzene, 1,2,4,5-	95-94-3	NC	√+	ND		√
Tetrachloroethane, 1,1,1,2-	630-20-6	√	√	Y (*)		√
Tetrachloroethylene	127-18-4	√	√	Y (E)	√ (>99%)	√
Tetrahydrofuran	109-99-9	√	√ (TIC)	ND		√
Toluene	108-88-3	√	√	Y	√ (>99%)	√
Toxaphene	8001-35-2	N	√	--		N (not reported in spent carbon during 1997-2007; not in spent carbon)
Trichloroethylene	79-01-6	√	√	Y		√
Trichlorofluoromethane	75-69-4	√	√	Y (*)		√
Triethylamine	121-44-8	√	√ (TIC)	--		N (not reported in spent carbon during 1997-2007)
Tris(hydroxymethyl) aminomethane	77-86-1	√	N	--		N (not reported in spent carbon during 1997-2007)
Vinyl Acetate	108-05-4	N	√	ND		√
Vinyl Chloride	75-01-4	√	√	Y (*)		√
Xylene, o-	95-47-6	√	√	Y (*)		√
Xylenes (mixed isomers)	1330-20-7	√	√	Y		√
Xylenes, m&p-	108-38-3 & 106-42-3	√	√	Y		√
PCDDs/PCDFs (Dioxins and Furans)						
2,3,7,8-TCDD	1746-01-6	N	√	Y (EMPC)		√
Total TCDD	NA	N	√	Y (EMPC)		N (only 2,3,7,8 congeners are evaluated)
2,3,7,8-TCDF	51207-31-9	N	√	Y (EMPC)		√
Total TCDF	NA	N	√	Y (EMPC)		N (only 2,3,7,8 congeners are evaluated)
1,2,3,7,8-PeCDD	40321-76-4	N	√	Y		√
Total PeCDD	NA	N	√	Y (EMPC)		N (only 2,3,7,8 congeners are evaluated)
1,2,3,7,8-PeCDF	57117-41-6	N	√	Y (EMPC)		√
2,3,4,7,8-PeCDF	57117-31-4	N	√	Y (EMPC)		√
Total PeCDF	NA	N	√	Y (EMPC)		N (only 2,3,7,8 congeners are evaluated)
1,2,3,6,7,8-HxCDD	57653-85-7	N	√	Y (EMPC)		√
1,2,3,4,7,8-HxCDD	39227-28-6	N	√	Y (EMPC)		√
1,2,3,7,8,9-HxCDD	19408-74-3	N	√	Y		√
Total HxCDD	NA	N	√	Y (EMPC)		N (only 2,3,7,8 congeners are evaluated)

Table 4.1-1
List of Selected Chemicals for Detailed Evaluation in the Stack Emissions Risk Assessment

Constituent	CAS NO.	Potentially Present in Spent Carbon (a) (√ /N)	PDT Methods: Included in Stack Sampling Analysis (√ / X) (c)	PDT Results: Detected in Stack Samples (Y/ND/--)	Spiked During PDT (√) (% total feed from spiked material) (d)	Selected as Chemical for Evaluation (√ /N)
1,2,3,6,7,8-HxCDF	57117-44-9	N	√	Y (EMPC)		√
1,2,3,4,7,8-HxCDF	70648-26-9	N	√	Y (EMPC)		√
1,2,3,7,8,9-HxCDF	72918-21-9	N	√	Y (B, EMPC)		√
2,3,4,6,7,8-HxCDF	60851-34-5	N	√	Y (B)		√
Total HxCDF	NA	N	√	Y (B, EMPC)		N (only 2,3,7,8 congeners are evaluated)
1,2,3,4,6,7,8-HpCDD	35822-46-9	N	√	Y (B)		√
Total HpCDD	NA	N	√	Y (B)		N (only 2,3,7,8 congeners are evaluated)
1,2,3,4,6,7,8-HpCDF	67562-39-4	N	√	Y (B, EMPC)		√
1,2,3,4,7,8,9-HpCDF	55673-89-7	N	√	Y (EMPC)		√
Total HpCDF	NA	N	√	Y (B, EMPC)		N (only 2,3,7,8 congeners are evaluated)
Total OCDD	3268-87-9	N	√	Y (B, EMPC)		√
Total OCDF	39001-02-0	N	√	Y (B, EMPC)		√
Polychlorinated Biphenyls						
3,4,3',4'-Tetrachlorobiphenyl (IUPAC 77)	32598-13-3	NoDa	√	Y (EMPC)		√ (b)
3,4,4',5-tetrachlorobiphenyl (IUPAC 81)	70362-50-4	NoDa	√	Y (*, EMPC)		√ (b)
2,3,4,3',4'-Pentachlorobiphenyl (IUPAC 105)	32598-14-4	NoDa	√	Y (B, EMPC)		√ (b)
2,3,4,5,4'-Pentachlorobiphenyl (IUPAC 114)	74472-37-0	NoDa	√	Y (*, EMPC)		√ (b)
2,4,5,3',4'-Pentachlorobiphenyl (IUPAC 118)	31508-00-6	NoDa	√	Y (B, EMPC)		√ (b)
3,4,5,2',4'-Pentachlorobiphenyl (IUPAC 123)	65510-44-3	NoDa	√	Y (B, *, EMPC)		√ (b)
3,4,5,3',4'-Pentachlorobiphenyl (IUPAC 126)	57465-28-8	NoDa	√	Y (EMPC)		√ (b)
2,3,4,5,3',4'-Hexachlorobiphenyl (IUPAC 156)	38380-98-4	NoDa	√	Y (C, EMPC)		√ (b)
2,3,4,3',4',5'-Hexachlorobiphenyl (IUPAC 157)	68782-90-7	NoDa	√	Y (C, EMPC)		√ (b)
2,4,5,3',4',5'-Hexachlorobiphenyl (IUPAC 167)	52663-72-6	NoDa	√	Y (EMPC)		√ (b)
3,4,5,3',4',5'-Hexachlorobiphenyl (IUPAC 169)	32774-16-6	NoDa	√	ND		√ (b)

Table 4.1-1
List of Selected Chemicals for Detailed Evaluation in the Stack Emissions Risk Assessment

Constituent	CAS NO.	Potentially Present in Spent Carbon (a) (√ /N)	PDT Methods: Included in Stack Sampling Analysis (√ / X) (c)	PDT Results: Detected in Stack Samples (Y/ND/--)	Spiked During PDT (√) (% total feed from spiked material) (d)	Selected as Chemical for Evaluation (√ /N)
2,3,4,5,3',4',5'-Heptachlorobiphenyl (IUPAC 189)	39635-31-9	NoDa	√	ND		√ (b)
Criteria Pollutants, Carbon Monoxide, and Total Particulate Matter						
Carbon Monoxide gas	630-08-0	N	√	Y		N (Addressed in PDT)
Nitrogen oxides	10102-44-0 & 10024-97-2	N	√	--		√
Total particulate matter (TSP)	NA	N	√	Y		N (Addressed in PDT)
Sulfur dioxide	7446-09-5	N	√	--		√

Notes:

-- = the compound was not analyzed for or not identified in the PDT sample results
* = the compound was detected very infrequently, in only one or two of the sampled fractions, from the three replicate runs
√ = yes
√+ = new compound; included in PDT sampling and analysis but not originally identified in the 2003 Workplan
√ (TIC) = compound was evaluated in the PDT analysis as a tentatively identified compound
B = one or more sample fraction results from one or more of the three replicate runs were affected by method blank contamination
C = co-eluting PCB isomer
COL = there was a greater than 40% difference between primary and confirmatory columns in one or more sample fraction results from one or more of the three replicate runs; reported result should be considered estimated.
DRE = destruction and removal efficiency
E = one or more sample fraction results from one or more of the three replicate runs exceeded the calibration range
EMPC = one or more of the front or back half sample results from one or more of the three replicate runs were an
N = No
NC = new compound; not identified in the 2003 Workplan, but included in the PDT results
ND = not detected in any sample fraction from any of the three replicate runs
NoDa = No Data
PDT = Performance Demonstration Test (consisted of three replicate runs evaluating "worst-case" operating conditions)
TIC = tentatively identified compound
X = not included in PDT analysis
Y = yes; detected in one or more sample fractions from at least one of the three replicate runs

(a) Source: Risk Assessment Workplan - Identification of compounds based on: 1) "Spent Carbon Feed Metal Results Summary", monthly composites, July 1994 - July 2001. 2) TRI information 1998 through 2000. 3) RCRA Part B Permit Application, November 1995, Table C-2.

(b) These co-planar PCB congeners are addressed in the discussion of uncertainties section of the risk assessment.

(c) Compounds included in PDT sampling program based on analyte lists and PDT results provided by Focus Environmental.

(d) Determined by Focus from PDT report based on average concentration in spent activated carbon feed, an average spent carbon feed rate of 3,049 lb/hr during the test, and average spiked feed rates.

Table 4.2-1
Chemical Emission Rates for Reactivation Furnace Stack

Compound	CAS Number	Stack Emission Rate Used in Risk Assessment (g/sec)	Emission Rate Basis	PDT Results: Detected in Stack Samples (Y or ND)	Additional Emission Rate Information
Inorganic Compounds					
Aluminum	7429-90-5	1.15E-04	PDT	Y	
Antimony	7440-36-0	3.89E-06	PDT	ND	
Arsenic	7440-38-2	1.26E-04	permit limit (a)	ND	PDT emission rate = 3.73E-06 g/sec
Barium	7440-39-3	9.01E-06	PDT	Y	
Beryllium	7440-41-7	1.26E-04	permit limit (a)	ND	PDT emission rate = 2.01E-07 g/sec
Cadmium	7440-43-9	3.12E-04	permit limit (b)	Y	PDT emission rate = 9.11E-06 g/sec
Chromium	7440-47-3	1.26E-04	permit limit (a)	Y	PDT emission rate (chromium was spiked) = 3.54E-05 g/sec
Chromium, hexavalent	18540-29-9	5.80E-06	PDT	Y	
Cobalt	7440-48-4	5.82E-07	PDT	ND	
Copper	7440-50-8	1.19E-04	PDT	Y	
Lead	7439-92-1	3.12E-04	permit limit (b)	Y	PDT emission rate (lead was spiked) = 3.83E-04 g/sec
Manganese	7439-96-5	4.61E-05	PDT	Y	
Mercuric chloride	7487-94-7	3.43E-5 (2.3E-5) (c)	permit limit (c)	Y	PDT emission rate = 2.20E-06 g/sec
Mercury, elemental	7439-97-6	1.35E-4 (1.34E-6) (c)	permit limit (c)	Y	PDT emission rate = 8.60E-06 g/sec
Nickel	7440-02-0	9.91E-06	PDT	Y	
Selenium	7782-49-2	3.76E-06	PDT	Y	
Silver	7440-22-4	2.73E-06	PDT	Y	
Thallium	7440-28-0	9.24E-06	PDT	ND	
Vanadium	7440-62-2	2.43E-06	PDT	ND	
Zinc	7440-66-6	1.51E-04	PDT	Y	
Organic Compounds					
1,1,1-Trichloroethane	71-55-6	2.78E-07	PDT	ND	
1,1,2,2-Tetrachloroethane	79-34-5	1.32E-06	PDT	ND	
1,1,2-Trichloroethane	79-00-5	8.02E-07	PDT	ND	
1,1-Dichloroethane	75-34-3	3.09E-07	PDT	ND	
1,1-Dichloroethene	75-35-4	3.52E-07	PDT	ND	
1,1-Dichloropropene	563-58-6	2.15E-07	PDT	ND	
1,2,3-Trichlorobenzene	87-61-6	1.73E-06	PDT	ND	
1,2,3-Trichloropropane	96-18-4	1.25E-06	PDT	ND	
1,2,4-Trichlorobenzene	120-82-1	9.30E-07	PDT	ND	
1,2,4-Trimethylbenzene	95-63-6	6.26E-07	PDT	ND	
1,2-Dibromo-3-chloropropane	96-12-8	2.60E-06	PDT	ND	
Ethylene dibromide	106-93-4	1.32E-06	PDT	ND	
1,2-Dichlorobenzene	95-50-1	8.43E-07	PDT	ND	
1,2-Dichloroethane	107-06-2	5.05E-07	PDT	Y	
1,2-Dichloroethene (cis)	156-59-2	4.17E-07	PDT	Y (*)	
1,2-Dichloroethene (trans)	156-60-5	2.89E-07	PDT	ND	
1,2-Dichloropropane	78-87-5	3.98E-07	PDT	ND	
1,2-Diphenylhydrazine	122-66-7	7.00E-07	PDT	ND	
1,3,5-Trimethylbenzene	108-67-8	4.05E-07	PDT	ND	
1,3-Dichlorobenzene	541-73-1	8.86E-07	PDT	ND	
1,3-Dichloropropane	142-28-9	3.77E-07	PDT	ND	
1,3-Dichloropropene	542-75-6	7.58E-07	PDT	ND	Emission rate is based on the sum of reported PDT results for (cis) + (trans) dichloropropene (10061-01-5 & 10061-02-6).
1,3-Dinitrobenzene	99-65-0	1.08E-06	PDT	ND	
1,4-Dichlorobenzene	106-46-7	1.00E-06	PDT	ND	
1-Hexane (n-hexane)	110-54-3	7.98E-10	FR&DRE	--	
2,2'-oxybis (1-Chloropropane)	108-60-1	9.72E-07	PDT	ND	
2,2-Dichloropropane	594-20-7	2.79E-07	PDT	ND	
2,4,5-Trichlorophenol	95-95-4	1.61E-06	PDT	ND	
2,4,6-Trichlorophenol	88-06-2	1.27E-06	PDT	ND	
2,4-Dichlorophenol	120-83-2	1.30E-06	PDT	ND	
2,4-Dimethylphenol	105-67-9	3.09E-06	PDT	ND	
2,4-Dinitrophenol	51-28-5	9.15E-06	PDT	ND	
2,4-Dinitrotoluene	121-14-2	1.32E-06	PDT	ND	
2,5-Dimethylfuran	625-86-5	8.43E-07	PDT	Y (TIC)	
2,5-Dimethylheptane	2216-30-0	1.68E-05	PDT	Y (TIC)	
2,5-Dione, 3-hexene	17559-81-8	9.53E-07	PDT	Y (TIC)	
2,6-Dinitrotoluene	606-20-2	1.06E-06	PDT	ND	
Methyl ethyl ketone	78-93-3	4.51E-06	PDT	ND	
2-Chloronaphthalene	91-58-7	6.53E-07	PDT	ND	
2-Chlorophenol	95-57-8	8.60E-07	PDT	ND	
2-Chlorotoluene	95-49-8	5.10E-07	PDT	ND	
2-Hexanone	591-78-6	1.88E-06	PDT	ND	
2-Methyl octane	3221-61-2	3.98E-06	PDT	Y (TIC)	
2-Methylnaphthalene	91-57-6	5.79E-08	PDT	Y (B)	
Cresol, o-	95-48-7	2.09E-06	PDT	ND	
2-Nitroaniline	88-74-4	1.04E-06	PDT	ND	

Table 4.2-1
Chemical Emission Rates for Reactivation Furnace Stack

Compound	CAS Number	Stack Emission Rate Used in Risk Assessment (g/sec)	Emission Rate Basis	PDT Results: Detected in Stack Samples (Y or ND)	Additional Emission Rate Information
2-Nitrophenol	88-75-5	1.77E-06	PDT	ND	
3,3'-Dichlorobenzidine	91-94-1	4.96E-06	PDT	ND	
Cresol, m-	108-39-4	9.15E-07	PDT	ND	Value is one-half of the PDT emission rate for m&p cresol (1.83E-06 g/sec).
Cresol, p-	106-44-5	9.15E-07	PDT	ND	Value is one-half of the PDT emission rate for m&p cresol (1.83E-06 g/sec).
3-Ethyl benzaldehyde	34246-54-3	2.38E-06	PDT	Y (TIC)	
3-Hexen-2-one	763-93-9	1.14E-04	PDT	Y (TIC)	
3-Nitroaniline	99-09-2	2.91E-06	PDT	ND	
Ethylidene acetone (3-penten-2-one)	625-33-2	4.83E-06	PDT	Y (TIC)	
3-Penten-2-one, 4-methyl	141-79-7	9.30E-05	PDT	Y (TIC)	
4,4'-DDD	72-54-8	1.31E-07	PDT	Y (*, COL)	
4,4'-DDE	72-55-9	4.47E-08	PDT	Y (*)	
4,4'-DDT	50-29-3	3.34E-08	PDT	Y (*, COL)	
4,6-Dinitro-2-methylphenol	534-52-1	4.37E-06	PDT	ND	
4-Bromophenyl-phenyl ether	101-55-3	6.71E-07	PDT	ND	
4-Chloro-3-methylphenol	59-50-7	2.17E-06	PDT	ND	
4-Chloroaniline	106-47-8	4.17E-06	PDT	ND	
4-Chlorophenyl-phenyl ether	7005-72-3	1.11E-06	PDT	ND	
4-Chlorotoluene	106-43-4	4.42E-07	PDT	ND	
4-Ethyl benzaldehyde	4748-78-1	1.30E-06	PDT	Y (TIC)	
4-Nitroaniline	100-01-6	2.34E-06	PDT	ND	
4-Nitrophenol	100-02-7	2.92E-06	PDT	ND	
9-Octadecenamide	301-02-0	2.52E-06	PDT	Y (TIC)	
Acenaphthene	83-32-9	4.48E-09	PDT	Y (B)	
Acenaphthylene	208-96-8	8.11E-09	PDT	Y	
Acetone	67-64-1	6.14E-05	PDT	Y (B)	
Acetophenone	98-86-2	3.41E-06	PDT	Y	
Acrylic Acid	79-10-7	1.80E-11	FR&DRE	--	
Acrylonitrile	107-13-1	1.10E-05	PDT	ND	
Aldrin	309-00-2	2.45E-08	PDT	ND	
Aniline	62-53-3	7.19E-06	PDT	ND	
Anthracene	120-12-7	1.28E-08	PDT	Y	
Benzaldehyde	100-52-7	4.90E-06	PDT	Y	
Benzene	71-43-2	2.59E-06	PDT	Y	
Benzidine	92-87-5	4.68E-05	PDT	ND	
Benzo(a)Anthracene	56-55-3	2.84E-09	PDT	Y	
Benzo(a)pyrene	50-32-8	3.58E-09	PDT	Y (B)	
Benzo(b)fluoranthene	205-99-2	2.94E-08	PDT	Y (B)	
Benzo(e)pyrene	192-97-2	5.35E-09	PDT	Y (B)	
Benzo(g,h,i)perylene	191-24-2	1.13E-08	PDT	Y	
Benzo(k)fluoranthene	207-08-9	5.43E-09	PDT	Y	
Benzoic Acid	65-85-0	2.81E-05	PDT	ND	
Benzoic acid, methyl ester	93-58-3	8.07E-07	PDT	Y (TIC)	
Benzonitrile	100-47-0	1.87E-06	PDT	ND	
Benzyl alcohol	100-51-6	2.09E-05	PDT	ND	
Bis(2-chloroethoxy) methane	111-91-1	8.34E-07	PDT	ND	
Bis-(2-chloroethyl) ether	111-44-4	8.14E-07	PDT	ND	
Bis(2-ethylhexyl) phthalate	117-81-7	1.69E-05	PDT	Y	
Bromobenzene	108-86-1	5.00E-07	PDT	ND	
Bromochloromethane	74-97-5	1.52E-06	PDT	ND	
Bromodichloromethane	75-27-4	5.44E-06	PDT	Y	
Bromoform (tribromomethane)	75-25-2	1.38E-05	PDT	Y	
Bromomethane (methyl bromide)	74-83-9	4.72E-06	PDT	Y (B)	
Butylbenzene, n-	104-51-8	6.09E-07	PDT	ND	
Butylbenzene, sec-	135-98-8	4.89E-07	PDT	ND	
Butylbenzene, tert-	98-06-6	5.80E-07	PDT	ND	
Butylbenzylphthalate	85-68-7	1.08E-06	PDT	ND	
Carbazole	86-74-8	9.83E-07	PDT	ND	
Carbon Disulfide	75-15-0	1.24E-06	PDT	Y	
Carbon Tetrachloride	56-23-5	6.77E-07	PDT	Y	
Chlorine	7782-50-5	3.60E-02	permit limit (f)	Y	PDT emission rate (chlorine was spiked) = 1.88E-03 g/sec
Chlorobenzene	108-90-7	2.58E-04	PDT	Y (E)	
Chlorobenzilate	510-15-6	1.17E-07	PDT	Y (*, COL)	
Chlorodibromomethane	124-48-1	1.08E-05	PDT	Y	
Chloroethane	75-00-3	1.32E-06	PDT	ND	
Chloroform	67-66-3	8.24E-06	PDT	Y	
Chloromethane (methyl chloride)	74-87-3	2.41E-05	PDT	Y	

Table 4.2-1
Chemical Emission Rates for Reactivation Furnace Stack

Compound	CAS Number	Stack Emission Rate Used in Risk Assessment (g/sec)	Emission Rate Basis	PDT Results: Detected in Stack Samples (Y or ND)	Additional Emission Rate Information
Chrysene	218-01-9	1.10E-08	PDT	Y (B)	
Cumene (Isopropylbenzene)	98-82-8	3.64E-07	PDT	Y (*)	
Diallate	2303-16-4	6.27E-06	PDT	ND	
Dibenzo(a,h)anthracene	53-70-3	4.67E-10	PDT	ND	
Dibenzofuran	132-64-9	1.06E-06	PDT	ND	
Dibromomethane	74-95-3	1.28E-06	PDT	ND	
Dichlorodifluoromethane (methylene bromide)	75-71-8	3.83E-06	PDT	Y	
Dieldrin	60-57-1	1.17E-08	PDT	ND	
Diethyl phthalate	84-66-2	1.01E-06	PDT	ND	
Dimethylphthalate	131-11-3	6.71E-07	PDT	ND	
Di-n-butylphthalate	84-74-2	3.71E-06	PDT	ND	
Di-n-octyl phthalate	117-84-0	1.42E-06	PDT	ND	
Dioxane (1,4)	123-91-1	8.91E-11	FR&DRE	--	
Diphenylamine	122-39-4	1.05E-06	PDT	ND	
Endosulfan I	959-98-8	1.31E-08	PDT	ND	Evaluated in risk assessment as endosulfan which is included in HHRAP (CAS #115-29-7)
Endosulfan II	33213-65-9	2.67E-08	PDT	Y (*, COL)	
Endosulfan sulfate	1031-07-8	1.52E-08	PDT	ND	
Endrin	72-20-8	4.79E-08	PDT	ND	
Endrin aldehyde	7421-93-4	5.83E-08	PDT	Y (B, COL)	
Endrin ketone	53494-70-5	1.72E-08	PDT	ND	
Ethylbenzene	100-41-4	3.13E-07	PDT	Y	
Ethylene Glycol	107-21-1	1.25E-07	FR&DRE	--	
Fluoranthene	206-44-0	4.90E-08	PDT	Y (B)	
Fluorene	86-73-7	1.26E-08	PDT	Y (B)	
Freon 113	76-13-1	3.33E-07	PDT	ND	
Heptachlor	76-44-8	4.31E-08	PDT	Y (COL)	
Heptachlor epoxide	1024-57-3	2.46E-08	PDT	Y (COL)	
Hexachlorobenzene	118-74-1	1.00E-06	PDT	ND	
Hexachlorobutadiene	87-68-3	1.12E-06	PDT	ND	
Hexachlorocyclo-pentadiene	77-47-4	7.53E-06	PDT	ND	
Hexachloroethane	67-72-1	1.39E-06	PDT	ND	
Hydrogen chloride	7647-01-0	1.60E-01	permit limit (f)	Y	PDT emission rate (chlorine was spiked) = 4.30E-02 g/sec
Indeno(1,2,3-cd)pyrene	193-39-5	5.08E-09	PDT	Y (B)	
Iodomethane	74-88-4	1.97E-06	PDT	Y (B)	
Isophorone	78-59-1	7.96E-07	PDT	ND	
Isopropyl toluene, p-	99-87-6	5.10E-07	PDT	ND	
Methoxychlor	72-43-5	5.38E-08	PDT	ND	
Methyl Isobutyl ketone (4-methyl-2-pentanone)	108-10-1	2.25E-06	PDT	Y (*)	
Methyl methacrylate	80-62-6	5.50E-09	FR&DRE	--	
methyl tert-butyl ether	1634-04-4	8.16E-08	FR&DRE	--	
Methylene chloride	75-09-2	1.74E-05	PDT	Y	
Naphthalene	91-20-3	3.58E-06	PDT	Y (B)	
Nitrobenzene	98-95-3	7.87E-07	PDT	ND	
N-nitrosodimethylamine	62-75-9	9.21E-07	PDT	ND	
N-Nitroso-di-n-propylamine	621-64-7	9.63E-07	PDT	ND	
N-Nitrosodiphenylamine	86-30-6	7.90E-07	PDT	ND	
Pentachlorobenzene	608-93-5	8.83E-07	PDT	ND	
Pentachloronitrobenzene	82-68-8	1.04E-06	PDT	ND	
Pentachlorophenol	87-86-5	1.55E-05	PDT	ND	
Perylene	198-55-0	1.34E-08	PDT	Y (*, B)	
Phenanthrene	85-01-8	1.51E-07	PDT	Y (*, B)	
Phenol	108-95-2	1.14E-06	PDT	ND	
Phosphine imide, P,P,P-triphenyl	2240-47-3	1.06E-06	PDT	Y (TIC)	
PCBs as Aroclor 1254 (d)	11097-69-1	2.34E-08	PDT	Y	
Propylbenzene, n-	103-65-1	4.15E-07	PDT	ND	
Propylene oxide	75-56-9	1.00E-09	FR&DRE	--	
Pyrene	129-00-0	4.93E-08	PDT	Y (B)	
Pyridine	110-86-1	1.85E-06	PDT	ND	
Styrene	100-42-5	2.89E-07	PDT	ND	
Tetrachlorobenzene, 1,2,4,5-	95-94-3	9.55E-07	PDT	ND	
Tetrachloroethane, 1,1,1,2-	630-20-6	2.68E-07	PDT	Y (*)	
Tetrachloroethylene	127-18-4	1.12E-04	PDT	Y (E)	
Tetrahydrofuran	109-99-9	4.59E-06	PDT	ND	
Toluene	108-88-3	1.18E-05	PDT	Y	
Trichloroethylene	79-01-6	2.63E-06	PDT	Y	
Trichlorofluoromethane (Freon 11)	75-69-4	1.27E-06	PDT	Y (*)	

Table 4.2-1
Chemical Emission Rates for Reactivation Furnace Stack

Compound	CAS Number	Stack Emission Rate Used in Risk Assessment (g/sec)	Emission Rate Basis	PDT Results: Detected in Stack Samples (Y or ND)	Additional Emission Rate Information
Vinyl Acetate	108-05-4	1.52E-06	PDT	ND	
Vinyl Chloride	75-01-4	6.75E-07	PDT	Y (*)	
Xylene, o-	95-47-6	3.70E-07	PDT	Y (*)	
Xylene, m-	108-38-3	5.80E-07	PDT	Y	Value is one-half of the PDT emission rate for xylenes, m & p (1.16E-06 g/sec).
Xylene, p-	106-42-3	5.80E-07	PDT	Y	Value is one-half of the PDT emission rate for xylenes, m & p (1.16E-06 g/sec).
BHC, alpha-	319-84-6	2.14E-08	PDT	Y (*)	
Chlordane	57-74-9	5.97E-08	PDT	Y (*, COL) (alpha); ND (beta)	Emission rate is based on the sum of reported PDT results for (cis) + (trans) chlordane (CAS #5103-71-9 & 5103-74-2).
BHC, beta-	319-85-7	5.53E-08	PDT	Y (COL)	
BHC, gamma- (lindane)	58-89-9	1.17E-08	PDT	ND	
BHC, delta-	319-86-8	4.97E-08	PDT	Y (COL)	
PCDDs/PCDFs (Dioxins and Furans)					
2,3,7,8-TCDD	1746-01-6	4.37E-11	permit limit (e)	Y (EMPC)	PDT emission rate = 1.06E-11 g/sec
2,3,7,8-TCDF	51207-31-9	4.20E-10	permit limit (e)	Y (EMPC)	PDT emission rate = 1.02E-10 g/sec
1,2,3,7,8-PeCDD	40321-76-4	1.16E-10	permit limit (e)	Y	PDT emission rate = 2.82E-11 g/sec
1,2,3,7,8-PeCDF	57117-41-6	4.29E-10	permit limit (e)	Y (EMPC)	PDT emission rate = 1.04E-10 g/sec
2,3,4,7,8-PeCDF	57117-31-4	4.45E-10	permit limit (e)	Y (EMPC)	PDT emission rate = 1.08E-10 g/sec
1,2,3,6,7,8-HxCDD	57653-85-7	7.99E-11	permit limit (e)	Y (EMPC)	PDT emission rate = 1.94E-11 g/sec
1,2,3,4,7,8-HxCDD	39227-28-6	7.91E-11	permit limit (e)	Y (EMPC)	PDT emission rate = 1.92E-11 g/sec
1,2,3,7,8,9-HxCDD	19408-74-3	9.35E-11	permit limit (e)	Y	PDT emission rate = 2.27E-11 g/sec
1,2,3,6,7,8-HxCDF	57117-44-9	2.76E-10	permit limit (e)	Y (EMPC)	PDT emission rate = 6.7E-11 g/sec
1,2,3,4,7,8-HxCDF	70648-26-9	5.07E-10	permit limit (e)	Y (EMPC)	PDT emission rate = 1.23E-10 g/sec
1,2,3,7,8,9-HxCDF	72918-21-9	7.33E-11	permit limit (e)	Y (B, EMPC)	PDT emission rate = 1.78E-11 g/sec
2,3,4,6,7,8-HxCDF	60851-34-5	1.55E-10	permit limit (e)	Y (B)	PDT emission rate = 3.76E-11 g/sec
1,2,3,4,6,7,8-HpCDD	35822-46-9	8.20E-11	permit limit (e)	Y (B)	PDT emission rate = 1.99E-11 g/sec
1,2,3,4,6,7,8-HpCDF	67562-39-4	3.98E-10	permit limit (e)	Y (B, EMPC)	PDT emission rate = 9.65E-11 g/sec
1,2,3,4,7,8,9-HpCDF	55673-89-7	9.52E-11	permit limit (e)	Y (EMPC)	PDT emission rate = 2.31E-11 g/sec
Total OCDD	3268-87-9	1.05E-10	permit limit (e)	Y (B, EMPC)	PDT emission rate = 2.54E-11 g/sec
Total OCDF	39001-02-0	5.81E-11	permit limit (e)	Y (B, EMPC)	PDT emission rate = 1.41E-11 g/sec
Combustion Gases					
Sulfur dioxide	7446-09-5	8.69E-02	miniburn data	Y	
Nitrogen dioxide	10102-44-0	3.28E-01	miniburn data	Y	

Notes:

* = The compound was detected very infrequently, in only one or two of the sampled fractions, from the three replicate runs

B = One or more sample fraction results from one or more of the three replicate runs were affected by method blank contamination

COL = There was a greater than 40% difference between primary and confirmatory columns in one or more sample fraction results from one or more of the three replicate runs; reported result should be considered estimated.

EMPC = One or more of the front or back half sample results from one or more of the three replicate runs were an estimated maximum possible concentration.

FR&DRE = Feed rate and destruction and removal efficiency. Since emission rates for this compound were not measured during the PDT, the emission rate was calculated from the annual average feed rate of the compound in received spent carbon, based on 2003-2006 Toxics Release Inventory data from the facility, conservatively assuming a 99.99% destruction and removal efficiency (DRE). The DREs reported from the PDT were all >99.99%.

HHRAP = Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (U.S. Environmental Protection Agency, 2005)

ND = Not detected in any sample fraction from any of the three replicate runs.

PDT = Performance Demonstration Test. The emission rate was calculated as the average across the three PDT test runs.

TIC = Tentatively identified compound.

Y = Yes; detected in one or more sample fractions from at least one of the three replicate runs.

(a) The proposed permit limit for arsenic, beryllium and chromium combined is 1.26E-4 g/sec (97 ug/dscm @7% O2). The emission rate for each compound was conservatively set at the total proposed permit limit.

(b) The proposed permit limit for lead and cadmium combined is 3.12E-4 g/sec (240 ug/dscm @7% O2). The emission rate for each compound was conservatively set at the total proposed permit limit.

(c) The proposed permit limit for total mercury is 1.69E-4 g/sec (130 ug/dscm @7% O2). This total was apportioned between elemental and divalent mercury based on the PDT results (79.7% and 20.3%, respectively). In the risk assessment, these emission rates wre further adjusted, per USEPA 2005 HHRAP guidance, to reflect the portion of mercury entering the global mercury cycle (85.6%) and the portion remaining available locally (14.4% overall, 1% for elemental, 36% for particulate divalent, and 68% for vapor phase divalent). The resulting emission rates available for local impacts, the input parameters used in HHRAP, were 1.34E-6 g/sec for elemental Hg, and 2.3E-5 g/sec for divalent Hg (mercuric chloride).

(d) PDT data for polychlorinated biphenyls (PCBs) (CAS #1336-36-3) was evaluated as Aroclor 1254 based on HHRAP guidance and an evaluation of the PCB homologue distribution, which showed that roughly 93% of the PCBs had 4 or less chlorines and 7% had more than 4 chlorines. Additionally, Aroclor 1254 was selected over Aroclor 1016 to represent total PCBs because it has more conservative human health toxicity criteria.

(e) Based on proposed permit limit of 0.4 ng/dscm @ 7% O2 for PCDD/F TEQs. The permit-limit based emission rate was apportioned between the congeners based on the distribution measured during the PDT.

Table 4.2-1
Chemical Emission Rates for Reactivation Furnace Stack

Compound	CAS Number	Stack Emission Rate Used in Risk Assessment (g/sec)	Emission Rate Basis	PDT Results: Detected in Stack Samples (Y or ND)	Additional Emission Rate Information

(f) Based on proposed permit limit for HCl and Cl2 combined of 77 ppmv @7% O2. The permit-limit based emission rate was apportioned between the compounds based on the results from the PDT (81.68% HCl and 18.32% Cl2).

Table 4.2-2
Upsets Analysis - Calendar Year 2000

Equipment Failure Emissions Affected	Duration Basis	Event Data Time (min)	 Time (min)	Total Failure Time (min)	% of Total Failures
Power Outage Organic, Metals/PM, HCL, CL	Outage + assumed maximum 15 min	56	15	**375**	**38.8%**
		95	23		
		101	20		
		65			
WESP Failure Metals/PM	Retention Time (maximum 42 min)	15		**57**	**5.9%**
		42			
Scrubber Pump Failure Metals/PM, HCL/CL	Retention Time (maximum 42 min)	42		**84**	**8.7%**
		42			
ID Fan Failure Organic, Metals/PM, HCl/Cl	Outage + assumed maximum 15 min	65	43	**305**	**31.6%**
		45	15		
		77	60		
Burner Failure Organic, Metals/PM, HCl/Cl	Outage + assumed maximum 15 min	63	30	**145**	**15.0%**
		25			
		27			
Caustic Failure HCl/Cl	Retention Time (maximum 42 min)			**0**	**0.0%**
Venturi Actuator Failure Metals/PM	Retention Time (maximum 42 min)			**0**	**0.0%**
Quench Spray Plugged Metals/PM	Retention Time (maximum 42 min)			**0**	**0.0%**
Secondary Combustion Fan Failure Organic	Retention Time (maximum 42 min)			**0**	**0.0%**

966 Minutes	**16.10 Hours**	**0.24% Percentage for year (a)**

(a) Total operating hours for the year = 7844 hours

Scaling factor = 1.02
Basis: 0.24% operation during upsets and 99.76% operation under normal conditions
Per USEPA 2005 guidance, scaling factor calculated as follows: (0.0024*10) + (.9976*1) = 1.02

Table 4.2-2 (continued)
Upsets Analysis - Calendar Year 2001

Equipment Failure Emissions Affected	Duration Basis	Event Data Time (min)	Time (min)	Time (min)	Time (min)	Total Failure Time (min)	% of Total Failures	
Power Outage Organic, Metals/PM, HCL, CL	Outage + assumed maximum 15 min	16	32	40	30	**666**	**60.5%**	Note: Power outages were mainly caused by power supplier - BIA
		20	26	45	25			
		44	60	35	155			
		95	43					
WESP Failure Metals/PM	Retention Time (maximum 42 min)	42				**42**	**3.8%**	
Scrubber Pump Failure Metals/PM, HCL/CL	Retention Time (maximum 42 min)	42				**45**	**4.1%**	
		3						
ID Fan Failure Organic, Metals/PM, HCl/Cl	Outage + assumed maximum 15 min	20	52			**297**	**27.0%**	events were caused by fault bearing vibration readings.
		75	66					
		42	42					
Burner Failure Organic, Metals/PM, HCl/Cl	Outage + assumed maximum 15 min	33				**51**	**4.6%**	
		18						
Caustic Failure HCl/Cl	Retention Time (maximum 42 min)					**0**	**0.0%**	
Venturi Actuator Failure Metals/PM	Retention Time (maximum 42 min)					**0**	**0.0%**	
Quench Spray Plugged Metals/PM	Retention Time (maximum 42 min)					**0**	**0.0%**	
Secondary Combustion Fan Failure Organic	Retention Time (maximum 48 min)					**0**	**0.0%**	
						1101 **Minutes**	**18.35** **Hours**	**0.23%** **Percentage for year (a)**

(a) Total operating hours for the year = 7844 hours

Scaling factor = 1.02
Basis: 0.23% operation during upsets and 99.77% operation under normal conditions
Per USEPA 2005 guidance, scaling factor calculated as follows: (0.0023*10) + (.9977*1) = 1.02

Table 4.2-3

Use of Dispersion and Deposition Modeling Results in the Carbon Reactivation Facility Risk Assessment

Exposure Pathway	Type of Environmental Concentration Calculated	Modeling Result Used
Air Dispersion Model		
Long-term chronic risks from inhalation of airborne compounds	Concentration in ambient air	Annual averages
Short-term inhalation risks from airborne compounds	Concentration in ambient air	1-hour averages
Air Dispersion and Deposition Model		
Long-term chronic risks from indirect pathways (e.g., ingestion of animal, products, ingestion of homegrown produce and soil ingestion)	Concentrations in ground-level and aquatic media (e.g., concentrations in plants, water, animal products, fish, soil) resulting from air concentrations and deposition of compounds	Annual averages

Table 4.2-4
Receptor Locations Evaluated for the Stack Emissions Risk Assessment

Receptor Name (a)	Description	Acute Inhalation Risk Evaluation	Chronic Multiple Pathway Risk Evaluation
Residential Receptors (developed area within and around Town of Parker)			
R_1 resident	Closest residential location to facility, residential area in town with highest hourly modeled impacts from stack emissions	√	√
R_2 resident	Residential area in town with highest annual modeled impacts from stack emissions	√	√
Farmer Receptors (residential areas with access to irrigation water and within modeling domain)			
R_3 resident farmer	Residential area with access to irrigation water with highest annual modeled impacts from stack emissions	√	√
R_4 resident farmer	Residential area with access to irrigation water with highest hourly modeled impacts from stack emissions	√	√
Maximum Impact Point (undeveloped land area)			
A_1 max hourly (stack)	Maximum stack emissions impact location for hourly concentrations. There is no residential or commercial land use in the vicinity of the maximum impact area (SW of facility).	√	--
Non-Residential Areas			
A_2 closest business (b)	Closest developed location beyond property boundary (non-residential) with highest hourly modeled impacts from stack emissions	√	--

-- = Not evaluated. These locations are not used for residential purposes.

(a) Receptor names are those used in the IRAP risk assessment software program.

(b) The County Agricultural Extension Office and CRIT Realty are located at receptor A_2. Maximum 1-hour average air concentrations due to stack emissions at all other non-residential developed land use locations were lower than at receptor A_2.

Table 4.2-5

Exposure Pathways and Receptors Quantitatively Evaluated in the Siemens Water Technology Corp. Facility Risk Assessment

Exposure Pathway	Receptors			
	Adult and Child Resident	Adult and Child Fisher	Adult and Child Livestock Farmer	Breast-Fed Infant (a)
Inhalation	✓		✓	
Incidental Soil Ingestion	✓		✓	
Ingestion of Homegrown Produce	✓		✓	
Ingestion of Fish Caught from the Main Drain		✓		
Ingestion of Fish Caught from the Colorado River		✓		
Ingestion of Locally-Raised Poultry			✓	
Ingestion of Locally-Raised Eggs			✓	
Ingestion of Locally-Raised Pork			✓	
Ingestion of Locally-Raised Beef			✓	
Ingestion of Breast-milk				✓

(a) A breast-fed infant exposure to PCDD/PCDFs was evaluated for each adult receptor.

Table 4.2-6
Site-Specific Fate and Transport Modeling Parameters for the Stack Emissions Risk Assessment

Input Parameter	Value	Units	Basis	Symbol
Global Input Parameters				
Average annual precipitation	13	cm/yr	National Climatic Data Center, Climate Summary for Parker, AZ. 1971-2000 Monthly Normals. Annual mean precipitation = 5.17 inches.year.	p
Ambient air temperature	294	K	Annual average temperature from Arizona Meteorological Network station in Parker for 2001-2005 period of record.	t
Average annual wind speed	2.38	m/sec	Annual average wind speed from Arizona Meteorological Network station in Parker for 2001-2005 period of record.	u
Fraction of mercury emissions not lost to the global cycle	.144	unitless	Fraction mercury not lost to global cycle based on PDT test results for mercury species in conjunction with USEPA default assumptions regarding percentages of mercury species lost to the global cycle (99% elemental Hg, 64% particulate Hg2+, 32% vapor Hg2+, per Figure 2-4 in USEPA's 2005 HHRAP).	merc_q_corr
Residential Receptor Area (developed area within and around Town of Parker)				
Average annual evapotranspiration	108	cm/yr	Annual evapotranspiration set at level necessary to meet IRAP program requirement P+I > E_v + RO. This reduces soil loss due to leaching to roughly 0, which will tend to overestimate soil concentrations.	E_v
Average annual irrigation	100	cm/yr	Irrigation based on water use information provided for several crop types by the University of Arizona Cooperative Extension (ag.arizona.edu/pubs/water) and the Arizona Master Gardener Manual (cals.arizona.edu/pubs/garden/mg/vegetable/index.html) in conjunction with growing season information for vegetable crops provided in U.S. Bureau of Reclamation. Lower Colorado River Accounting System Report. March 2007.	I
Average annual runoff	4.8	cm/yr	Calculated using curve number method described in Maidment (1992) and properties for soils present in non-irrigated areas within the modeling domain from SCS (1983). Sources: Maidment, D.R., Ed. 1992. Handbook of Hydrology. McGraw-Hill, Inc. and Soil Conservation Service. 1983. Soil Survey of Colorado River Indian Reservation. Arizona-California. U.S. Department of Agriculture.	RO
Farmer Receptor Area (residential areas with access to irrigation water and within modeling domain)				
Grain fraction grown on affected soil eaten by beef cattle	0	unitless	L. Masters, Director, La Paz County Agricultural Extension Office. Personal communcation with S. Foster, CPF Associates, June 26 and July 2, 2007.	beef_fi_grain
Grain fraction grown on affected soil eaten by chicken	0	unitless	L. Masters, Director, La Paz County Agricultural Extension Office. Personal communcation with S. Foster, CPF Associates, June 26 and July 2, 2007.	chick_fi_grain

Table 4.2-6
Site-Specific Fate and Transport Modeling Parameters for the Stack Emissions Risk Assessment

Input Parameter	Value	Units	Basis	Symbol
Average annual evapotranspiration	182	cm/yr	U.S. Bureau of Reclamation (USBR) calculated evapotranspiration rate for Parker, AZ area. (Source: U.S. Bureau of Reclamation. Lower Colorado River Accounting System Evapotranspiration and Evaporation Calculations. Calendar Year 2005. U.S. Dept. of Interior. March 2007.)	E_v
Average annual irrigation	230	cm/yr	Irrigation rate calculated by dividing water diverted at Headgate Rock Dam to the CRIT irrigation canal (544,600 acre-feet/yr for water year 2005) by number of acres irrigated for 2005 (73,159 acres). Source for water diverted: USGS Annual Water Report for Main Canal Near Parker, Station #09428500, Water Resources Data. Arizona. Water Year 2005. Report AZ-05-1. Source for acres irrigated: U.S. Bureau of Reclamation. Lower Colorado River Accounting System Report. March 2007. Sheet K - Colorado River Indian Reservation, Arizona.	I
Fraction of grain grown on affected soil eaten by pigs	0	unitless	L. Masters, Director, La Paz County Agricultural Extension Office. Personal communcation with S. Foster, CPF Associates, June 26 and July 2, 2007.	pork_fi_grain
Fraction of silage grown on affected soil and eaten by pigs	0	unitless	L. Masters, Director, La Paz County Agricultural Extension Office. Personal communcation with S. Foster, CPF Associates, June 26 and July 2, 2007.	pork_fi_silage
Average annual runoff	7.4	cm/yr	Calculated using curve number method described in Maidment (1992) and properties for soils present in the irrigated area within the modeling domain from SCS (1983). Sources: Maidment, D.R., Ed. 1992. Handbook of Hydrology. McGraw-Hill, Inc. and Soil Conservation Service. 1983. Soil Survey of Colorado River Indian Reservation. Arizona-California. U.S. Department of Agriculture.	RO
Parameters for the Main Drain Fate and Transport Modeling				
Universal Soil Loss Equation (USLE) cover management factor	0.08	unitless	Weighted average for major crop types grown (alfalfa, cotton, sudangrass, bermudagrass, wheat). Crop types and acreages were obtained from the CRIT Annual Irrigation Crop Report for 2000. Cover management factors (C values) were obtained from Mills et al. 1985, Table III-4 (USEPA. 1985. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water – Part I).	C
Universal Soil Loss Equation (USLE) erodibility factor	0.28	tons/acre	Average value based on soil types in irrigated areas, where soil types and erodibility (K) values were identified from the SCS Soil Survey of Colorado River Indian Reservation. Arizona-California. USDA 1986 (from maps and Table 13, respectively).	K
Universal Soil Loss Equation (USLE) erosivity factor	35	yr^{-1}	Obtained from Mills et al. (1985), Figure III-11 for the general Parker, Arizona region (USEPA. 1985. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water – Part I).	RF

Table 4.2-6
Site-Specific Fate and Transport Modeling Parameters for the Stack Emissions Risk Assessment

Input Parameter	Value	Units	Basis	Symbol
Impervious watershed area	0	m^2	Assumes the area of impervious surfaces, such as paved roads, is negligible in comparison to the entire watershed area.	AI
Watershed area	76,643,414	m^2	Surface area within modeling domain calculated by IRAP based on waterbody geometry drawn on base map within IRAP program.	AL
Water column depth	0.7	m	Average water depth of Main Drain at USGS Upper Main Drain Near Poston station (USGS #09428508), based on 2003-2007 data.	dwc
Current velocity	0.26	m/sec	Average water velocity of Main Drain at USGS Upper Main Drain Near Poston station (USGS #09428508), based on 2003-2007 data.	u
Total suspended solids concentration	2.6	mg/L	mg/L - Suspended solids concentration was estimated from turbidity measurements collected from 2002-2006 from the Colorado River at the USGS Parker Dam station #09427520. Suspended solids concentration was calculated using three regression equations that relate turbidity to suspended solids derived from studies of the Alamo River, CA, Verde River, AZ and Little Colorado River, AZ.	TSS
Flow rate	5.62E+07	m^3/yr	Average flow rate of Main Drain at USGS Upper Main Drain Near Poston station (USGS #09428508), based on 2003-2007 data (63 cfs). Flow rate measurement data were not available at any other location along the Main Drain.	Vfx
Water body surface area	86,322	m^2	Surface area within modeling domain calculated by IRAP based on waterbody geometry drawn on base map within IRAP program.	Aw
Average annual evapotranspiration	182	cm/yr	U.S. Bureau of Reclamation (USBR) calculated evapotranspiration rate for Parker, AZ area. (Source: U.S. Bureau of Reclamation. Lower Colorado River Accounting System Evapotranspiration and Evaporation Calculations. Calendar Year 2005. U.S. Dept. of Interior. March 2007.)	E_v
Average annual irrigation	230	cm/yr	Irrigation rate calculated by dividing water diverted at Headgate Rock Dam to the CRIT irrigation canal (544,600 acre-feet/yr for water year 2005) by number of acres irrigated for 2005 (73,159 acres). Source for water diverted: USGS Annual Water Report for Main Canal Near Parker, Station #09428500, Water Resources Data. Arizona. Water Year 2005. Report AZ-05-1. Source for acres irrigated: U.S. Bureau of Reclamation. Lower Colorado River Accounting System Report. March 2007. Sheet K - Colorado River Indian Reservation, Arizona.	I

Table 4.2-6
Site-Specific Fate and Transport Modeling Parameters for the Stack Emissions Risk Assessment

Input Parameter	Value	Units	Basis	Symbol
Average annual runoff	7.4	cm/yr	Calculated using curve number method described in Maidment (1992) and properties for soils present in the irrigated area within the modeling domain from SCS (1983). Sources: Maidment, D.R., Ed. 1992. Handbook of Hydrology. McGraw-Hill, Inc. and Soil Conservation Service. 1983. Soil Survey of Colorado River Indian Reservation. Arizona-California. U.S. Department of Agriculture.	RO
Parameters for the Colorado River Fate and Transport Modeling				
Universal Soil Loss Equation (USLE) cover management factor	0.2	unitless	Weighted average for major crop types grown (alfalfa, cotton, sudangrass, bermudagrass, wheat). Crop types and acreages were obtained from the CRIT Annual Irrigation Crop Report for 2000. Cover management factors (C values) were obtained from Mills et al. 1985, Table III-4 (USEPA. 1985. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water – Part I).	C
Universal Soil Loss Equation (USLE) erodibility factor	0.13	tons/acre	Average value based on soil types in irrigated areas, where soil types and erodibility (K) values were identified from the SCS Soil Survey of Colorado River Indian Reservation. Arizona-California. USDA 1986 (from maps and Table 13, respectively).	K
Universal Soil Loss Equation (USLE) erosivity factor	35	yr-1	Obtained from Mills et al. (1985), Figure III-11 for the general Parker, Arizona region (USEPA. 1985. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water – Part I).	RF
Impervious watershed area	0	m^2	Assumes the area of impervious surfaces, such as paved roads, is negligible in comparison to the entire watershed area.	AI
Watershed area	359,614,253	m^2	Surface area within modeling domain calculated by IRAP based on waterbody geometry drawn on base map within IRAP program.	AL
Water column depth	1.7	m	Average water depth of Main Drain at USGS Upper Main Drain Near Poston station (USGS #09428508), based on 2003-2007 data.	dwc
Current velocity	0.99	m/sec	Average water velocity of Main Drain at USGS Upper Main Drain Near Poston station (USGS #09428508), based on 2003-2007 data.	u
Water body temperature	292	K	Average temperature measured at inlet to Main Colorado River Irrigation Canal, which draws water from the Colorado River at Headgate Rock Dam, from USGS Station #09428500 for period 1969-1983 (years for which data were available for electronic download).	T

Table 4.2-6
Site-Specific Fate and Transport Modeling Parameters for the Stack Emissions Risk Assessment

Input Parameter	Value	Units	Basis	Symbol
Total suspended solids concentration	2.6	mg/L	mg/L - Suspended solids concentration was estimated from turbidity measurements collected from 2002-2006 from the Colorado River at the USGS Parker Dam station #09427520. Suspended solids concentration was calculated using three regression equations that relate turbidity to suspended solids derived from studies of the Alamo River, CA, Verde River, AZ and Little Colorado River, AZ.	TSS
Flow rate	6.10E+06	m^3/yr	Average flow rate of Main Drain at USGS Upper Main Drain Near Poston station (USGS #09428508), based on 2003-2007 data (63 cfs). Flow rate measurement data were not available at any other location along the Main Drain.	Vfx
Water body surface area		m^2	Surface area within modeling domain calculated by IRAP based on waterbody geometry drawn on base map within IRAP program.	Aw
Average annual evapotranspiration	8.19	cm/yr	Annual evapotranspiration set at level necessary to meet IRAP program requirement P+I > E_v + RO, assuming that irrigation = 0 cm/year for this receptor area.	E_v
Average annual irrigation	0	cm/yr	Watershed assumed to be non-irrigated. For non-irrigated areas, irrigation was set to 0, and annual evapotranspiration was set at a level necessary to meet the modeling program condition of P+I > E_v + RO.	I
Average annual runoff	4.8	cm/yr	Calculated using curve number method described in Maidment (1992) and properties for soils present in non-irrigated areas within the modeling domain from SCS (1983). Sources: Maidment, D.R., Ed. 1992. Handbook of Hydrology. McGraw-Hill, Inc. and Soil Conservation Service. 1983. Soil Survey of Colorado River Indian Reservation. Arizona-California. U.S. Department of Agriculture.	RO

Table 4.2-7
Receptor Locations and Area-Wide Receptors Evaluated for the Stack Emissions Risk Assessment

Receptor Name (a)	Description	Acute Inhalation Risk Evaluation	Chronic Multiple Pathway Risk Evaluation
Residential Receptors (developed area within and around Town of Parker)			
R_1 resident	Closest residential location to facility, residential area in town with highest hourly modeled impacts from stack emissions	√	√
R_2 resident	Residential area in town with highest annual modeled impacts from stack emissions	√	√
Town area	Average of modeled impacts across town area	**	√
Farmer Receptors (residential areas with access to irrigation water and within modeling domain)			
R_3 resident farmer	Residential area with access to irrigation water with highest annual modeled impacts from stack emissions	√	√
R_4 resident farmer	Residential area with access to irrigation water with highest hourly modeled impacts from stack emissions	√	√
Farmer area	Average of modeled impacts across area with access to irrigation water within modeling domain	**	√
Fish Ingestion Pathway			
R_only_fish_drain	Average modeled impacts across Main Drain within modeling domain	**	√
R_only_fish_river	Average modeled impacts across Colorado River within modeling domain	**	√
Maximum Impact Point (undeveloped land area)			
A_1 max hourly (stack)	Maximum stack emissions impact location for hourly concentrations. There is no residential or commercial land use in the vicinity of the maximum impact area (SW of facility).	√	--
Non-Residential Areas			
A_2 closest business (b)	Closest developed location beyond property boundary (non-residential) with highest hourly modeled impacts from stack emissions	√	--

** = Not evaluated. Acute inhalation risks were evaluated at specific modeled receptor points. The "town area" and "farmer area" receptors were assessed based on the average of the annual average ISCST3 modeling results across each of these areas, respectively, within the modeling domain, and thus these areas were not associated with any single receptor point. Similarly, the fish ingestion pathway receptors were associated with waterbody and watershed areas within the modeling domain for either the Main Drain or the Colorado River, and thus they too were not associated with any single receptor point.

-- = Not evaluated. These locations are not used for residential purposes.

(a) Receptor names are those used in the IRAP risk assessment software program.

(b) The County Agricultural Extension Office and CRIT Realty are located at receptor A_2. Maximum 1-hour average air concentrations due to stack emissions at all other non-residential developed land use locations were lower than at receptor A_2.

Table 4.3-1
Data Used to Select Chemicals for the Fugitive Emissions Evaluation

2003-2006 TRI data from Siemens Parker Facility (January 1, 2003 - December 31, 2006)							Chemical-Specific Toxicity Information			Volatility Information
compound	CAS #	number of deliveries over 4 year period	average concentration in received carbon loads (ppm)	maximum concentration in received carbon loads (ppm)	total carbon received over 4 year period (lbs)	total chemical received over 4 year period (lbs)	acute inhalation reference concentration (mg/m^3) (a)	chronic inhalation reference concentration (mg/m^3) (a)	inhalation cancer unit risk $(\mu g/m^3)^{-1}$ (a)	Henry's law constant ($atm\text{-}m^3/mol$) (b)
1,1,1-Trichloroethane	71-55-6	265	797	21,362	1,109,140	965.4	68			1.70E-02
1,1,2,2,-Tetrachloroethane	79-34-5	26	490	983	107,740	36.01	60	0.11	7.40E-06	3.40E-04
1,1,2-Trichloroethane	79-00-5	64	937	3,405	451,280	626.1	50		1.60E-05	9.10E-04
1,1-Dichlorethane	75-34-3	193	58	1,500	933,660	37.40	1250	0.5		5.60E-03
1,1-Dichloroethene	75-35-4	782	130	9,921	3,644,640	501.9	75	0.2		2.60E-02
1,2-Dichlorobenzene	95-50-1	52	6,550	78,000	274,720	684.1	300	0.2		1.90E-03
1,2,3-Trichloropropane	96-18-4	3	0.40	0.396	60,000	0.0238	60	0.021	0.002	4.10E-04
1,2,4-Trimethylbenzene	95-63-6	47	8.72	33	294,920	2.156	150			6.16E-03
1,2-Dibromoethane	106-93-4	11	152	402	18,100	3.147	200	0.009	6.00E-04	7.43E-04
1,2-Dichloroethane	107-06-2	437	166	16,000	2,476,100	528.1	202	2.4	2.60E-05	9.80E-04
1,2-Dichloroethene	540-59-0	32	196	1,700	104,700	15.41	555	0.07		9.40E-03
1,2-Dichloropropane	78-87-5	17	157	2,310	93,300	4.874	500	0.004	1.00E-05	2.80E-03
1,3-Butadiene	106-99-0	1	12,880	12,880	7,400	95.31	1481	2.00E-03	3.00E-05	7.36E-02
1,3-Dichlorobenzene	541-73-1	11	308	680	24,000	6.610	12.5	0.0032		3.10E-03
1,4-Dichlorobenzene	106-46-7	59	6,550	34,500	206,120	892.42	600	0.8	1.10E-05	2.40E-03
1,4-Dioxane	123-91-1	8	29	29	8,540	0.2477	3	3	3.10E-06	4.80E-06
2,4,Dinitrophenol	51-28-5	9	1.80	1.8	108,000	0.1944	7.5	0.007		4.43E-07
Acetone	67-64-1	63	222	720	340,140	30.74	475	0.35		3.90E-05
Acrylic Acid	79-10-7	1	25	25	2,000	0.0500	6	1.00E-03		1.17E-07
Acrylonitrile	107-13-1	9	11,500	11,500	57,000	655.5	22	0.002	6.80E-05	1.03E-04
Aldrin	309-00-2	2	2.60	2.6	3,000	0.0078	0.75	0.0001	0.0049	1.70E-04
Aniline	62-53-3	14	128	137	190,000	23.63	30.45	0.001	1.60E-06	1.90E-06
Antimony	7440-36-0	10	0.99	2.11	16,020	0.0203	1.5	0.0014		2.50E-02
Arsenic	7440-38-2	10	7.13	139	937,220	3.834	0.00019	3.00E-05	4.30E-03	
Barium	7440-39-3	302	40	920	2,361,760	78.82	1.5	5.00E-04		
Benzene	71-43-2	3443	2,057	70,000	19,245,740	67,042	1.3	0.03	7.80E-06	5.60E-03
Beryllium	7440-41-7	52	0.59	9.76	547,040	0.219	0.005	2.00E-05	2.40E-03	
Bromodichloromethane	75-27-4	3	0.82	1.2	7,280	0.00793	4	0.07	1.80E-05	1.60E-03
Cadmium	7440-43-9	63	3.31	79.3	818,120	3.576	0.03	2.00E-04	1.80E-03	
Carbon Tetrachloride	56-23-5	142	19	935	1,051,660	14.52	1.9	0.04	1.50E-05	3.00E-02
Chlorobenzene	108-90-7	109	444	5,762	764,100	1,376.04	125	0.06		3.70E-03
Chloroethane	75-00-3	3	11	11	3,000	0.0330	2500	10		8.80E-03
Chloroform	67-66-3	634	130	20,940	4,318,420	483.5	0.15	0.0003	2.30E-05	3.70E-03
Chloromethane	74-87-3	3	1,836	5,500	6,000	22.01	200	0.09	1.80E-06	8.82E-03
Chromium	7440-47-3	310	12	294	2,789,000	36.92	1.5	5.3		
cis 1,2-Dichloroethene	156-59-2	3	490	490	6,620	3.244	555	0.07		4.10E-03
Cobalt	7440-48-4	171	11	798	1,808,760	12.16	3	1.00E-04		
Copper	7440-50-8	256	119	6,820	2,075,180	56.81	0.1	3.50E-02		
Cyclohexane	110-82-7	16	8,634	46,000	48,800	231.4	1000	6		1.95E-01

Table 4.3-1
Data Used to Select Chemicals for the Fugitive Emissions Evaluation

2003-2006 TRI data from Siemens Parker Facility (January 1, 2003 - December 31, 2006)							Chemical-Specific Toxicity Information			Volatility Information
compound	CAS #	number of deliveries over 4 year period	average concentration in received carbon loads (ppm)	maximum concentration in received carbon loads (ppm)	total carbon received over 4 year period (lbs)	total chemical received over 4 year period (lbs)	acute inhalation reference concentration (mg/m^3) (a)	chronic inhalation reference concentration (mg/m^3) (a)	inhalation cancer unit risk $(\mu g/m^3)^{-1}$ (a)	Henry's law constant ($atm\text{-}m^3/mol$) (b)
Ethylbenzene	100-41-4	888	1,408	25,932	5,225,120	5,168	500	1		7.90E-03
Ethylene Glycol	107-21-1	1	87,000	87,000	4,000	348.0	100	1.3		6.00E-08
Lead	7439-92-1	768	4.31	125	3,489,880	12.01	0.15	0.0015	1.20E-05	
Lindane	58-89-9	9	78	140	11,020	0.808	1.5			1.40E-05
Mercury	7439-97-6	69	1.34	11.6	266,000	0.118	0.0018	3.00E-04		7.10E-03
Methyl ethyl ketone	78-93-3	134	1,463	31,200	642,680	398.3	13	5		5.60E-05
methyl Isobutyl ketone	108-10-1	13	11,437	46,600	13,000	100.5	300	3		1.40E-04
Methyl methacrylate	80-62-6	3	4,002	12,000	5,060	15.13	70	0.7		3.37E-04
Methyl tert-butyl ether	1634-04-4	119	336	15,000	707,960	226.9	180	3		5.90E-04
Methylene chloride	75-09-2	134	2,047	7,913	943,120	1,385	14	3	4.70E-07	2.20E-03
Molybdenum	7439-98-7	29	14	130	375,700	6.227	30			
Naphthalene	91-20-3	57	663	3,600	248,520	110.44	75	0.003		4.80E-04
n-Hexane	110-54-3	1	2,220	2,220	1,000	2.220	1500	0.7		1.80E+00
Nickel	7440-02-0	226	39	1,610	2,035,460	24.49	0.006	2.00E-04	2.40E-04	
Nitrobenzene	98-95-3	10	1,936	2,150	128,000	232.4	15			2.40E-05
o-Xylene	95-47-6	11	205	530	31,220	2.448	22	0.1		5.20E-03
Pentachlorophenol	87-86-5	13	331	3,970	128,520	24.75	1.5		4.60E-06	2.40E-08
Phenol	108-95-2	75	864	27,000	233,040	93.32	5.8	0.2		4.00E-07
Propylene oxide	75-56-9	10	40	61	61,760	2.788	3.1	0.03	3.70E-06	1.23E-04
Selenium	7782-49-2	65	2.26	18.9	330,760	0.803	1.47	0.02		
Silver	7440-22-4	25	11	262	54,480	0.666	0.3	0.018		
Styrene	100-42-5	107	20,428	84,784	775,400	22,092	21	1		2.70E-03
Tetrachloroethylene	127-18-4	1562	1,608	91,000	5,908,780	5,343	20	0.4	5.90E-06	1.80E-02
Toluene	108-88-3	1145	1,855	35,837	7,178,420	13,322	37	0.4		6.60E-03
Trichloroethylene	79-01-6	2114	606	16,667	9,283,060	6,134	698	0.6	2.00E-06	1.00E-02
Trichlorofluoromethane	75-69-4	4	7.23	7.23	11,760	0.085	2500	0.7		9.70E-02
Vanadium	7440-62-2	156	4.09	124	1,632,640	5.050	0.15	2.00E-04		
Vinyl acetate	108-05-4	7	370	2,590	7,160	2.592	23.6	0.2		5.10E-04
Vinyl Chloride	75-01-4	375	61	6,100	1,116,660	64.63	180	0.1	8.80E-06	2.70E-02
Xylene	1330-20-7	565	1,240	90,657	3,234,140	2,578	22	0.1		7.70E-03
Zinc	7440-66-6	203	25	167	1,867,280	43.95	30	5.3		

(a) Toxicity data were obtained from values compiled by USEPA in its 2005 HHRAP, if available, or from the sources recommended in the USEPA guidance if they were not available. Reference concentrations for 1,2-dichloroethene and cis-1,2-dichloroethene were based on the lowest values reported in HHRAP for either the cis- or trans- compound for the selection of compounds for evaluation.
(b) Henry's law constants were obtained from values compiled by USEPA in its 2005 HHRAP, if available, or from the sources recommended in the USEPA guidance if they were not available.
Blank spaces indicate no data were available or the parameter was not applicable.

Table 4.3-2
Top Five (5) Compound Rankings by Category

Highlighted Rows Indicate Selected Compounds for Fugitive Emissions Evaluation

Basis for selection: ranked in top five (5) in any category or classified as a known human carcinogen by the U.S. Environmetnal Protection Agency, International Agency for Research on Cancer, or the National Toxicology Program

Blank cells indicate that a compound was ranked below the top five (5) compounds or that a ranking was not calculated, either because a toxicity criterion was not available or the ranking was not applicable (i.e., volatility rank was not calculated for metals except mercury).

Compound	CAS #	Number of deliveries rank	Total lbs received rank	Volatility rank (avg conc * Henry's law constant)	Acute effect rank (avg conc / acute reference air conc)	Acute effect rank (max conc / acute reference air conc)	Chronic effect rank (avg conc / chronic reference air conc)	Chronic effect rank (max conc / chronic reference air conc)	Cancer rank (avg conc * inhal unit risk)	Cancer rank (max conc * inhal unit risk)	Known human carcinogens (2005 11th NTP ROC and IARC Group 1)	EPA's IRIS carcinogen classification	Number of deliveries if <5
1,1,1-trichloroethane	71-55-6												
1,1,2,2,-tetrachloroethane	630-20-6											C	
1,1,2-Trichloroethane	79-00-5											C	
1,1dichlorethane	75-34-3												
1,1dichloroethene	75-35-4												
1,2, dichlorobenzene	95-50-1												
1,2,3,trichloropropane	96-18-4												3
1,2,4,trimethylbenzene	95-63-6												
1,2,dibromoethane	**106-93-4**								**3**			**likely carc to humans**	
1,2,dichloroethane	107-06-2											B2	
1,2,dichloroethene	540-59-0												
1,2,dichloropropane	78-87-5												
1,3-Butadiene	**106-99-0**			**3**			**1**	**4**	**2**		√	**carc to humans**	**1**
1,3-dichlorobenzene	541-73-1												
1,4, -dichlorobenzene	**106-46-7**								**4**				
1,4-Dioxane	123-91-1											B2	
2,4,Dinitrophenol	51-28-5												
acetone	67-64-1												
Acrylic Acid	79-10-7												1
acrylonitrile	**107-13-1**						**2**	**5**	**1**	**1**		**B1**	
Aldrin	309-00-2											B2	2
Aniline	62-53-3											B2	
Antimony	7440-36-0												
Arsenic	**7440-38-2**				**1**	**1**	**4**		**5**	**2**	√	**A**	
Barium	7440-39-3												
Benzene	**71-43-2**	**1** (3444)	**1** (67,042 lbs)		**3**	**5**				**3**	√	**A**	
Beryllium	**7440-41-7**										√	**B1**	
Bromodichloromethane	75-27-4											B2	3
Cadmium	**7440-43-9**										√	**B1**	
Carbon Tetrachloride	56-23-5											B2	
Chlorobenzene	108-90-7												
chloroethane	75-00-3												3
Chloroform	**67-66-3**					**3**	**3**	**1**	**5**			**B2**	
chloromethane	74-87-3											D	3
Chromium	7440-47-3												
cis 1,2-Dichloroethene	156-60-5												3
Cobalt	**7440-48-4**							**3**					

Table 4.3-2
Top Five (5) Compound Rankings by Category

Highlighted Rows Indicate Selected Compounds for Fugitive Emissions Evaluation

Basis for selection: ranked in top five (5) in any category or classified as a known human carcinogen by the U.S. Environmetnal Protection Agency, International Agency for Research on Cancer, or the National Toxicology Program

Blank cells indicate that a compound was ranked below the top five (5) compounds or that a ranking was not calculated, either because a toxicity criterion was not available or the ranking was not applicable (i.e., volatility rank was not calculated for metals except mercury).

Compound	CAS #	Number of deliveries rank	Total lbs received rank	Volatility rank (avg conc * Henry's law constant)	Acute effect rank (avg conc / acute reference air conc)	Acute effect rank (max conc / acute reference air conc)	Chronic effect rank (avg conc / chronic reference air conc)	Chronic effect rank (max conc / chronic reference air conc)	Cancer rank (avg conc * inhal unit risk)	Cancer rank (max conc * inhal unit risk)	Known human carcinogens (2005 11th NTP ROC and IARC Group 1)	EPA's IRIS carcinogen classification	Number of deliveries if <5
Copper	**7440-50-8**				**4**	**4**							
Cyclohexane	**110-82-7**			**2**									
Ethylbenzene	**100-41-4**	**5** (888)											
Ethylene Glycol	107-21-1												1
Lead	7439-92-1											B2	
Lindane	58-89-9												
Mercury	7439-97-6												
Methyl ethyl ketone	78-93-3												
methyl Isobutyl ketone	108-10-1												
Methyl methacrylate	80-62-6												3
methyl tert-butyl ether	1634-04-4												
Methylene chloride	75-09-2											B2	
molybdenum	7439-98-7												
Naphthalene	**91-20-3**						**5**						
n-Hexane	**110-54-3**			**1**									**1**
Nickel	**7440-02-0**				**2**	**2**		**2**			√	**A** (refinery dust)	
Nitrobenzene	98-95-3												
o-Xylene	95-47-6												
Pentachlorophenol	87-86-5											B2	
Phenol	108-95-2												
Propylene oxide	75-56-9											B2	
Selenium	7782-49-2												
Silver	7440-22-4												
Styrene	**100-42-5**		**2**	**4**	**5**								
Tetrachloroethylene	**127-18-4**	**3**	**5** (5343 lbs)	**5**						**4**			
Toluene	**108-88-3**	**4**	**3**										
Trichloroethylene	**79-01-6**	**2**	**4**										
Trichlorofluoromethane	75-69-4												4
Vanadium	7440-62-2												
vinyl acetate	108-05-4												
Vinyl Chloride	**75-01-4**										√	**A**	
Xylene	1330-20-7												
Zinc	7440-66-6												

Table 4.3-3
Input Parameters For Modeling Fugitive Organic Vapor Emissions During Unloading at the Outdoor Hopper

Parameter Name (Variable, units)	Aqua Spent Carbon (used to treat liquid)	Vapor Spent Carbon (used to treat gases)	Basis
Fraction organic carbon (foc, unitless)	0.89	0.89	Kleineidam, S., Schuth, C. and Grathwohl, P. 2002. Solubility-normalized combined adsorption-partitioning sorption isotherms for organic pollutants. Environ. Sci. & Technol. 36:4689-4697.
Bulk density of spent carbon (BD, g/cm^3)	0.50	0.50	Typical bulk density for activated carbon.
Total porosity of spent carbon (Et, unitless)	0.22	0.22	Calculated based on Kleineidam at al. (2002) pore volume for activated carbon of 441 cm^3/kg and assumed density for activated carbon of 0.5 g/cm^3.
Moisture content of spent carbon (M, unitless)	0.50	0.10	Personal communication with M. McCue, Director of Plant Operations, May 2007
Water-filled porosity of spent carbon (Ew, unitless)	0.11	0.02	Calculated based on total porosity and moisture content
Air-filled porosity of spent carbon (Ea, unitless)	0.11	0.20	Calculated: air-filled porosity = (total porosity - water-filled porosity)
Mass of spent carbon unloaded per unloading event per hour at hopper (Q, kg spent carbon/hr)	3,864	3,242	Based on analysis of spent carbon containers' capacities, approximate unloading times per container type, and the average amount of spent carbon, by container type and container capacity, unloaded during 2005 and 2006 (data provided by M. McCue, Director of Plant Operations, May 2007). Amount unloaded per unloading event per hour = average amount spent carbon unloaded per event (2,975 kg aqua spent carbon or 1,783 kg vapor spent carbon) / average unloading duration (0.77 hours for aqua spent carbon containers or 0.55 hours for vapor spent carbon containers).
Hours unloading per workday (HR, hrs)	4	4	Maximum duration of unloading activities at facility during a workday (personal communication with M. McCue, Director of Plant Operations, May 2007).
Pore gas to atmosphere exchange constant (Exc, unitless)	0.10	0.33	USEPA default values. Used value for wet soils to represent aqua and value for dry, sandy soils to represent vapor spent carbon (USEPA. 1997. Air Emissions from the Treatment of Soils Contaminated with Petroleum Fuels and Other Substances. EPA-600/R-97-116)
Volume of air-filled pore spaces in spent carbon affected per hour (Vol, cm^3/hr)	850,100	1,296,800	Calculated: cm^3/hr = (air-filled porosity of spent carbon in cm^3 air/cm^3 spent carbon * amount spent carbon unloaded per event in kg/hr * 1000 g/kg) /(bulk_density g/cm^3 spent carbon)

Table 4.3-4
Chemical-Specific Input Parameters Used to Calculate Fugitive Organic Vapor Emission Rates

compound	CAS #	Average concentration in received spent carbon loads (ppm)	Maximum concentration in received carbon loads (ppm)	Henry's law constant (atm-m^3/mol) (a)	Henry's law constant (unitless) (b)	Organic carbon:water partition coefficient (Koc)	H and Koc Sources
1,2-Dibromoethane	106-93-4	1.52E+02	4.02E+02	7.43E-04	3.10E-02	92.53	HHRAP
1,3-Butadiene	106-99-0	1.29E+04	1.29E+04	7.36E-02	3.07E+00	116	Chemfate
1,4-Dichlorobenzene	106-46-7	6.55E+03	3.45E+04	2.40E-03	1.00E-01	616	HHRAP
Acrylonitrile	107-13-1	1.15E+04	1.15E+04	1.03E-04	4.29E-03	1.76	HHRAP
Arsenic	7440-38-2	7.13E+00	1.39E+02	0.00E+00	0.00E+00	NA	HHRAP
Benzene	71-43-2	2.06E+03	7.00E+04	5.60E-03	2.33E-01	61.7	HHRAP
Beryllium	7440-41-7	5.95E-01	9.76E+00	0.00E+00	0.00E+00	NA	HHRAP
Cadmium	7440-43-9	3.31E+00	7.93E+01	0.00E+00	0.00E+00	NA	HHRAP
Chloroform	67-66-3	1.30E+02	2.09E+04	3.70E-03	1.54E-01	52.5	HHRAP
Cobalt	7440-48-4	1.15E+01	7.98E+02	0.00E+00	0.00E+00	NA	HHRAP
Copper	7440-50-8	1.19E+02	6.82E+03	0.00E+00	0.00E+00	NA	HHRAP
Cyclohexane	110-82-7	8.63E+03	4.60E+04	1.95E-01	8.13E+00	482	Chemfate
Ethylbenzene	100-41-4	1.41E+03	2.59E+04	7.90E-03	3.29E-01	204	HHRAP
Naphthalene	91-20-3	6.63E+02	3.60E+03	4.80E-04	2.00E-02	1190	HHRAP
n-Hexane	110-54-3	2.22E+03	2.22E+03	1.80E+00	7.50E+01	1468	Physprop (c)
Nickel	7440-02-0	3.89E+01	1.61E+03	0.00E+00	0.00E+00	NA	HHRAP
Styrene	100-42-5	2.04E+04	8.48E+04	2.70E-03	1.13E-01	912	HHRAP
Tetrachloroethylene	127-18-4	1.61E+03	9.10E+04	1.80E-02	7.50E-01	265	HHRAP
Toluene	108-88-3	1.86E+03	3.58E+04	6.60E-03	2.75E-01	140	HHRAP
Trichloroethylene	79-01-6	6.06E+02	1.67E+04	1.00E-02	4.17E-01	94.3	HHRAP
Vinyl Chloride	75-01-4	6.08E+01	6.10E+03	2.70E-02	1.13E+00	15.38	HHRAP

(a) Unless otherwise noted, Henry's law constants and Koc values were obtained from values compiled by USEPA in its 2005 HHRAP, if available, or from the sources recommended in the USEPA guidance if they were not available.
(b) The unitless H' = (H atm-m3/mol) / (RT of 2.4E-2 atm-m3/mol)
(c) The Koc was calculated from the log Kow using HHRAP methodology, and log Kow was obtained from Physprop.

NA = Not applicable.
Chemfate = Syracuse Research Service Chemical fate database (http://www.syrres.com/eSc/chemfate.htm)
HHRAP = USEPA's 2005 Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (EPA-530/R-05-006).
Physprop = Syracuse Research Service physical chemical properties database (http://www.syrres.com/eSc/physdemo.htm)

Table 4.3-5
Fugitive Organic Compound Emission Rates During Spent Carbon Unloading at the Outdoor Hopper (a)

Compound	CAS #	Average Concentration in spent carbon (g/g)	Aqua Spent Carbon: Concentration in air-filled pore spaces of spent carbon (g/cm^3)	Vapor Spent Carbon: Concentration in air-filled pore spaces of spent carbon (g/cm^3)	Aqua Spent Carbon: Emission Rate (g/sec)	Vapor Spent Carbon: Emission Rate (g/sec)
1,2-Dibromoethane	106-93-4	1.52E-04	5.70E-08	5.71E-08	7.69E-07	3.88E-06
1,3-Butadiene	106-99-0	1.29E-02	3.79E-04	3.78E-04	5.12E-03	2.57E-02
1,4-Dichlorobenzene	106-46-7	6.55E-03	1.19E-06	1.19E-06	1.61E-05	8.11E-05
Acrylonitrile	107-13-1	1.15E-02	2.76E-05	3.06E-05	3.73E-04	2.08E-03
Arsenic	7440-38-2	7.13E-06	NA	NA	NA	NA
Benzene	71-43-2	2.06E-03	8.70E-06	8.72E-06	1.17E-04	5.92E-04
Beryllium	7440-41-7	5.95E-07	NA	NA	NA	NA
Cadmium	7440-43-9	3.31E-06	NA	NA	NA	NA
Chloroform	67-66-3	1.30E-04	4.26E-07	4.27E-07	5.74E-06	2.90E-05
Cobalt	7440-48-4	1.15E-05	NA	NA	NA	NA
Copper	7440-50-8	1.19E-04	NA	NA	NA	NA
Cyclohexane	110-82-7	8.63E-03	1.63E-04	1.62E-04	2.20E-03	1.10E-02
Ethylbenzene	100-41-4	1.41E-03	2.55E-06	2.55E-06	3.44E-05	1.73E-04
Naphthalene	91-20-3	6.63E-04	1.25E-08	1.25E-08	1.69E-07	8.50E-07
n-Hexane	110-54-3	2.22E-03	1.26E-04	1.25E-04	1.70E-03	8.46E-03
Nickel	7440-02-0	3.89E-05	NA	NA	NA	NA
Styrene	100-42-5	2.04E-02	2.83E-06	2.83E-06	3.82E-05	1.92E-04
Tetrachloroethylene	127-18-4	1.61E-03	5.10E-06	5.10E-06	6.89E-05	3.47E-04
Toluene	108-88-3	1.86E-03	4.08E-06	4.09E-06	5.51E-05	2.78E-04
Trichloroethylene	79-01-6	6.06E-04	3.00E-06	3.00E-06	4.05E-05	2.04E-04
Vinyl Chloride	75-01-4	6.08E-05	4.83E-06	4.82E-06	6.52E-05	3.27E-04

NA = Not applicable. Organic compound vapor emissions were not calculated for inorganic compounds.
(a) See text for description of modeling method.

Table 4.3-6
Evaluation of Potential Fugitive Dust Emissions During Spent Carbon Unloading

Parameter	Value	Units	Basis	Variable Name
Input Parameters				
PM10 particle size multiplier	0.35	unitless	USEPA default for PM10 (particles less than 10 microns in diameter). This multiplier was developed based on data for material with silt content between 0.44-19%. (USEPA 2006)	kPM10
PM2.5 particle size multiplier	0.053	unitless	USEPA default for PM2.5 (particles less than 2.510 microns in diameter). This multiplier was developed based on data for material with silt content between 0.44-19%. (USEPA 2006)	kPM2.5
Mean wind speed	2.38	m/sec	Long-term average value based on Parker AZ data	U
Material moisture content	10	%	Value for vapor carbon. M. McCue, Director of Plant Operations, May 2007.	M
Mass unloaded per unloading event per hour	3,242	kg spent carbon/hr	Based on analysis of spent carbon containers' capacities, approximate unloading times per container type, and the average amount of spent carbon, by container type and container capacity, unloaded during 2005 and 2006 (data provided by M. McCue, Director of Plant Operations, May 2007). Amount unloaded per unloading event per hour = average amount spent carbon unloaded per event (1,783 kg vapor spent carbon) / average unloading duration (0.55 hours for vapor spent carbon containers).	Q
Emission Rate Calculations				
Total Dust Emission Rate				
E in kg particulate / megagram material	1.86E-04	kg/megagram	E = k * (0.0016) * [((U/2.20)^1.3) / ((M/2)^1.4)]. This equation was developed based on data for material with silt content between 0.44-19%, and moisture content between 0.25-4.8%. (USEPA 2006)	
E in g particulate / kg material unloaded	1.86E-04	g/kg	g / kg = (kg / megagram) * megagram/1,000 kg * 1,000 g/kg	
Emission rate in g/sec	1.68E-04	g/sec	g/kg * kg spent carbon/hr * hr/3,600 sec	
PM10 Emission Rate				
E in kg particulate / megagram material	6.52E-05	kg/megagram	E = k * (0.0016) * [((U/2.20)^1.3) / ((M/2)^1.4)]. This equation was devleoped based on data for material with silt content between 0.44-19%, and moisture content between 0.25-4.8%. (USEPA 2006)	
E in g particulate / kg material unloaded	6.52E-05	g/kg	g / kg = (kg / megagram) * megagram/1,000 kg * 1,000 g/kg	
Emission rate in g/sec	5.87E-05	g/sec	g/kg * kg spent carbon/hr * hr/3,600 sec	
PM2.5 Emission Rate				
E in kg particulate / megagram material	9.87E-06	kg/megagram	E = k * (0.0016) * [((U/2.20)^1.3) / ((M/2)^1.4)]. This equation was devleoped based on data for material with silt content between 0.44-19%, and moisture content between 0.25-4.8%. (USEPA 2006)	
E in g particulate / kg material unloaded	9.87E-06	g/kg	g / kg = (kg / megagram) * megagram/1,000 kg * 1,000 g/kg	
Emission rate in g/sec	8.89E-06	g/sec	g/kg * kg spent carbon/hr * hr/3,600 sec	

USEPA 2006 = U.S. Environmental Protection Agency. 2006. AP-42 Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources. Aggregate Handling and Storage Piles, Section 13.2.4. November 2006.

Table 4.3-7
Inorganic Compound Emission Rates During Spent Carbon Unloading at the Outdoor Hopper (a)

Compound	CAS #	Average Concentration in spent carbon (g/g)	Inorganic Emission Rate (g/sec) (a)
1,2-Dibromoethane	106-93-4	1.52E-04	NA
1,3-Butadiene	106-99-0	1.29E-02	NA
1,4-Dichlorobenzene	106-46-7	6.55E-03	NA
Acrylonitrile	107-13-1	1.15E-02	NA
Arsenic	7440-38-2	7.13E-06	4.19E-10
Benzene	71-43-2	2.06E-03	NA
Beryllium	7440-41-7	5.95E-07	3.49E-11
Cadmium	7440-43-9	3.31E-06	1.94E-10
Chloroform	67-66-3	1.30E-04	NA
Cobalt	7440-48-4	1.15E-05	6.73E-10
Copper	7440-50-8	1.19E-04	6.99E-09
Cyclohexane	110-82-7	8.63E-03	NA
Ethylbenzene	100-41-4	1.41E-03	NA
Naphthalene	91-20-3	6.63E-04	NA
n-Hexane	110-54-3	2.22E-03	NA
Nickel	7440-02-0	3.89E-05	2.28E-09
Styrene	100-42-5	2.04E-02	NA
Tetrachloroethylene	127-18-4	1.61E-03	NA
Toluene	108-88-3	1.86E-03	NA
Trichloroethylene	79-01-6	6.06E-04	NA
Vinyl Chloride	75-01-4	6.08E-05	NA

NA = not applicable.

(a) Emission rate (g/sec) = PM10 dust emission rate (g/sec) * concentration in spent carbon (g/g), where the PM10 dust emission rate is 5.87E-5 g/sec (see text for description of PM10 emission rate calculation).

Table 4.3-8

Receptor Locations Evaluated for Fugitive Emissions During Spent Carbon Unloading at the Outdoor Hopper

Receptor Name (a)	Description	Acute Inhalation Risk Evaluation	Chronic Inhalation Risk Evaluation
Residential Receptors (developed area within and around Town of Parker)			
R_1 resident	Closest residential location to facility, residential area in town with highest hourly modeled impacts for stack emissions	√	√
R_2 resident	Residential area in town with highest annual modeled impacts for stack emissions	√	√
R_5 resident	Residential area in town with highest hourly modeled impacts for fugitive hopper emissions	√	√
R_6 resident	Residential area in town with highest annual modeled impacts for fugitive hopper emissions	√	√
Farmer Receptors (residential areas with access to irrigation water and within modeling domain)			
R_3 resident farmer	Residential area with access to irrigation water with highest annual modeled impacts (stack and fugitive hopper emissions)	√	√
R_4 resident farmer	Residential area with access to irrigation water with highest hourly modeled impacts (stack and fugitive hopper emissions)	√	√
Maximum Impact Point (undeveloped land area)			
A_1 max hourly (stack)	Maximum stack emissions impact location for hourly concentrations. There is no residential or commercial land use in the vicinity of the maximum impact area (SW of facility).	√	--
A_3 max hourly (fugitives)	Maximum fugitive hopper emissions impact location for hourly concentrations. There is no residential or commercial land use in the vicinity of the maximum impact area (immediately N of facility at property boundary).	√	--
Non-Residential Areas			
A_2 closest business (b)	Closest developed location beyond property boundary (non-residential) with highest hourly modeled impacts	√	--

-- = Not evaluated. These locations are not used for residential purposes.

(a) Receptor names are those used in the IRAP risk assessment software program.

(b) The County Agricultural Extension Office and CRIT Realty are located at receptor A_2. Maximum 1-hour average air concentrations at all other non-residential developed land use locations were lower than at receptor A_2.

Table 4.4-1
Chronic Risk Assessment Results - Reactivation Facility Stack

Receptor Name	Scenario	Description	EXCESS LIFETIME CANCER RISK (a)			TOTAL HAZARD INDEX (b)			Exposure Pathways
			Group 1: All Detected Compounds (n=95) (c)	Group 2: All Compounds (except benzidine) (n=177) (d)	Group 3: All Compounds (n=178) (e)	Group 1: All Detected Compounds (n=95) (c)	Group 2: All Compounds (except benzidine) (n=177) (d)	Group 3: All Compounds (n=178) (e)	
Residential Receptors (developed area within and around Town of Parker)									
R_1 resident	resident_adult	Closest residential location to facility	2.E-08	6.E-08	7.E-07	1.E-02	1.E-02	1.E-02	Inhalation Soil ingestion Homegrown produce ingestion (f)
	resident_child		7.E-09	2.E-08	3.E-07	1.E-02	1.E-02	1.E-02	
R_2 resident	resident_adult	Residential area in town with highest annual modeled impacts	8.E-08	2.E-07	2.E-06	5.E-02	5.E-02	5.E-02	
	resident_child		2.E-08	4.E-08	9.E-07	5.E-02	5.E-02	5.E-02	
Town area	resident_adult	Average across town area	1.E-08	3.E-08	4.E-07	1.E-02	1.E-02	1.E-02	
	resident_child		3.E-09	7.E-09	1.E-07	1.E-02	1.E-02	1.E-02	
Farmer Receptors (residential area with access to irrigation water and within modeling domain)									
R_3 resident farmer	farmer_adult	Residential area with access to irrigation water with highest annual modeled impacts	5.E-08	9.E-08	5.E-07	1.E-02	2.E-02	2.E-02	Inhalation Soil ingestion Homegrown produce ingestion Locally raised beef ingestion Locally raised poultry ingestion Locally raised egg ingestion Locally raised pork ingestion (f)
	farmer_child		7.E-09	1.E-08	1.E-07	2.E-02	2.E-02	2.E-02	
R_4 resident farmer	farmer_adult	Residential area with access to irrigation water with highest hourly modeled impacts	5.E-08	8.E-08	5.E-07	1.E-02	1.E-02	1.E-02	
	farmer_child		6.E-09	1.E-08	1.E-07	1.E-02	1.E-02	1.E-02	
Farmer area	farmer_adult	Average across residential area with access to irrigation water within modeling domain	2.E-08	3.E-08	2.E-07	6.E-03	6.E-03	6.E-03	
	farmer_child		3.E-09	5.E-09	6.E-08	6.E-03	6.E-03	6.E-03	
Fish Ingestion Pathway									
R_only fish_drain	fisher_adult	Fish ingestion evaluation for the Main Drain	4.E-08	4.E-08	4.E-08	1.E-02	1.E-02	1.E-02	Locally caught fish ingestion (f)
R_only fish_drain	fisher_child		5.E-09	6.E-09	6.E-09	1.E-02	1.E-02	1.E-02	
R_only fish_river	fisher_adult	Fish ingestion evaluation for the Colorado River	3.E-08	3.E-08	4.E-08	4.E-03	4.E-03	4.E-03	
R_only fish_river	fisher_child		4.E-09	4.E-09	5.E-09	3.E-03	3.E-03	3.E-03	

NOTES:
n = Number of compounds.
PDT = Performance Demonstration Test.

(a) The additional (excess) lifetime cancer risks reflect exposure to all potential carcinogens evaluated. The regulatory target cancer risk level used by USEPA for combustion sources is 1E-5 (1 in 100,000). A value of 1E-5 is 10 times higher than 1E-6 and 100 times higher than 1E-7.

(b) The listed hazard index values for non-cancer effects reflect exposure to all evaluated compounds, regardless of the type of health effects. If a hazard index, based on the sum of hazard quotients for all compounds, is above 1, then the hazard index values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. USEPA uses a target hazard index value, for compounds grouped according to specific types of health effects, of 0.25 for combustion sources. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

(c) Group 1 includes 95 compounds, with chronic toxicity data, that were detected in the PDT in addition to several compounds that were not measured during the PDT but which were evaluated based on emission rates derived from feed rates. This group does not include compounds not detected in the PDT.

(d) Group 2 includes 177 compounds with chronic toxicity data, 82 of which were not detected in the PDT. This group does not include benzidine which was not detected in the PDT. There is no evidence from waste profile reports or analytical spent carbon data that benzidine has been received at the facility. Benzidine was singled out because it was found to be a significant risk driver, accounting for more than 95% of the total cancer risk when included in the risk calculations.

(e) Group 3 includes 178 compounds with chronic toxicity data, of which 83 were not detected in the PDT, including benzidine.

(f) Masters (2007) estimated that at most 20% of the produce and animal foods ingested could be homegrown or raised locally, respectively (information obtained from La Paz County Agricultural Extension Office, personal communication, 6/26/07 and 7/2/07). Information was not available for the fish ingestion pathway and, therefore, it was assumed that 100% of fish ingested was caught exclusively in either the Main Drain or the Colorado River within 10 km of the facility.

Table 4.4-2
Infant Average Daily Doses of Dioxins and Furans From Breastmilk Ingestion

Receptor Name	Scenario	Infant Average Daily Dose (pg PCDD/PCDF TEQs/ kg BW-day) (a)	Adult (Mother's) Exposure Pathways
Residential Receptors (developed area within and around Town of Parker)			
R_1 resident	resident_adult	2.E-04	Inhalation, soil ingestion, and produce ingestion
R_2 resident	resident_adult	8.E-04	
Town area	resident_adult	2.E-04	
Farmer Receptors (residential area with access to irrigation water and within modeling domain)			
R_3 resident farmer	farmer_adult	2.E-03	Inhalation, soil ingestion, and produce ingestion plus ingestion of beef, poultry, eggs, and pork
R_4 resident farmer	farmer_adult	2.E-03	
Farmer area	farmer_adult	9.E-04	
Fish Ingestion Pathway			
R_only fish_drain	fisher_adult	7.E-03	Fish ingestion
R_only fish_river	fisher_adult	5.E-03	
Comparison Target Level		60	

(a) Doses are based on the sum of all dioxin and furan congeners (PCDDs/PCDFs) expressed as 2,3,7,8-TCDD toxic equivalents (TEQs).

Table 4.4-3
Acute Inhalation Results - Reactivation Facility Stack (a)

Receptor Name	Description	Minimum Hazard Quotient (b)	Maximum Hazard Quotient (b)
Residential Receptors (developed area within and around Town of Parker)			
R_1 resident	Closest residential location to facility and residential area in town with highest hourly modeled impacts	<1E-10	0.02
R_2 resident	Residential area in town with highest annual modeled impacts	<1E-10	0.01
Farmer Receptors (residential area with access to irrigation water and within modeling domain)			
R_3 resident farmer	Residential area with access to irrigation water with highest annual modeled impacts	<1E-10	0.009
R_4 resident farmer	Residential area with access to irrigation water with highest hourly modeled impacts	<1E-10	0.02
Maximum Impact Point (undeveloped land area)			
A_1 max hourly	Maximum impact location for hourly concentrations. There is no residential or commercial land use in the vicinity of the maximum impact area (SW of facility).	<1E-10	0.08
Non-Residential Areas			
A_2 closest business (c)	Closest developed location beyond property boundary (non-residential) with highest hourly modeled impacts	<1E-10	0.04

(a) These results are conservatively based on the highest 1-hour average air concentration calculated for each specified receptor location and compound out of a total of 43,800 hours evaluated by the ISCST3 model (i.e., 5 years of hourly meteorological data from Parker, from 2001-2005, were used). The concentrations for all other hours were lower than those used to calculate these hazard quotients.

(b) The minimum and maximum results are the lowest and highest hazard quotients, respectively, calculated among all of the evaluated compounds. The typical target hazard quotient value used by regulatory agencies is 1.

(c) The County Agricultural Extension Office and CRIT Realty are located at receptor A_2. Maximum 1-hour average air concentrations at all other non-residential developed land use locations were lower than at receptor A_2.

Table 4.4-4
Chronic Inhalation Risk Assessment Results - Fugitive Hopper Emissions (a)

Receptor Name	Scenario	Description	Excess Lifetime Cancer Risk (b)	Total Hazard Index (c)
Residential Receptors (developed area within and around Town of Parker)				
R_1 resident	resident_adult	Closest residential location to facility, residential area in town with highest hourly modeled impacts for stack emissions	1.E-08	4.E-04
	resident_child		2.E-09	4.E-04
R_2 resident	resident_adult	Residential area in town with highest annual modeled impacts for stack emissions	3.E-08	1.E-03
	resident_child		6.E-09	1.E-03
R_5 resident	resident_adult	Residential area in town with highest hourly modeled impacts for fugitive hopper emissions	2.E-08	9.E-04
	resident_child		5.E-09	9.E-04
R_6 resident	resident_adult	Residential area in town with highest annual modeled impacts for fugitive hopper emissions	3.E-08	1.E-03
	resident_child		6.E-09	1.E-03
Farmer Receptors (residential area with access to irrigation water and within modeling domain)				
R_3 resident farmer	farmer_adult	Residential area with access to irrigation water with highest annual modeled impacts (stack and fugitive hopper emissions)	5.E-08	1.E-03
	farmer_child		7.E-09	1.E-03
R_4 resident farmer	farmer_adult	Residential area with access to irrigation water with highest hourly modeled impacts (stack and fugitive hopper emissions)	4.E-08	1.E-03
	farmer_child		6.E-09	1.E-03

(a) Risks were calculated for 21 compounds selected for the fugitive emissions evaluation (see text).

(b) The additional (excess) lifetime cancer risks reflect exposure to all potential carcinogens evaluated. The regulatory target cancer risk level used by USEPA for combustion sources is 1E-5 (1 in 100,000). A value of 1E-5 is 10 times higher than 1E-6 and 100 times higher than 1E-7.

(c) The listed hazard index values for non-cancer effects reflect exposure to all evaluated compounds, regardless of the type of health effects. If a hazard index, based on the sum of hazard quotients for all compounds, is above 1, then the hazard index values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. USEPA uses a target hazard index value, for compounds grouped according to specific types of health effects, of 0.25 for combustion sources. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Table 4.4-5
Acute Inhalation Results - Fugitive Hopper Emissions (a)

Receptor Name	Description	Minimum Hazard Quotient (b)	Maximum Hazard Quotient (b)
Residential Receptors (developed area within and around Town of Parker)			
R_1 resident	Closest residential location to facility, residential area in town with highest hourly modeled impacts for stack emissions	<1E-9	3E-05
R_2 resident	Residential area in town with highest annual modeled impacts for stack emissions	<1E-9	3E-05
R_5 resident	Residential area in town with highest hourly modeled impacts for fugitive hopper emissions	<1E-9	3E-05
R_6 resident	Residential area in town with highest annual modeled impacts for fugitive hopper emissions	<1E-9	2E-05
Farmer Receptors (residential area with access to irrigation water and within modeling domain)			
R_3 resident farmer	Residential area with access to irrigation water with highest annual modeled impacts (stack and fugitive hopper emissions)	<1E-9	2E-05
R_4 resident farmer	Residential area with access to irrigation water with highest hourly modeled impacts (stack and fugitive hopper emissions)	<1E-9	3E-05
Maximum Impact Point (undeveloped land area)			
A_1 max hourly (stack)	Maximum stack emissions impact location for hourly concentrations. There is no residential or commercial land use in the vicinity of the maximum impact area (SW of facility).	<1E-8	2E-04
A_3 max hourly (fugitives)	Maximum fugitive hopper emissions impact location for hourly concentrations. There is no residential or commercial land use in the vicinity of the maximum impact area (immediately N of facility at property boundary).	<1E-7	0.01
Non-Residential Areas			
A_2 closest business (c)	Closest developed location beyond property boundary (non-residential) with highest hourly modeled impacts	<1E-9	5E-04

(a) These results are conservatively based on the highest 1-hour average air concentration calculated for each specified receptor location and compound out of a total of 43,800 hours evaluated by the ISCST3 model (i.e., 5 years of hourly meteorological data from Parker, from 2001-2005, were used). The concentrations for all other hours were lower than those used to calculate these hazard quotients.

(b) The minimum and maximum results are the lowest and highest hazard quotients, respectively, calculated among all of the evaluated compounds. The typical target hazard quotient value used by regulatory agencies is 1.

(c) The County Agricultural Extension Office and CRIT Realty are located at receptor A_2. Maximum 1-hour average air concentrations at all other non-residential developed land use locations were lower than at receptor A_2.

Table 4.4-6
2005 - 2006 Effluent Discharge Data From the Facility

Date	Year	Compound: / Sample Type	Aluminum (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Beryllium (ug/L)	Boron (ug/L)	Cadmium (ug/L)	Chromium III (ug/L)	Lead (ug/L)	Magnesium (ug/L)	Manganese (ug/L)	Mercury (ug/L)	Nickel (ug/L)	Selenium (ug/L)	Strontium (ug/L)	Vanadium (ug/L)	Acetone (ug/L)	Bromo-dichloro-methane (ug/L)	Bromo-form (ug/L)	Carbon disulfide (ug/L)	Chloro-dibromo-methane (ug/L)	Chloro-form (ug/L)
Metals Sampling																							
Jan	2005	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	< 1.0	--	--	< 0.2	--	9.1	--	--	--	--	--	--	--	--
Feb	2005	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	< 1.0	--	--	< 0.2	--	36	--	--	--	--	--	--	--	--
Mar	2005	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	1.0	--	--	< 0.2	--	37	--	--	--	--	--	--	--	--
Apr	2005	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	2.3	--	--	< 0.2	--	19	--	--	--	--	--	--	--	--
May	2005	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	< 1.0	--	--	< 0.2	--	18	--	--	--	--	--	--	--	--
Jun	2005	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	< 1.0	--	--	< 0.2	--	11	--	--	--	--	--	--	--	--
Jul	2005	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	< 1.0	--	--	< 0.2	--	11	--	--	--	--	--	--	--	--
Aug	2005	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	1.5	--	--	< 0.2	--	8.7	--	--	--	--	--	--	--	--
Sep	2005	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	< 1.0	--	--	< 0.2	--	11	--	--	--	--	--	--	--	--
Oct	2005	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	< 1.0	--	--	< 0.2	--	4.3	--	--	--	--	--	--	--	--
Nov	2005	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	< 1.0	--	--	< 0.2	--	19	--	--	--	--	--	--	--	--
Dec	2005	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	< 1.0	--	--	< 0.2	--	9.6	--	--	--	--	--	--	--	--
Jan	2006	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	< 1.0	--	--	< 0.2	--	7.6	--	--	--	--	--	--	--	--
Feb	2006	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	< 1.0	--	--	< 0.2	--	7.8	--	--	--	--	--	--	--	--
Mar	2006	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	< 1.0	--	--	< 0.2	--	12	--	--	--	--	--	--	--	--
Apr	2006	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	< 1.0	--	--	< 0.2	--	21	--	--	--	--	--	--	--	--
May	2006	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	< 1.0	--	--	< 0.2	--	16	--	--	--	--	--	--	--	--
Jun	2006	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	< 1.0	--	--	< 0.2	--	17	--	--	--	--	--	--	--	--
Jul	2006	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	1.2	--	--	< 0.2	--	11	--	--	--	--	--	--	--	--
Aug	2006	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	< 1.0	--	--	< 0.2	--	10	--	--	--	--	--	--	--	--
Sep	2006	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	< 1.0	--	--	< 0.2	--	17	--	--	--	--	--	--	--	--
Oct	2006	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	< 1.0	--	--	< 0.2	--	14	--	--	--	--	--	--	--	--
Nov	2006	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	< 1.0	--	--	< 0.2	--	2.2	--	--	--	--	--	--	--	--
Dec	2006	24-hr composite (a)	--	--	--	< 0.5	--	< 1.0	--	< 1.0	--	--	< 0.2	--	< 2.0	--	--	--	--	--	--	--	--
Performance Demonstration Test (detected compounds)																							
Mar	2006	4 hour composite (b)	114	13.7	247	<1.8	--	< 0.82	-- (c)	-- (c)	--	115	< 0.06	< 3.8	11	--	16.6	3.7	< 1.0	2	< 1.0	1.4	0.14
Mar	2006	6 hour composite (b)	<100	12.6	226	<1.8	--	< 0.82	-- (c)	-- (c)	--	61.2	< 0.06	< 3.8	10	--	21	4.8	0.89	2.1	< 1.0	1.3	0.15
Mar	2006	4 hour composite (b)	148	11.9	238	<1.8	--	2.4	-- (c)	-- (c)	--	85.9	< 0.06	4.8	9	--	21.1	4.07	1	2.03	0.16	1.4	0.14
Compliance Report for Categorical Pretreatment Standards (detected compounds)																							
Jun	2005	24-hour composite	--	13	--	--	--	< 5	5	< 5	--	--	< 0.2	< 10	--	--	<10	--	--	--	--	--	--
Dec	2005	24-hour composite	--	11	--	--	--	< 5	5.9	< 5	--	--	< 0.2	< 10	--	--	<10	--	--	--	--	--	--
Jun	2006	24-hour composite	--	12	--	--	--	< 5	< 5	< 5	--	--	< 0.2	< 10	--	--	31	--	--	--	--	--	--
Dec	2006	24-hour composite	--	<10	--	--	--	< 5	< 5	< 5	--	--	< 0.2	< 10	--	--	<10	--	--	--	--	--	--
Priority Pollutant Testing Report																							
Jul	2005	24-hour composite	82	5.2	75	--	640	--	--	--	29000	--	--	--	--	1700	--	--	--	--	--	--	--
Selection of Compounds for Evaluation																							
Compound Selected for Evaluation			√	√	√	NE	√	√	√	√	√	√	NE	√	√	√	√	√	√	√	√	√	√
Summary Data																							
Average (d)			99	11	197	NE	NC	NC	NC	NC	NC	87	NE	NC	13	NC	13	4.2	0.80	2.0	NC	1.4	0.14
Minimum detected level			82	5.2	75	NE	640	2.4	5	1	29000	61.2	NE	4.8	2.2	1700	16.6	3.7	0.89	2.0	0.16	1.3	0.14
Maximum			148	13.7	247	NE	640	2.4	5.9	2.3	29000	115	NE	4.8	37	1700	31	4.8	1	2.1	0.16	1.4	0.15

Source: Data obtained from M. McCue, Director of Plant Operations, May 2007.
-- = not available or not applicable
NC = not calculated due to the large percentage of samples that were non-detects
NE = not evaluated - compound was not detected
(a) One 24-hr composite sample collected per month
(b) Composite collected every 30 minutes during each test run (approximately 4 hours for runs 1 and 3, and approximately 6 hours for run 2)
(c) Lead and chromium were spiked in the Performance Demonstration Test
(d) Arithmetic average calculated using one-half the reported detection limit

Table 4.4-7
Analysis of Facility Incremental Contribution on CRSSJV POTW Concentrations

Concentrations in Facility Effluent (ug/L)				Concentrations in Facility Effluent and Entering POTW (ug/L)							
	Effluent Concentration (total ug/L)			Suspended solids:water partition coefficient for facility effluent (Kd_{sw})		Average Concentration - used to evaluate long-term (chronic) impacts			Maximum Concentration - used to evaluate acute (daily) impacts		
Compound	Average	Minimum detected level	Maximum	(L/kg)	Source (a)	Total	Dissolved (b)	Particulate (c)	Total	Dissolved (b)	Particulate (c)
Aluminum	99	82	148	9.9	2a	9.9E+01	9.8E+01	6.8E-03	1.5E+02	1.5E+02	1.0E-02
Arsenic	11	5.2	13.7	31	2b	1.1E+01	1.1E+01	2.3E-03	1.4E+01	1.4E+01	3.0E-03
Barium	197	75	247	52	2b	2.0E+02	2.0E+02	7.1E-02	2.5E+02	2.5E+02	9.0E-02
Boron	NC	640	640	3	2a	NC	NC	NC	6.4E+02	6.4E+02	1.3E-02
Cadmium	NC	2.4	2.4	4300	2b	NC	NC	NC	2.4E+00	2.3E+00	7.0E-02
Chromium III	NC	5	5.9	4.30E+06	2b	NC	NC	NC	5.9E+00	1.9E-01	5.7E+00
Lead	NC	1	2.3	900	1	NC	NC	NC	2.3E+00	2.3E+00	1.4E-02
Magnesium	NC	29000	29000	4.5	2c	NC	NC	NC	2.9E+04	2.9E+04	9.1E-01
Manganese	87	61.2	115	65	2a	8.7E+01	8.7E+01	4.0E-02	1.2E+02	1.1E+02	5.2E-02
Nickel	NC	4.8	4.8	1900	2b	NC	NC	NC	4.8E+00	4.7E+00	6.3E-02
Selenium	13	2.2	37	2.2	2b	1.3E+01	1.3E+01	2.1E-04	3.7E+01	3.7E+01	5.7E-04
Strontium	NC	1700	1700	35	2a	NC	NC	NC	1.7E+03	1.7E+03	4.2E-01
Vanadium	13	16.6	31	1000	2a	1.3E+01	1.3E+01	8.9E-02	3.1E+01	3.1E+01	2.2E-01
Acetone	4.2	3.7	4.8	0.04	1	4.2E+00	4.2E+00	1.2E-06	4.8E+00	4.8E+00	1.3E-06
Bromodichloromethane	0.80	0.89	1	0.11	2a	8.0E-01	8.0E-01	6.1E-07	1.0E+00	1.0E+00	7.7E-07
Bromoform	2.0	2	2.1	9.45	1	2.0E+00	2.0E+00	1.4E-04	2.1E+00	2.1E+00	1.4E-04
Carbon disulfide	NC	0.16	0.16	4.96	1	NC	NC	NC	1.6E-01	1.6E-01	5.6E-06
Chlorodibromomethane	1.4	1.3	1.4	5.24	1	1.4E+00	1.4E+00	5.0E-05	1.4E+00	1.4E+00	5.1E-05
Chloroform	0.14	0.14	0.15	3.94	1	1.4E-01	1.4E-01	4.0E-06	1.5E-01	1.5E-01	4.1E-06

CRSSJV POTW = Colorado River Sewage System Joint Venture Publicly Owned Treatment Works.

(a) Kdsw values were obtained from the following hierarchy of sources: (1) USEPA's HHRAP (2005) or (2) sources recommended in HHRAP (2005) consisting of (2a) USEPA's 2004 Superfund Chemical Data Matrix, (2b) USEPA's 1996 Soil Screening Guidance, and (2c) Baes et al. 1984. For pH-dependent Kd values, values provided in source (2b) were used basedon average pH levels in facility effluent (8.1) and in POTW outfall (7.0).

(b) Partitioning based on USEPA (1985): dissolved ug/L = total ug/L / [1 + (Kd L/kg * TSS mg/L * 1E-6)]

TSS in facility effluent (mg/L) = 7 Basis: Average from 2005 and 2006 sampling results at facility

TSS in POTW outfall (mg/L) = 3 Basis: Average from POTW discharge monitoring reports for 2005

(c) Particulate concentration = total concentration - dissolved concentration

Tables 4.4-8 and 4.4-9

Table 4.4-8

Incremental Facility Concentrations at POTW (ug/L)
(Concentrations reflect treatment to remove particulates and organics and effect of water flow into the POTW from other sources)

Compound	Average Concentration - used to evaluate long-term (chronic) impacts		Maximum Concentration - used to evaluate acute (daily) impacts	
	Dissolved (d)	Particulate (d)	Dissolved (d)	Particulate (d)
Aluminum	1.8E+01	2.5E-05	2.7E+01	3.7E-05
Arsenic	1.9E+00	8.4E-06	2.5E+00	1.1E-05
Barium	3.6E+01	2.6E-04	4.5E+01	3.3E-04
Boron	NC	NC	1.2E+02	4.9E-05
Cadmium	NC	NC	4.3E-01	2.6E-04
Chromium III	NC	NC	3.5E-02	2.1E-02
Lead	NC	NC	4.2E-01	5.3E-05
Magnesium	NC	NC	5.3E+03	3.3E-03
Manganese	1.6E+01	1.4E-04	2.1E+01	1.9E-04
Nickel	NC	NC	8.7E-01	2.3E-04
Selenium	2.4E+00	7.5E-07	6.8E+00	2.1E-06
Strontium	NC	NC	3.1E+02	1.5E-03
Vanadium	2.3E+00	3.2E-04	5.6E+00	7.9E-04
Acetone	1.5E-02	4.3E-09	1.8E-02	4.9E-09
Bromodichloromethane	2.9E-03	2.2E-09	3.7E-03	2.8E-09
Bromoform	7.5E-03	4.9E-07	7.7E-03	5.1E-07
Carbon disulfide	NC	NC	5.8E-04	2.0E-08
Chlorodibromomethane	5.0E-03	1.8E-07	5.1E-03	1.9E-07
Chloroform	5.2E-04	1.4E-08	5.5E-04	1.5E-08

Table 4.4-9

Incremental Concentrations Exiting in POTW Outfall (ug/L)
(Repartitioned Concentrations Between Total, Dissolved and Particulate)

Compound	Average Concentration - used to evaluate long-term (chronic) impacts	Maximum Concentration - used to evaluate acute (daily) impacts	Suspended solids:water partition coefficient for POTW outfall (Kd_{sw})		Average Concentration - used to evaluate long-term (chronic) impacts		Maximum Concentration - used to evaluate acute (daily) impacts	
	Total (e)	Total (e)	(L/kg)	Source (a)	Dissolved (b)	Particulate (c)	Dissolved (b)	Particulate (c)
Aluminum	1.8E+01	2.7E+01	9.9	2a	1.8E+01	5.3E-04	2.7E+01	8.0E-04
Arsenic	1.9E+00	2.5E+00	29	2b	1.9E+00	1.7E-04	2.5E+00	2.2E-04
Barium	3.6E+01	4.5E+01	42	2b	3.6E+01	4.5E-03	4.5E+01	5.7E-03
Boron	NC	1.2E+02	3	2a	NC	NC	1.2E+02	1.1E-03
Cadmium	NC	4.3E-01	110	2b	NC	NC	4.3E-01	1.4E-04
Chromium III	NC	5.6E-02	2.50E+06	2b	NC	NC	6.5E-03	4.9E-02
Lead	NC	4.2E-01	900	1	NC	NC	4.2E-01	1.1E-03
Magnesium	NC	5.3E+03	4.5	2c	NC	NC	5.3E+03	7.2E-02
Manganese	1.6E+01	2.1E+01	65	2a	1.6E+01	3.1E-03	2.1E+01	4.1E-03
Nickel	NC	8.7E-01	88	2b	NC	NC	8.7E-01	2.3E-04
Selenium	2.4E+00	6.8E+00	4.3	2b	2.4E+00	3.1E-05	6.8E+00	8.7E-05
Strontium	NC	3.1E+02	35	2a	NC	NC	3.1E+02	3.3E-02
Vanadium	2.3E+00	5.6E+00	1000	2a	2.3E+00	6.9E-03	5.6E+00	1.7E-02
Acetone	1.5E-02	1.8E-02	0.04	1	1.5E-02	1.8E-09	1.8E-02	2.1E-09
Bromodichloromethane	2.9E-03	3.7E-03	0.11	2a	2.9E-03	9.6E-10	3.7E-03	1.2E-09
Bromoform	7.5E-03	7.7E-03	9.45	1	7.5E-03	2.1E-07	7.7E-03	2.2E-07
Carbon disulfide	NC	5.8E-04	4.96	1	NC	NC	5.8E-04	8.7E-09
Chlorodibromomethane	5.0E-03	5.1E-03	5.24	1	5.0E-03	7.9E-08	5.1E-03	8.0E-08
Chloroform	5.2E-04	5.5E-04	3.94	1	5.2E-04	6.2E-09	5.5E-04	6.5E-09

(a) Kdsw values were obtained from the following hierarchy of sources: (1) USEPA's HHRAP (2005) or (2) sources recommended in HHRAP (2005) consisting of (2a) USEPA's 2004 Superfund Chemical Data Matrix, (2b) USEPA's 1996 Soil Screening Guidance, and (2c) Baes et al. 1984. For pH-dependent Kd values, values provided in source (2b) were used basedon average pH levels in facility effluent (8.1) and in POTW outfall (7.0).

(b) Partitioning based on USEPA (1985): dissolved ug/L = total ug/L / [1 + (Kd L/kg * TSS mg/L * 1E-6)]

TSS in facility effluent (mg/L) =	7	Basis: Average from 2005 and 2006 sampling results at facility
TSS in POTW outfall (mg/L) =	3	Basis: Average from POTW discharge monitoring reports for 2005

(c) Particulate concentration = total concentration - dissolved concentration

(d) Concentrations at POTW reflect treatment (particulate and organics removal) and effect of water flow into the POTW from other sources.

Concentration at POTW (ug/L) = influent concentration (ug/L) * (1-fractional removal efficiency) * facility effluent flow rate (gpd) / POTW outfall flow rate (gpd)

Removal efficiencies for constituents as follows:

Dissolved metal constituents:	0	%	Basis: POTW does not remove dissolved constituents
Particulate metal constituents:	98	%	Basis: Average suspended solids removal % in POTW discharge monitoring reports for 2005
Dissolved and particulate organic constituents:	98	%	Basis: Average BOD % removal in POTW discharge monitoring reports for 2005

Water flow rates as follows:

RF-2 facility effluent (gpd) =	129465	gpd	Basis: Average effluent flow rate to POTW for 2006 year
POTW outfall (gpd) =	708541	gpd	Basis: Average POTW outfall flow rate for 2006 year

(e) Total concentration in outfall due to facility increment = particulate + dissolved concentrations

Table 4.4-10
Ambient Water Quality Criteria and Standards
(Concentrations in ug/L)

Compound	Joint Venture NPDES Discharge Limit (1,2)						Arizona Water Quality Standards (WQS) for Colorado River Designated Uses (1,3) (Total concentration unless otherwise noted)								
	Average (monthly)	Basis		Maximum (daily)	Basis		DWS	FC	FBC	AgI	AgL	A&Ww -C		A&Ww-A	
Inorganic Compounds															
Aluminum												87 (4)		750 (4)	
Arsenic	--	--		--	--		50	1,450	50	2,000	200	190	d	360	d
Barium	--	--		--	--		2,000	--	98,000	--	--	--		--	
Boron							630	--	126,000	1,000	--	--		--	
Cadmium	3	A&Ww -C	d	70	FBC		5	84	700	50	50	5.3	d,h	15	d,h
Chromium (III)	--	--		--	--		10,500	1,010,000	2,100,000	--	--	191	d,h	1,470	d,h
Lead	15	A&Ww -C	d	386	A&Ww-A	d	15	--	15	10,000	100	8.7	d,h	222	d,h
Magnesium															
Manganese	--	--		--	--		980	--	196,000	10,000	--	--		--	
Nickel	--	--		--	--		140	4,600	28,000	--	--	138	d,h	1,246	d,h
Selenium	2	A&Ww -C		20	A&Ww-A		50	9,000	7,000	20	50	2		20	
Strontium															
Vanadium															
Organic Compounds															
Acetone															
Bromodichloromethane							TTHM	46	TTHM	--	--	--		--	
Bromoform							TTHM	360	180	--	--	--		--	
Carbon disulfide															
Chlorodibromomethane							TTHM	34	TTHM	--	--	--		--	
Chloroform							TTHM	470	230	--	--	--		--	

Notes

-- = value not available

NPDES = National Pollution Discharge Elimination System (USEPA program)

TTHM = compound is a trihalomethane. The drinking water standard for total trihalomethanes is 100 ug/L.

(1) Water Use Codes

FC = Fish Consumption
FBC = Full-body contact
DWS = Domestic Water Supply (domestic drinking water in the area is obtained from groundwater wells)
AgI = Agricultural Irrigation
AgL = Agricultural Livestock
A&Ww-C = Aquatic & wildlife, warmwater - chronic
A&Ww-A = Aquatic and wildlife, warmwater - acute

Water quality criteria descriptors

h = hardness-dependent criterion. Calculated using hardness data reported by the U.S. Geological Survey (USGS) for October 2005 - September 2006 in Colorado River below Parker Dam (318 mg $CaCO_3$/L)

d = dissolved concentration

(2) The basis of the NPDES limits are Arizona Water Quality Standards (WQS). The specific limits are the lowest criteria for all applicable water uses in the Colorado River near the POTW that were in effect prior to March 2002 (when the standards were updated).

(3) Arizona WQS, updated March 29, 2002 and April 8, 2003 (www.azsos.gov/public_services/Title_18/18-11.htm).

(4) USEPA National Recommended Water Quality Criteria (www.epa.gov/waterscience/criteria/wqcriteria/html).

Table 4.4-11
POTW Outfall Evaluation: Comparison to Most Stringent Applicable Criteria or Standard (ug/L)

Compound	Potential for Acute Effects			Potential for Chronic Effects		
	Acute Criterion	Basis of Criterion	Ratio of Modeled Result to Criterion	Chronic Criterion	Basis of Criterion	Ratio of Modeled Result to Criterion
Aluminum	750	total recoverable - aquatic life	0.04	87	total recoverable - aquatic life	0.2
Arsenic	360	total - aquatic life	0.007	50	dissolved - full body contact	0.04
Barium	--		NC	98000	total - full body contact	0.0004
Boron	--		NC	1000	total - agricultural irrigation	NC
Cadmium	15	dissolved - aquatic life	0.03	5.3	dissolved - aquatic life	NC
Chromium III	1470	dissolved - aquatic life	0.000004	191	dissolved - aquatic life	NC
Lead	222	dissolved - aquatic life	0.002	8.7	dissolved - aquatic life	NC
Magnesium	--		NC	--		NC
Manganese	--		NC	10000	total - agricultural irrigation	0.002
Nickel	1246	dissolved - aquatic life	0.0007	138	dissolved - aquatic life	NC
Selenium	20	total - aquatic life	0.3	2	total - aquatic life	1.2
Strontium	--		NC	--		NC
Vanadium	--		NC	--		NC
Acetone	--		NC	--		NC
Bromodichloromethane	--		NC	46	fish consumption	0.00006
Bromoform	--		NC	180	full body contact	0.00004
Carbon disulfide	--		NC	--		NC
Chlorodibromomethane	--		NC	34	fish consumption	0.0001
Chloroform	--		NC	230	full body contact	0.000002

-- = not available.

NC = not calculated either because a criterion or standard was not available or because of the large percentage of non-detected concentrations in the Seimens facility effluent.

Table 4.4-12

Fish Ingestion Pathway Risk Assessment
Concentrations in Main Drain and in Fish at Potential Fishing Location

Compound	Average Dissolved Concentration at POTW Outfall due to Facility Effluent (ug/L) (a)	Average Dissolved Concentration in Main Drain at USGS Station (ug/L) (b)	Fish Biotransfer Factor (L/kg FW)		Fish Tissue Concentration (mg/kg FW) (c)	Fish Ingestion Intake (mg/kg body weight-day) (d)		Oral Toxicity Criterion (e)			Excess Lifetime Cancer Risk (f)		Noncancer Hazard Quotient (g)	
			Value	Source		Adult	Child	CSF $(mg/kg\text{-}day)^{-1}$	RfD (mg/kg-day)	Source	Adult	Child	Adult	Child
Aluminum	18	3.1E-01	500	(7)	1.6E-01	2.0E-04	1.4E-04	NA	1	(4)	NC	NC	2E-04	1E-04
Arsenic	1.9	3.3E-02	114	(1)	3.8E-03	4.7E-07	3.3E-07	1.5	3.00E-04	(3)	3E-07	4E-08	2E-03	1E-03
Barium	36	6.3E-01	633	(1)	4.0E-01	5.0E-04	3.5E-04	NA	0.07	(3)	NC	NC	7E-03	5E-03
Boron	NC	NC	--	--	--	NC	NC	NA	2.00E-01	(5)	NC	NC	NC	NC
Cadmium	NC	NC	907	(1)	--	NC	NC	0.38	4.00E-04	(3)	NC	NC	NC	NC
Chromium III	NC	NC	19	(1)	--	NC	NC	NA	1.5	(3)	NC	NC	NC	NC
Lead	NC	NC	0.09	(1)	--	NC	NC	8.50E-03	4.30E-04	(3)	NC	NC	NC	NC
Magnesium	NC	NC	--	--	--	NC	NC	NA	NA		NC	NC	NC	NC
Manganese	16	2.8E-01	400	(7)	1.1E-01	1.4E-04	9.8E-05	NA	0.14	(5)	NC	NC	1E-03	7E-04
Nickel	NC	NC	78	(1)	--	NC	NC	NA	2.00E-02	(3)	NC	NC	NC	NC
Selenium	2.4	4.2E-02	409	(2)	1.7E-02	2.1E-05	1.5E-05	NA	5.00E-03	(3)	NC	NC	4E-03	3E-03
Strontium	NC	NC	60	(7)	--	NC	NC	NA	6.00E-01	(5)	NC	NC	NC	NC
Vanadium	2.3	4.0E-02	--	--	--	NC	NC	NA	3.00E-03	(6)	NC	NC	NC	NC
Acetone	0.015	2.6E-04	129	(1)	3.4E-05	4.2E-08	3.0E-08	NA	0.9	(3)	NC	NC	4E-08	3E-08
Bromodichloro-methane	2.90E-03	5.0E-05	8.26	(1)	4.2E-07	5.2E-10	3.7E-10	6.20E-02	2.00E-02	(3)	1E-11	2E-12	2E-08	2E-08
Bromoform	7.50E-03	1.3E-04	13.3	(1)	1.7E-06	2.2E-09	1.5E-09	7.90E-03	2.00E-02	(3)	7E-12	1E-12	1E-07	7E-08
Carbon disulfide	NC	NC	9.86	(1)	--	NC	NC	NA	1.00E-01	(3)	NC	NC	NC	NC
Chlorodibromo-methane	5.00E-03	8.7E-05	10.4	(1)	9.0E-07	1.1E-09	8.0E-10	8.40E-02	2.00E-02	(3)	4E-11	5E-12	5E-08	4E-08
Chloroform	5.20E-04	9.0E-06	6.92	(1)	6.3E-08	7.8E-11	5.5E-11	NA	1.00E-02	(3)	NC	NC	8E-09	5E-09
									Total		3E-07	4E-08	1E-02	1E-02

NA = not available.
NC = not calculated. An average concentration was not calculated for a compound if there was a large percentage of non-detected concentrations reported in the facility effluent.
-- = not identified (because an average concentration in the Main Drain was not calculated or because the biotransfer factor is not available or not applicable).
FW = fresh weight.

(a) Average dissolved concentration (from prior table).

(b) Concentrations were calculated at the only location on the Main Drain at which water flow rate data are measured (U.S. Geological Survey Station station #09428508). This USGS station is about 10 miles downstream of the outfall and about 5 miles upstream of the Colorado River.
Concentration downstream in Main Drain (ug/L) = incremental concentration at outfall (ug/L) * flow rate at outfall (gpd) / flow rate at USGS station (gpd)
Water flow rates as follows:

POTW outfall flow rate (gpd) = 708541 gpd Basis: Average POTW outfall flow rate for 2006 year.
Flow rate at USGS Main Drain station (gpd) = 4.07E+07 gpd Basis: Annual average flow rate from 2003-2007 measurements (63 ft3/sec) at USGS Station #09428508

(c) Fish tissue concentration (mg/kg) = BCF (L/kg) * dissolved H2O concentration (ug/L) * (1 mg/1,000 ug)

(d) Fish intake (mg/kg BW-day) = fish concentration (mg/kg FW) * fish ingestion rate (kg/kg body weight-day) * fraction ingested from evaluated location, where ingestion rates were 0.00125 and 0.00088 kg/kg body weight-day for an adult and child, respectively, and the fraction ingested was asusmed to be 1.0 (i.e., 100%), based on USEPA's 2005 HHRAP default assumptions.

The intake for arsenic was also adjusted to reflect the fraction of arsenic present in the inorganic form in fish, since most arsenic in fish is present in the nontoxic organic form (ATSDR 2005). Field measurements of arsenic in freshwater fish show the fraction inorganic as 0.01-0.125 (ATSDR 2003, USEPA 2003c). The State of Arizona uses a value of 0.1 fraction inorganic in calculating the State ambient water quality criterion for arsenic for fish consumption (S. Pawlowski, personal communication, May 29, 2007). In this analysis, the Arizona value of 0.1 was thus used to adjust the fish ingestion arsenic intakes.

(e) Hierarchy for chronic toxicity data as follows: USEPA's 2005 HHRAP, USEPA's IRIS, USEPA's Provisional Peer-Reviewed Toxicity Values (PPRTVs), ATSDR's chronic minimum risk level.

(f) Cancer risk = intake (mg/kg body weight-day) * exposure duration (yrs) * exposure frequency (days/yr) * CSF $(mg/kg\text{-}day)^{1}$ / (averaging time (yrs) * 365 days/yr), with the parameters defined based on USEPA 2005 HHRAP as follows: exposure duration (30 yrs adult, 6 yrs child), exposure frequency (350 days/yr), averaging time (70 yrs).

(g) Noncancer hazard quotient = intake (mg/kg body weight-day) * exposure duration (yrs) * exposure frequency (days/yr) / (reference dose (mg/kg-day) * exposure duration (yrs) * 365 days/yr), with the parameters defined based on USEPA 2005 HHRAP as follows: exposure duration (30 yrs adult, 6 yrs child), and exposure frequency (350 days/yr).

Sources:
(1) USEPA 2005 Human Health Risk Assessment Protocol (HHRAP), Appendix A, Biotransfer Factors
(2) Geometric mean of field-derived BAF values reported in USEPA's 2004 Draft Aquatic Life Water Quality Criteria for Selenium (EPA 822-D-04-001)
(3) USEPA 2005 Human Health Risk Assessment Protocol (HHRAP), Appendix A, health benchmarks
(4) USEPA's Provisional Peer-Reviewed Toxicity Values (PPRTVs), provided by D. Crawford, USEPA, March 2007.
(5) USEPA's Integrated Risk Information System (IRIS). 2007.
(6) Chronic minimum risk level (MRL) developed by Agency for Toxic Substances and Disease Registry (ATSDR). 2007
(7) Oak Ridge National Laboratory, Risk Assessment Information System (RAIS). Rais.ornl.gov/homepage/rap_tool.shtml. 2007

Table 4.4-13
Modeled Ambient Air Concentrations On Site Associated with Fugitive Emissions During Spent Carbon Unloading and Comparison to Occupational Exposure Limits

Compound	CAS #	8-Hour Average Air Concentration (mg/m3) (a)		Occupational Exposure Limits (mg/m3) (b)		Comparison of Maximum Modeled 8-Hour Average Concentrations to Occupational Exposure Limits			
						Aqua Spent Carbon (used to treat liquids)		Vapor Spent Carbon (used to treat vapors)	
		Aqua Spent Carbon (used to treat liquids)	Vapor Spent Carbon (used to treat vapors)	NIOSH Reference Exposure Limit (8-hr TWA REL)	OSHA Permissible Exposure Limit (8-hr TWA PEL)	Ratio - Air Concentration/ NIOSH REL	Ratio - Air Concentration/ OSHA PEL	Ratio - Air Concentration/ NIOSH REL	Ratio - Air Concentration/ OSHA PEL
1,2-Dibromoethane	106-93-4	1.26E-05	6.37E-05	0.35	150	4E-05	8E-08	2E-04	4E-07
1,3-Butadiene	106-99-0	8.41E-02	4.22E-01	4.4 (c)	2.2	2E-02	4E-02	1E-01	2E-01
1,4-Dichlorobenzene	106-46-7	2.65E-04	1.33E-03	60 (c)	450	4E-06	6E-07	2E-05	3E-06
Acrylonitrile	107-13-1	6.12E-03	3.42E-02	2.2	4.3	3E-03	1E-03	2E-02	8E-03
Arsenic	7440-38-2	NA	6.88E-09	0.002	0.01	--	--	3E-06	7E-07
Benzene	71-43-2	1.93E-03	9.73E-03	0.32	3.2	6E-03	6E-04	3E-02	3E-03
Beryllium	7440-41-7	NA	5.74E-10	0.0005	0.002	--	--	1E-06	3E-07
Cadmium	7440-43-9	NA	3.19E-09	--	0.005	--	--	--	6E-07
Chloroform	67-66-3	9.44E-05	4.76E-04	49 (c,e)	--	2E-06	--	1E-05	--
Cobalt	7440-48-4	NA	1.11E-08	0.05	0.1	--	--	2E-07	1E-07
Copper	7440-50-8	NA	1.15E-07	1	1	--	--	1E-07	1E-07
Cyclohexane	110-82-7	3.61E-02	1.81E-01	1050	1050	3E-05	3E-05	2E-04	2E-04
Ethylbenzene	100-41-4	5.65E-04	2.85E-03	435	435	1E-06	1E-06	7E-06	7E-06
Naphthalene	91-20-3	2.77E-06	1.40E-05	50	50	6E-08	6E-08	3E-07	3E-07
n-Hexane	110-54-3	2.79E-02	1.39E-01	180	1800	2E-04	2E-05	8E-04	8E-05
Nickel	7440-02-0	NA	3.75E-08	0.015	1	--	--	3E-06	4E-08
Styrene	100-42-5	6.27E-04	3.16E-03	215	430	3E-06	1E-06	1E-05	7E-06
Tetrachloroethylene	127-18-4	1.13E-03	5.70E-03	170 (c)	680	7E-06	2E-06	3E-05	8E-06
Toluene	108-88-3	9.05E-04	4.56E-03	375	750	2E-06	1E-06	1E-05	6E-06
Trichloroethylene	79-01-6	6.65E-04	3.35E-03	134 (d)	540	5E-06	1E-06	2E-05	6E-06
Vinyl Chloride	75-01-4	1.07E-03	5.38E-03	2.6 (c)	2.6	4E-04	4E-04	2E-03	2E-03

NA = not applicable.
-- = not available or not calculated.
TWA = time-weighted average.

(a) Air concentration (mg/m3) = emission rate (g/sec) * maximum 8-hour average unit air concentration (16,426 ug/m3 per 1 g/sec) * mg/1,000 ug. The maximum 8-hour average unit air concentration among the modeled on-site receptor locations for the fugitive emissions source occurred about 10 m north of the hopper for all five years of modeled meteorological data (2001-2005 datasets). The results at this receptor ranged from 8,586 ug/m^3 per 1 g/sec (2001 meteorological data) to 16,426 ug/m^3 per 1 g/sec (2003 meteorological data).
(b) Sources: OSHA PELS - www.osha.gov/pls/oshaweb. NIOSH RELs - www.cdc.gov/niosh/npg. ACGIH TLVs - www.osha.gov/dts/chemicalsampling/toc/toc_chemsamp.html.
(c) The ACGIH TWA-threshold limit value (TLV) was used, if available, if a NIOSH REL was not available.
(d) 10-hour TWA concentration.
(e) The NIOSH REL is 9.78 mg/m^3, for a 60-minute short-term exposure period.

Table 4.5-1
Uncertainties in the Facility Risk Assessment

Uncertainty	Effect of Uncertainty on Potential Risk
Selection of Chemicals	
Over 170 compounds were evaluated quantitatively in the risk assessment, including over 80 compounds that were not detected in stack emissions	Over- or under-estimation
Toxicity Characterization	
Conservatively derived cancer slope factors and reference doses were used to assess risks	Over-estimation
Excess lifetime cancer risks for PCDDs/PCDFs other than 2,3,7,8-TCDD were evaluated using toxicity equivalency factors	Over- or under-estimation
Acute inhalation toxicity criteria were derived from a variety of sources, and incorporated safety factors to account for even sensitive members of the population	Over- or under-estimation
Chronic and acute toxicity criteria were not available for all selected compounds	Under-estimation
Quantification of Stack Emission Rates	
Emission rates for several compounds were set at proposed permit levels that are higher than actually occur at the facility	Over-estimation
Calculation of Environmental Concentrations	
The ISCST3 model was used to calculate ambient air concentrations and deposition rates	Over- or under-estimation
USEPA fate and transport mathematical equations were used to calculate environmental concentrations	Over-estimation
Numerous USEPA default input parameters were used to calculate concentrations	Over-estimation
Mercury speciation in soil, sediment and water was based on USEPA default speciation fractions	Over- or under-estimation
Chemical concentrations in produce and in animal products were based on biotransfer coefficients, often derived using regression equations	Over- or under-estimation
Input parameters used to calculate chemical concentrations in water bodies were estimated from site-specific information as well as default assumptions	Over- or under-estimation
A number of scenarios calculated concentrations in produce and animal meat products at a single point rather than across the acreages necessary to support these practices	Over-estimation
Calculation of Human Exposures	
USEPA default assumptions for exposure duration, exposure frequency, and ingestion and inhalation rates were used to calculate exposures	Over-estimation
The fish ingestion exposure scenarios assume 100% of all fish ingested come from fish caught only from specific water bodies	Over-estimation
Risk Characterization	
Potential exposure to PCDDs/PCDFs were evaluated for infants and adults by comparison with estimates of current background exposure levels	Over- or under-estimation
Acute inhalation risks were evaluated for specific chemicals although the short-term effects of some chemicals may be additive, synergistic or antagonistic	Over- or under-estimation

Table 4.5-2
Analysis of Dioxin-Like Polychlorinated Biphenyls (PCBs)

Constituent	CAS NO.	PDT Results: Detected in Stack Samples (Y/ND)	Emission Rate Based on PDT (g/sec)	Ratio: Dioxin-like Emission Rate / Total PCB Emission Rate (a)	Extrapolated Lifetime Average Daily Dose (mg/kg-day) (b)	Dioxin-like PCB TEFs (c)	Extrapolated TEQ Lifetime Average Daily Dose (mg/kg-day) (d)
3,4,3',4'-Tetrachlorobiphenyl (IUPAC 77)	32598-13-3	Y (EMPC)	1.48E-10	6.32E-03	9.49E-13	0.0001	9.49E-17
3,4,4',5-tetrachlorobiphenyl (IUPAC 81)	70362-50-4	Y (*, EMPC)	2.62E-11	1.12E-03	1.68E-13	0.0001	1.68E-17
2,3,4,3',4'-Pentachlorobiphenyl (IUPAC 105)	32598-14-4	Y (B, EMPC)	6.29E-11	2.69E-03	4.03E-13	0.0001	4.03E-17
2,3,4,5,4'-Pentachlorobiphenyl (IUPAC 114)	74472-37-0	Y (*, EMPC)	8.41E-12	3.59E-04	5.39E-14	0.0005	2.70E-17
2,4,5,3',4'-Pentachlorobiphenyl (IUPAC 118)	31508-00-6	Y (B, EMPC)	1.36E-10	5.81E-03	8.72E-13	0.0001	8.72E-17
3,4,5,2',4'-Pentachlorobiphenyl (IUPAC 123)	65510-44-3	Y (B, *, EMPC)	1.28E-11	5.47E-04	8.21E-14	0.0001	8.21E-18
3,4,5,3',4'-Pentachlorobiphenyl (IUPAC 126)	57465-28-8	Y (EMPC)	4.3E-11	1.84E-03	2.76E-13	0.1	2.76E-14
2,3,4,5,3',4'-Hexachlorobiphenyl (IUPAC 156)	38380-98-4	Y (C, EMPC)	3.84E-11	1.64E-03	2.46E-13	0.0005	1.23E-16
2,3,4,3',4',5'-Hexachlorobiphenyl (IUPAC 157)	68782-90-7	Y (C, EMPC)	3.84E-11	1.64E-03	2.46E-13	0.0005	1.23E-16
2,4,5,3',4',5'-Hexachlorobiphenyl (IUPAC 167)	52663-72-6	Y (EMPC)	1.76E-11	7.52E-04	1.13E-13	0.00001	1.13E-18
3,4,5,3',4',5'-Hexachlorobiphenyl (IUPAC 169)	32774-16-6	ND	1E-11	4.27E-04	6.41E-14	0.01	6.41E-16
2,3,4,5,3',4',5'-Heptachlorobiphenyl (IUPAC 189)	39635-31-9	ND	6.7E-12	2.86E-04	4.29E-14	0.0001	4.29E-18
Total dioxin-like PCBs							2.87E-14
Total PCBs (as Aroclor 1254)	11097-69-1	Y	2.34E-08		1.50E-10		
Total dioxin-like PCBs excess lifetime cancer risk							4.3E-09

Notes:

* = the compound was detected very infrequently, in only one or two of the sampled fractions, from the three replicate runs

B = one or more sample fraction results from one or more of the three replicate runs were affected by method blank contamination

C = co-eluting PCB isomer

EMPC = one or more of the front or back half sample results from one or more of the three replicate runs were an estimated maximum possible concentration

ND = not detected in any sample fraction from any of the three replicate runs

Y = yes; detected in one or more sample fractions from at least one of the three replicate runs

(a) Ratio = dioxin-like PCB emission rate / total PCB emission rate used in the risk assessment.
(b) Extrapolated dose = lifetime average daily dose calculated for total PCBs for the Main Drain fish ingestion pathway (1.5E-10 mg/kg-day) * ratio of dioxin-like to total PCB emission rate.
(c) Toxic equivalency factors (TEFs) for dioxin-like PCBs are based on WHO values as summarized in USEPA's HHRAP.
(d) Toxic equivalents (TEQ) dose = dioxin-like extrapolated lifetime average daily dose * TEF.
(e) Cancer risk = TEQ dose * TCDD cancer slope factor (1.5E+5 (mg/kg-day)^-1).

Table 4.5-3
Compounds Selected for the Risk Assessment Without Human Health Toxicity Data

Compound	CAS Number	PDT Results: Detected in Stack Samples (Y or ND)	Compound Included in USEPA (2005) HHRAP	Compound Did Not Have Chronic Toxicity Data	Compound Did Not Have Acute Toxicity Data
1,1-Dichloropropene	563-58-6	ND		X	
1,2,3-Trichlorobenzene	87-61-6	ND	√	X	
1,2,4-Trimethylbenzene	95-63-6	ND		X	
1,2-Dichloroethene (cis)	156-59-2	Y (*)	√	X	
1,3,5-Trimethylbenzene	108-67-8	ND	√	X	
2,2-Dichloropropane	594-20-7	ND		X	
2,5-Dimethylfuran	625-86-5	Y (TIC)		X	X
2,5-Dimethylheptane	2216-30-0	Y (TIC)		X	
2,5-Dione, 3-hexene	17559-81-8	Y (TIC)		X	X
2-Hexanone	591-78-6	ND		X	
2-Methyl octane	3221-61-2	Y (TIC)		X	X
2-Nitroaniline	88-74-4	ND	√	X	
2-Nitrophenol	88-75-5	ND	√	X	
3-Ethyl benzaldehyde	34246-54-3	Y (TIC)		X	
3-Hexen-2-one	763-93-9	Y (TIC)		X	X
3-Nitroaniline	99-09-2	ND	√	X	
Ethylidene acetone (3-penten-2-one)	625-33-2	Y (TIC)		X	X
3-Penten-2-one, 4-methyl	141-79-7	Y (TIC)		X	
4-Bromophenyl-phenyl ether	101-55-3	ND	√	X	
4-Chloro-3-methylphenol	59-50-7	ND	√	X	
4-Chlorophenyl-phenyl ether	7005-72-3	ND	√	X	
4-Ethyl benzaldehyde	4748-78-1	Y (TIC)		X	
4-Nitroaniline	100-01-6	ND	√	X	
9-Octadecenamide	301-02-0	Y (TIC)		X	X
Acenaphthylene	208-96-8	Y		X	
Benzo(e)pyrene	192-97-2	Y (B)		X	X
Benzo(g,h,i)perylene	191-24-2	Y		X	
Benzoic acid, methyl ester	93-58-3	Y (TIC)		X	X
Benzonitrile	100-47-0	ND	√	X	
Benzyl alcohol	100-51-6	ND	√	X	
BHC, delta-	319-86-8	Y (COL)			X
Bromobenzene	108-86-1	ND		X	
Bromochloromethane	74-97-5	ND		X	
Butylbenzene, n-	104-51-8	ND		X	
Butylbenzene, sec-	135-98-8	ND		X	
Butylbenzene, tert-	98-06-6	ND		X	
Carbazole	86-74-8	ND		X	
Diallate	2303-16-4	ND		X	X
Dimethylphthalate	131-11-3	ND	√	X	
Di-n-octyl phthalate	117-84-0	ND	√	X	
Endosulfan II	33213-65-9	Y (*, COL)		X	X
Endosulfan sulfate	1031-07-8	ND		X	X
Endrin aldehyde	7421-93-4	Y (B, COL)		X	X
Endrin ketone	53494-70-5	ND		X	X
Iodomethane	74-88-4	Y (B)		X	
Isopropyl toluene, p-	99-87-6	ND		X	X
Perylene	198-55-0	Y (*, B)		X	X
Phenanthrene	85-01-8	Y (*, B)	√	X	
Phosphine imide, P,P,P-triphenyl	2240-47-3	Y (TIC)		X	X
Propylbenzene, n-	103-65-1	ND		X	

Notes:

* = The compound was detected very infrequently, in only 1-2 of the sampled fractions, from the three replicate runs.

B = One or more sample fraction results from one or more of the three replicate runs were affected by method blank contamination.

COL = There was a greater than 40% difference between primary and confirmatory columns in one or more sample fraction results from one or more of the three replicate runs; reported result should be considered estimated.

HHRAP = Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (U.S. Environmental Protection Agency, 2005).

ND = Not detected in any sample fraction from any of the three replicate runs.

PDT = Performance Demonstration Test.

TIC = Tentatively identified compound.

X = Compound did not have chronic or acute human health toxicity data.

Y = Yes; detected in one or more sample fractions from at least one of the three replicate runs.

Table 5.1-1
Ecological Receptors and Exposure Pathways Evaluated in the Ecological Risk Assessment

a. Creosote Bush Scrub

Receptor	Taxa	Reason for Selection	Exposure Medium & Exposure Route	
			Soil	Diet
Badger	mammal	Common in study area. Carnivorous species. Member of mustelid family, which often demonstrates a greater sensitivity to toxicants than other mammals. Digs and forages in soil. Carnivorous habit will result in greater dietary exposures than other common mammals of this habitat (e.g., jackrabbit, pocket mice).	ingestion	ingestion
Gambel's quail	bird	Common to abundant study area resident. Most important game resource in the lower Colorado River Valley (Rosenberg et al. 1991). Toxicity data available for some chemicals. Exposures will be representative of that in other seed eaters of this habitat (e.g., dove, sparrow).	ingestion	ingestion
Great horned owl	bird	Fairly common resident throughout Parker Valley. Carnivorous.	ingestion	ingestion
Desert tortoise	reptile	Species of special concern in Arizona. Potentially distributed throughout desert scrub habitat of study area.	ingestion	ingestion
Creosote bush	plant	Dominant vegetative species in desert scrub habitat. Wide-spread throughout study area. Important plant to native people, and single most widely and frequently used medicinal herb in the Sonoran desert (Phillips and Comus 2000).	root uptake	na

na = not applicable to this receptor.

Table 5.1-1 (Continued)
Ecological Receptors and Exposure Pathways Evaluated in the Ecological Risk Assessment

b. Agricultural Areas

Receptor	Taxa	Reason for Selection	Exposure Medium & Exposure Route	
			Soil	Diet
Gambel's quail	bird	Common to abundant study area resident. Most important game resource in the lower Colorado River Valley (Rosenberg et al. 1991). Toxicity data available for some chemicals. Exposures will be representative of that in other seed eaters of this habitat (e.g., dove, sparrow).	ingestion	ingestion
Burrowing owl	bird	Common resident of agricultural areas in Parker Valley (Rosenberg et al. 1991). Special concern species in the State of California. Carnivorous.	ingestion	ingestion
Alfalfa	plant	Principal crop in agricultural lands of study area. Toxicity data available for some grass species. Other crops less important economically.	root uptake	na

na = not applicable to this receptor.

Table 5.1-1 (Continued)
Ecological Receptors and Exposure Pathways Evaluated in the Ecological Risk Assessment

c. Riparian Corridors

Receptor	Taxa	Reason for Selection	Exposure Medium & Exposure Route	
			Soil	Diet
Southwestern willow flycatcher	bird	Federally endangered. Carnivorous (Insectivorous) species. Presence historically documented in study area. Entire study area population limited to riparian areas. This species will be representative of potential exposures in other insectivorous birds of this habitat.	na	ingestion
Gambel's quail	bird	Common to abundant study area resident. Most important game resource in the lower Colorado River Valley (Rosenberg et al. 1991). Toxicity data available for some chemicals. Screwbeam mesquite of riparian habitats important seasonal food source for this species. Exposures will be representative of that in other seed eaters of this habitat (e.g., dove, sparrow). Other birds in this habitat are less important economically.	ingestion	ingestion
Screwbean mesquite	plant	Ecologically important plant of study area riparian areas, providing food for resident seed eaters. Part of re-vegetation efforts by CRIT to reestablish riparian vegetation in the area. Mesquite is an important and sacred tree in the Mohave religious tradition. Exposures will be representative of that in other woody vegetation of the corridor.	root uptake	na

na = not applicable to this receptor.

Table 5.1-1 (Continued)
Ecological Receptors and Exposure Pathways Evaluated in the Ecological Risk Assessment

d. Colorado River

Receptor	Taxa	Reason for Selection	Exposure Medium & Exposure Route		
			diet	surface water	sediment
Double-crested cormorant	bird	Year-round resident. Piscivorous. Some data suggest a potentially greater sensitivity to some toxicants.	ingestion	ingestion	ingestion
Aquatic community	fish, invertebrates, amphibians, plants	Year-round residents. Some fish and amphibian species important recreationally. Aquatic community is inclusive of all potential aquatic receptors.	ne (1)	all exposure routes	all exposure routes

ne = not evaluated

(1) aquatic life dietary exposures were considered as part of overall evaluation of surface water quality.

Table 5.1-1 (Continued)
Ecological Receptors and Exposure Pathways Evaluated in the Ecological Risk Assessment

e. Riparian Backwaters

Receptor	Taxa	Reason for Selection	Exposure Medium & Exposure Route		
			diet	surface water	sediment
Yuma clapper rail	bird	Federally endangered. Carnivorous (invertivorous) species. Presence historically documented in study area. Entire study area population limited to riparian areas.	ingestion	ingestion	ingestion
Aquatic community	fish, invertebrates, amphibians, plants, benthic invertebrates	Year-round residents. Some fish and amphibian species important recreationally. Aquatic community is inclusive of all potential aquatic receptors. Exposure in benthic invertebrates assessed separately from water column species to evaluate potential impacts of chemicals that partition preferentially to sediments.	ne (1)	all routes	all routes

na = not applicable to this receptor.
ne = not evaluated

(1) aquatic life dietary exposures were considered as part of overall evaluation of surface water quality.

Table 5.1-1 (Continued)
Ecological Receptors and Exposure Pathways Evaluated in the Ecological Risk Assessment

f. Canals, Aqueducts, Main Drain

Receptor	Taxa	Reason for Selection	Exposure Medium & Exposure Route		
			diet	surface water	soil/ sediment
Double-crested cormorant	bird	Year-round resident. Piscivorous. Some data suggest a potentially greater sensitivity to some toxicants.	ingestion	ingestion	ingestion
Mule deer	Mammal	Year-round resident. Could ingest surface water from these areas. Requested by USEPA.	Ingestion	Ingestion	Ingestion
Aquatic community	fish, invertebrates, amphibians, plants	Year-round residents. Some fish and amphibian species important recreationally.	ne (1)	all routes	all routes

na = not applicable to this receptor in this habitat.
ne = not evaluated

(1) aquatic life dietary exposures were considered as part of overall evaluation of surface water quality.

Table 5.2-1
Dietary Parameters for Selected Receptor Species

Receptor	Food Items					Media		
	Terrestrial Plants	Terrestrial Invertebrates	Benthic Invertebrates	Fish	Small Mammals	Soil	Sediment	Surface Water
Southwestern willow flycatcher		X				I		
Gambel's quail	X					I		
Burrowing owl					X	I		
Great horned owl					X	I		
Badger					X	I		
Double crested cormorant				X			I	I
Yuma clapper rail			X				I	I
Mule deer	X					I		I

X - Food chain model assumes 100 percent of a receptor's diet comes from the food source indicated.

I - Food chain model assumes incidental ingestion of medium indicated.

Table 5.2-2
Ingestion Rates for Selected Receptor Species

Receptor	Receptor Body Weight		Food Ingestion Rate		Water Ingestion Rate		Soil Ingestion Rate (d)		Sediment Ingestion Rate	
	(kg)	Reference	(kg WW/ kg BW-d)	Notes	(L/ kg BW-d)	Notes	(kg DW/ kg BW-d)	Notes	(kg DW/ kg BW-d)	Notes
Southwest willow flycatcher	0.011	Sedgewick 2000	1.680	(a, b)	--		0.00	(h)	--	
Gambel's quail	1.04	Brown et al. 1998	0.478	(a, c)	--		0.002	(i)	--	
Burrowing owl	0.15	Haug et al. 1993	0.352	(a, d)	--		0.064	(i)	--	
Great horned owl	0.91	Houston et al.1998	0.188	(a, d)	--		0.010	(i)	--	
Badger	6.4	Baker 1983	0.154	(a, d)	--		0.00004	(i)	--	
Double-crested cormorant	1.2	Hatch and Weseloh 1999	0.273	(a, e)	0.056	(g)	--		0.005	(j)
Yuma clapper rail	0.16	Eddleman and Conway 1998	0.660	(a, f)	0.108	(g)	--		0.021	(k)
Mule Deer	43.7	Relyea et al. 2000	0.292	(a, c)	0.068	(g)	0.0007	(l)	--	

-- = Not applicable; BW - body weight; d –day; DW- dry weight; g – grams; kg – kilograms; L- liters; WW- wet weight.

(a) Food Ingestion Rates (Food IR) were calculated using allometric equations presented in Table 5-1 of USEPA's Screening Level Ecological Risk Assessment Protocol (USEPA 1999):

Bird: IR (g DW/day) = 0.648 x BW $^{0.651}$ (g)

Mammal: IR (g DW/day)=0.235 x BW $^{0.822}$ (g)

Then, the IR was divided by 1000 to convert the IR from g to kg, and divided by the receptor's body weight to get an ingestion rate in kg DW/kg BW-day.

Finally, to convert the IR from dry weight (DW) to wet weight (WW), the following equation was used:

Food IR (kg WW/kg BW-day) = (IR kg DW/kg BW-day)/(1- % moisture/100)

where % moisture of ingested material is

88% for plant matter (see Table 5-1 in USEPA 1999)
68% for small mammals (see Table 5-1 in USEPA 1999)
83.3% for terrestrial invertebrates (see page C-2 in USEPA 1999)
80% for fish (see page C-4 in USEPA 1999)
83.3% for aquatic invertebrates (see page C-3 in USEPA 1999)

(b) Assumes diet consists of aquatic invertebrates.

(c) Assumes diet consists of plants.

(d) Assumes diet consists of small mammals.

(e) Assumes diet consists of fish.

(f) Assumes diet consists of benthic macroinvertebrates.

(g) Water Ingestion Rates (Water IR) were calculated using allometric equations presented in Table 5-1 of USEPA, 1999:

Bird: IR (L/day) = 0.059 x BW $^{0.670}$ (kg)

Mammal: IR (L/day) = 0.099 x BW $^{0.900}$ (kg)

Then, the bird and mammal IR was divided by the receptor's body weight to get an ingestion rate in L/kg BW-day.

(h) No suitable surrogate species were found in either USEPA (1999) or Beyer et al. (1994). Soil ingestion is assumed to be zero because flycatchers forage by either aerially gleaning (capturing an insect from a substrate while hovering) or hawking (waiting on perches and capturing insects in flight) and thus have negligible contact with soil while foraging. (Craig and Williams, 1998).

(i) Soil ingestion rates for Gambel's quail, Burrowing owl, Great horned owl, and Badger were based on surrogate values for Northern bobwhite, Red-tailed hawk, Red-tailed hawk, and Long-tailed weasel, respectively (USEPA, 1999) were but corrected for the receptor species' body weight. Surrogates were chosen based on similarities in feeding strategy.

(j) No suitable surrogate species were found in USEPA (1999). The two highest sediment ingestion rates estimated by Beyer et al. (1994) for ducks and geese (i.e. wading and diving birds) were 11% of the food ingestion rate for the wood duck and 8.2% for Canada goose. The rounded average of these two rates (10%) was assumed to be a conservative estimate of the proportion of sediment ingestion for the double crested cormorant, which is a diving bird. The sediment ingestion rate was calculated by multiplying the cormorant's dry weight FIR by 10% (USEPA, 1999).

(k) The sediment ingestion rate for the Yuma clapper rail was based on a surrogate value for mallard but corrected for the Yuma clapper rail's body weight. The surrogate was chosen based on similarities in feeding strategy.

(l) Because a mule-deer specific soil ingestion rate (2%) was available from Beyer et al. (1994), a surrogate was not needed.

Table 5.2-3
Summary of Cumulative Hazard Index Values for Selected Ecological Receptors

Exposure Area	Receptor	Cumulative Hazard Index (a)
Creosote Bush Scrub Area	Badger	7.E-06
	Gambel's Quail	7.E-03
	Great Horned Owl	1.E-04
	Creosote Scrub Bush	2.E-01
Agricultural Area	Gambel's Quail	5.E-05
	Burrowing Owl	2.E-05
	Alfalfa	6.E-04
Riparian Corridor Area	Southwestern Willow Flycatcher	3.E-02
	Gambel's Quail	1.E-04
	Plant	8.E-03
Colorado River Area	Double-crested Cormorant	1.E-02
	Surface Water	1.E-04
	Sediment	8.E-05
Riparian Backwater Area	Yuma Clapper Rail	2.E-03
	Surface Water (b)	1.E-04
	Sediment (b)	8.E-05
Main Drain Area	Double-crested Cormorant	5.E-02
	Mule Deer	5.E-05
	Surface Water	8.E-05
	Sediment	3.E-04

(a) The cumulative hazard index (HI) conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. It is calculated by summing individual chemical-specific hazard quotient values. For this project, the target hazard index was specified by USEPA Region 9 at a value of 0.25. The target hazard index value used by most states and many other USEPA programs, for compounds grouped according to the mechanism of effects, is 1.0. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted.

(b) Results for surface water and sediment for the riparian backwater were evaluated using the results for the Colorado River.

APPENDIX L

FUGITIVE EMISSIONS:
COMPARISON TO USEPA REGION 9
PRELIMINARY REMEDIATION GOALS

Comparison of Modeled Ambient Air Concentrations at Residential Assessment Receptor Location R_6 with USEPA Region 9 Preliminary Remediation Goals

Fugitive Emissions Associated with Spent Carbon Unloading

Calculated Air Concentrations at Receptor R_6			USEPA Region 9 Preliminary Remediation Goals (PRGs) (a)				Comparison of Concentrations to PRGs
Compound (as listed in IRAP software)	CAS Number	Annual Average Air Concentration (ug/m^3)	Compound (as listed in PRG Table)	CAS Number	Ambient Air PRG (ug/m^3)		Air Concentration Ratio: modeled concentration/PRG
					Air Concentration	Basis	
1,3-Butadiene	106-99-0	2.08E-03	1,3-Butadiene	106-99-0	6.1E-02	ca*	3.E-02
1-Hexane (n-hexane)	110-54-3	6.84E-04	n-Hexane	110-54-3	2.1E+02	nc	3.E-06
Acrylonitrile	107-13-1	1.68E-04	Acrylonitrile	107-13-1	2.8E-02	ca*	6.E-03
Arsenic	7440-38-2	2.34E-11	Arsenic	7440-38-2	4.5E-04	ca	5.E-08
Benzene	71-43-2	4.79E-05	Benzene	71-43-2	2.5E-01	ca	2.E-04
Beryllium	7440-41-7	1.95E-12	Beryllium and compounds	7440-41-7	8.0E-04	ca*	2.E-09
Cadmium	7440-43-9	1.08E-11	Cadmium and compounds	7440-43-9	1.1E-03	ca	1.E-08
Chloroform (Trichloromethane)	67-66-3	2.34E-06	Chloroform	67-66-3	8.3E-02	ca	3.E-05
Cobalt	7440-48-4	3.74E-11	Cobalt	7440-48-4	6.9E-04	ca*	5.E-08
Copper	7440-50-8	3.89E-10	Copper and compounds	7440-50-8	NA		NC
Cyclohexane	110-82-7	8.89E-04	Cyclohexane	110-82-7	6.2E+03	nc	1.E-07
Dichlorobenzene,1,4-	106-46-7	6.56E-06	1,4-Dichlorobenzene	106-46-7	3.1E-01	ca	2.E-05
Ethylbenzene	100-41-4	1.40E-05	Ethylbenzene	100-41-4	1.1E+03	nc	1.E-08
Ethylene dibromide (1,2-dibromoethane)	106-93-4	3.14E-07	1,2-Dibromoethane (EDB)	106-93-4	3.4E-03	ca	9.E-05
Ethylene Glycol	107-21-1	3.31E-07	Ethylene glycol	107-21-1	7.3E+03	nc	5.E-11
Naphthalene	91-20-3	6.87E-08	Naphthalene	91-20-3	3.1E+00	nc	2.E-08
Nickel	7440-02-0	1.27E-10	Nickel (soluble salts)	7440-02-0	NA		NC
Styrene	100-42-5	1.55E-05	Styrene	100-42-5	1.1E+03	nc	1.E-08
Tetrachloroethylene (Perchloroethylene)	127-18-4	2.81E-05	Tetrachloroethylene (PCE)	127-18-4	3.2E-01	ca	9.E-05
Toluene	108-88-3	2.25E-05	Toluene	108-88-3	4.0E+02	nc	6.E-08
Trichloroethylene	79-01-6	1.65E-05	Trichloroethylene (TCE)	79-01-6	1.7E-02	ca	1.E-03
Vinyl Chloride	75-01-4	2.64E-05	Vinyl chloride	75-01-4	1.1E-01	ca	3.E-04

NA = PRG not available.
(a) Source: http://www.epa.gov/region09/waste/sfund/prg/files/prgtable2004.xls
Notes from USEPA Region IX PRG Table: ca=Cancer PRG; nc= Noncancer PRG; ca* (where: nc PRG < 100X ca PRG)

APPENDIX K

FUGITIVE EMISSIONS RISK ASSESSMENT: ACUTE INHALATION RISK RESULTS

ACUTE INHALATION RISK RESULTS
FUGITIVE AIR EMISSIONS DURING UNLOADING AT OUTDOOR HOPPER

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
A_1 maximum impact point (stack emissions)	
Benzene	2.1E-04
Chloroform (Trichloromethane)	8.8E-05
Acrylonitrile	4.3E-05
1,3-Butadiene	7.9E-06
Tetrachloroethylene (Perchloroethylene)	7.9E-06
Cyclohexane	5.0E-06
Styrene	4.1E-06
Toluene	3.4E-06
1-Hexane (n-hexane)	2.6E-06
Arsenic	1.0E-06
Vinyl Chloride	8.2E-07
Nickel	1.7E-07
Ethylbenzene	1.6E-07
Trichloroethylene	1.3E-07
Dichlorobenzene,1,4-	6.1E-08
Copper	3.2E-08
Ethylene Glycol	1.9E-08
Ethylene Dibromide	8.8E-09
Naphthalene	5.1E-09
Beryllium	3.2E-09
Cadmium	2.9E-09
Cobalt	1.0E-10
Total (b)	3.7E-04
A_2 closest business	
Benzene	4.6E-04
Chloroform (Trichloromethane)	1.9E-04
Acrylonitrile	9.5E-05
1,3-Butadiene	1.7E-05
Tetrachloroethylene (Perchloroethylene)	1.7E-05
Cyclohexane	1.1E-05
Styrene	9.2E-06
Toluene	7.5E-06
1-Hexane (n-hexane)	5.7E-06
Arsenic	2.2E-06
Vinyl Chloride	1.8E-06
Nickel	3.8E-07
Ethylbenzene	3.5E-07
Trichloroethylene	2.9E-07
Dichlorobenzene,1,4-	1.4E-07
Copper	7.0E-08
Ethylene Glycol	4.1E-08
Ethylene Dibromide	1.9E-08
Naphthalene	1.1E-08
Beryllium	7.0E-09
Cadmium	6.5E-09
Cobalt	2.3E-10
Total (b)	8.2E-04
A_3 maximum impact point (hopper fugitive emissions)	
Benzene	1.1E-02
Chloroform (Trichloromethane)	4.8E-03
Acrylonitrile	2.4E-03
1,3-Butadiene	4.3E-04
Tetrachloroethylene (Perchloroethylene)	4.3E-04
Cyclohexane	2.7E-04
Styrene	2.3E-04
Toluene	1.9E-04
1-Hexane (n-hexane)	1.4E-04
Arsenic	5.5E-05

ACUTE INHALATION RISK RESULTS
FUGITIVE AIR EMISSIONS DURING UNLOADING AT OUTDOOR HOPPER

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Vinyl Chloride	4.5E-05
Nickel	9.5E-06
Ethylbenzene	8.6E-06
Trichloroethylene	7.3E-06
Dichlorobenzene,1,4-	3.4E-06
Copper	1.7E-06
Ethylene Glycol	1.0E-06
Ethylene Dibromide	4.8E-07
Naphthalene	2.8E-07
Beryllium	1.7E-07
Cadmium	1.6E-07
Cobalt	5.6E-09
Total (b)	2.0E-02
R_1 resident	
Benzene	2.8E-05
Chloroform (Trichloromethane)	1.2E-05
Acrylonitrile	5.8E-06
1,3-Butadiene	1.1E-06
Tetrachloroethylene (Perchloroethylene)	1.1E-06
Cyclohexane	6.8E-07
Styrene	5.7E-07
Toluene	4.6E-07
1-Hexane (n-hexane)	3.5E-07
Arsenic	1.4E-07
Vinyl Chloride	1.1E-07
Nickel	2.4E-08
Ethylbenzene	2.1E-08
Trichloroethylene	1.8E-08
Dichlorobenzene,1,4-	8.4E-09
Copper	4.3E-09
Ethylene Glycol	2.5E-09
Ethylene Dibromide	1.2E-09
Naphthalene	7.0E-10
Beryllium	4.3E-10
Cadmium	4.0E-10
Cobalt	1.4E-11
Total (b)	5.1E-05
R_2 resident	
Benzene	2.6E-05
Chloroform (Trichloromethane)	1.1E-05
Acrylonitrile	5.4E-06
1,3-Butadiene	9.9E-07
Tetrachloroethylene (Perchloroethylene)	9.9E-07
Cyclohexane	6.3E-07
Styrene	5.2E-07
Toluene	4.3E-07
1-Hexane (n-hexane)	3.2E-07
Arsenic	1.3E-07
Vinyl Chloride	1.0E-07
Nickel	2.2E-08
Ethylbenzene	2.0E-08
Trichloroethylene	1.7E-08
Dichlorobenzene,1,4-	7.7E-09
Copper	4.0E-09
Ethylene Glycol	2.3E-09
Ethylene Dibromide	1.1E-09
Naphthalene	6.5E-10
Beryllium	4.0E-10
Cadmium	3.7E-10
Cobalt	1.3E-11

ACUTE INHALATION RISK RESULTS
FUGITIVE AIR EMISSIONS DURING UNLOADING AT OUTDOOR HOPPER

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Total (b)	4.7E-05
R_3 resident farmer	
Benzene	2.1E-05
Chloroform (Trichloromethane)	8.9E-06
Acrylonitrile	4.4E-06
1,3-Butadiene	8.0E-07
Tetrachloroethylene (Perchloroethylene)	8.0E-07
Cyclohexane	5.1E-07
Styrene	4.2E-07
Toluene	3.5E-07
1-Hexane (n-hexane)	2.6E-07
Arsenic	1.0E-07
Vinyl Chloride	8.4E-08
Nickel	1.8E-08
Ethylbenzene	1.6E-08
Trichloroethylene	1.4E-08
Dichlorobenzene,1,4-	6.3E-09
Copper	3.2E-09
Ethylene Glycol	1.9E-09
Ethylene Dibromide	9.0E-10
Naphthalene	5.2E-10
Beryllium	3.2E-10
Cadmium	3.0E-10
Cobalt	1.0E-11
Total (b)	3.8E-05
R_4 resident farmer	
Benzene	2.7E-05
Chloroform (Trichloromethane)	1.2E-05
Acrylonitrile	5.6E-06
1,3-Butadiene	1.0E-06
Tetrachloroethylene (Perchloroethylene)	1.0E-06
Cyclohexane	6.6E-07
Styrene	5.4E-07
Toluene	4.5E-07
1-Hexane (n-hexane)	3.4E-07
Arsenic	1.3E-07
Vinyl Chloride	1.1E-07
Nickel	2.3E-08
Ethylbenzene	2.1E-08
Trichloroethylene	1.7E-08
Dichlorobenzene,1,4-	8.1E-09
Copper	4.2E-09
Ethylene Glycol	2.4E-09
Ethylene Dibromide	1.2E-09
Naphthalene	6.7E-10
Beryllium	4.2E-10
Cadmium	3.9E-10
Cobalt	1.3E-11
Total (b)	4.9E-05
R_5 resident	
Benzene	3.4E-05
Chloroform (Trichloromethane)	1.4E-05
Acrylonitrile	7.0E-06
1,3-Butadiene	1.3E-06
Tetrachloroethylene (Perchloroethylene)	1.3E-06
Cyclohexane	8.2E-07
Styrene	6.8E-07
Toluene	5.6E-07
1-Hexane (n-hexane)	4.2E-07

ACUTE INHALATION RISK RESULTS
FUGITIVE AIR EMISSIONS DURING UNLOADING AT OUTDOOR HOPPER

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Arsenic	1.6E-07
Vinyl Chloride	1.4E-07
Nickel	2.8E-08
Ethylbenzene	2.6E-08
Trichloroethylene	2.2E-08
Dichlorobenzene,1,4-	1.0E-08
Copper	5.2E-09
Ethylene Glycol	3.1E-09
Ethylene Dibromide	1.4E-09
Naphthalene	8.4E-10
Beryllium	5.2E-10
Cadmium	4.8E-10
Cobalt	1.7E-11
Total (b)	6.1E-05
R_6 resident	
Benzene	1.5E-05
Chloroform (Trichloromethane)	6.5E-06
Acrylonitrile	3.2E-06
1,3-Butadiene	5.8E-07
Tetrachloroethylene (Perchloroethylene)	5.8E-07
Cyclohexane	3.7E-07
Styrene	3.1E-07
Toluene	2.5E-07
1-Hexane (n-hexane)	1.9E-07
Arsenic	7.4E-08
Vinyl Chloride	6.1E-08
Nickel	1.3E-08
Ethylbenzene	1.2E-08
Trichloroethylene	9.8E-09
Dichlorobenzene,1,4-	4.5E-09
Copper	2.3E-09
Ethylene Glycol	1.4E-09
Ethylene Dibromide	6.5E-10
Naphthalene	3.8E-10
Beryllium	2.3E-10
Cadmium	2.2E-10
Cobalt	7.5E-12
Total (b)	2.7E-05

(a) Acute hazard quotients were calculated for all compounds with fugitive air emission rates and acute inhalation toxicity criteria.

(b) The total is based on the sum of all chemical-specific hazard quotients regardless of the type of health effects of the summed compounds. A total value summed across all compounds is used as a screening tool only, to determine if additional evaluation for specific types of health effects is warranted (i.e., if the total value is greater than 1).

APPENDIX J

FUGITIVE EMISSIONS RISK ASSESSMENT: CHRONIC INHALATION RISK RESULTS BY COMPOUND

Fugitive Air Emissions Risk Assessment
Chronic Inhalation Risk Results by Compound
(IRAP Software Output Information)

Receptor	Scenario	Compound	Inhalation Excess Lifetime Cancer Risk	Inhalation Non-Cancer Hazard Quotient
R_1 resident	resident_adult	1,3-Butadiene	1.0E-08	3.9E-04
R_1 resident	resident_adult	1-Hexane (n-hexane)	0.0E+00	3.7E-07
R_1 resident	resident_adult	Acrylonitrile	1.8E-09	3.2E-05
R_1 resident	resident_adult	Arsenic	2.3E-14	4.2E-10
R_1 resident	resident_adult	Benzene	6.0E-11	6.0E-07
R_1 resident	resident_adult	Beryllium	1.1E-15	5.3E-11
R_1 resident	resident_adult	Cadmium	4.5E-15	2.9E-11
R_1 resident	resident_adult	Chloroform (Trichloromethane)	8.7E-12	2.9E-06
R_1 resident	resident_adult	Cobalt	0.0E+00	2.0E-10
R_1 resident	resident_adult	Copper	0.0E+00	6.1E-12
R_1 resident	resident_adult	Cyclohexane	0.0E+00	5.6E-08
R_1 resident	resident_adult	Dichlorobenzene,1,4-	1.2E-11	3.1E-09
R_1 resident	resident_adult	Ethylbenzene	0.0E+00	5.3E-09
R_1 resident	resident_adult	Ethylene Dibromide	3.0E-11	1.3E-08
R_1 resident	resident_adult	Ethylene Glycol	0.0E+00	9.6E-11
R_1 resident	resident_adult	Naphthalene	0.0E+00	8.6E-09
R_1 resident	resident_adult	Nickel	7.1E-15	3.5E-10
R_1 resident	resident_adult	Styrene	0.0E+00	5.8E-09
R_1 resident	resident_adult	Tetrachloroethylene (Perchloroethylene)	2.7E-11	2.6E-08
R_1 resident	resident_adult	Toluene	0.0E+00	2.1E-08
R_1 resident	resident_adult	Trichloroethylene	5.3E-12	1.0E-08
R_1 resident	resident_adult	Vinyl Chloride	3.7E-11	9.9E-08
		Total	1E-08	4E-04
R_1 resident	resident_child	1,3-Butadiene	2.0E-09	3.9E-04
R_1 resident	resident_child	1-Hexane (n-hexane)	0.0E+00	3.7E-07
R_1 resident	resident_child	Acrylonitrile	3.7E-10	3.2E-05
R_1 resident	resident_child	Arsenic	4.7E-15	4.2E-10
R_1 resident	resident_child	Benzene	1.2E-11	6.0E-07
R_1 resident	resident_child	Beryllium	2.2E-16	5.3E-11
R_1 resident	resident_child	Cadmium	9.1E-16	2.9E-11
R_1 resident	resident_child	Chloroform (Trichloromethane)	1.7E-12	2.9E-06
R_1 resident	resident_child	Cobalt	0.0E+00	2.0E-10
R_1 resident	resident_child	Copper	0.0E+00	6.1E-12
R_1 resident	resident_child	Cyclohexane	0.0E+00	5.6E-08
R_1 resident	resident_child	Dichlorobenzene,1,4-	2.3E-12	3.1E-09
R_1 resident	resident_child	Ethylbenzene	0.0E+00	5.3E-09
R_1 resident	resident_child	Ethylene Dibromide	6.1E-12	1.3E-08
R_1 resident	resident_child	Ethylene Glycol	0.0E+00	9.6E-11
R_1 resident	resident_child	Naphthalene	0.0E+00	8.6E-09
R_1 resident	resident_child	Nickel	1.4E-15	3.5E-10
R_1 resident	resident_child	Styrene	0.0E+00	5.8E-09
R_1 resident	resident_child	Tetrachloroethylene (Perchloroethylene)	5.3E-12	2.6E-08
R_1 resident	resident_child	Toluene	0.0E+00	2.1E-08
R_1 resident	resident_child	Trichloroethylene	1.1E-12	1.0E-08
R_1 resident	resident_child	Vinyl Chloride	7.5E-12	9.9E-08
		Total	2E-09	4E-04
R_2 resident	resident_adult	1,3-Butadiene	2.4E-08	9.2E-04
R_2 resident	resident_adult	1-Hexane (n-hexane)	0.0E+00	8.7E-07
R_2 resident	resident_adult	Acrylonitrile	4.4E-09	7.5E-05
R_2 resident	resident_adult	Arsenic	5.5E-14	1.0E-09
R_2 resident	resident_adult	Benzene	1.4E-10	1.4E-06
R_2 resident	resident_adult	Beryllium	2.6E-15	1.3E-10
R_2 resident	resident_adult	Cadmium	1.1E-14	7.0E-11
R_2 resident	resident_adult	Chloroform (Trichloromethane)	2.1E-11	6.9E-06
R_2 resident	resident_adult	Cobalt	0.0E+00	4.8E-10
R_2 resident	resident_adult	Copper	0.0E+00	1.4E-11
R_2 resident	resident_adult	Cyclohexane	0.0E+00	1.3E-07

Fugitive Air Emissions Risk Assessment
Chronic Inhalation Risk Results by Compound
(IRAP Software Output Information)

Receptor	Scenario	Compound	Inhalation Excess Lifetime Cancer Risk	Inhalation Non-Cancer Hazard Quotient
R_2 resident	resident_adult	Dichlorobenzene,1,4-	2.7E-11	7.3E-09
R_2 resident	resident_adult	Ethylbenzene	0.0E+00	1.2E-08
R_2 resident	resident_adult	Ethylene Dibromide	7.2E-11	3.1E-08
R_2 resident	resident_adult	Ethylene Glycol	0.0E+00	2.3E-10
R_2 resident	resident_adult	Naphthalene	0.0E+00	2.0E-08
R_2 resident	resident_adult	Nickel	1.7E-14	8.2E-10
R_2 resident	resident_adult	Styrene	0.0E+00	1.4E-08
R_2 resident	resident_adult	Tetrachloroethylene (Perchloroethylene)	6.3E-11	6.2E-08
R_2 resident	resident_adult	Toluene	0.0E+00	5.0E-08
R_2 resident	resident_adult	Trichloroethylene	1.3E-11	2.4E-08
R_2 resident	resident_adult	Vinyl Chloride	8.9E-11	2.3E-07
		Total	3E-08	1E-03
R_2 resident	resident_child	1,3-Butadiene	4.7E-09	9.2E-04
R_2 resident	resident_child	1-Hexane (n-hexane)	0.0E+00	8.7E-07
R_2 resident	resident_child	Acrylonitrile	8.7E-10	7.5E-05
R_2 resident	resident_child	Arsenic	1.1E-14	1.0E-09
R_2 resident	resident_child	Benzene	2.8E-11	1.4E-06
R_2 resident	resident_child	Beryllium	5.2E-16	1.3E-10
R_2 resident	resident_child	Cadmium	2.1E-15	7.0E-11
R_2 resident	resident_child	Chloroform (Trichloromethane)	4.1E-12	6.9E-06
R_2 resident	resident_child	Cobalt	0.0E+00	4.8E-10
R_2 resident	resident_child	Copper	0.0E+00	1.4E-11
R_2 resident	resident_child	Cyclohexane	0.0E+00	1.3E-07
R_2 resident	resident_child	Dichlorobenzene,1,4-	5.5E-12	7.3E-09
R_2 resident	resident_child	Ethylbenzene	0.0E+00	1.2E-08
R_2 resident	resident_child	Ethylene Dibromide	1.4E-11	3.1E-08
R_2 resident	resident_child	Ethylene Glycol	0.0E+00	2.3E-10
R_2 resident	resident_child	Naphthalene	0.0E+00	2.0E-08
R_2 resident	resident_child	Nickel	3.4E-15	8.2E-10
R_2 resident	resident_child	Styrene	0.0E+00	1.4E-08
R_2 resident	resident_child	Tetrachloroethylene (Perchloroethylene)	1.3E-11	6.2E-08
R_2 resident	resident_child	Toluene	0.0E+00	5.0E-08
R_2 resident	resident_child	Trichloroethylene	2.5E-12	2.4E-08
R_2 resident	resident_child	Vinyl Chloride	1.8E-11	2.3E-07
		Total	6E-09	1E-03
R_3 resident farmer	farmer_adult	1,3-Butadiene	3.9E-08	1.1E-03
R_3 resident farmer	farmer_adult	1-Hexane (n-hexane)	0.0E+00	1.1E-06
R_3 resident farmer	farmer_adult	Acrylonitrile	7.2E-09	9.3E-05
R_3 resident farmer	farmer_adult	Arsenic	9.2E-14	1.2E-09
R_3 resident farmer	farmer_adult	Benzene	2.4E-10	1.8E-06
R_3 resident farmer	farmer_adult	Beryllium	4.3E-15	1.6E-10
R_3 resident farmer	farmer_adult	Cadmium	1.8E-14	8.7E-11
R_3 resident farmer	farmer_adult	Chloroform (Trichloromethane)	3.4E-11	8.6E-06
R_3 resident farmer	farmer_adult	Cobalt	0.0E+00	6.0E-10
R_3 resident farmer	farmer_adult	Copper	0.0E+00	1.8E-11
R_3 resident farmer	farmer_adult	Cyclohexane	0.0E+00	1.6E-07
R_3 resident farmer	farmer_adult	Dichlorobenzene,1,4-	4.6E-11	9.1E-09
R_3 resident farmer	farmer_adult	Ethylbenzene	0.0E+00	1.5E-08
R_3 resident farmer	farmer_adult	Ethylene Dibromide	1.2E-10	3.9E-08
R_3 resident farmer	farmer_adult	Ethylene Glycol	0.0E+00	2.8E-10
R_3 resident farmer	farmer_adult	Naphthalene	0.0E+00	2.5E-08
R_3 resident farmer	farmer_adult	Nickel	2.8E-14	1.0E-09
R_3 resident farmer	farmer_adult	Styrene	0.0E+00	1.7E-08
R_3 resident farmer	farmer_adult	Tetrachloroethylene (Perchloroethylene)	1.0E-10	7.8E-08
R_3 resident farmer	farmer_adult	Toluene	0.0E+00	6.2E-08
R_3 resident farmer	farmer_adult	Trichloroethylene	2.1E-11	3.0E-08

Fugitive Air Emissions Risk Assessment
Chronic Inhalation Risk Results by Compound
(IRAP Software Output Information)

Receptor	Scenario	Compound	Inhalation Excess Lifetime Cancer Risk	Inhalation Non-Cancer Hazard Quotient
R_3 resident farmer	farmer_adult	Vinyl Chloride	1.5E-10	2.9E-07
		Total	5E-08	1E-03
R_3 resident farmer	farmer_child	1,3-Butadiene	5.9E-09	1.1E-03
R_3 resident farmer	farmer_child	1-Hexane (n-hexane)	0.0E+00	1.1E-06
R_3 resident farmer	farmer_child	Acrylonitrile	1.1E-09	9.3E-05
R_3 resident farmer	farmer_child	Arsenic	1.4E-14	1.2E-09
R_3 resident farmer	farmer_child	Benzene	3.5E-11	1.8E-06
R_3 resident farmer	farmer_child	Beryllium	6.4E-16	1.6E-10
R_3 resident farmer	farmer_child	Cadmium	2.7E-15	8.7E-11
R_3 resident farmer	farmer_child	Chloroform (Trichloromethane)	5.1E-12	8.6E-06
R_3 resident farmer	farmer_child	Cobalt	0.0E+00	6.0E-10
R_3 resident farmer	farmer_child	Copper	0.0E+00	1.8E-11
R_3 resident farmer	farmer_child	Cyclohexane	0.0E+00	1.6E-07
R_3 resident farmer	farmer_child	Dichlorobenzene,1,4-	6.8E-12	9.1E-09
R_3 resident farmer	farmer_child	Ethylbenzene	0.0E+00	1.5E-08
R_3 resident farmer	farmer_child	Ethylene Dibromide	1.8E-11	3.9E-08
R_3 resident farmer	farmer_child	Ethylene Glycol	0.0E+00	2.8E-10
R_3 resident farmer	farmer_child	Naphthalene	0.0E+00	2.5E-08
R_3 resident farmer	farmer_child	Nickel	4.2E-15	1.0E-09
R_3 resident farmer	farmer_child	Styrene	0.0E+00	1.7E-08
R_3 resident farmer	farmer_child	Tetrachloroethylene (Perchloroethylene)	1.6E-11	7.8E-08
R_3 resident farmer	farmer_child	Toluene	0.0E+00	6.2E-08
R_3 resident farmer	farmer_child	Trichloroethylene	3.1E-12	3.0E-08
R_3 resident farmer	farmer_child	Vinyl Chloride	2.2E-11	2.9E-07
		Total	7E-09	1E-03
R_4 resident farmer	farmer_adult	1,3-Butadiene	3.2E-08	9.4E-04
R_4 resident farmer	farmer_adult	1-Hexane (n-hexane)	0.0E+00	8.8E-07
R_4 resident farmer	farmer_adult	Acrylonitrile	5.9E-09	7.6E-05
R_4 resident farmer	farmer_adult	Arsenic	7.5E-14	1.0E-09
R_4 resident farmer	farmer_adult	Benzene	1.9E-10	1.4E-06
R_4 resident farmer	farmer_adult	Beryllium	3.5E-15	1.3E-10
R_4 resident farmer	farmer_adult	Cadmium	1.5E-14	7.1E-11
R_4 resident farmer	farmer_adult	Chloroform (Trichloromethane)	2.8E-11	7.0E-06
R_4 resident farmer	farmer_adult	Cobalt	0.0E+00	4.9E-10
R_4 resident farmer	farmer_adult	Copper	0.0E+00	1.5E-11
R_4 resident farmer	farmer_adult	Cyclohexane	0.0E+00	1.3E-07
R_4 resident farmer	farmer_adult	Dichlorobenzene,1,4-	3.7E-11	7.4E-09
R_4 resident farmer	farmer_adult	Ethylbenzene	0.0E+00	1.3E-08
R_4 resident farmer	farmer_adult	Ethylene Dibromide	9.7E-11	3.1E-08
R_4 resident farmer	farmer_adult	Ethylene Glycol	0.0E+00	2.3E-10
R_4 resident farmer	farmer_adult	Naphthalene	0.0E+00	2.1E-08
R_4 resident farmer	farmer_adult	Nickel	2.3E-14	8.3E-10
R_4 resident farmer	farmer_adult	Styrene	0.0E+00	1.4E-08
R_4 resident farmer	farmer_adult	Tetrachloroethylene (Perchloroethylene)	8.5E-11	6.3E-08
R_4 resident farmer	farmer_adult	Toluene	0.0E+00	5.1E-08
R_4 resident farmer	farmer_adult	Trichloroethylene	1.7E-11	2.5E-08
R_4 resident farmer	farmer_adult	Vinyl Chloride	1.2E-10	2.4E-07
		Total	4E-08	1E-03
R_4 resident farmer	farmer_child	1,3-Butadiene	4.8E-09	9.4E-04
R_4 resident farmer	farmer_child	1-Hexane (n-hexane)	0.0E+00	8.8E-07
R_4 resident farmer	farmer_child	Acrylonitrile	8.8E-10	7.6E-05
R_4 resident farmer	farmer_child	Arsenic	1.1E-14	1.0E-09
R_4 resident farmer	farmer_child	Benzene	2.9E-11	1.4E-06
R_4 resident farmer	farmer_child	Beryllium	5.2E-16	1.3E-10
R_4 resident farmer	farmer_child	Cadmium	2.2E-15	7.1E-11
R_4 resident farmer	farmer_child	Chloroform (Trichloromethane)	4.2E-12	7.0E-06

Fugitive Air Emissions Risk Assessment
Chronic Inhalation Risk Results by Compound
(IRAP Software Output Information)

Receptor	Scenario	Compound	Inhalation Excess Lifetime Cancer Risk	Inhalation Non-Cancer Hazard Quotient
R_4 resident farmer	farmer_child	Cobalt	0.0E+00	4.9E-10
R_4 resident farmer	farmer_child	Copper	0.0E+00	1.5E-11
R_4 resident farmer	farmer_child	Cyclohexane	0.0E+00	1.3E-07
R_4 resident farmer	farmer_child	Dichlorobenzene,1,4-	5.6E-12	7.4E-09
R_4 resident farmer	farmer_child	Ethylbenzene	0.0E+00	1.3E-08
R_4 resident farmer	farmer_child	Ethylene Dibromide	1.5E-11	3.1E-08
R_4 resident farmer	farmer_child	Ethylene Glycol	0.0E+00	2.3E-10
R_4 resident farmer	farmer_child	Naphthalene	0.0E+00	2.1E-08
R_4 resident farmer	farmer_child	Nickel	3.4E-15	8.3E-10
R_4 resident farmer	farmer_child	Styrene	0.0E+00	1.4E-08
R_4 resident farmer	farmer_child	Tetrachloroethylene (Perchloroethylene)	1.3E-11	6.3E-08
R_4 resident farmer	farmer_child	Toluene	0.0E+00	5.1E-08
R_4 resident farmer	farmer_child	Trichloroethylene	2.5E-12	2.5E-08
R_4 resident farmer	farmer_child	Vinyl Chloride	1.8E-11	2.4E-07
		Total	6E-09	1E-03
R_5 resident	resident_adult	1,3-Butadiene	2.1E-08	8.0E-04
R_5 resident	resident_adult	1-Hexane (n-hexane)	0.0E+00	7.5E-07
R_5 resident	resident_adult	Acrylonitrile	3.8E-09	6.5E-05
R_5 resident	resident_adult	Arsenic	4.8E-14	8.7E-10
R_5 resident	resident_adult	Benzene	1.2E-10	1.2E-06
R_5 resident	resident_adult	Beryllium	2.2E-15	1.1E-10
R_5 resident	resident_adult	Cadmium	9.3E-15	6.0E-11
R_5 resident	resident_adult	Chloroform (Trichloromethane)	1.8E-11	6.0E-06
R_5 resident	resident_adult	Cobalt	0.0E+00	4.2E-10
R_5 resident	resident_adult	Copper	0.0E+00	1.2E-11
R_5 resident	resident_adult	Cyclohexane	0.0E+00	1.1E-07
R_5 resident	resident_adult	Dichlorobenzene,1,4-	2.4E-11	6.3E-09
R_5 resident	resident_adult	Ethylbenzene	0.0E+00	1.1E-08
R_5 resident	resident_adult	Ethylene Dibromide	6.2E-11	2.7E-08
R_5 resident	resident_adult	Ethylene Glycol	0.0E+00	2.0E-10
R_5 resident	resident_adult	Naphthalene	0.0E+00	1.8E-08
R_5 resident	resident_adult	Nickel	1.5E-14	7.1E-10
R_5 resident	resident_adult	Styrene	0.0E+00	1.2E-08
R_5 resident	resident_adult	Tetrachloroethylene (Perchloroethylene)	5.5E-11	5.4E-08
R_5 resident	resident_adult	Toluene	0.0E+00	4.3E-08
R_5 resident	resident_adult	Trichloroethylene	1.1E-11	2.1E-08
R_5 resident	resident_adult	Vinyl Chloride	7.7E-11	2.0E-07
		Total	2E-08	9E-04
R_5 resident	resident_child	1,3-Butadiene	4.1E-09	8.0E-04
R_5 resident	resident_child	1-Hexane (n-hexane)	0.0E+00	7.5E-07
R_5 resident	resident_child	Acrylonitrile	7.5E-10	6.5E-05
R_5 resident	resident_child	Arsenic	9.6E-15	8.7E-10
R_5 resident	resident_child	Benzene	2.5E-11	1.2E-06
R_5 resident	resident_child	Beryllium	4.5E-16	1.1E-10
R_5 resident	resident_child	Cadmium	1.9E-15	6.0E-11
R_5 resident	resident_child	Chloroform (Trichloromethane)	3.6E-12	6.0E-06
R_5 resident	resident_child	Cobalt	0.0E+00	4.2E-10
R_5 resident	resident_child	Copper	0.0E+00	1.2E-11
R_5 resident	resident_child	Cyclohexane	0.0E+00	1.1E-07
R_5 resident	resident_child	Dichlorobenzene,1,4-	4.8E-12	6.3E-09
R_5 resident	resident_child	Ethylbenzene	0.0E+00	1.1E-08
R_5 resident	resident_child	Ethylene Dibromide	1.2E-11	2.7E-08
R_5 resident	resident_child	Ethylene Glycol	0.0E+00	2.0E-10
R_5 resident	resident_child	Naphthalene	0.0E+00	1.8E-08
R_5 resident	resident_child	Nickel	2.9E-15	7.1E-10
R_5 resident	resident_child	Styrene	0.0E+00	1.2E-08

Fugitive Air Emissions Risk Assessment
Chronic Inhalation Risk Results by Compound
(IRAP Software Output Information)

Receptor	Scenario	Compound	Inhalation Excess Lifetime Cancer Risk	Inhalation Non-Cancer Hazard Quotient
R_5 resident	resident_child	Tetrachloroethylene (Perchloroethylene)	1.1E-11	5.4E-08
R_5 resident	resident_child	Toluene	0.0E+00	4.3E-08
R_5 resident	resident_child	Trichloroethylene	2.2E-12	2.1E-08
R_5 resident	resident_child	Vinyl Chloride	1.5E-11	2.0E-07
		Total	5E-09	9E-04
R_6 resident	resident_adult	1,3-Butadiene	2.6E-08	1.0E-03
R_6 resident	resident_adult	1-Hexane (n-hexane)	0.0E+00	9.4E-07
R_6 resident	resident_adult	Acrylonitrile	4.7E-09	8.1E-05
R_6 resident	resident_adult	Arsenic	6.0E-14	1.1E-09
R_6 resident	resident_adult	Benzene	1.5E-10	1.5E-06
R_6 resident	resident_adult	Beryllium	2.8E-15	1.4E-10
R_6 resident	resident_adult	Cadmium	1.2E-14	7.5E-11
R_6 resident	resident_adult	Chloroform (Trichloromethane)	2.2E-11	7.5E-06
R_6 resident	resident_adult	Cobalt	0.0E+00	5.2E-10
R_6 resident	resident_adult	Copper	0.0E+00	1.5E-11
R_6 resident	resident_adult	Cyclohexane	0.0E+00	1.4E-07
R_6 resident	resident_adult	Dichlorobenzene,1,4-	3.0E-11	7.9E-09
R_6 resident	resident_adult	Ethylbenzene	0.0E+00	1.3E-08
R_6 resident	resident_adult	Ethylene Dibromide	7.7E-11	3.3E-08
R_6 resident	resident_adult	Ethylene Glycol	0.0E+00	2.4E-10
R_6 resident	resident_adult	Naphthalene	0.0E+00	2.2E-08
R_6 resident	resident_adult	Nickel	1.8E-14	8.8E-10
R_6 resident	resident_adult	Styrene	0.0E+00	1.5E-08
R_6 resident	resident_adult	Tetrachloroethylene (Perchloroethylene)	6.8E-11	6.7E-08
R_6 resident	resident_adult	Toluene	0.0E+00	5.4E-08
R_6 resident	resident_adult	Trichloroethylene	1.4E-11	2.6E-08
R_6 resident	resident_adult	Vinyl Chloride	9.6E-11	2.5E-07
		Total	3E-08	1E-03
R_6 resident	resident_child	1,3-Butadiene	5.1E-09	1.0E-03
R_6 resident	resident_child	1-Hexane (n-hexane)	0.0E+00	9.4E-07
R_6 resident	resident_child	Acrylonitrile	9.4E-10	8.1E-05
R_6 resident	resident_child	Arsenic	1.2E-14	1.1E-09
R_6 resident	resident_child	Benzene	3.1E-11	1.5E-06
R_6 resident	resident_child	Beryllium	5.6E-16	1.4E-10
R_6 resident	resident_child	Cadmium	2.3E-15	7.5E-11
R_6 resident	resident_child	Chloroform (Trichloromethane)	4.4E-12	7.5E-06
R_6 resident	resident_child	Cobalt	0.0E+00	5.2E-10
R_6 resident	resident_child	Copper	0.0E+00	1.5E-11
R_6 resident	resident_child	Cyclohexane	0.0E+00	1.4E-07
R_6 resident	resident_child	Dichlorobenzene,1,4-	5.9E-12	7.9E-09
R_6 resident	resident_child	Ethylbenzene	0.0E+00	1.3E-08
R_6 resident	resident_child	Ethylene Dibromide	1.5E-11	3.3E-08
R_6 resident	resident_child	Ethylene Glycol	0.0E+00	2.4E-10
R_6 resident	resident_child	Naphthalene	0.0E+00	2.2E-08
R_6 resident	resident_child	Nickel	3.6E-15	8.8E-10
R_6 resident	resident_child	Styrene	0.0E+00	1.5E-08
R_6 resident	resident_child	Tetrachloroethylene (Perchloroethylene)	1.4E-11	6.7E-08
R_6 resident	resident_child	Toluene	0.0E+00	5.4E-08
R_6 resident	resident_child	Trichloroethylene	2.7E-12	2.6E-08
R_6 resident	resident_child	Vinyl Chloride	1.9E-11	2.5E-07
		Total	6E-09	1E-03

APPENDIX I

STACK EMISSIONS:
COMPARISON TO USEPA REGION 9
PRELIMINARY REMEDIATION GOALS

Comparison of Modeled Air and Soil Concentrations at Residential Assessment Receptor Location R_2 with USEPA Region 9 Preliminary Remediation Goals

Stack Emissions

Calculated Air and Soil Concentrations at Receptor R_2				USEPA Region 9 Preliminary Remediation Goals (PRGs) (c)						Comparison of Concentrations to PRGs	
Compound (as listed in IRAP software)	CAS Number	Maximum (Annual) Soil Concentration (mg/kg)	Annual Average Air Concentration (ug/m^3)	Compound (as listed in PRG Table)	CAS Number	Residential Soil PRG (mg/kg)		Ambient Air PRG (ug/m^3)		Soil Concentration Ratio: modeled concentration/PRG	Air Concentration Ratio: modeled concentration/PRG
						Soil Concentration	Basis	Air Concentration	Basis		
11-Dichloropropene	563-58-6	1.13E-16	5.56E-08	NA						NC	NC
1,2,4-Trimethylbenzene	95-63-6	4.27E-09	1.62E-07	1,2,4-Trimethylbenzene	95-63-6	5.2E+01	nc	6.2E+00	nc	8.E-11	3.E-08
1,3-Dichloropropane	142-28-9	1.04E-09	9.75E-08	1,3-Dichloropropane	142-28-9	1.0E+02	nc	7.3E+01	nc	1.E-11	1.E-09
1-Hexane (n-hexane)	110-54-3	7.03E-15	2.06E-10	n-Hexane	110-54-3	1.1E+02	sat	2.1E+02	nc	6.E-17	1.E-12
2,2-oxybis (1-Chloropropane)	108-60-1	1.60E-08	2.51E-07	Bis(2-chloro-1-methylethyl)ether	108-60-1	2.9E+00	ca	1.9E-01	ca	6.E-09	1.E-06
2,2-Dichloropropane	594-20-7	1.28E-10	7.22E-08	NA						NC	NC
2,5-Dimethylfuran	625-86-5	2.18E-10	2.18E-07	NA						NC	NC
2,5-Dimethylheptane	2216-30-0	1.74E-16	4.34E-06	NA						NC	NC
2,5-Dione, 3-hexene	17559-81-8	2.21E-09	2.46E-07	NA						NC	NC
2-Chlorotoluene	95-49-8	6.28E-09	1.32E-07	o-Chlorotoluene	95-49-8	1.6E+02	nc	7.3E+01	nc	4.E-11	2.E-09
2-Hexanone	591-78-6	1.09E-08	4.86E-07	NA						NC	NC
2-Methyl octane	3221-61-2	2.51E-17	1.03E-06	NA						NC	NC
2-Methylnaphthalene	91-57-6	1.60E-07	1.50E-08	NA						NC	NC
3-Ethyl benzaldehyde	34246-54-3	1.28E-12	6.16E-07	NA						NC	NC
3-Hexen-2-one	763-93-9	5.06E-11	2.95E-05	NA						NC	NC
3-Penten-2-one (ethylidene acetone)	625-33-2	2.57E-12	1.25E-06	NA						NC	NC
3-Penten-2-one, 4-methyl	141-79-7	7.45E-11	2.41E-05	NA						NC	NC
4,6-Dinitro-2-methylphenol	534-52-1	6.69E-06	1.13E-06	4,6-Dinitro-o-cresol	534-52-1	6.1E+00	nc	3.7E-01	nc	1.E-06	3.E-06
4-Chlorotoluene	106-43-4	1.81E-09	1.14E-07	NA						NC	NC
4-Ethyl benzaldehyde	4748-78-1	6.96E-13	3.36E-07	NA						NC	NC
9-Octadecenamide (oleamide)	301-02-0	9.72E-11	6.52E-07	NA						NC	NC
Acenaphthene	83-32-9	2.08E-10	1.16E-09	Acenaphthene	83-32-9	3.7E+03	nc	2.2E+02	nc	6.E-14	5.E-12
Acenaphthylene	208-96-8	2.72E-08	2.10E-09	NA						NC	NC
Acetone	67-64-1	1.06E-07	1.59E-05	Acetone	67-64-1	1.4E+04	nc	3.3E+03	nc	8.E-12	5.E-09
Acetophenone	98-86-2	3.04E-07	8.82E-07	NA						NC	NC
Acrylic Acid	79-10-7	4.77E-14	4.66E-12	Acrylic acid	79-10-7	2.9E+04	nc	1.0E+00	nc	2.E-18	4.E-12
Acrylonitrile	107-13-1	3.65E-09	2.84E-06	Acrylonitrile	107-13-1	2.1E-01	ca*	2.8E-02	ca*	2.E-08	1.E-04
Aldrin	309-00-2	6.51E-09	6.34E-09	Aldrin	309-00-2	2.9E-02	ca*	3.9E-04	ca	2.E-07	2.E-05
Aluminum	7429-90-5	2.71E-03	2.53E-05	Aluminum	7429-90-5	7.6E+04	nc	5.1E+00	nc	4.E-08	5.E-06
Aniline	62-53-3	4.47E-06	1.86E-06	NA						NC	NC
Anthracene	120-12-7	2.67E-09	3.31E-09	Anthracene	120-12-7	2.2E+04	nc	1.1E+03	nc	1.E-13	3.E-12
Antimony	7440-36-0	1.96E-08	1.01E-06	Antimony and compounds	7440-36-0	3.1E+01	nc			6.E-10	NC
Aroclor 1254	11097-69-1	5.30E-08	6.06E-09	PCBs (unspeciated mixture, high risk, e.g. Aroclor 1254)	11097-69-1	2.2E-01	ca**	3.4E-03	ca*	2.E-07	2.E-06
Arsenic	7440-38-2	1.14E-07	2.77E-05	Arsenic	7440-38-2	3.9E-01	ca*	4.5E-04	ca	3.E-07	6.E-02
Barium	7440-39-3	2.51E-04	1.98E-06	Barium and compounds	7440-39-3	5.4E+03	nc	5.2E-01	nc	5.E-08	4.E-06
Benzaldehyde	100-52-7	1.27E-06	1.27E-06	Benzaldehyde	100-52-7	6.1E+03	nc	3.7E+02	nc	2.E-10	3.E-09
Benzene	71-43-2	1.35E-10	6.70E-07	Benzene	71-43-2	6.4E-01	ca*	2.5E-01	ca	2.E-10	3.E-06
Benzidine (d)	92-87-5	2.18E-05	1.30E-05	Benzidine	92-87-5	2.1E-03	ca	2.9E-05	ca	1.E-02	4.E-01
Benzo(a)Anthracene	56-55-3	6.91E-10	7.67E-10	Benz[a]anthracene	56-55-3	6.2E-01	ca	9.2E-03	ca	1.E-09	8.E-08
Benzo(a)pyrene	50-32-8	6.04E-10	9.82E-10	Benzo[a]pyrene	50-32-8	6.2E-02	ca	9.2E-04	ca	1.E-08	1.E-06
Benzo(b)fluoranthene	205-99-2	8.13E-09	7.63E-09	Benzo[b]fluoranthene	205-99-2	6.2E-01	ca	9.2E-03	ca	1.E-08	8.E-07
Benzo(e)pyrene	192-97-2	5.67E-13	1.47E-09	NA						NC	NC
Benzo(g,h,i)perylene	191-24-2	2.37E-08	3.15E-09	NA						NC	NC
Benzo(k)fluoranthene	207-08-9	3.52E-09	1.49E-09	Benzo[k]fluoranthene	207-08-9	6.2E+00	ca	9.2E-02	ca	6.E-10	2.E-08
Benzoic Acid	65-85-0	2.23E-06	7.27E-06	Benzoic acid	65-85-0	1.0E+05	max	1.5E+04	nc	2.E-11	5.E-10
Benzoic acid, methyl ester (methyl benzoate)	93-58-3	9.80E-08	2.09E-07	NA						NC	NC
Benzonitrile	100-47-0	4.96E-07	4.84E-07	NA						NC	NC
Benzyl alcohol	100-51-6	3.64E-06	5.41E-06	Benzyl alcohol	100-51-6	1.8E+04	nc	1.1E+03	nc	2.E-10	5.E-09
Beryllium	7440-41-7	1.59E-04	2.77E-05	Beryllium and compounds	7440-41-7	1.5E+02	nc	8.0E-04	ca*	1.E-06	3.E-02
BHC, alpha-	319-84-6	1.27E-09	5.53E-09	HCH (alpha)	319-84-6	9.0E-02	ca	1.1E-03	ca	1.E-08	5.E-06
BHC, beta-	319-85-7	3.02E-09	1.43E-08	HCH (beta)	319-85-7	3.2E-01	ca	3.7E-03	ca	1.E-08	4.E-06
Bis(2-chlorethyl)ether	111-44-4	4.42E-08	2.11E-07	Bis(2-chloroethyl)ether	111-44-4	2.2E-01	ca	6.1E-03	ca	2.E-07	3.E-05

Comparison of Modeled Air and Soil Concentrations at Residential Assessment Receptor Location R_2 with USEPA Region 9 Preliminary Remediation Goals

Stack Emissions

Calculated Air and Soil Concentrations at Receptor R_2				USEPA Region 9 Preliminary Remediation Goals (PRGs) (c)						Comparison of Concentrations to PRGs	
Compound (as listed in IRAP software)	CAS Number	Maximum (Annual) Soil Concentration (mg/kg)	Annual Average Air Concentration (ug/m^3)	Compound (as listed in PRG Table)	CAS Number	Residential Soil PRG (mg/kg)		Ambient Air PRG (ug/m^3)		Soil Concentration Ratio: modeled concentration/PRG	Air Concentration Ratio: modeled concentration/PRG
						Soil Concentration	Basis	Air Concentration	Basis		
Bis(2-chloroethoxy) methane	111-91-1	4.15E-07	2.16E-07	NA						NC	NC
Bromobenzene	108-86-1	1.23E-09	1.29E-07	Bromobenzene	108-86-1	2.8E+01	nc	1.0E+01	nc	4.E-11	1.E-08
Bromochloromethane	74-97-5	3.27E-14	3.93E-07	Chloroethane	75-00-3	3.0E+00	ca	2.3E+00	ca	1.E-14	2.E-07
Bromodichloromethane	75-27-4	7.42E-08	1.41E-06	Bromodichloromethane	75-27-4	8.2E-01	ca	1.1E-01	ca	9.E-08	1.E-05
Bromoform (tribromomethane)	75-25-2	3.88E-11	3.57E-06	Bromoform (tribromomethane)	75-25-2	6.2E+01	ca*	1.7E+00	ca*	6.E-13	2.E-06
Bromophenyl-phenylether, 4-	101-55-3	2.31E-06	1.74E-07	NA						NC	NC
Butylbenzene, n-	104-51-8	1.45E-15	1.58E-07	n-Butylbenzene	104-51-8	2.4E+02	sat	1.5E+02	nc	6.E-18	1.E-09
Butylbenzene, sec	135-98-8	1.05E-15	1.26E-07	sec-Butylbenzene	135-9-88	2.2E+02	sat	1.5E+02	nc	5.E-18	9.E-10
Butylbenzene, tert	98-06-6	3.61E-09	1.50E-07	tert-Butylbenzene	98-06-6	3.9E+02	sat	1.5E+02	nc	9.E-12	1.E-09
Butylbenzylphthalate	85-68-7	3.36E-09	2.81E-07	Butyl benzyl phthalate	85-68-7	1.2E+04	nc	7.3E+02	nc	3.E-13	4.E-10
Cadmium	7440-43-9	1.81E-05	6.87E-05	Cadmium and compounds	7440-43-9	3.7E+01	nc	1.1E-03	ca	5.E-07	6.E-02
Carbazole	86-74-8	3.37E-06	2.54E-07	Carbazole	86-74-8	2.4E+01	ca	3.4E-01	ca	1.E-07	8.E-07
Carbon Disulfide	75-15-0	7.81E-12	3.21E-07	Carbon disulfide	75-15-0	3.6E+02	nc	7.3E+02	nc	2.E-14	4.E-10
Carbon Tetrachloride	56-23-5	2.19E-11	1.75E-07	Carbon tetrachloride	56-23-5	2.5E-01	ca**	1.3E-01	ca*	9.E-11	1.E-06
Chlordane	57-74-9	3.77E-08	1.54E-08	Chlordane (technical) (a)	12789-03-6	1.6E+00	ca*	1.9E-02	ca*	2.E-08	8.E-07
Chlorine	7782-50-5	3.31E-03	9.31E-03	Chlorine	7782-50-5			2.1E-01	nc	NC	4.E-02
Chloro-3-methylphenol, 4-	59-50-7	6.04E-06	5.61E-07	NA						NC	NC
Chloroaniline, p-	106-47-8	2.18E-06	1.08E-06	4-Chloroaniline	106-47-8	2.4E+02	nc	1.5E+01	nc	9.E-09	7.E-08
Chlorobenzene	108-90-7	9.02E-08	6.67E-05	Chlorobenzene	108-90-7	1.5E+02	nc	6.2E+01	nc	6.E-10	1.E-06
Chlorobenzilate	510-15-6	1.75E-09	3.06E-08	Chlorobenzilate	510-15-6	1.8E+00	ca	2.5E-02	ca	1.E-09	1.E-06
Chloroethane	75-00-3	3.82E-12	3.41E-07	NA						NC	NC
Chloroform (Trichloromethane)	67-66-3	3.69E-10	2.13E-06	Chloroform	67-66-3	2.2E-01	ca	8.3E-02	ca	2.E-09	3.E-05
Chloronaphthalene,2-	91-58-7	1.79E-06	1.69E-07	beta-Chloronaphthalene	91-58-7	4.9E+03	nc	2.9E+02	nc	4.E-10	6.E-10
Chlorophenol, 2-	95-57-8	9.79E-07	2.22E-07	2-Chlorophenol	95-57-8	6.3E+01	nc	1.8E+01	nc	2.E-08	1.E-08
Chlorophenyl-phenylether, 4-	7005-72-3	1.42E-07	2.87E-07	NA						NC	NC
Chromium	7440-47-3	1.51E-04	1.28E-06	Chromium III	16065-83-1	1.0E+05	max			2.E-09	NC
Chromium, hexavalent	7440-47-3	1.51E-04	1.28E-06	Chromium VI	18540-29-9	3.0E+01	ca**	2.3E-05	ca	5.E-06	6.E-02
Chrysene	218-01-9	4.51E-09	2.91E-09	Chrysene	218-01-9	6.2E+01	ca	9.2E-01	ca	7.E-11	3.E-09
Cobalt	7440-48-4	1.65E-05	1.28E-07	Cobalt	7440-48-4	9.0E+02	ca**	6.9E-04	ca*	2.E-08	2.E-04
Copper	7440-50-8	4.96E-05	2.62E-05	Copper and compounds	7440-50-8	3.1E+03	nc			2.E-08	NC
Cresol, m-	108-39-4	1.18E-08	2.37E-07	3-Methylphenol	108-39-4	3.1E+03	nc	1.8E+02	nc	4.E-12	1.E-09
Cresol, o-	95-48-7	6.61E-09	5.41E-07	2-Methylphenol	95-48-7	3.1E+03	nc	1.8E+02	nc	2.E-12	3.E-09
Cresol, p-	106-44-5	2.77E-10	2.37E-07	4-Methylphenol	106-44-5	3.1E+02	nc	1.8E+01	nc	9.E-13	1.E-08
Cumene (Isopropylbenzene)	98-82-8	4.15E-10	9.41E-08	Cumene (isopropylbenzene)	98-82-8	5.7E+02	nc	4.0E+02	nc	7.E-13	2.E-10
DDD, 4,4'-	72-54-8	2.53E-07	3.41E-08	DDD	72-54-8	2.4E+00	ca	2.8E-02	ca	1.E-07	1.E-06
DDE, 4,4'-	72-55-9	8.91E-08	1.16E-08	DDE	72-55-9	1.7E+00	ca	2.0E-02	ca	5.E-08	6.E-07
DDT, 4-4'-	50-29-3	5.90E-08	8.85E-09	DDT	50-29-3	1.7E+00	ca*	2.0E-02	ca*	3.E-08	4.E-07
delta-BHC	319-86-8	1.61E-07	1.29E-08	NA						NC	NC
Diallate	2303-16-4	1.67E-10	1.62E-06	Diallate	2303-16-4	8.0E+00	ca	1.1E-01	ca	2.E-11	1.E-05
Dibenz(a,h)anthracene	53-70-3	1.64E-09	1.04E-10	Dibenz[ah]anthracene	53-70-3	6.2E-02	ca	9.2E-04	ca	3.E-08	1.E-07
Dibenzofuran	132-64-9	3.64E-06	2.74E-07	Dibenzofuran	132-64-9	1.5E+02	nc	7.3E+00	nc	3.E-08	4.E-08
Dibromo-3-chloropropane, 1,2-	96-12-8	1.23E-07	6.72E-07	1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	4.6E-01	ca**	2.1E-01	nc	3.E-07	3.E-06
Dibromochloromethane	124-48-1	5.63E-07	2.79E-06	Dibromochloromethane	124-48-1	1.1E+00	ca	8.0E-02	ca	5.E-07	3.E-05
Dichlorobenzene, 1,2-	95-50-1	4.88E-09	2.18E-07	1,2-Dichlorobenzene	95-50-1	6.0E+02	sat	2.1E+02	nc	8.E-12	1.E-09
Dichlorobenzene, 1,3-	541-73-1	6.85E-09	2.29E-07	1,3-Dichlorobenzene	541-73-1	5.3E+02	nc	1.1E+02	nc	1.E-11	2.E-09
Dichlorobenzene,1,4-	106-46-7	1.53E-09	2.59E-07	1,4-Dichlorobenzene	106-46-7	3.4E+00	ca	3.1E-01	ca	4.E-10	8.E-07
Dichlorobenzidine, 3,3'-	91-94-1	3.12E-07	1.34E-06	3,3-Dichlorobenzidine	91-94-1	1.1E+00	ca	1.5E-02	ca	3.E-07	9.E-05
Dichlorodifluoromethane	75-71-8	1.49E-09	9.91E-07	Dichlorodifluoromethane	75-71-8	9.4E+01	nc	2.1E+02	nc	2.E-11	5.E-09
Dichloroethane 1,1-	75-34-3	9.62E-12	7.99E-08	1,1-Dichloroethane	75-34-3	5.1E+02	nc	5.2E+02	nc	2.E-14	2.E-10
Dichloroethane, 1,2- (Ethylene Dichloride	107-06-2	3.74E-11	1.31E-07	1,2-Dichloroethane (EDC)	107-06-2	2.8E-01	ca*	7.4E-02	ca*	1.E-10	2.E-06
Dichloroethylene 1,1-	75-35-4	3.90E-12	9.10E-08	1,1-Dichloroethylene	75-35-4	1.2E+02	nc	2.1E+02	nc	3.E-14	4.E-10
Dichloroethylene, cis-1,2-	156-59-2	1.52E-09	1.08E-07	1,2-Dichloroethylene (cis)	156-59-2	4.3E+01	nc	3.7E+01	nc	4.E-11	3.E-09
Dichloroethylene-1,2 (trans)	156-60-5	9.44E-12	7.47E-08	1,2-Dichloroethylene (trans)	156-60-5	6.9E+01	nc	7.3E+01	nc	1.E-13	1.E-09
Dichlorophenol, 2,4-	120-83-2	3.73E-08	3.36E-07	2,4-Dichlorophenol	120-83-2	1.8E+02	nc	1.1E+01	nc	2.E-10	3.E-08
Dichloropropane, 1,2-	78-87-5	3.53E-11	1.03E-07	1,2-Dichloropropane	78-87-5	3.4E-01	ca*	9.9E-02	ca*	1.E-10	1.E-06

Comparison of Modeled Air and Soil Concentrations at Residential Assessment Receptor Location R_2 with USEPA Region 9 Preliminary Remediation Goals

Stack Emissions

Calculated Air and Soil Concentrations at Receptor R_2				USEPA Region 9 Preliminary Remediation Goals (PRGs) (c)						Comparison of Concentrations to PRGs	
Compound (as listed in IRAP software)	CAS Number	Maximum (Annual) Soil Concentration (mg/kg)	Annual Average Air Concentration (ug/m^3)	Compound (as listed in PRG Table)	CAS Number	Residential Soil PRG (mg/kg)		Ambient Air PRG (ug/m^3)		Soil Concentration Ratio: modeled concentration/PRG	Air Concentration Ratio: modeled concentration/PRG
						Soil Concentration	Basis	Air Concentration	Basis		
Dichloropropene, 1,3- (cis)	542-75-6	1.32E-11	1.96E-07	1,3-Dichloropropene	542-75-6	7.8E-01	ca	4.8E-01	ca	2.E-11	4.E-07
Dieldrin	60-57-1	5.74E-09	3.03E-09	Dieldrin	60-57-1	3.0E-02	ca	4.2E-04	ca	2.E-07	7.E-06
Diethyl phthalate	84-66-2	2.57E-08	2.61E-07	Diethyl phthalate	84-66-2	4.9E+04	nc	2.9E+03	nc	5.E-13	9.E-11
Dimethyl phthalate	131-11-3	2.11E-09	1.74E-07	Dimethyl phthalate	131-11-3	1.0E+05	max	3.7E+04	nc	2.E-14	5.E-12
Dimethylphenol, 2,4-	105-67-9	9.83E-09	7.99E-07	2,4-Dimethylphenol	105-67-9	1.2E+03	nc	7.3E+01	nc	8.E-12	1.E-08
Di-n-butyl phthalate	84-74-2	3.87E-08	9.60E-07	Dibutyl phthalate	84-74-2	6.1E+03	nc	3.7E+02	nc	6.E-12	3.E-09
Dinitrobenzene, 1,3-	99-65-0	8.58E-08	2.79E-07	1,3-Dinitrobenzene	99-65-0	6.1E+00	nc	3.7E-01	nc	1.E-08	8.E-07
Dinitrophenol, 2,4-	51-28-5	1.58E-08	2.37E-06	2,4-Dinitrophenol	51-28-5	1.2E+02	nc	7.3E+00	nc	1.E-10	3.E-07
Dinitrotoluene, 2,4-	121-14-2	9.57E-08	3.41E-07	2,4-Dinitrotoluene	121-14-2	1.2E+02	nc	7.3E+00	nc	8.E-10	5.E-08
Dinitrotoluene, 2,6-	606-20-2	7.26E-08	2.74E-07	2,6-Dinitrotoluene	606-20-2	6.1E+01	nc	3.7E+00	nc	1.E-09	8.E-08
Di-n-octylphthalate	117-84-0	1.70E-08	3.72E-07	di-n-Octyl phthalate	117-84-0	2.4E+03	nc	1.5E+02	nc	7.E-12	3.E-09
Dioxane, 1,4-	123-91-1	1.68E-13	2.30E-11	1,4-Dioxane	123-91-1	4.4E+01	ca	6.1E-01	ca	4.E-15	4.E-11
Diphenylamine	122-39-4	3.59E-06	2.72E-07	Diphenylamine	122-39-4	1.5E+03	nc	9.1E+01	nc	2.E-09	3.E-09
Diphenylhydrazine,1,2-	122-66-7	5.70E-08	1.81E-07	1,2-Diphenylhydrazine	122-66-7	6.1E-01	ca	8.4E-03	ca	9.E-08	2.E-05
Endosulfan I	115-29-7	5.39E-11	3.39E-09	Endosulfan	115-29-7	3.7E+02	nc	2.2E+01	nc	1.E-13	2.E-10
Endosulfan II	33213-65-9	3.08E-08	6.91E-09	NA						NC	NC
Endosulfan sulfate	1031-07-8	4.83E-08	3.95E-09	NA						NC	NC
Endrin	72-20-8	1.41E-07	1.25E-08	Endrin	72-20-8	1.8E+01	nc	1.1E+00	nc	8.E-09	1.E-08
Endrin aldehyde	7421-93-4	1.91E-07	1.52E-08	NA						NC	NC
Endrin ketone	53494-70-5	4.92E-11	4.45E-09	Endrin	72-20-8	1.8E+01	nc	1.1E+00	nc	3.E-12	4.E-09
Ethylbenzene	100-41-4	7.86E-11	8.09E-08	Ethylbenzene	100-41-4	4.0E+02	sat	1.1E+03	nc	2.E-13	8.E-11
Ethylene dibromide	106-93-4	2.23E-08	3.41E-07	1,2-Dibromoethane (EDB)	106-93-4	3.2E-02	ca	3.4E-03	ca	7.E-07	1.E-04
Ethylene Glycol	107-21-1	1.37E-08	3.23E-08	Ethylene glycol	107-21-1	1.0E+05	max	7.3E+03	nc	1.E-13	4.E-12
Ethylhexyl phthalate, bis-2-	117-81-7	1.12E-07	4.69E-06	Bis(2-ethylhexyl)phthalate (DEHP)	117-81-7	3.5E+01	ca*	4.8E-01	ca	3.E-09	1.E-05
Fluoranthene	206-44-0	9.85E-09	1.27E-08	Fluoranthene	206-44-0	2.3E+03	nc	1.5E+02	nc	4.E-12	9.E-11
Fluorene	86-73-7	3.43E-10	3.26E-09	Fluorene	86-73-7	2.7E+03	nc	1.5E+02	nc	1.E-13	2.E-11
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroet	76-13-1	7.13E-12	8.61E-08	Freon 113	76-13-1	5.6E+03	sat	3.1E+04	nc	1.E-15	3.E-12
gamma-BHC (Lindane)	58-89-9	1.05E-08	3.03E-09	HCH (gamma) Lindane	58-89-9	4.4E-01	ca*	5.2E-03	ca	2.E-08	6.E-07
HeptaCDD, 1,2,3,4,6,7,8-	35822-46-9	1.09E-10	2.30E-11	Dioxin (2,3,7,8-TCDD)+++	1746-01-6	3.9E-06	ca	4.5E-08	ca	3.E-05	5.E-04
HeptaCDF, 1,2,3,4,6,7,8-	67562-39-4	5.29E-10	1.12E-10	Dioxin (2,3,7,8-TCDD)+++	1746-01-6	3.9E-06	ca	4.5E-08	ca	1.E-04	2.E-03
HeptaCDF, 1,2,3,4,7,8,9-	55673-89-7	1.31E-10	2.66E-11	Dioxin (2,3,7,8-TCDD)+++	1746-01-6	3.9E-06	ca	4.5E-08	ca	3.E-05	6.E-04
Heptachlor	1024-57-3	1.06E-10	1.11E-08	Heptachlor epoxide	1024-57-3	5.3E-02	ca*	7.4E-04	ca*	2.E-09	2.E-05
Heptachlor epoxide	76-44-8	6.15E-09	6.36E-09	Heptachlor	76-44-8	1.1E-01	ca	1.5E-03	ca	6.E-08	4.E-06
HexaCDD, 1,2,3,4,7,8-	39227-28-6	1.06E-10	2.22E-11	Dioxin (2,3,7,8-TCDD)+++	1746-01-6	3.9E-06	ca	4.5E-08	ca	3.E-05	5.E-04
HexaCDD, 1,2,3,6,7,8-	57653-85-7	1.08E-10	2.24E-11	Dioxin (2,3,7,8-TCDD)+++	1746-01-6	3.9E-06	ca	4.5E-08	ca	3.E-05	5.E-04
HexaCDD, 1,2,3,7,8,9-	19408-74-3	1.25E-10	2.62E-11	Dioxin (2,3,7,8-TCDD)+++	1746-01-6	3.9E-06	ca	4.5E-08	ca	3.E-05	6.E-04
HexaCDF, 1,2,3,4,7,8-	70648-26-9	6.93E-10	1.42E-10	Dioxin (2,3,7,8-TCDD)+++	1746-01-6	3.9E-06	ca	4.5E-08	ca	2.E-04	3.E-03
HexaCDF, 1,2,3,6,7,8-	57117-44-9	3.78E-10	7.71E-11	Dioxin (2,3,7,8-TCDD)+++	1746-01-6	3.9E-06	ca	4.5E-08	ca	1.E-04	2.E-03
HexaCDF, 1,2,3,7,8,9-	72918-21-9	1.03E-10	2.04E-11	Dioxin (2,3,7,8-TCDD)+++	1746-01-6	3.9E-06	ca	4.5E-08	ca	3.E-05	5.E-04
HexaCDF, 2,3,4,6,7,8-	60851-34-5	2.13E-10	4.33E-11	Dioxin (2,3,7,8-TCDD)+++	1746-01-6	3.9E-06	ca	4.5E-08	ca	5.E-05	1.E-03
Hexachloro-1,3-butadiene (Perchlorobuta	87-68-3	8.93E-08	2.90E-07	Hexachlorobutadiene	87-68-3	6.2E+00	ca**	8.6E-02	ca*	1.E-08	3.E-06
Hexachlorobenzene	118-74-1	2.48E-07	2.59E-07	Hexachlorobenzene	118-74-1	3.0E-01	ca	4.2E-03	ca	8.E-07	6.E-05
Hexachlorocyclopentadiene	77-47-4	9.46E-08	1.95E-06	Hexachlorocyclopentadiene	77-47-4	3.7E+02	nc	2.1E-01	nc	3.E-10	9.E-06
Hexachloroethane (Perchloroethane)	67-72-1	9.11E-08	3.59E-07	Hexachloroethane	67-72-1	3.5E+01	ca**	4.8E-01	ca**	3.E-09	7.E-07
Hydrogen chloride	7647-01-0	1.47E-02	4.14E-02	Hydrogen chloride	7647-01-0			2.1E+01	nc	NC	2.E-03
Indeno(1,2,3-cd) pyrene	193-39-5	1.44E-08	1.12E-09	Indeno[1,2,3-cd]pyrene	193-39-5	6.2E-01	ca	9.2E-03	ca	2.E-08	1.E-07
Iodomethane	74-88-4	2.44E-09	5.09E-07	NA						NC	NC
Isophorone	78-59-1	9.32E-09	2.06E-07	Isophorone	78-59-1	5.1E+02	ca*	7.1E+00	ca	2.E-11	3.E-08
Isopropyl toluene, p-	99-87-6	3.77E-09	1.32E-07	NA						NC	NC
Lead	7439-92-1	2.70E-04	6.87E-05	Lead	7439-92-1	4.0E+02	nc	1.5E+00	NAAQS	7.E-07	5.E-05
Manganese	7439-96-5	2.96E-06	1.01E-05	Manganese and compounds	7439-96-5	1.8E+03	nc	5.1E-02	nc	2.E-09	2.E-04
Mercuric chloride	7487-94-7	7.28E-05	6.02E-06	Mercury and compounds	7487-94-7	2.3E+01	nc			3.E-06	NC
Mercury, elemental	7439-97-6	--	3.49E-07	NA						NC	NC
Methoxychlor	72-43-5	8.26E-09	1.41E-08	Methoxychlor	72-43-5	3.1E+02	nc	1.8E+01	nc	3.E-11	8.E-10
Methyl bromide (Bromomethane)	74-83-9	2.01E-10	1.22E-06	Bromomethane (Methyl bromide)	74-83-9	3.9E+00	nc	5.2E+00	nc	5.E-11	2.E-07

Comparison of Modeled Air and Soil Concentrations at Residential Assessment Receptor Location R_2 with USEPA Region 9 Preliminary Remediation Goals

Stack Emissions

Calculated Air and Soil Concentrations at Receptor R_2				USEPA Region 9 Preliminary Remediation Goals (PRGs) (c)						Comparison of Concentrations to PRGs	
Compound (as listed in IRAP software)	CAS Number	Maximum (Annual) Soil Concentration (mg/kg)	Annual Average Air Concentration (ug/m^3)	Compound (as listed in PRG Table)	CAS Number	Residential Soil PRG (mg/kg)		Ambient Air PRG (ug/m^3)		Soil Concentration Ratio: modeled concentration/PRG	Air Concentration Ratio: modeled concentration/PRG
						Soil Concentration	Basis	Air Concentration	Basis		
Methyl chloride (Chloromethane)	74-87-3	2.81E-10	6.23E-06	Chloromethane (methyl chloride)	74-87-3	4.7E+01	nc	9.5E+01	nc	6.E-12	7.E-08
Methyl ethyl ketone (2-Butanone)	78-93-3	5.96E-08	1.17E-06	Methyl ethyl ketone (2-Butanone)	78-93-3	2.2E+04	nc	5.1E+03	nc	3.E-12	2.E-10
Methyl isobutyl ketone	108-10-1	6.67E-09	5.82E-07	Methyl isobutyl ketone	108-10-1	5.3E+03	nc	3.1E+03	nc	1.E-12	2.E-10
Methyl mercury	22967-92-6	1.49E-06	--	Mercury (methyl)	22967-92-6	6.1E+00	nc			2.E-07	NC
Methyl methacrylate	80-62-6	9.99E-12	1.42E-09	Methyl methacrylate	80-62-6	2.2E+03	nc	7.3E+02	nc	5.E-15	2.E-12
methyl tert-butyl ether	1634-04-4	3.07E-09	2.11E-08	Methyl tertbutyl ether (MTBE)	1634-04-4	3.2E+01	ca	7.4E+00	ca	1.E-10	3.E-09
Methylene bromide	74-95-3	1.36E-08	3.31E-07	Methylene bromide	74-95-3	6.7E+01	nc	3.7E+01	nc	2.E-10	9.E-09
Methylene chloride	75-09-2	4.05E-10	4.50E-06	Methylene chloride	75-09-2	9.1E+00	ca	4.1E+00	ca	4.E-11	1.E-06
Naphthalene	91-20-3	7.74E-08	9.26E-07	Naphthalene	91-20-3	5.6E+01	nc	3.1E+00	nc	1.E-09	3.E-07
Nickel	7440-02-0	6.19E-07	2.18E-06	Nickel (soluble salts)	7440-02-0	1.6E+03	nc			4.E-10	NC
Nitroaniline, 2-	88-74-4	5.51E-07	2.69E-07	2-Nitroaniline	88-74-4	1.8E+02	nc	1.1E-01	nc	3.E-09	2.E-06
Nitroaniline, 3-	99-09-2	6.74E-07	7.53E-07	3-Nitroaniline	99-09-2	1.8E+01	nc	3.2E-01	ca**	4.E-08	2.E-06
Nitroaniline, 4-	100-01-6	5.86E-07	6.05E-07	4-Nitroaniline	100-01-6	2.3E+01	ca**	3.2E-01	ca*	3.E-08	2.E-06
Nitrobenzene	98-95-3	4.07E-08	2.04E-07	Nitrobenzene	98-95-3	2.0E+01	nc	2.1E+00	nc	2.E-09	1.E-07
Nitrogen dioxide	10102-44-0	1.08E-06	8.48E-02	Nitrogen dioxide				1.0E+02	NAAQS	NC	8.E-04
Nitrophenol, 2-	88-75-5	2.19E-08	4.58E-07	NA						NC	NC
Nitrophenol, 4-	100-02-7	1.60E-09	7.55E-07	NA						NC	NC
Nitrosodiphenylamine, N-	86-30-6	1.22E-08	2.04E-07	N-Nitrosodiphenylamine	86-30-6	9.9E+01	ca*	1.4E+00	ca*	1.E-10	1.E-07
Nitrosodipropylamine, n-	621-64-7	5.87E-08	2.49E-07	NA						NC	NC
N-nitrosodimethylamine	62-75-9	8.74E-08	2.38E-07	N-Nitrosodimethylamine	62-75-9	9.5E-03	ca*	1.4E-04	ca	9.E-06	2.E-03
OctaCDD, 1,2,3,4,6,7,8,9-	3268-87-9	1.39E-10	2.95E-11	Dioxin (2,3,7,8-TCDD)+++	1746-01-6	3.9E-06	ca	4.5E-08	ca	4.E-05	7.E-04
OctaCDF, 1,2,3,4,6,7,8,9-	39001-02-0	7.68E-11	1.63E-11	Dioxin (2,3,7,8-TCDD)+++	1746-01-6	3.9E-06	ca	4.5E-08	ca	2.E-05	4.E-04
PentaCDD, 1,2,3,7,8-	40321-76-4	1.66E-10	3.23E-11	Dioxin (2,3,7,8-TCDD)+++	1746-01-6	3.9E-06	ca	4.5E-08	ca	4.E-05	7.E-04
PentaCDF, 1,2,3,7,8-	57117-41-6	6.76E-10	1.18E-10	Dioxin (2,3,7,8-TCDD)+++	1746-01-6	3.9E-06	ca	4.5E-08	ca	2.E-04	3.E-03
PentaCDF, 2,3,4,7,8-	57117-31-4	6.81E-10	1.23E-10	Dioxin (2,3,7,8-TCDD)+++	1746-01-6	3.9E-06	ca	4.5E-08	ca	2.E-04	3.E-03
Pentachlorobenzene	608-93-5	1.36E-07	2.28E-07	Pentachlorobenzene	608-93-5	4.9E+01	nc	2.9E+00	nc	3.E-09	8.E-08
Pentachloronitrobenzene (PCNB)	82-68-8	3.31E-07	2.69E-07	Pentachloronitrobenzene	82-68-8	1.9E+00	ca*	2.6E-02	ca	2.E-07	1.E-05
Pentachlorophenol	87-86-5	1.15E-06	4.01E-06	Pentachlorophenol	87-86-5	3.0E+00	ca	5.6E-02	ca	4.E-07	7.E-05
Perylene	198-55-0	3.21E-13	3.53E-09	NA						NC	NC
Phenanthrene	85-01-8	1.38E-08	3.91E-08	NA						NC	NC
Phenol	108-95-2	5.17E-09	2.95E-07	Phenol	108-95-2	1.8E+04	nc	1.1E+03	nc	3.E-13	3.E-10
Phosphine imide, P,P,P-triphenyl	2240-47-3	3.56E-10	2.74E-07	NA						NC	NC
Propylbenzene, n-	103-65-1	1.42E-15	1.07E-07	n-Propylbenzene	103-65-1	2.4E+02	sat	1.5E+02	nc	6.E-18	7.E-10
Propylene oxide	75-56-9	4.15E-12	2.59E-10	Propylene oxide	75-56-9	1.9E+00	ca*	5.2E-01	ca*	2.E-12	5.E-10
Pyrene	129-00-0	4.26E-08	1.28E-08	Pyrene	129-00-0	2.3E+03	nc	1.1E+02	nc	2.E-11	1.E-10
Pyridine	110-86-1	4.54E-09	4.78E-07	Pyridine	110-86-1	6.1E+01	nc	3.7E+00	nc	7.E-11	1.E-07
Selenium	7782-49-2	4.69E-08	8.26E-07	Selenium	7782-49-2	3.9E+02	nc			1.E-10	NC
Silver	7440-22-4	6.10E-05	6.01E-07	Silver and compounds	7440-22-4	3.9E+02	nc			2.E-07	NC
Styrene	100-42-5	3.36E-09	7.47E-08	Styrene	100-42-5	1.7E+03	sat	1.1E+03	nc	2.E-12	7.E-11
Sulfur dioxide	9/5/7446	5.83E-06	2.25E-02	Sulfur dioxide				7.8E+01	NAAQS	NC	3.E-04
TetraCDD, 2,3,7,8-	1746-01-6	8.53E-11	1.16E-11	2,3,7,8-TCDD (dioxin)	1746-01-6	3.9E-06	ca	4.5E-08	ca	2.E-05	3.E-04
TetraCDF, 2,3,7,8-	51207-31-9	8.63E-10	1.11E-10	Dioxin (2,3,7,8-TCDD)+++	1746-01-6	3.9E-06	ca	4.5E-08	ca	2.E-04	2.E-03
Tetrachlorobenzene, 1,2,4,5-	95-94-3	7.08E-08	2.47E-07	1,2,4,5-Tetrachlorobenzene	95-94-3	1.8E+01	nc	1.1E+00	nc	4.E-09	2.E-07
Tetrachloroethane, 1,1,1,2-	630-20-6	8.97E-10	6.93E-08	1,1,1,2-Tetrachloroethane	630-20-6	3.2E+00	ca	2.6E-01	ca	3.E-10	3.E-07
Tetrachloroethane, 1,1,2,2-	79-34-5	2.05E-09	3.41E-07	1,1,2,2-Tetrachloroethane	79-34-5	4.1E-01	ca	3.3E-02	ca	5.E-09	1.E-05
Tetrachloroethylene (Perchloroethylene)	127-18-4	5.78E-09	2.90E-05	Tetrachloroethylene (PCE)	127-18-4	4.8E-01	ca*	3.2E-01	ca	1.E-08	9.E-05
Tetrahydrofuran	109-99-9	4.27E-09	1.19E-06	Tetrahydrofuran	109-99-9	9.4E+00	ca	9.9E-01	ca	5.E-10	1.E-06
Thallium (I)	7440-28-0	2.64E-04	2.03E-06	Thallium and compounds	7440-28-0	5.2E+00	nc			5.E-05	NC
Toluene	108-88-3	1.58E-09	3.05E-06	Toluene	108-88-3	5.2E+02	sat	4.0E+02	nc	3.E-12	8.E-09
Trichlorobenzene, 1,2,3-	87-61-6	3.35E-06	4.47E-07	NA						NC	NC
Trichlorobenzene, 1,2,4-	120-82-1	1.39E-08	2.41E-07	1,2,4-Trichlorobenzene	120-82-1	6.2E+01	nc	3.7E+00	nc	2.E-10	7.E-08
Trichloroethane, 1,1,1-	71-55-6	9.95E-12	7.19E-08	1,1,1-Trichloroethane	71-55-6	1.2E+03	sat	2.3E+03	nc	8.E-15	3.E-11
Trichloroethane, 1,1,2-	79-00-5	2.43E-10	2.07E-07	1,1,2-Trichloroethane	79-00-5	7.3E-01	ca*	1.2E-01	ca	3.E-10	2.E-06
Trichloroethylene	79-01-6	2.37E-10	6.80E-07	Trichloroethylene (TCE)	79-01-6	5.3E-02	ca	1.7E-02	ca	4.E-09	4.E-05
Trichlorofluoromethane (Freon 11)	75-69-4	7.80E-12	3.28E-07	Trichlorofluoromethane	75-69-4	3.9E+02	nc	7.3E+02	nc	2.E-14	4.E-10

Comparison of Modeled Air and Soil Concentrations at Residential Assessment Receptor Location R_2 with USEPA Region 9 Preliminary Remediation Goals

Stack Emissions

Calculated Air and Soil Concentrations at Receptor R_2				USEPA Region 9 Preliminary Remediation Goals (PRGs) (c)						Comparison of Concentrations to PRGs	
Compound (as listed in IRAP software)	CAS Number	Maximum (Annual) Soil Concentration (mg/kg)	Annual Average Air Concentration (ug/m^3)	Compound (as listed in PRG Table)	CAS Number	Residential Soil PRG (mg/kg)		Ambient Air PRG (ug/m^3)		Soil Concentration Ratio: modeled concentration/PRG	Air Concentration Ratio: modeled concentration/PRG
						Soil Concentration	Basis	Air Concentration	Basis		
Trichlorophenol, 2,4,5-	95-95-4	4.81E-07	4.16E-07	2,4,5-Trichlorophenol	95-95-4	6.1E+03	nc	3.7E+02	nc	8.E-11	1.E-09
Trichlorophenol, 2,4,6-	88-06-2	3.84E-08	3.28E-07	2,4,6-Trichlorophenol	88-06-2	6.1E+00	nc**	3.7E-01	nc**	6.E-09	9.E-07
Trichloropropane, 1,2,3-	96-18-4	1.28E-09	3.23E-07	1,2,3-Trichloropropane	96-18-4	3.4E-02	ca	3.4E-03	ca	4.E-08	1.E-04
Trimethylbenzene, 1,3,5-	108-67-8	1.01E-09	1.05E-07	1,3,5-Trimethylbenzene	108-67-8	2.1E+01	nc	6.2E+00	nc	5.E-11	2.E-08
Vanadium	7440-62-2	7.24E-05	5.34E-07	Vanadium and compounds	7440-62-2	7.8E+01	nc			9.E-07	NC
Vinyl Acetate	108-05-4	5.94E-09	3.93E-07	Vinyl acetate	108-05-4	4.3E+02	nc	2.1E+02	nc	1.E-11	2.E-09
Vinyl Chloride	75-01-4	1.88E-12	1.75E-07	Vinyl chloride	75-01-4	7.9E-02	ca	1.1E-01	ca	2.E-11	2.E-06
Xylene, m-	108-38-3	1.93E-10	1.50E-07	Xylenes (b)	1330-20-7	2.7E+02	nc	1.1E+02	nc	7.E-13	1.E-09
Xylene, o-	95-47-6	1.25E-10	9.57E-08	Xylenes (b)	1330-20-7	2.7E+02	nc	1.1E+02	nc	5.E-13	9.E-10
Xylene, p-	106-42-3	1.61E-10	1.50E-07	Xylenes (b)	1330-20-7	2.7E+02	nc	1.1E+02	nc	6.E-13	1.E-09
Zinc	7440-66-6	9.00E-06	3.32E-05	Zinc	7440-66-6	2.3E+04	nc			4.E-10	NC

NAAQS = National Ambient Air Quality Standard (annual average). Value for lead is a quarterly average.
+++ = Used PRG value for 2,3,7,8-TCDD toxic equivalents (TEQs) in comparison with other congeners, which are also expressed as 2,3,7,8-TCDD TEQs.
NA = PRG not available.
-- = Not calculated (per USEPA's HHRAP methodology).
(a) Used PRG value for technical chlordane
(b) Used PRG value for xylenes
(c) Source: http://www.epa.gov/region09/waste/sfund/prg/files/prgtable2004.xls
Notes from USEPA Region IX PRG Table: ca=Cancer PRG; nc= Noncancer PRG; ca* (where: nc PRG < 100X ca PRG); ca** (where nc PRG < 10X ca PRG); max=Ceiling limit; sat=Soil
(d) Benzidine was not detected in stack gases during the Performance Demonstration Test (PDT) and there is no evidence from waste profile reports and analytical spent carbon data that it has been accepted in spent carbon received at the facility.

APPENDIX H

STACK EMISSIONS RISK ASSESSMENT: ACUTE INHALATION RISK RESULTS

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
A_1 max hourly impact point (stack)	
Arsenic	8.2E-02
Nitrogen dioxide	3.6E-02
Chlorine	8.9E-03
Sulfur dioxide	6.8E-03
Hydrogen chloride	4.0E-03
Beryllium	3.1E-03
Cadmium	1.3E-03
Lead	2.6E-04
Nickel	2.1E-04
Copper	1.5E-04
Mercury	3.9E-05
Mercuric chloride	9.7E-06
Hexachlorobenzene	8.7E-06
Chlorophenyl-phenylether, 4-	7.7E-06
Benzidine	5.2E-06
Dibromo-3-chloropropane, 1,2-	4.5E-06
Thallium (I)	3.8E-06
Chloroform (Trichloromethane)	2.9E-06
Vanadium	2.0E-06
Hexachlorocyclopentadiene	2.0E-06
Manganese	1.9E-06
4,6-Dinitro-2-methylphenol	1.1E-06
Silver	1.1E-06
Barium	7.5E-07
Zinc	6.3E-07
Pentachlorophenol	5.4E-07
Chromium	4.8E-07
Chromium, hexavalent	4.8E-07
Aluminum	4.8E-07
PentaCDF, 2,3,4,7,8-	3.3E-07
Selenium	3.2E-07
Tetrachloroethylene (Perchloroethylene)	2.9E-07
Nitrosodipropylamine, n-	2.5E-07
Fluoranthene	1.7E-07
Bromoform (tribromomethane)	1.4E-07
Antimony	1.3E-07
Benzoic Acid	1.2E-07
Dinitrotoluene, 2,4-	1.1E-07
Chlorobenzene	1.1E-07
Benzene	1.0E-07
Ethylhexyl phthalate, bis-2-	9.4E-08
Dibromochloromethane	9.4E-08
Dinitrotoluene, 2,6-	9.2E-08
Bromodichloromethane	7.1E-08
Methylene chloride	6.5E-08
Dinitrophenol, 2,4-	6.3E-08
Methyl bromide (Bromomethane)	6.3E-08
Nitrophenol, 4-	6.1E-08
Nitroaniline, 3-	6.1E-08
Chloronaphthalene,2-	5.7E-08
3-Penten-2-one, 4-methyl	4.8E-08
Dichlorobenzidine, 3,3'-	4.5E-08
Methylene bromide	4.4E-08
Pentachloronitrobenzene (PCNB)	3.6E-08
Dimethylphenol, 2,4-	2.7E-08
Acrylonitrile	2.6E-08
Chlorobenzilate	2.5E-08
Cobalt	2.4E-08
Nitrophenol, 2-	2.3E-08
Carbazole	2.0E-08
Dinitrobenzene, 1,3-	1.9E-08
Carbon Tetrachloride	1.9E-08
Benzyl alcohol	1.8E-08
Methyl ethyl ketone (2-Butanone)	1.8E-08
Benzaldehyde	1.7E-08
Toluene	1.7E-08
Heptachlor	1.5E-08
Nitroaniline, 4-	1.4E-08

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Benzonitrile	1.3E-08
Di-n-butyl phthalate	1.3E-08
Aniline	1.2E-08
TetraCDF, 2,3,7,8-	1.1E-08
Carbon Disulfide	1.0E-08
Phenol	1.0E-08
Heptachlor epoxide	8.5E-09
Endrin	8.4E-09
Phenanthrene	7.9E-09
Chlorophenol, 2-	7.5E-09
Chloroaniline, p-	7.2E-09
Acetone	6.7E-09
Methyl chloride (Chloromethane)	6.3E-09
HexaCDF, 1,2,3,6,7,8-	6.2E-09
Trichlorobenzene, 1,2,3-	6.0E-09
Acetophenone	5.9E-09
Bromophenyl-phenylether, 4-	5.8E-09
HexaCDF, 2,3,4,6,7,8-	5.8E-09
Chloro-3-methylphenol, 4-	5.6E-09
Hexachloro-1,3-butadiene (Perchlorobutadiene)	5.4E-09
Cresol, o-	5.4E-09
N-nitrosodimethylamine	4.8E-09
HexaCDF, 1,2,3,4,7,8-	3.8E-09
Butylbenzylphthalate	3.8E-09
Dichlorobenzene, 1,3-	3.7E-09
HexaCDD, 1,2,3,4,7,8-	3.6E-09
Diethyl phthalate	3.5E-09
Tetrachloroethane, 1,1,2,2-	3.4E-09
Vinyl Acetate	3.3E-09
PentaCDF, 1,2,3,7,8-	3.2E-09
Dichloropropene, 1,3- (cis)	3.2E-09
Bis(2-chloroethoxy) methane	2.9E-09
Trichlorophenol, 2,4,5-	2.8E-09
Nitrobenzene	2.7E-09
Nitroaniline, 2-	2.7E-09
PentaCDD, 1,2,3,7,8-	2.6E-09
Benzo(b)fluoranthene	2.6E-09
2,5-Dimethylheptane	2.5E-09
Naphthalene	2.5E-09
2-Hexanone	2.4E-09
Hexachloroethane (Perchloroethane)	2.4E-09
Cresol, m-	2.4E-09
Cresol, p-	2.4E-09
Dimethyl phthalate	2.3E-09
Endosulfan I	2.3E-09
Dichlorophenol, 2,4-	2.3E-09
Trichlorophenol, 2,4,6-	2.2E-09
Acenaphthylene	2.1E-09
Chlordane	2.1E-09
Pyridine	1.9E-09
BHC, beta-	1.9E-09
Dibenzofuran	1.8E-09
Diphenylamine	1.8E-09
Bromobenzene	1.7E-09
Aldrin	1.7E-09
Isophorone	1.7E-09
Tetrachlorobenzene, 1,2,4,5-	1.7E-09
Nitrosodiphenylamine, N-	1.6E-09
TetraCDD, 2,3,7,8-	1.6E-09
Pentachlorobenzene	1.5E-09
Di-n-octylphthalate	1.5E-09
Trichlorobenzene, 1,2,4-	1.4E-09
Xylene, m-	1.4E-09
Xylene, p-	1.4E-09
Indeno(1,2,3-cd) pyrene	1.3E-09
Diphenylhydrazine,1,2-	1.2E-09
Trichloropropane, 1,2,3-	1.1E-09
Butylbenzene, sec	1.0E-09
Chrysene	9.7E-10
1,1-Dichloropropene	8.9E-10
Xylene, o-	8.7E-10

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Trichloroethane, 1,1,2-	8.3E-10
3-Ethyl benzaldehyde	8.2E-10
Aroclor 1254	8.1E-10
Dieldrin	8.1E-10
BHC, alpha-	7.4E-10
Styrene	7.2E-10
Iodomethane	7.1E-10
Bis(2-chlorethyl)ether	7.1E-10
2,2'-oxybis (1-Chloropropane)	6.7E-10
DDT, 4-4'-	5.9E-10
Benzo(a)Anthracene	5.1E-10
Benzo(k)fluoranthene	5.0E-10
4-Ethyl benzaldehyde	4.5E-10
OctaCDF, 1,2,3,4,6,7,8,9-	4.4E-10
gamma-BHC (Lindane)	4.1E-10
Methyl isobutyl ketone	3.9E-10
HexaCDD, 1,2,3,7,8,9-	3.5E-10
Ethylene dibromide	3.4E-10
Benzo(a)pyrene	3.3E-10
Tetrahydrofuran	3.2E-10
HexaCDD, 1,2,3,6,7,8-	3.0E-10
1,3-Dichloropropane	2.6E-10
Butylbenzene, n-	2.5E-10
Dichloroethylene 1,1-	2.4E-10
2,2-Dichloropropane	2.4E-10
Butylbenzene, tert	2.4E-10
Tetrachloroethane, 1,1,1,2-	2.3E-10
DDD, 4,4'-	2.3E-10
Trichloroethane, 1,1,1-	2.1E-10
Trichloroethylene	2.0E-10
Vinyl Chloride	1.9E-10
Acenaphthene	1.8E-10
Pyrene	1.7E-10
Trimethylbenzene, 1,3,5-	1.7E-10
2-Methylnaphthalene	1.5E-10
HeptaCDF, 1,2,3,4,6,7,8-	1.5E-10
Dichlorobenzene, 1,2-	1.5E-10
Dichloroethane, 1,2- (Ethylene Dichloride)	1.3E-10
Anthracene	1.1E-10
Methoxychlor	9.4E-11
Dichlorobenzene,1,4-	8.7E-11
OctaCDD, 1,2,3,4,6,7,8,9-	7.9E-11
DDE, 4,4'-	7.8E-11
Cumene (Isopropylbenzene)	7.7E-11
2-Chlorotoluene	6.6E-11
4-Chlorotoluene	6.6E-11
Ethylene Glycol	6.5E-11
Fluorene	5.7E-11
Propylbenzene, n-	5.4E-11
1,2,4-Trimethylbenzene	4.7E-11
Dichloropropane, 1,2-	4.1E-11
Dichloroethylene, cis-1,2-	3.9E-11
HexaCDF, 1,2,3,7,8,9-	3.3E-11
Ethylbenzene	3.3E-11
Chloroethane	2.7E-11
Trichlorofluoromethane (Freon 11)	2.6E-11
Bromochloromethane	2.6E-11
methyl tert-butyl ether	2.4E-11
HeptaCDF, 1,2,3,4,7,8,9-	2.1E-11
Benzo(g,h,i)perylene	2.1E-11
Propylene oxide	1.7E-11
Dichloroethylene-1,2 (trans)	1.4E-11
Dichlorodifluoromethane	1.3E-11
Dichloroethane 1,1-	1.3E-11
HeptaCDD, 1,2,3,4,6,7,8-	7.7E-12
Methyl methacrylate	4.1E-12
Dibenz(a,h)anthracene	1.9E-12
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	1.7E-12
Dioxane, 1,4-	1.5E-12
Acrylic Acid	1.6E-13
1-Hexane (n-hexane)	2.8E-14

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
2,5-Dimethylfuran	NC
2,5-Dione, 3-hexene	NC
2-Methyl octane	NC
3-Hexen-2-one	NC
3-Penten-2-one (ethylidene acetone)	NC
9-Octadecenamide (oleamide)	NC
Benzo(e)pyrene	NC
Benzoic acid, methyl ester (methyl benzoate)	NC
delta-BHC	NC
Diallate	NC
Endosulfan II	NC
Endosulfan sulfate	NC
Endrin aldehyde	NC
Endrin ketone	NC
Isopropyl toluene, p-	NC
Perylene	NC
Phosphine imide, P,P,P-triphenyl	NC
Total (b)	1.0E-01
A_2 closest business	
Nitrogen dioxide	3.6E-02
Arsenic	3.3E-02
Chlorine	9.0E-03
Sulfur dioxide	6.9E-03
Hydrogen chloride	4.0E-03
Beryllium	1.3E-03
Cadmium	5.2E-04
Lead	1.0E-04
Nickel	8.2E-05
Copper	5.9E-05
Mercury	3.9E-05
Mercuric chloride	9.7E-06
Hexachlorobenzene	8.7E-06
Chlorophenyl-phenylether, 4-	7.7E-06
Benzidine	5.1E-06
Dibromo-3-chloropropane, 1,2-	4.5E-06
Chloroform (Trichloromethane)	2.9E-06
Hexachlorocyclopentadiene	2.0E-06
Thallium (I)	1.5E-06
4,6-Dinitro-2-methylphenol	1.1E-06
Vanadium	8.1E-07
Manganese	7.7E-07
Pentachlorophenol	5.4E-07
Silver	4.5E-07
PentaCDF, 2,3,4,7,8-	3.2E-07
Barium	3.0E-07
Tetrachloroethylene (Perchloroethylene)	2.9E-07
Nitrosodipropylamine, n-	2.5E-07
Zinc	2.5E-07
Chromium	1.9E-07
Chromium, hexavalent	1.9E-07
Aluminum	1.9E-07
Fluoranthene	1.7E-07
Bromoform (tribromomethane)	1.4E-07
Antimony	1.4E-07
Selenium	1.3E-07
Benzoic Acid	1.2E-07
Dinitrotoluene, 2,4-	1.2E-07
Chlorobenzene	1.1E-07
Benzene	1.0E-07
Dibromochloromethane	9.4E-08
Dinitrotoluene, 2,6-	9.2E-08
Ethylhexyl phthalate, bis-2-	9.2E-08
Bromodichloromethane	7.1E-08
Methylene chloride	6.5E-08
Dinitrophenol, 2,4-	6.4E-08
Methyl bromide (Bromomethane)	6.3E-08
Nitrophenol, 4-	6.1E-08
Nitroaniline, 3-	6.1E-08
Chloronaphthalene,2-	5.7E-08

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
3-Penten-2-one, 4-methyl	4.9E-08
Methylene bromide	4.5E-08
Dichlorobenzidine, 3,3'-	4.4E-08
Pentachloronitrobenzene (PCNB)	3.6E-08
Dimethylphenol, 2,4-	2.7E-08
Acrylonitrile	2.6E-08
Chlorobenzilate	2.5E-08
Nitrophenol, 2-	2.3E-08
Carbazole	2.1E-08
Dinitrobenzene, 1,3-	1.9E-08
Carbon Tetrachloride	1.9E-08
Benzyl alcohol	1.8E-08
Methyl ethyl ketone (2-Butanone)	1.8E-08
Benzaldehyde	1.7E-08
Toluene	1.7E-08
Heptachlor	1.5E-08
Nitroaniline, 4-	1.4E-08
Benzonitrile	1.3E-08
Di-n-butyl phthalate	1.3E-08
Aniline	1.2E-08
TetraCDF, 2,3,7,8-	1.1E-08
Carbon Disulfide	1.0E-08
Phenol	1.0E-08
Cobalt	9.7E-09
Heptachlor epoxide	8.6E-09
Endrin	8.4E-09
Phenanthrene	7.9E-09
Chlorophenol, 2-	7.5E-09
Chloroaniline, p-	7.3E-09
Acetone	6.8E-09
Methyl chloride (Chloromethane)	6.3E-09
HexaCDF, 1,2,3,6,7,8-	6.0E-09
Trichlorobenzene, 1,2,3-	6.0E-09
Acetophenone	5.9E-09
Bromophenyl-phenylether, 4-	5.8E-09
Chloro-3-methylphenol, 4-	5.7E-09
HexaCDF, 2,3,4,6,7,8-	5.7E-09
Hexachloro-1,3-butadiene (Perchlorobutadiene)	5.5E-09
Cresol, o-	5.5E-09
N-nitrosodimethylamine	4.8E-09
Butylbenzylphthalate	3.8E-09
Dichlorobenzene, 1,3-	3.7E-09
HexaCDF, 1,2,3,4,7,8-	3.7E-09
Diethyl phthalate	3.5E-09
HexaCDD, 1,2,3,4,7,8-	3.5E-09
Tetrachloroethane, 1,1,2,2-	3.5E-09
Vinyl Acetate	3.4E-09
Dichloropropene, 1,3- (cis)	3.2E-09
PentaCDF, 1,2,3,7,8-	3.1E-09
Bis(2-chloroethoxy) methane	2.9E-09
Trichlorophenol, 2,4,5-	2.8E-09
Nitrobenzene	2.7E-09
Nitroaniline, 2-	2.7E-09
Benzo(b)fluoranthene	2.6E-09
PentaCDD, 1,2,3,7,8-	2.5E-09
2,5-Dimethylheptane	2.5E-09
Naphthalene	2.5E-09
2-Hexanone	2.5E-09
Hexachloroethane (Perchloroethane)	2.4E-09
Cresol, m-	2.4E-09
Cresol, p-	2.4E-09
Dimethyl phthalate	2.3E-09
Endosulfan I	2.3E-09
Dichlorophenol, 2,4-	2.3E-09
Trichlorophenol, 2,4,6-	2.2E-09
Acenaphthylene	2.1E-09
Chlordane	2.1E-09
Pyridine	1.9E-09
BHC, beta-	1.9E-09
Dibenzofuran	1.8E-09
Diphenylamine	1.8E-09

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Bromobenzene	1.7E-09
Aldrin	1.7E-09
Isophorone	1.7E-09
Tetrachlorobenzene, 1,2,4,5-	1.7E-09
Nitrosodiphenylamine, N-	1.7E-09
TetraCDD, 2,3,7,8-	1.5E-09
Pentachlorobenzene	1.5E-09
Di-n-octylphthalate	1.5E-09
Trichlorobenzene, 1,2,4-	1.4E-09
Xylene, m-	1.4E-09
Xylene, p-	1.4E-09
Diphenylhydrazine,1,2-	1.2E-09
Trichloropropane, 1,2,3-	1.1E-09
Butylbenzene, sec	1.0E-09
Chrysene	9.7E-10
1,1-Dichloropropene	9.0E-10
Xylene, o-	8.8E-10
Trichloroethane, 1,1,2-	8.4E-10
3-Ethyl benzaldehyde	8.3E-10
Aroclor 1254	8.2E-10
Dieldrin	8.2E-10
BHC, alpha-	7.5E-10
Styrene	7.2E-10
Iodomethane	7.1E-10
Bis(2-chlorethyl)ether	7.1E-10
2,2'-oxybis (1-Chloropropane)	6.8E-10
DDT, 4-4'-	5.9E-10
Benzo(a)Anthracene	5.1E-10
Indeno(1,2,3-cd) pyrene	5.1E-10
Benzo(k)fluoranthene	4.9E-10
4-Ethyl benzaldehyde	4.5E-10
OctaCDF, 1,2,3,4,6,7,8,9-	4.2E-10
gamma-BHC (Lindane)	4.1E-10
Methyl isobutyl ketone	3.9E-10
Ethylene dibromide	3.5E-10
HexaCDD, 1,2,3,7,8,9-	3.4E-10
Benzo(a)pyrene	3.2E-10
Tetrahydrofuran	3.2E-10
HexaCDD, 1,2,3,6,7,8-	2.9E-10
1,3-Dichloropropane	2.6E-10
Butylbenzene, n-	2.5E-10
Dichloroethylene 1,1-	2.5E-10
2,2-Dichloropropane	2.4E-10
Butylbenzene, tert	2.4E-10
Tetrachloroethane, 1,1,1,2-	2.3E-10
DDD, 4,4'-	2.3E-10
Trichloroethane, 1,1,1-	2.1E-10
Trichloroethylene	2.0E-10
Vinyl Chloride	2.0E-10
Acenaphthene	1.8E-10
Pyrene	1.7E-10
Trimethylbenzene, 1,3,5-	1.7E-10
2-Methylnaphthalene	1.5E-10
Dichlorobenzene, 1,2-	1.5E-10
HeptaCDF, 1,2,3,4,6,7,8-	1.5E-10
Dichloroethane, 1,2- (Ethylene Dichloride)	1.3E-10
Anthracene	1.1E-10
Methoxychlor	9.4E-11
Dichlorobenzene,1,4-	8.7E-11
DDE, 4,4'-	7.8E-11
Cumene (Isopropylbenzene)	7.7E-11
OctaCDD, 1,2,3,4,6,7,8,9-	7.7E-11
2-Chlorotoluene	6.7E-11
4-Chlorotoluene	6.6E-11
Ethylene Glycol	6.5E-11
Fluorene	5.7E-11
Propylbenzene, n-	5.4E-11
1,2,4-Trimethylbenzene	4.8E-11
Dichloropropane, 1,2-	4.2E-11
Dichloroethylene, cis-1,2-	3.9E-11
Ethylbenzene	3.3E-11

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
HexaCDF, 1,2,3,7,8,9-	3.2E-11
Chloroethane	2.8E-11
Trichlorofluoromethane (Freon 11)	2.7E-11
Bromochloromethane	2.6E-11
methyl tert-butyl ether	2.4E-11
HeptaCDF, 1,2,3,4,7,8,9-	2.1E-11
Benzo(g,h,i)perylene	2.1E-11
Propylene oxide	1.7E-11
Dichloroethylene-1,2 (trans)	1.4E-11
Dichlorodifluoromethane	1.3E-11
Dichloroethane 1,1-	1.3E-11
HeptaCDD, 1,2,3,4,6,7,8-	7.5E-12
Methyl methacrylate	4.1E-12
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	1.7E-12
Dioxane, 1,4-	1.6E-12
Dibenz(a,h)anthracene	7.8E-13
Acrylic Acid	1.6E-13
1-Hexane (n-hexane)	2.8E-14
2,5-Dimethylfuran	NC
2,5-Dione, 3-hexene	NC
2-Methyl octane	NC
3-Hexen-2-one	NC
3-Penten-2-one (ethylidene acetone)	NC
9-Octadecenamide (oleamide)	NC
Benzo(e)pyrene	NC
Benzoic acid, methyl ester (methyl benzoate)	NC
delta-BHC	NC
Diallate	NC
Endosulfan II	NC
Endosulfan sulfate	NC
Endrin aldehyde	NC
Endrin ketone	NC
Isopropyl toluene, p-	NC
Perylene	NC
Phosphine imide, P,P,P-triphenyl	NC
Total (b)	9.0E-02
R_1 resident	
Nitrogen dioxide	1.5E-02
Arsenic	1.2E-02
Chlorine	3.7E-03
Sulfur dioxide	2.8E-03
Hydrogen chloride	1.6E-03
Beryllium	4.5E-04
Cadmium	1.8E-04
Lead	3.7E-05
Nickel	2.9E-05
Copper	2.1E-05
Mercury	1.6E-05
Mercuric chloride	4.0E-06
Hexachlorobenzene	3.6E-06
Chlorophenyl-phenylether, 4-	3.2E-06
Benzidine	2.2E-06
Dibromo-3-chloropropane, 1,2-	1.8E-06
Chloroform (Trichloromethane)	1.2E-06
Hexachlorocyclopentadiene	8.0E-07
Thallium (I)	5.5E-07
4,6-Dinitro-2-methylphenol	4.7E-07
Vanadium	2.9E-07
Manganese	2.7E-07
Pentachlorophenol	2.2E-07
Silver	1.6E-07
PentaCDF, 2,3,4,7,8-	1.4E-07
Tetrachloroethylene (Perchloroethylene)	1.2E-07
Barium	1.1E-07
Nitrosodipropylamine, n-	1.0E-07
Zinc	8.9E-08
Fluoranthene	7.0E-08
Chromium	6.9E-08
Chromium, hexavalent	6.9E-08

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Aluminum	6.8E-08
Bromoform (tribromomethane)	5.9E-08
Antimony	5.5E-08
Benzoic Acid	4.8E-08
Dinitrotoluene, 2,4-	4.7E-08
Selenium	4.5E-08
Chlorobenzene	4.4E-08
Benzene	4.2E-08
Ethylhexyl phthalate, bis-2-	4.1E-08
Dibromochloromethane	3.8E-08
Dinitrotoluene, 2,6-	3.8E-08
Bromodichloromethane	2.9E-08
Methylene chloride	2.6E-08
Dinitrophenol, 2,4-	2.6E-08
Methyl bromide (Bromomethane)	2.6E-08
Nitrophenol, 4-	2.5E-08
Nitroaniline, 3-	2.5E-08
Chloronaphthalene,2-	2.3E-08
3-Penten-2-one, 4-methyl	2.0E-08
Dichlorobenzidine, 3,3'-	1.9E-08
Methylene bromide	1.8E-08
Pentachloronitrobenzene (PCNB)	1.5E-08
Dimethylphenol, 2,4-	1.1E-08
Acrylonitrile	1.1E-08
Chlorobenzilate	1.0E-08
Nitrophenol, 2-	9.4E-09
Carbazole	8.4E-09
Dinitrobenzene, 1,3-	7.7E-09
Carbon Tetrachloride	7.6E-09
Benzyl alcohol	7.4E-09
Methyl ethyl ketone (2-Butanone)	7.4E-09
Benzaldehyde	7.0E-09
Toluene	6.8E-09
Heptachlor	6.1E-09
Nitroaniline, 4-	5.5E-09
Benzonitrile	5.3E-09
Di-n-butyl phthalate	5.3E-09
Aniline	5.0E-09
TetraCDF, 2,3,7,8-	4.6E-09
Carbon Disulfide	4.3E-09
Phenol	4.2E-09
Heptachlor epoxide	3.5E-09
Endrin	3.5E-09
Cobalt	3.4E-09
Phenanthrene	3.2E-09
Chlorophenol, 2-	3.1E-09
Chloroaniline, p-	3.0E-09
Acetone	2.8E-09
HexaCDF, 1,2,3,6,7,8-	2.7E-09
Methyl chloride (Chloromethane)	2.6E-09
HexaCDF, 2,3,4,6,7,8-	2.5E-09
Trichlorobenzene, 1,2,3-	2.5E-09
Acetophenone	2.4E-09
Bromophenyl-phenylether, 4-	2.4E-09
Chloro-3-methylphenol, 4-	2.3E-09
Hexachloro-1,3-butadiene (Perchlorobutadiene)	2.2E-09
Cresol, o-	2.2E-09
N-nitrosodimethylamine	2.0E-09
HexaCDF, 1,2,3,4,7,8-	1.6E-09
Butylbenzylphthalate	1.5E-09
HexaCDD, 1,2,3,4,7,8-	1.5E-09
Dichlorobenzene, 1,3-	1.5E-09
Diethyl phthalate	1.4E-09
Tetrachloroethane, 1,1,2,2-	1.4E-09
Vinyl Acetate	1.4E-09
PentaCDF, 1,2,3,7,8-	1.3E-09
Dichloropropene, 1,3- (cis)	1.3E-09
Bis(2-chloroethoxy) methane	1.2E-09
Trichlorophenol, 2,4,5-	1.1E-09
Nitrobenzene	1.1E-09
PentaCDD, 1,2,3,7,8-	1.1E-09

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Nitroaniline, 2-	1.1E-09
Benzo(b)fluoranthene	1.0E-09
2,5-Dimethylheptane	1.0E-09
Naphthalene	1.0E-09
2-Hexanone	1.0E-09
Hexachloroethane (Perchloroethane)	9.9E-10
Cresol, m-	9.7E-10
Cresol, p-	9.7E-10
Dimethyl phthalate	9.5E-10
Endosulfan I	9.3E-10
Dichlorophenol, 2,4-	9.2E-10
Trichlorophenol, 2,4,6-	9.0E-10
Acenaphthylene	8.6E-10
Chlordane	8.5E-10
Pyridine	7.9E-10
BHC, beta-	7.9E-10
Dibenzofuran	7.5E-10
Diphenylamine	7.5E-10
Bromobenzene	7.1E-10
Aldrin	7.0E-10
Isophorone	6.8E-10
Tetrachlorobenzene, 1,2,4,5-	6.8E-10
Nitrosodiphenylamine, N-	6.7E-10
TetraCDD, 2,3,7,8-	6.5E-10
Pentachlorobenzene	6.3E-10
Di-n-octylphthalate	6.2E-10
Trichlorobenzene, 1,2,4-	5.7E-10
Xylene, m-	5.6E-10
Xylene, p-	5.6E-10
Diphenylhydrazine,1,2-	5.0E-10
Trichloropropane, 1,2,3-	4.4E-10
Butylbenzene, sec	4.2E-10
Chrysene	4.0E-10
1,1-Dichloropropene	3.7E-10
Xylene, o-	3.6E-10
Trichloroethane, 1,1,2-	3.4E-10
3-Ethyl benzaldehyde	3.4E-10
Aroclor 1254	3.3E-10
Dieldrin	3.3E-10
BHC, alpha-	3.0E-10
Styrene	2.9E-10
Iodomethane	2.9E-10
Bis(2-chlorethyl)ether	2.9E-10
2,2'-oxybis (1-Chloropropane)	2.8E-10
DDT, 4-4'-	2.5E-10
Benzo(a)Anthracene	2.2E-10
Benzo(k)fluoranthene	2.1E-10
OctaCDF, 1,2,3,4,6,7,8,9-	1.9E-10
4-Ethyl benzaldehyde	1.8E-10
Indeno(1,2,3-cd) pyrene	1.8E-10
gamma-BHC (Lindane)	1.7E-10
Methyl isobutyl ketone	1.6E-10
HexaCDD, 1,2,3,7,8,9-	1.5E-10
Ethylene dibromide	1.4E-10
Benzo(a)pyrene	1.4E-10
Tetrahydrofuran	1.3E-10
HexaCDD, 1,2,3,6,7,8-	1.3E-10
1,3-Dichloropropane	1.1E-10
Butylbenzene, n-	1.0E-10
Dichloroethylene 1,1-	1.0E-10
2,2-Dichloropropane	9.9E-11
Butylbenzene, tert	9.9E-11
Tetrachloroethane, 1,1,1,2-	9.5E-11
DDD, 4,4'-	9.4E-11
Trichloroethane, 1,1,1-	8.7E-11
Trichloroethylene	8.0E-11
Vinyl Chloride	8.0E-11
Acenaphthene	7.3E-11
Pyrene	7.0E-11
Trimethylbenzene, 1,3,5-	6.9E-11
HeptaCDF, 1,2,3,4,6,7,8-	6.5E-11

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
2-Methylnaphthalene	6.2E-11
Dichlorobenzene, 1,2-	6.0E-11
Dichloroethane, 1,2- (Ethylene Dichloride)	5.3E-11
Anthracene	4.5E-11
Methoxychlor	3.9E-11
Dichlorobenzene,1,4-	3.6E-11
OctaCDD, 1,2,3,4,6,7,8,9-	3.4E-11
DDE, 4,4'-	3.2E-11
Cumene (Isopropylbenzene)	3.2E-11
2-Chlorotoluene	2.7E-11
4-Chlorotoluene	2.7E-11
Ethylene Glycol	2.7E-11
Fluorene	2.3E-11
Propylbenzene, n-	2.2E-11
1,2,4-Trimethylbenzene	1.9E-11
Dichloropropane, 1,2-	1.7E-11
Dichloroethylene, cis-1,2-	1.6E-11
HexaCDF, 1,2,3,7,8,9-	1.4E-11
Ethylbenzene	1.3E-11
Chloroethane	1.1E-11
Trichlorofluoromethane (Freon 11)	1.1E-11
Bromochloromethane	1.1E-11
methyl tert-butyl ether	9.7E-12
HeptaCDF, 1,2,3,4,7,8,9-	9.2E-12
Benzo(g,h,i)perylene	9.1E-12
Propylene oxide	6.9E-12
Dichloroethylene-1,2 (trans)	5.5E-12
Dichlorodifluoromethane	5.4E-12
Dichloroethane 1,1-	5.3E-12
HeptaCDD, 1,2,3,4,6,7,8-	3.3E-12
Methyl methacrylate	1.7E-12
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	7.1E-13
Dioxane, 1,4-	6.3E-13
Dibenz(a,h)anthracene	2.8E-13
Acrylic Acid	6.4E-14
1-Hexane (n-hexane)	1.1E-14
2,5-Dimethylfuran	NC
2,5-Dione, 3-hexene	NC
2-Methyl octane	NC
3-Hexen-2-one	NC
3-Penten-2-one (ethylidene acetone)	NC
9-Octadecenamide (oleamide)	NC
Benzo(e)pyrene	NC
Benzoic acid, methyl ester (methyl benzoate)	NC
delta-BHC	NC
Diallate	NC
Endosulfan II	NC
Endosulfan sulfate	NC
Endrin aldehyde	NC
Endrin ketone	NC
Isopropyl toluene, p-	NC
Perylene	NC
Phosphine imide, P,P,P-triphenyl	NC
Total (b)	4.0E-02
R_2 resident	
Nitrogen dioxide	9.9E-03
Arsenic	7.0E-03
Chlorine	2.4E-03
Sulfur dioxide	1.9E-03
Hydrogen chloride	1.1E-03
Beryllium	2.6E-04
Cadmium	1.1E-04
Lead	2.2E-05
Nickel	1.7E-05
Copper	1.2E-05
Mercury	1.1E-05
Mercuric chloride	2.7E-06
Hexachlorobenzene	2.4E-06
Chlorophenyl-phenylether, 4-	2.1E-06

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Benzidine	1.5E-06
Dibromo-3-chloropropane, 1,2-	1.2E-06
Chloroform (Trichloromethane)	7.8E-07
Hexachlorocyclopentadiene	5.4E-07
Thallium (I)	3.2E-07
4,6-Dinitro-2-methylphenol	3.1E-07
Vanadium	1.7E-07
Manganese	1.6E-07
Pentachlorophenol	1.5E-07
Silver	9.6E-08
PentaCDF, 2,3,4,7,8-	9.5E-08
Tetrachloroethylene (Perchloroethylene)	8.0E-08
Nitrosodipropylamine, n-	6.9E-08
Barium	6.3E-08
Zinc	5.3E-08
Fluoranthene	4.7E-08
Chromium	4.1E-08
Chromium, hexavalent	4.1E-08
Aluminum	4.0E-08
Bromoform (tribromomethane)	3.9E-08
Antimony	3.7E-08
Benzoic Acid	3.2E-08
Dinitrotoluene, 2,4-	3.1E-08
Chlorobenzene	2.9E-08
Benzene	2.8E-08
Ethylhexyl phthalate, bis-2-	2.7E-08
Selenium	2.7E-08
Dibromochloromethane	2.6E-08
Dinitrotoluene, 2,6-	2.5E-08
Bromodichloromethane	1.9E-08
Methylene chloride	1.8E-08
Dinitrophenol, 2,4-	1.7E-08
Methyl bromide (Bromomethane)	1.7E-08
Nitrophenol, 4-	1.7E-08
Nitroaniline, 3-	1.7E-08
Chloronaphthalene,2-	1.6E-08
3-Penten-2-one, 4-methyl	1.3E-08
Dichlorobenzidine, 3,3'-	1.3E-08
Methylene bromide	1.2E-08
Pentachloronitrobenzene (PCNB)	9.9E-09
Dimethylphenol, 2,4-	7.3E-09
Acrylonitrile	7.1E-09
Chlorobenzilate	6.8E-09
Nitrophenol, 2-	6.3E-09
Carbazole	5.6E-09
Dinitrobenzene, 1,3-	5.1E-09
Carbon Tetrachloride	5.1E-09
Benzyl alcohol	5.0E-09
Methyl ethyl ketone (2-Butanone)	4.9E-09
Benzaldehyde	4.7E-09
Toluene	4.5E-09
Heptachlor	4.1E-09
Nitroaniline, 4-	3.7E-09
Benzonitrile	3.6E-09
Di-n-butyl phthalate	3.5E-09
Aniline	3.4E-09
TetraCDF, 2,3,7,8-	3.1E-09
Carbon Disulfide	2.9E-09
Phenol	2.8E-09
Heptachlor epoxide	2.3E-09
Endrin	2.3E-09
Phenanthrene	2.2E-09
Chlorophenol, 2-	2.0E-09
Cobalt	2.0E-09
Chloroaniline, p-	2.0E-09
Acetone	1.8E-09
HexaCDF, 1,2,3,6,7,8-	1.8E-09
Methyl chloride (Chloromethane)	1.7E-09
HexaCDF, 2,3,4,6,7,8-	1.7E-09
Trichlorobenzene, 1,2,3-	1.6E-09
Acetophenone	1.6E-09

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Bromophenyl-phenylether, 4-	1.6E-09
Chloro-3-methylphenol, 4-	1.5E-09
Hexachloro-1,3-butadiene (Perchlorobutadiene)	1.5E-09
Cresol, o-	1.5E-09
N-nitrosodimethylamine	1.3E-09
HexaCDF, 1,2,3,4,7,8-	1.1E-09
HexaCDD, 1,2,3,4,7,8-	1.0E-09
Butylbenzylphthalate	1.0E-09
Dichlorobenzene, 1,3-	1.0E-09
Diethyl phthalate	9.6E-10
Tetrachloroethane, 1,1,2,2-	9.4E-10
Vinyl Acetate	9.2E-10
PentaCDF, 1,2,3,7,8-	9.1E-10
Dichloropropene, 1,3- (cis)	8.6E-10
Bis(2-chloroethoxy) methane	7.9E-10
Trichlorophenol, 2,4,5-	7.7E-10
PentaCDD, 1,2,3,7,8-	7.5E-10
Nitrobenzene	7.5E-10
Nitroaniline, 2-	7.4E-10
Benzo(b)fluoranthene	7.0E-10
2,5-Dimethylheptane	6.8E-10
Naphthalene	6.8E-10
2-Hexanone	6.7E-10
Hexachloroethane (Perchloroethane)	6.6E-10
Cresol, m-	6.5E-10
Cresol, p-	6.5E-10
Dimethyl phthalate	6.4E-10
Endosulfan I	6.2E-10
Dichlorophenol, 2,4-	6.2E-10
Trichlorophenol, 2,4,6-	6.0E-10
Acenaphthylene	5.8E-10
Chlordane	5.7E-10
Pyridine	5.3E-10
BHC, beta-	5.3E-10
Dibenzofuran	5.0E-10
Diphenylamine	5.0E-10
Bromobenzene	4.8E-10
Aldrin	4.7E-10
Isophorone	4.5E-10
Tetrachlorobenzene, 1,2,4,5-	4.5E-10
Nitrosodiphenylamine, N-	4.5E-10
TetraCDD, 2,3,7,8-	4.4E-10
Pentachlorobenzene	4.2E-10
Di-n-octylphthalate	4.1E-10
Trichlorobenzene, 1,2,4-	3.8E-10
Xylene, m-	3.8E-10
Xylene, p-	3.8E-10
Diphenylhydrazine,1,2-	3.3E-10
Trichloropropane, 1,2,3-	3.0E-10
Butylbenzene, sec	2.8E-10
Chrysene	2.7E-10
1,1-Dichloropropene	2.5E-10
Xylene, o-	2.4E-10
Trichloroethane, 1,1,2-	2.3E-10
3-Ethyl benzaldehyde	2.3E-10
Aroclor 1254	2.2E-10
Dieldrin	2.2E-10
BHC, alpha-	2.0E-10
Styrene	2.0E-10
Iodomethane	1.9E-10
Bis(2-chlorethyl)ether	1.9E-10
2,2'-oxybis (1-Chloropropane)	1.8E-10
DDT, 4-4'-	1.7E-10
Benzo(a)Anthracene	1.5E-10
Benzo(k)fluoranthene	1.4E-10
OctaCDF, 1,2,3,4,6,7,8,9-	1.3E-10
4-Ethyl benzaldehyde	1.2E-10
gamma-BHC (Lindane)	1.1E-10
Methyl isobutyl ketone	1.1E-10
Indeno(1,2,3-cd) pyrene	1.1E-10
HexaCDD, 1,2,3,7,8,9-	1.0E-10

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Benzo(a)pyrene	9.5E-11
Ethylene dibromide	9.4E-11
HexaCDD, 1,2,3,6,7,8-	8.8E-11
Tetrahydrofuran	8.7E-11
1,3-Dichloropropane	7.2E-11
Butylbenzene, n-	6.9E-11
Dichloroethylene 1,1-	6.7E-11
2,2-Dichloropropane	6.6E-11
Butylbenzene, tert	6.6E-11
Tetrachloroethane, 1,1,1,2-	6.4E-11
DDD, 4,4'-	6.3E-11
Trichloroethane, 1,1,1-	5.8E-11
Trichloroethylene	5.4E-11
Vinyl Chloride	5.3E-11
Acenaphthene	4.9E-11
Pyrene	4.7E-11
Trimethylbenzene, 1,3,5-	4.6E-11
HeptaCDF, 1,2,3,4,6,7,8-	4.4E-11
2-Methylnaphthalene	4.1E-11
Dichlorobenzene, 1,2-	4.0E-11
Dichloroethane, 1,2- (Ethylene Dichloride)	3.6E-11
Anthracene	3.0E-11
Methoxychlor	2.6E-11
Dichlorobenzene,1,4-	2.4E-11
OctaCDD, 1,2,3,4,6,7,8,9-	2.3E-11
DDE, 4,4'-	2.1E-11
Cumene (Isopropylbenzene)	2.1E-11
2-Chlorotoluene	1.8E-11
4-Chlorotoluene	1.8E-11
Ethylene Glycol	1.8E-11
Fluorene	1.6E-11
Propylbenzene, n-	1.5E-11
1,2,4-Trimethylbenzene	1.3E-11
Dichloropropane, 1,2-	1.1E-11
Dichloroethylene, cis-1,2-	1.1E-11
HexaCDF, 1,2,3,7,8,9-	9.6E-12
Ethylbenzene	8.9E-12
Chloroethane	7.5E-12
Trichlorofluoromethane (Freon 11)	7.2E-12
Bromochloromethane	7.2E-12
methyl tert-butyl ether	6.5E-12
HeptaCDF, 1,2,3,4,7,8,9-	6.2E-12
Benzo(g,h,i)perylene	6.2E-12
Propylene oxide	4.6E-12
Dichloroethylene-1,2 (trans)	3.7E-12
Dichlorodifluoromethane	3.6E-12
Dichloroethane 1,1-	3.5E-12
HeptaCDD, 1,2,3,4,6,7,8-	2.3E-12
Methyl methacrylate	1.1E-12
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	4.7E-13
Dioxane, 1,4-	4.2E-13
Dibenz(a,h)anthracene	1.7E-13
Acrylic Acid	4.3E-14
1-Hexane (n-hexane)	7.6E-15
2,5-Dimethylfuran	NC
2,5-Dione, 3-hexene	NC
2-Methyl octane	NC
3-Hexen-2-one	NC
3-Penten-2-one (ethylidene acetone)	NC
9-Octadecenamide (oleamide)	NC
Benzo(e)pyrene	NC
Benzoic acid, methyl ester (methyl benzoate)	NC
delta-BHC	NC
Diallate	NC
Endosulfan II	NC
Endosulfan sulfate	NC
Endrin aldehyde	NC
Endrin ketone	NC
Isopropyl toluene, p-	NC
Perylene	NC
Phosphine imide, P,P,P-triphenyl	NC

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Total (b)	2.0E-02
R_3 resident farmer	
Nitrogen dioxide	9.4E-03
Arsenic	6.6E-03
Chlorine	2.3E-03
Sulfur dioxide	1.8E-03
Hydrogen chloride	1.0E-03
Beryllium	2.5E-04
Cadmium	1.0E-04
Lead	2.1E-05
Nickel	1.6E-05
Copper	1.2E-05
Mercury	1.0E-05
Mercuric chloride	2.5E-06
Hexachlorobenzene	2.2E-06
Chlorophenyl-phenylether, 4-	2.0E-06
Benzidine	1.5E-06
Dibromo-3-chloropropane, 1,2-	1.2E-06
Chloroform (Trichloromethane)	7.4E-07
Hexachlorocyclopentadiene	5.1E-07
Thallium (I)	3.1E-07
4,6-Dinitro-2-methylphenol	2.9E-07
Vanadium	1.6E-07
Manganese	1.5E-07
Pentachlorophenol	1.4E-07
PentaCDF, 2,3,4,7,8-	9.1E-08
Silver	9.1E-08
Tetrachloroethylene (Perchloroethylene)	7.5E-08
Nitrosodipropylamine, n-	6.5E-08
Barium	6.0E-08
Zinc	5.0E-08
Fluoranthene	4.4E-08
Chromium	3.9E-08
Chromium, hexavalent	3.9E-08
Aluminum	3.8E-08
Bromoform (tribromomethane)	3.7E-08
Antimony	3.5E-08
Benzoic Acid	3.0E-08
Dinitrotoluene, 2,4-	3.0E-08
Chlorobenzene	2.8E-08
Benzene	2.7E-08
Ethylhexyl phthalate, bis-2-	2.6E-08
Selenium	2.5E-08
Dibromochloromethane	2.4E-08
Dinitrotoluene, 2,6-	2.4E-08
Bromodichloromethane	1.8E-08
Methylene chloride	1.7E-08
Dinitrophenol, 2,4-	1.6E-08
Methyl bromide (Bromomethane)	1.6E-08
Nitrophenol, 4-	1.6E-08
Nitroaniline, 3-	1.6E-08
Chloronaphthalene,2-	1.5E-08
3-Penten-2-one, 4-methyl	1.2E-08
Dichlorobenzidine, 3,3'-	1.2E-08
Methylene bromide	1.1E-08
Pentachloronitrobenzene (PCNB)	9.3E-09
Dimethylphenol, 2,4-	6.9E-09
Acrylonitrile	6.7E-09
Chlorobenzilate	6.4E-09
Nitrophenol, 2-	5.9E-09
Carbazole	5.3E-09
Dinitrobenzene, 1,3-	4.8E-09
Carbon Tetrachloride	4.8E-09
Benzyl alcohol	4.7E-09
Methyl ethyl ketone (2-Butanone)	4.7E-09
Benzaldehyde	4.4E-09
Toluene	4.3E-09
Heptachlor	3.9E-09
Nitroaniline, 4-	3.5E-09

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Benzonitrile	3.3E-09
Di-n-butyl phthalate	3.3E-09
Aniline	3.2E-09
TetraCDF, 2,3,7,8-	2.9E-09
Carbon Disulfide	2.7E-09
Phenol	2.6E-09
Heptachlor epoxide	2.2E-09
Endrin	2.2E-09
Phenanthrene	2.0E-09
Cobalt	1.9E-09
Chlorophenol, 2-	1.9E-09
Chloroaniline, p-	1.9E-09
Acetone	1.7E-09
HexaCDF, 1,2,3,6,7,8-	1.7E-09
HexaCDF, 2,3,4,6,7,8-	1.6E-09
Methyl chloride (Chloromethane)	1.6E-09
Trichlorobenzene, 1,2,3-	1.5E-09
Acetophenone	1.5E-09
Bromophenyl-phenylether, 4-	1.5E-09
Chloro-3-methylphenol, 4-	1.5E-09
Hexachloro-1,3-butadiene (Perchlorobutadiene)	1.4E-09
Cresol, o-	1.4E-09
N-nitrosodimethylamine	1.2E-09
HexaCDF, 1,2,3,4,7,8-	1.1E-09
HexaCDD, 1,2,3,4,7,8-	1.0E-09
Butylbenzylphthalate	9.8E-10
Dichlorobenzene, 1,3-	9.5E-10
Diethyl phthalate	9.0E-10
Tetrachloroethane, 1,1,2,2-	8.9E-10
PentaCDF, 1,2,3,7,8-	8.7E-10
Vinyl Acetate	8.6E-10
Dichloropropene, 1,3- (cis)	8.1E-10
Bis(2-chloroethoxy) methane	7.5E-10
PentaCDD, 1,2,3,7,8-	7.2E-10
Trichlorophenol, 2,4,5-	7.2E-10
Nitrobenzene	7.0E-10
Nitroaniline, 2-	7.0E-10
Benzo(b)fluoranthene	6.6E-10
2,5-Dimethylheptane	6.4E-10
Naphthalene	6.4E-10
2-Hexanone	6.3E-10
Hexachloroethane (Perchloroethane)	6.2E-10
Cresol, m-	6.1E-10
Cresol, p-	6.1E-10
Dimethyl phthalate	6.0E-10
Endosulfan I	5.9E-10
Dichlorophenol, 2,4-	5.8E-10
Trichlorophenol, 2,4,6-	5.7E-10
Acenaphthylene	5.4E-10
Chlordane	5.4E-10
Pyridine	5.0E-10
BHC, beta-	5.0E-10
Dibenzofuran	4.7E-10
Diphenylamine	4.7E-10
Bromobenzene	4.5E-10
Aldrin	4.4E-10
Isophorone	4.3E-10
Tetrachlorobenzene, 1,2,4,5-	4.3E-10
Nitrosodiphenylamine, N-	4.2E-10
TetraCDD, 2,3,7,8-	4.1E-10
Pentachlorobenzene	4.0E-10
Di-n-octylphthalate	3.9E-10
Trichlorobenzene, 1,2,4-	3.6E-10
Xylene, m-	3.5E-10
Xylene, p-	3.5E-10
Diphenylhydrazine,1,2-	3.1E-10
Trichloropropane, 1,2,3-	2.8E-10
Butylbenzene, sec	2.6E-10
Chrysene	2.6E-10
1,1-Dichloropropene	2.3E-10
Xylene, o-	2.3E-10

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Trichloroethane, 1,1,2-	2.2E-10
3-Ethyl benzaldehyde	2.1E-10
Aroclor 1254	2.1E-10
Dieldrin	2.1E-10
BHC, alpha-	1.9E-10
Styrene	1.8E-10
Iodomethane	1.8E-10
Bis(2-chlorethyl)ether	1.8E-10
2,2'-oxybis (1-Chloropropane)	1.7E-10
DDT, 4-4'-	1.6E-10
Benzo(a)Anthracene	1.4E-10
Benzo(k)fluoranthene	1.4E-10
OctaCDF, 1,2,3,4,6,7,8,9-	1.2E-10
4-Ethyl benzaldehyde	1.2E-10
gamma-BHC (Lindane)	1.0E-10
Indeno(1,2,3-cd) pyrene	1.0E-10
Methyl isobutyl ketone	1.0E-10
HexaCDD, 1,2,3,7,8,9-	9.9E-11
Benzo(a)pyrene	9.0E-11
Ethylene dibromide	8.9E-11
HexaCDD, 1,2,3,6,7,8-	8.4E-11
Tetrahydrofuran	8.2E-11
1,3-Dichloropropane	6.7E-11
Butylbenzene, n-	6.5E-11
Dichloroethylene 1,1-	6.3E-11
2,2-Dichloropropane	6.2E-11
Butylbenzene, tert	6.2E-11
Tetrachloroethane, 1,1,1,2-	6.0E-11
DDD, 4,4'-	6.0E-11
Trichloroethane, 1,1,1-	5.5E-11
Trichloroethylene	5.1E-11
Vinyl Chloride	5.0E-11
Acenaphthene	4.6E-11
Pyrene	4.4E-11
Trimethylbenzene, 1,3,5-	4.4E-11
HeptaCDF, 1,2,3,4,6,7,8-	4.2E-11
2-Methylnaphthalene	3.9E-11
Dichlorobenzene, 1,2-	3.8E-11
Dichloroethane, 1,2- (Ethylene Dichloride)	3.4E-11
Anthracene	2.9E-11
Methoxychlor	2.5E-11
Dichlorobenzene,1,4-	2.2E-11
OctaCDD, 1,2,3,4,6,7,8,9-	2.2E-11
DDE, 4,4'-	2.0E-11
Cumene (Isopropylbenzene)	2.0E-11
2-Chlorotoluene	1.7E-11
4-Chlorotoluene	1.7E-11
Ethylene Glycol	1.7E-11
Fluorene	1.5E-11
Propylbenzene, n-	1.4E-11
1,2,4-Trimethylbenzene	1.2E-11
Dichloropropane, 1,2-	1.1E-11
Dichloroethylene, cis-1,2-	1.0E-11
HexaCDF, 1,2,3,7,8,9-	9.2E-12
Ethylbenzene	8.4E-12
Chloroethane	7.1E-12
Trichlorofluoromethane (Freon 11)	6.8E-12
Bromochloromethane	6.8E-12
methyl tert-butyl ether	6.1E-12
HeptaCDF, 1,2,3,4,7,8,9-	6.0E-12
Benzo(g,h,i)perylene	5.9E-12
Propylene oxide	4.3E-12
Dichloroethylene-1,2 (trans)	3.5E-12
Dichlorodifluoromethane	3.4E-12
Dichloroethane 1,1-	3.3E-12
HeptaCDD, 1,2,3,4,6,7,8-	2.2E-12
Methyl methacrylate	1.1E-12
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	4.5E-13
Dioxane, 1,4-	4.0E-13
Dibenz(a,h)anthracene	1.6E-13
Acrylic Acid	4.0E-14

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
1-Hexane (n-hexane)	7.1E-15
2,5-Dimethylfuran	NC
2,5-Dione, 3-hexene	NC
2-Methyl octane	NC
3-Hexen-2-one	NC
3-Penten-2-one (ethylidene acetone)	NC
9-Octadecenamide (oleamide)	NC
Benzo(e)pyrene	NC
Benzoic acid, methyl ester (methyl benzoate)	NC
delta-BHC	NC
Diallate	NC
Endosulfan II	NC
Endosulfan sulfate	NC
Endrin aldehyde	NC
Endrin ketone	NC
Isopropyl toluene, p-	NC
Perylene	NC
Phosphine imide, P,P,P-triphenyl	NC
Total (b)	2.0E-02
R_4 resident farmer	
Nitrogen dioxide	1.5E-02
Arsenic	1.1E-02
Chlorine	3.7E-03
Sulfur dioxide	2.9E-03
Hydrogen chloride	1.7E-03
Beryllium	4.2E-04
Cadmium	1.7E-04
Lead	3.5E-05
Nickel	2.8E-05
Copper	2.0E-05
Mercury	1.6E-05
Mercuric chloride	4.1E-06
Hexachlorobenzene	3.6E-06
Chlorophenyl-phenylether, 4-	3.2E-06
Benzidine	2.4E-06
Dibromo-3-chloropropane, 1,2-	1.9E-06
Chloroform (Trichloromethane)	1.2E-06
Hexachlorocyclopentadiene	8.2E-07
Thallium (I)	5.2E-07
4,6-Dinitro-2-methylphenol	4.8E-07
Vanadium	2.7E-07
Manganese	2.6E-07
Pentachlorophenol	2.3E-07
Silver	1.5E-07
PentaCDF, 2,3,4,7,8-	1.5E-07
Tetrachloroethylene (Perchloroethylene)	1.2E-07
Nitrosodipropylamine, n-	1.0E-07
Barium	1.0E-07
Zinc	8.4E-08
Fluoranthene	7.1E-08
Chromium	6.5E-08
Chromium, hexavalent	6.5E-08
Aluminum	6.4E-08
Bromoform (tribromomethane)	6.0E-08
Antimony	5.7E-08
Benzoic Acid	4.9E-08
Dinitrotoluene, 2,4-	4.8E-08
Chlorobenzene	4.5E-08
Ethylhexyl phthalate, bis-2-	4.4E-08
Benzene	4.3E-08
Selenium	4.3E-08
Dibromochloromethane	3.9E-08
Dinitrotoluene, 2,6-	3.9E-08
Bromodichloromethane	3.0E-08
Methylene chloride	2.7E-08
Dinitrophenol, 2,4-	2.7E-08
Methyl bromide (Bromomethane)	2.6E-08
Nitrophenol, 4-	2.5E-08
Nitroaniline, 3-	2.5E-08

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Chloronaphthalene,2-	2.4E-08
3-Penten-2-one, 4-methyl	2.0E-08
Dichlorobenzidine, 3,3'-	2.0E-08
Methylene bromide	1.9E-08
Pentachloronitrobenzene (PCNB)	1.5E-08
Dimethylphenol, 2,4-	1.1E-08
Acrylonitrile	1.1E-08
Chlorobenzilate	1.1E-08
Nitrophenol, 2-	9.6E-09
Carbazole	8.6E-09
Dinitrobenzene, 1,3-	7.8E-09
Carbon Tetrachloride	7.8E-09
Benzyl alcohol	7.6E-09
Methyl ethyl ketone (2-Butanone)	7.6E-09
Benzaldehyde	7.1E-09
Toluene	7.0E-09
Heptachlor	6.3E-09
Nitroaniline, 4-	5.7E-09
Benzonitrile	5.4E-09
Di-n-butyl phthalate	5.4E-09
Aniline	5.1E-09
TetraCDF, 2,3,7,8-	4.8E-09
Carbon Disulfide	4.4E-09
Phenol	4.3E-09
Endrin	3.6E-09
Heptachlor epoxide	3.6E-09
Phenanthrene	3.3E-09
Cobalt	3.2E-09
Chlorophenol, 2-	3.1E-09
Chloroaniline, p-	3.0E-09
HexaCDF, 1,2,3,6,7,8-	2.9E-09
Acetone	2.8E-09
HexaCDF, 2,3,4,6,7,8-	2.7E-09
Methyl chloride (Chloromethane)	2.6E-09
Trichlorobenzene, 1,2,3-	2.5E-09
Acetophenone	2.5E-09
Bromophenyl-phenylether, 4-	2.4E-09
Chloro-3-methylphenol, 4-	2.4E-09
Hexachloro-1,3-butadiene (Perchlorobutadiene)	2.3E-09
Cresol, o-	2.3E-09
N-nitrosodimethylamine	2.0E-09
HexaCDF, 1,2,3,4,7,8-	1.8E-09
HexaCDD, 1,2,3,4,7,8-	1.7E-09
Butylbenzylphthalate	1.6E-09
Dichlorobenzene, 1,3-	1.5E-09
Diethyl phthalate	1.5E-09
PentaCDF, 1,2,3,7,8-	1.5E-09
Tetrachloroethane, 1,1,2,2-	1.4E-09
Vinyl Acetate	1.4E-09
Dichloropropene, 1,3- (cis)	1.3E-09
PentaCDD, 1,2,3,7,8-	1.2E-09
Bis(2-chloroethoxy) methane	1.2E-09
Trichlorophenol, 2,4,5-	1.2E-09
Nitrobenzene	1.1E-09
Nitroaniline, 2-	1.1E-09
Benzo(b)fluoranthene	1.1E-09
2,5-Dimethylheptane	1.0E-09
Naphthalene	1.0E-09
2-Hexanone	1.0E-09
Hexachloroethane (Perchloroethane)	1.0E-09
Cresol, m-	1.0E-09
Cresol, p-	1.0E-09
Dimethyl phthalate	9.8E-10
Endosulfan I	9.5E-10
Dichlorophenol, 2,4-	9.4E-10
Trichlorophenol, 2,4,6-	9.2E-10
Acenaphthylene	8.8E-10
Chlordane	8.7E-10
Pyridine	8.1E-10
BHC, beta-	8.0E-10
Dibenzofuran	7.7E-10

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Diphenylamine	7.6E-10
Bromobenzene	7.3E-10
Aldrin	7.1E-10
Isophorone	6.9E-10
Tetrachlorobenzene, 1,2,4,5-	6.9E-10
Nitrosodiphenylamine, N-	6.9E-10
TetraCDD, 2,3,7,8-	6.8E-10
Pentachlorobenzene	6.4E-10
Di-n-octylphthalate	6.4E-10
Trichlorobenzene, 1,2,4-	5.8E-10
Xylene, m-	5.7E-10
Xylene, p-	5.7E-10
Diphenylhydrazine,1,2-	5.1E-10
Trichloropropane, 1,2,3-	4.5E-10
Butylbenzene, sec	4.3E-10
Chrysene	4.2E-10
1,1-Dichloropropene	3.7E-10
Xylene, o-	3.7E-10
Trichloroethane, 1,1,2-	3.5E-10
3-Ethyl benzaldehyde	3.5E-10
Aroclor 1254	3.4E-10
Dieldrin	3.4E-10
BHC, alpha-	3.1E-10
Styrene	3.0E-10
Iodomethane	3.0E-10
Bis(2-chlorethyl)ether	3.0E-10
2,2'-oxybis (1-Chloropropane)	2.8E-10
DDT, 4-4'-	2.6E-10
Benzo(a)Anthracene	2.3E-10
Benzo(k)fluoranthene	2.3E-10
OctaCDF, 1,2,3,4,6,7,8,9-	2.1E-10
4-Ethyl benzaldehyde	1.9E-10
Indeno(1,2,3-cd) pyrene	1.7E-10
gamma-BHC (Lindane)	1.7E-10
HexaCDD, 1,2,3,7,8,9-	1.7E-10
Methyl isobutyl ketone	1.6E-10
Benzo(a)pyrene	1.5E-10
Ethylene dibromide	1.4E-10
HexaCDD, 1,2,3,6,7,8-	1.4E-10
Tetrahydrofuran	1.3E-10
1,3-Dichloropropane	1.1E-10
Butylbenzene, n-	1.1E-10
Dichloroethylene 1,1-	1.0E-10
2,2-Dichloropropane	1.0E-10
Butylbenzene, tert	1.0E-10
Tetrachloroethane, 1,1,1,2-	9.7E-11
DDD, 4,4'-	9.7E-11
Trichloroethane, 1,1,1-	8.9E-11
Trichloroethylene	8.2E-11
Vinyl Chloride	8.2E-11
Acenaphthene	7.5E-11
Pyrene	7.2E-11
HeptaCDF, 1,2,3,4,6,7,8-	7.1E-11
Trimethylbenzene, 1,3,5-	7.1E-11
2-Methylnaphthalene	6.3E-11
Dichlorobenzene, 1,2-	6.1E-11
Dichloroethane, 1,2- (Ethylene Dichloride)	5.5E-11
Anthracene	4.7E-11
Methoxychlor	4.0E-11
OctaCDD, 1,2,3,4,6,7,8,9-	3.8E-11
Dichlorobenzene,1,4-	3.6E-11
DDE, 4,4'-	3.3E-11
Cumene (Isopropylbenzene)	3.2E-11
2-Chlorotoluene	2.8E-11
4-Chlorotoluene	2.8E-11
Ethylene Glycol	2.7E-11
Fluorene	2.4E-11
Propylbenzene, n-	2.3E-11
1,2,4-Trimethylbenzene	2.0E-11
Dichloropropane, 1,2-	1.7E-11
Dichloroethylene, cis-1,2-	1.6E-11

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
HexaCDF, 1,2,3,7,8,9-	1.5E-11
Ethylbenzene	1.4E-11
Chloroethane	1.2E-11
Trichlorofluoromethane (Freon 11)	1.1E-11
Bromochloromethane	1.1E-11
HeptaCDF, 1,2,3,4,7,8,9-	1.0E-11
Benzo(g,h,i)perylene	1.0E-11
methyl tert-butyl ether	9.9E-12
Propylene oxide	7.0E-12
Dichloroethylene-1,2 (trans)	5.7E-12
Dichlorodifluoromethane	5.6E-12
Dichloroethane 1,1-	5.4E-12
HeptaCDD, 1,2,3,4,6,7,8-	3.7E-12
Methyl methacrylate	1.7E-12
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	7.3E-13
Dioxane, 1,4-	6.5E-13
Dibenz(a,h)anthracene	2.6E-13
Acrylic Acid	6.5E-14
1-Hexane (n-hexane)	1.2E-14
2,5-Dimethylfuran	NC
2,5-Dione, 3-hexene	NC
2-Methyl octane	NC
3-Hexen-2-one	NC
3-Penten-2-one (ethylidene acetone)	NC
9-Octadecenamide (oleamide)	NC
Benzo(e)pyrene	NC
Benzoic acid, methyl ester (methyl benzoate)	NC
delta-BHC	NC
Diallate	NC
Endosulfan II	NC
Endosulfan sulfate	NC
Endrin aldehyde	NC
Endrin ketone	NC
Isopropyl toluene, p-	NC
Perylene	NC
Phosphine imide, P,P,P-triphenyl	NC
Total (b)	4.0E-02

NC = Not calculated.

(a) Acute hazard quotients were calculated for all compounds with stack air emission rates and acute inhalation toxicity criteria.

(b) The total is based on the sum of all chemical-specific hazard quotients regardless of the type of health effects of the summed compounds. A total value summed across all compounds is used as a screening tool only, to determine if additional evaluation for specific types of health effects is warranted (i.e., if the total value is greater than 1).

APPENDIX G

STACK EMISSIONS RISK ASSESSMENT: CHRONIC MULTIPLE PATHWAY RISK RESULTS BY PATHWAY AND RECEPTOR

Appendix G

Stack Emissions Risk Assessment:
Chronic Multipathway Risk Results by Pathway and Receptor

Group 1: All Detected Compounds

Stack Emissions Risk Assessment
Chronic Multipathway Risk Results by Pathway and Receptor
Group 1: All Detected Compounds (a)
(IRAP Software Output Information)

Receptor	Scenario	Pathway (b)	Total Excess Lifetime Cancer Risk	Total Non-Cancer Hazard Index
R_1 resident	resident_adult	air_crisk_inhale	1.9E-08	1.1E-02
R_1 resident	resident_adult	intake_crisk_ag	5.2E-09	1.4E-04
R_1 resident	resident_adult	intake_crisk_soil	9.4E-11	1.4E-06
		Total	2E-08	1E-02
R_1 resident	resident_child	air_crisk_inhale	3.8E-09	1.1E-02
R_1 resident	resident_child	intake_crisk_ag	2.5E-09	3.3E-04
R_1 resident	resident_child	intake_crisk_soil	1.8E-10	1.3E-05
		Total	7E-09	1E-02
R_2 resident	resident_adult	air_crisk_inhale	6.4E-08	4.8E-02
R_2 resident	resident_adult	intake_crisk_ag	1.1E-08	3.1E-04
R_2 resident	resident_adult	intake_crisk_soil	2.6E-10	4.9E-06
		Total	8E-08	5E-02
R_2 resident	resident_child	air_crisk_inhale	1.3E-08	4.8E-02
R_2 resident	resident_child	intake_crisk_ag	5.5E-09	7.4E-04
R_2 resident	resident_child	intake_crisk_soil	4.8E-10	4.6E-05
		Total	2E-08	5E-02
R_3 resident farmer	farmer_adult	air_crisk_inhale	2.5E-08	1.5E-02
R_3 resident farmer	farmer_adult	intake_crisk_ag	2.6E-09	4.2E-05
R_3 resident farmer	farmer_adult	intake_crisk_beef	2.4E-08	3.3E-06
R_3 resident farmer	farmer_adult	intake_crisk_chick	2.7E-12	6.2E-09
R_3 resident farmer	farmer_adult	intake_crisk_eggs	1.7E-12	5.4E-09
R_3 resident farmer	farmer_adult	intake_crisk_pork	6.0E-11	1.9E-09
R_3 resident farmer	farmer_adult	intake_crisk_soil	6.5E-11	2.9E-07
		Total	5E-08	1E-02
R_3 resident farmer	farmer_child	air_crisk_inhale	3.8E-09	1.5E-02
R_3 resident farmer	farmer_child	intake_crisk_ag	9.3E-10	1.0E-04
R_3 resident farmer	farmer_child	intake_crisk_beef	2.2E-09	2.1E-06
R_3 resident farmer	farmer_child	intake_crisk_chick	2.5E-13	4.2E-09
R_3 resident farmer	farmer_child	intake_crisk_eggs	1.6E-13	3.9E-09
R_3 resident farmer	farmer_child	intake_crisk_pork	6.1E-12	1.4E-09
R_3 resident farmer	farmer_child	intake_crisk_soil	8.1E-11	2.7E-06
		Total	7E-09	1E-02
R_4 resident farmer	farmer_adult	air_crisk_inhale	2.3E-08	1.2E-02
R_4 resident farmer	farmer_adult	intake_crisk_ag	2.9E-09	5.0E-05
R_4 resident farmer	farmer_adult	intake_crisk_beef	2.1E-08	3.9E-06
R_4 resident farmer	farmer_adult	intake_crisk_chick	2.5E-12	5.7E-09
R_4 resident farmer	farmer_adult	intake_crisk_eggs	1.6E-12	4.6E-09
R_4 resident farmer	farmer_adult	intake_crisk_pork	5.5E-11	1.6E-09
R_4 resident farmer	farmer_adult	intake_crisk_soil	6.1E-11	2.8E-07
		Total	5E-08	1E-02
R_4 resident farmer	farmer_child	air_crisk_inhale	3.4E-09	1.2E-02
R_4 resident farmer	farmer_child	intake_crisk_ag	1.0E-09	1.2E-04
R_4 resident farmer	farmer_child	intake_crisk_beef	1.9E-09	2.4E-06
R_4 resident farmer	farmer_child	intake_crisk_chick	2.3E-13	3.9E-09
R_4 resident farmer	farmer_child	intake_crisk_eggs	1.5E-13	3.3E-09
R_4 resident farmer	farmer_child	intake_crisk_pork	5.6E-12	1.2E-09
R_4 resident farmer	farmer_child	intake_crisk_soil	7.6E-11	2.6E-06
		Total	6E-09	1E-02
R_only fish_drain	fisher_adult	intake_crisk_fish	3.7E-08	1.4E-02
		Total	4E-08	1E-02

Stack Emissions Risk Assessment
Chronic Multipathway Risk Results by Pathway and Receptor
Group 1: All Detected Compounds (a)
(IRAP Software Output Information)

Receptor	Scenario	Pathway (b)	Total Excess Lifetime Cancer Risk	Total Non-Cancer Hazard Index
R_only fish_drain	fisher_child	intake_crisk_fish	5.2E-09	1.0E-02
		Total	5E-09	1E-02
R_only fish_river	fisher_adult	intake_crisk_fish	2.9E-08	3.8E-03
		Total	3E-08	4E-03
R_only fish_river	fisher_child	intake_crisk_fish	4.1E-09	2.7E-03
		Total	4E-09	3E-03
Farmer area	farmer_adult	air_crisk_inhale	1.0E-08	5.8E-03
Farmer area	farmer_adult	intake_crisk_ag	6.9E-10	1.0E-05
Farmer area	farmer_adult	intake_crisk_beef	9.4E-09	8.0E-07
Farmer area	farmer_adult	intake_crisk_chick	9.7E-13	2.2E-09
Farmer area	farmer_adult	intake_crisk_eggs	6.2E-13	2.1E-09
Farmer area	farmer_adult	intake_crisk_pork	2.2E-11	7.4E-10
Farmer area	farmer_adult	intake_crisk_soil	2.3E-11	9.9E-08
		Total	2E-08	6E-03
Farmer area	farmer_child	air_crisk_inhale	1.6E-09	5.8E-03
Farmer area	farmer_child	intake_crisk_ag	2.5E-10	2.4E-05
Farmer area	farmer_child	intake_crisk_beef	8.7E-10	4.9E-07
Farmer area	farmer_child	intake_crisk_chick	8.9E-14	1.5E-09
Farmer area	farmer_child	intake_crisk_eggs	5.9E-14	1.5E-09
Farmer area	farmer_child	intake_crisk_pork	2.2E-12	5.6E-10
Farmer area	farmer_child	intake_crisk_soil	2.9E-11	9.2E-07
		Total	3E-09	6E-03
Town area	resident_adult	air_crisk_inhale	1.3E-08	1.1E-02
Town area	resident_adult	intake_crisk_ag	8.9E-10	2.7E-05
Town area	resident_adult	intake_crisk_soil	3.8E-11	9.7E-07
		Total	1E-08	1E-02
Town area	resident_child	air_crisk_inhale	2.6E-09	1.1E-02
Town area	resident_child	intake_crisk_ag	4.3E-10	6.6E-05
Town area	resident_child	intake_crisk_soil	7.1E-11	9.1E-06
		Total	3E-09	1E-02

(a) Group 1 includes 95 compounds that were detected in the Performance Demonstration Test (PDT) in addition to several compounds that were not measured during the PDT but which were evaluated based on emission rates derived from feed rates.

(b) Exposure pathway definitions:

IRAP Term	Exposure pathway
air_crisk_inhale	= inhalation of air
intake_crisk_ag	= ingestion of produce
intake_crisk_beef	= ingestion of beef
intake_crisk_chick	= ingestion of chicken
intake_crisk_eggs	= ingestion of eggs
intake_crisk_pork	= ingestion of pork
intake_crisk_soil	= incidental ingestion of soil
intake_crisk_fish	= ingestion of fish

Appendix G

Stack Emissions Risk Assessment:
Chronic Multipathway Risk Results by Pathway and Receptor

Group 2: All Compounds (except benzidine)

Stack Emissions Risk Assessment
Chronic Multipathway Risk Results by Pathway and Receptor
Group 2: All Compounds (except benzidine) (a)
(IRAP Software Output Information)

Receptor	Scenario	Pathway (b)	Total Excess Lifetime Cancer Risk	Total Non-Cancer Hazard Index
R_1 resident	resident_adult	air_crisk_inhale	4.4E-08	1.2E-02
R_1 resident	resident_adult	intake_crisk_ag	1.3E-08	1.8E-04
R_1 resident	resident_adult	intake_crisk_soil	9.5E-11	1.5E-06
		Total	6E-08	1E-02
R_1 resident	resident_child	air_crisk_inhale	8.8E-09	1.2E-02
R_1 resident	resident_child	intake_crisk_ag	6.4E-09	4.3E-04
R_1 resident	resident_child	intake_crisk_soil	1.8E-10	1.4E-05
		Total	2E-08	1E-02
R_2 resident	resident_adult	air_crisk_inhale	1.4E-07	5.1E-02
R_2 resident	resident_adult	intake_crisk_ag	3.2E-08	4.1E-04
R_2 resident	resident_adult	intake_crisk_soil	2.6E-10	5.0E-06
		Total	2E-07	5E-02
R_2 resident	resident_child	air_crisk_inhale	2.9E-08	5.1E-02
R_2 resident	resident_child	intake_crisk_ag	1.5E-08	9.8E-04
R_2 resident	resident_child	intake_crisk_soil	4.9E-10	4.7E-05
		Total	4E-08	5E-02
R_3 resident farmer	farmer_adult	air_crisk_inhale	5.6E-08	1.5E-02
R_3 resident farmer	farmer_adult	intake_crisk_ag	6.1E-09	6.1E-05
R_3 resident farmer	farmer_adult	intake_crisk_beef	2.6E-08	9.8E-06
R_3 resident farmer	farmer_adult	intake_crisk_chick	2.7E-12	6.3E-09
R_3 resident farmer	farmer_adult	intake_crisk_eggs	1.7E-12	5.5E-09
R_3 resident farmer	farmer_adult	intake_crisk_pork	6.1E-11	4.3E-09
R_3 resident farmer	farmer_adult	intake_crisk_soil	6.5E-11	3.1E-07
		Total	9E-08	2E-02
R_3 resident farmer	farmer_child	air_crisk_inhale	8.5E-09	1.5E-02
R_3 resident farmer	farmer_child	intake_crisk_ag	2.2E-09	1.4E-04
R_3 resident farmer	farmer_child	intake_crisk_beef	2.4E-09	6.0E-06
R_3 resident farmer	farmer_child	intake_crisk_chick	2.5E-13	4.3E-09
R_3 resident farmer	farmer_child	intake_crisk_eggs	1.6E-13	3.9E-09
R_3 resident farmer	farmer_child	intake_crisk_pork	6.2E-12	3.3E-09
R_3 resident farmer	farmer_child	intake_crisk_soil	8.2E-11	2.9E-06
		Total	1E-08	2E-02
R_4 resident farmer	farmer_adult	air_crisk_inhale	5.0E-08	1.3E-02
R_4 resident farmer	farmer_adult	intake_crisk_ag	6.9E-09	7.0E-05
R_4 resident farmer	farmer_adult	intake_crisk_beef	2.3E-08	1.2E-05
R_4 resident farmer	farmer_adult	intake_crisk_chick	2.5E-12	5.8E-09
R_4 resident farmer	farmer_adult	intake_crisk_eggs	1.6E-12	4.7E-09
R_4 resident farmer	farmer_adult	intake_crisk_pork	5.6E-11	3.7E-09
R_4 resident farmer	farmer_adult	intake_crisk_soil	6.1E-11	3.0E-07
		Total	8E-08	1E-02
R_4 resident farmer	farmer_child	air_crisk_inhale	7.6E-09	1.3E-02
R_4 resident farmer	farmer_child	intake_crisk_ag	2.5E-09	1.6E-04
R_4 resident farmer	farmer_child	intake_crisk_beef	2.1E-09	7.2E-06
R_4 resident farmer	farmer_child	intake_crisk_chick	2.4E-13	4.0E-09
R_4 resident farmer	farmer_child	intake_crisk_eggs	1.5E-13	3.4E-09
R_4 resident farmer	farmer_child	intake_crisk_pork	5.7E-12	2.8E-09
R_4 resident farmer	farmer_child	intake_crisk_soil	7.7E-11	2.8E-06
		Total	1E-08	1E-02
R_only fish_drain	fisher_adult	intake_crisk_fish	3.9E-08	1.4E-02
		Total	4E-08	1E-02

Stack Emissions Risk Assessment
Chronic Multipathway Risk Results by Pathway and Receptor
Group 2: All Compounds (except benzidine) (a)
(IRAP Software Output Information)

Receptor	Scenario	Pathway (b)	Total Excess Lifetime Cancer Risk	Total Non-Cancer Hazard Index
R_only fish_drain	fisher_child	intake_crisk_fish	5.6E-09	1.0E-02
		Total	6E-09	1E-02
R_only fish_river	fisher_adult	intake_crisk_fish	3.0E-08	3.8E-03
		Total	3E-08	4E-03
R_only fish_river	fisher_child	intake_crisk_fish	4.3E-09	2.7E-03
		Total	4E-09	3E-03
Farmer area	farmer_adult	air_crisk_inhale	2.3E-08	6.1E-03
Farmer area	farmer_adult	intake_crisk_ag	1.6E-09	1.6E-05
Farmer area	farmer_adult	intake_crisk_beef	9.8E-09	2.3E-06
Farmer area	farmer_adult	intake_crisk_chick	9.8E-13	2.2E-09
Farmer area	farmer_adult	intake_crisk_eggs	6.2E-13	2.2E-09
Farmer area	farmer_adult	intake_crisk_pork	2.2E-11	1.7E-09
Farmer area	farmer_adult	intake_crisk_soil	2.3E-11	1.0E-07
		Total	3E-08	6E-03
Farmer area	farmer_child	air_crisk_inhale	3.4E-09	6.1E-03
Farmer area	farmer_child	intake_crisk_ag	5.9E-10	3.6E-05
Farmer area	farmer_child	intake_crisk_beef	9.0E-10	1.4E-06
Farmer area	farmer_child	intake_crisk_chick	9.0E-14	1.5E-09
Farmer area	farmer_child	intake_crisk_eggs	6.0E-14	1.5E-09
Farmer area	farmer_child	intake_crisk_pork	2.2E-12	1.3E-09
Farmer area	farmer_child	intake_crisk_soil	2.9E-11	9.6E-07
		Total	5E-09	6E-03
Town area	resident_adult	air_crisk_inhale	2.9E-08	1.2E-02
Town area	resident_adult	intake_crisk_ag	3.4E-09	3.8E-05
Town area	resident_adult	intake_crisk_soil	3.9E-11	9.8E-07
		Total	3E-08	1E-02
Town area	resident_child	air_crisk_inhale	5.8E-09	1.2E-02
Town area	resident_child	intake_crisk_ag	1.5E-09	8.7E-05
Town area	resident_child	intake_crisk_soil	7.3E-11	9.2E-06
		Total	7E-09	1E-02

(a) Group 2 includes over 170 compounds, of which 82 were not detected in the Performance Demonstration Test (PDT). This group does not include benzidine which was not detected in the PDT.

(b) Exposure pathway definitions:

IRAP Term	Exposure pathway
air_crisk_inhale	= inhalation of air
intake_crisk_ag	= ingestion of produce
intake_crisk_beef	= ingestion of beef
intake_crisk_chick	= ingestion of chicken
intake_crisk_eggs	= ingestion of eggs
intake_crisk_pork	= ingestion of pork
intake_crisk_soil	= incidental ingestion of soil
intake_crisk_fish	= ingestion of fish

Appendix G

Stack Emissions Risk Assessment:
Chronic Multipathway Risk Results by Pathway and Receptor

Group 3: All Compounds

Stack Emissions Risk Assessment
Chronic Multipathway Risk Results by Pathway and Receptor
Group 3: All Compounds (a)
(IRAP Software Output Information)

Receptor	Scenario	Pathway (b)	Total Excess Lifetime Cancer Risk	Total Non-Cancer Hazard Index
R_1 resident	resident_adult	air_crisk_inhale	1.3E-07	1.2E-02
R_1 resident	resident_adult	intake_crisk_ag	5.9E-07	1.8E-04
R_1 resident	resident_adult	intake_crisk_soil	9.9E-10	1.5E-06
		Total	7E-07	1E-02
R_1 resident	resident_child	air_crisk_inhale	2.5E-08	1.2E-02
R_1 resident	resident_child	intake_crisk_ag	2.8E-07	4.4E-04
R_1 resident	resident_child	intake_crisk_soil	1.8E-09	1.4E-05
		Total	3E-07	1E-02
R_2 resident	resident_adult	air_crisk_inhale	5.0E-07	5.1E-02
R_2 resident	resident_adult	intake_crisk_ag	1.6E-06	4.2E-04
R_2 resident	resident_adult	intake_crisk_soil	2.6E-09	5.1E-06
		Total	2E-06	5E-02
R_2 resident	resident_child	air_crisk_inhale	1.0E-07	5.1E-02
R_2 resident	resident_child	intake_crisk_ag	7.9E-07	1.0E-03
R_2 resident	resident_child	intake_crisk_soil	4.9E-09	4.7E-05
		Total	9E-07	5E-02
R_3 resident farmer	farmer_adult	air_crisk_inhale	2.1E-07	1.5E-02
R_3 resident farmer	farmer_adult	intake_crisk_ag	2.8E-07	6.2E-05
R_3 resident farmer	farmer_adult	intake_crisk_beef	4.0E-08	9.8E-06
R_3 resident farmer	farmer_adult	intake_crisk_chick	3.2E-12	6.3E-09
R_3 resident farmer	farmer_adult	intake_crisk_eggs	2.0E-12	5.5E-09
R_3 resident farmer	farmer_adult	intake_crisk_pork	7.1E-11	4.4E-09
R_3 resident farmer	farmer_adult	intake_crisk_soil	2.3E-10	3.1E-07
		Total	5E-07	2E-02
R_3 resident farmer	farmer_child	air_crisk_inhale	3.1E-08	1.5E-02
R_3 resident farmer	farmer_child	intake_crisk_ag	1.1E-07	1.4E-04
R_3 resident farmer	farmer_child	intake_crisk_beef	3.8E-09	6.0E-06
R_3 resident farmer	farmer_child	intake_crisk_chick	3.1E-13	4.3E-09
R_3 resident farmer	farmer_child	intake_crisk_eggs	2.0E-13	3.9E-09
R_3 resident farmer	farmer_child	intake_crisk_pork	7.6E-12	3.3E-09
R_3 resident farmer	farmer_child	intake_crisk_soil	3.6E-10	2.9E-06
		Total	1E-07	2E-02
R_4 resident farmer	farmer_adult	air_crisk_inhale	1.8E-07	1.3E-02
R_4 resident farmer	farmer_adult	intake_crisk_ag	2.5E-07	7.1E-05
R_4 resident farmer	farmer_adult	intake_crisk_beef	3.7E-08	1.2E-05
R_4 resident farmer	farmer_adult	intake_crisk_chick	2.9E-12	5.8E-09
R_4 resident farmer	farmer_adult	intake_crisk_eggs	1.8E-12	4.7E-09
R_4 resident farmer	farmer_adult	intake_crisk_pork	6.5E-11	3.7E-09
R_4 resident farmer	farmer_adult	intake_crisk_soil	2.2E-10	3.0E-07
		Total	5E-07	1E-02
R_4 resident farmer	farmer_child	air_crisk_inhale	2.7E-08	1.3E-02
R_4 resident farmer	farmer_child	intake_crisk_ag	9.9E-08	1.7E-04
R_4 resident farmer	farmer_child	intake_crisk_beef	3.4E-09	7.2E-06
R_4 resident farmer	farmer_child	intake_crisk_chick	2.9E-13	4.0E-09
R_4 resident farmer	farmer_child	intake_crisk_eggs	1.9E-13	3.4E-09
R_4 resident farmer	farmer_child	intake_crisk_pork	7.0E-12	2.9E-09
R_4 resident farmer	farmer_child	intake_crisk_soil	3.5E-10	2.8E-06
		Total	1E-07	1E-02
R_only fish_drain	fisher_adult	intake_crisk_fish	4.4E-08	1.4E-02
		Total	4E-08	1E-02

Stack Emissions Risk Assessment
Chronic Multipathway Risk Results by Pathway and Receptor
Group 3: All Compounds (a)
(IRAP Software Output Information)

Receptor	Scenario	Pathway (b)	Total Excess Lifetime Cancer Risk	Total Non-Cancer Hazard Index
R_only fish_drain	fisher_child	intake_crisk_fish	6.2E-09	1.0E-02
		Total	6E-09	1E-02
R_only fish_river	fisher_adult	intake_crisk_fish	3.9E-08	3.8E-03
		Total	4E-08	4E-03
R_only fish_river	fisher_child	intake_crisk_fish	5.4E-09	2.7E-03
		Total	5E-09	3E-03
Farmer area	farmer_adult	air_crisk_inhale	9.0E-08	6.1E-03
Farmer area	farmer_adult	intake_crisk_ag	1.0E-07	1.6E-05
Farmer area	farmer_adult	intake_crisk_beef	1.5E-08	2.3E-06
Farmer area	farmer_adult	intake_crisk_chick	1.1E-12	2.2E-09
Farmer area	farmer_adult	intake_crisk_eggs	7.2E-13	2.2E-09
Farmer area	farmer_adult	intake_crisk_pork	2.5E-11	1.7E-09
Farmer area	farmer_adult	intake_crisk_soil	7.9E-11	1.0E-07
		Total	2E-07	6E-03
Farmer area	farmer_child	air_crisk_inhale	1.3E-08	6.1E-03
Farmer area	farmer_child	intake_crisk_ag	4.0E-08	3.6E-05
Farmer area	farmer_child	intake_crisk_beef	1.4E-09	1.4E-06
Farmer area	farmer_child	intake_crisk_chick	1.1E-13	1.5E-09
Farmer area	farmer_child	intake_crisk_eggs	7.3E-14	1.5E-09
Farmer area	farmer_child	intake_crisk_pork	2.7E-12	1.3E-09
Farmer area	farmer_child	intake_crisk_soil	1.3E-10	9.6E-07
		Total	6E-08	6E-03
Town area	resident_adult	air_crisk_inhale	1.2E-07	1.2E-02
Town area	resident_adult	intake_crisk_ag	2.5E-07	3.9E-05
Town area	resident_adult	intake_crisk_soil	3.7E-10	9.9E-07
		Total	4E-07	1E-02
Town area	resident_child	air_crisk_inhale	2.3E-08	1.2E-02
Town area	resident_child	intake_crisk_ag	1.2E-07	9.0E-05
Town area	resident_child	intake_crisk_soil	6.9E-10	9.2E-06
		Total	1E-07	1E-02

(a) Group 3 includes over 170 compounds, of which 83 were not detected in the Performance Demonstration Test, including benzidine.

(b) Exposure pathway definitions:

IRAP Term	Exposure pathway
air_crisk_inhale	= inhalation of air
intake_crisk_ag	= ingestion of produce
intake_crisk_beef	= ingestion of beef
intake_crisk_chick	= ingestion of chicken
intake_crisk_eggs	= ingestion of eggs
intake_crisk_pork	= ingestion of pork
intake_crisk_soil	= incidental ingestion of soil
intake_crisk_fish	= ingestion of fish

APPENDIX F

CHEMICAL-PHYSICAL PARAMETERS FOR COMPOUNDS NOT INCLUDED IN USEPA'S HHRAP

APPENDIX F

CHEMICAL-PHYSICAL PARAMETERS FOR COMPOUNDS NOT INCLUDED IN USEPA'S HHRAP

A large number of chemical-physical properties are required to calculate environmental concentrations and potential risks for compounds in a combustion source risk assessment. In its 2005 Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (HHRAP), the U.S. Environmental Protection Agency (USEPA) identified these properties for over 200 compounds. In this risk assessment, there were over 50 additional compounds selected for evaluation, based on the results of the Performance Demonstration Test, for which chemical-physical properties were not provided by HHRAP and which needed to be independently obtained

Table 1, which is included in this appendix, lists the properties compiled for these additional compounds. The methods used to identify these properties were those employed by USEPA for HHRAP, specifically as described in Appendix A-2 of the HHRAP report. In some cases, where data sources recommended in USEPA's Appendix A-2 did not provide information necessary to identify chemical-physical properties, alternative data sources were used. Notes are provided in Table 1 for every chemical-physical parameter indicating the source or basis for each listed value. Table 2 lists the basis for each note included in Table 1.

Either a full set of all chemical-physical properties, or a subset of the properties, was compiled for each compound, depending upon the availability of human health and ecological toxicity criteria. Compounds without chronic human health toxicity criteria and ecological toxicity reference values were not evaluated in the multiple pathway risk assessment and thus, for these compounds, a limited subset of the chemical physical properties was compiled. For these compounds, many of the chemical physical parameters used in USEPA's fate and transport modeling equations to calculate concentrations in plants and animals (e.g., plant, beef, poultry, pork and egg biotransfer coefficients) were not needed and thus were not compiled.

TABLE 1

CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

TABLE 1
CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

		Molecular weight (g/mole)		Melting point (K)	Melting point (oC)		Vapor pressure (atm) @25°C (or 20-30°C)	Vapor pressure (mmHg or Torr) @25°C (or 20-30°C)		Solubility in H2O (mg/L) @25°C (or 20-30°C)		Henry's law constant (atm-m^3/mol)		Diffusivity in air (cm2/sec)		Diffusivity in water (cm2/sec)		Octanol:water partition coefficient (unitless)	LOG Octanol:water partition coefficient
CAS #	Compound name	MW	Note	Tm		Note	Vp		Note	S	Note	H	Note	Da	Note	Dw	Note	Kow	Log Kow
563-58-6	1,1-Dichloropropene	111	3	183	-90	24	1.19E-01	90.8	3	749	3	0.05	3	0.0823	6a	9.53E-06	6a	3.39E+02	2.53
95-63-6	1,2,4-Trimethylbenzene	120	2	229	-44	2	2.76E-03	2.1	2	57	2	6.16E-03	2	0.0606	6	7.92E-06	6	6.03E+03	3.78
142-28-9	1,3-Dichloropropane	113	3	173.5	-99.5	3	2.39E-02	18.2	3	2750	3	9.76E-04	3	0.074	6	9.87E-06	6	1.00E+02	2
108-60-1	2,2'-oxybis (1-Chloropropane)	171	2	176	-97	2	1.16E-03	0.88	2	1700	2	1.17E-04	2	0.0617	6a	7.14E-06	6a	3.02E+02	2.48
594-20-7	2,2-Dichloropropane	113	2	239.2	-33.8	3	1.78E-01	135	3	391	3	1.61E-02	3	0.072	6	9.48E-06	6	8.32E+02	2.92
625-86-5	2,5-Dimethylfuran	96	3	210.2	-62.8	3	3.41E-02	25.9	3	1470	3	6.55E-03	3	0.0906	6a	1.05E-05	6a	1.74E+02	2.24
2216-30-0	2,5-Dimethylheptane	128	3	194	-79	24	1.25E-02	9.48	3	3.11	3	4	3	0.052	6	6.75E-06	6	4.07E+04	4.61
17559-81-8	2,5-Dione, 3-hexene	112	2	255	-18	24	2.86E-03	2.17	3	3.46E+04	3	1.11E-08	3	0.0818	6a	9.47E-06	6a	3.72E+00	0.57
78-93-3	2-Butanone	72	1	186	-87	1	1.25E-01	95	1	2.20E+05	1	5.60E-05	1	0.0808	6	9.80E-06	6	1.95E+00	0.29
95-49-8	2-Chlorotoluene	127	2	237.4	-35.6	2	4.51E-03	3.43	2	374	2	1.53E-03	2	0.0628	6	8.70E-06	6	2.63E+03	3.42
591-78-6	2-Hexanone	100	2	217.5	-55.5	3	1.53E-02	11.6	2	1.75E+04	2	9.32E-05	3	0.0882	6a	1.02E-05	6a	2.40E+01	1.38
3221-61-2	2-Methyl octane	128	2	192.7	-80.3	3	8.16E-03	6.2	2	2.87	3	5.73	3	0.0597	6	8.24E-06	6	4.90E+04	4.69
91-57-6	2-Methylnaphthalene	140	1	307	34	1	8.95E-05	0.068	1	25	1	5.20E-04	1	0.0522	6	7.75E-06	6	7.94E+03	3.9
34246-54-3	3-Ethyl benzaldehyde	134	24	280.1	7.1	24	1.64E-04	0.125	24	398	24	5.55E-05	24	0.0726	6a	8.40E-06	6a	5.62E+02	2.75

TABLE 1
CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

		Molecular weight (g/mole)		Melting point (K)	Melting point (oC)		Vapor pressure (atm) @25^{o}C (or 20-30^{o}C)	Vapor pressure (mmHg or Torr) @25^{o}C (or 20-30^{o}C)		Solubility in H2O (mg/L) @25^{o}C (or 20-30^{o}C)		Henry's law constant (atm-m^{3}/mol)		Diffusivity in air (cm2/sec)		Diffusivity in water (cm2/sec)		Octanol:water partition coefficient (unitless)	LOG Octanol:water partition coefficient
CAS #	Compound name	MW	Note	Tm		Note	Vp		Note	S	Note	H	Note	Da	Note	Dw	Note	Kow	Log Kow
763-93-9	3-Hexen-2-one	98	3	217.5	-55.5	24	1.05E-02	7.96	3	8970	3	5.44E-05	3	0.0894	6a	1.03E-05	6a	2.04E+01	1.31
625-33-2	3-Penten-2-one (ethylidene acetone)	84	2	205	-68	24	5.14E-02	39.1	3	4.62E+04	3	4.10E-05	3	0.0991	6a	1.15E-05	6a	3.31E+00	0.52
141-79-7	3-Penten-2-one, 4-methyl	98	2	214	-59	3	1.45E-02	11	2	2.89E+04	3	3.67E-05	3	0.0734	6	8.83E-06	6	2.34E+01	1.37
534-52-1	4,6-Dinitro-2-methylphenol	198	2	358	85	2	4.26E-07	3.24E-04	2	198	2	4.27E-07	2	0.0276	6	6.91E-06	6	1.32E+02	2.12
106-43-4	4-Chlorotoluene	127	2	280.5	7.5	3	3.54E-03	2.69	2	106	3	4.38E-03	3	0.0625	6	8.65E-06	6	2.14E+03	3.33
4748-78-1	4-Ethyl benzaldehyde	134	24	280.1	7.1	24	1.64E-04	0.125	24	398	24	5.55E-05	24	0.0726	6a	8.40E-06	6a	5.62E+02	2.75
301-02-0	9-Octadecenamide (oleamide)	281	2	432	159	24	4.82E-09	3.66E-06	24	0.046	24	1.26E-06	24	0.0443	6a	5.13E-06	6a	3.02E+06	6.48
208-96-8	Acenaphthylene	150	1	366	93	1	1.20E-06	9.10E-04	1	16	1	1.10E-04	1	0.0449	6	6.98E-06	6	1.26E+04	4.1
7429-90-5	Aluminum	27	1	933	660	1	0.00E+00	0	43	9.50E+04	1	0	3a	0.0772	6	9.57E-06	6	2.14E+00	0.33
92-87-5	Benzidine	180	1	393	120	1	1.05E-11	8.00E-09	1	500	1	3.90E-11	1	0.033	6	1.50E-05	6	5.01E+01	1.7
192-97-2	Benzo(e)pyrene	252	3	450.5	177.5	3	7.50E-12	5.70E-09	3	6.30E-03	3	3.00E-07	3	0.0476	6a	5.51E-06	6a	2.75E+06	6.44
191-24-2	Benzo(g,h,i)perylene	280	1	551	278	2	1.32E-13	1.00E-10	1	2.60E-04	1	3.31E-07	3	0.022	6	5.26E-06	6	3.98E+06	6.6
93-58-3	Benzoic acid, methyl ester (methyl benzoate)	136	2	258	-15	3	5.00E-04	0.38	3	2100	3	3.24E-05	3	0.0577	6	8.39E-06	6	1.32E+02	2.12
111-91-1	Bis(2-chloroethoxy) methane	173	2	241	-32	2	1.84E-07	1.40E-04	2	121000	2	1.70E-07	2	0.044	6	8.46E-06	6	5.62E+00	0.75

TABLE 1
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		Molecular weight (g/mole)		Melting point (K)	Melting point (oC)		Vapor pressure (atm) @25°C (or 20-30°C)	Vapor pressure (mmHg or Torr) @25°C (or 20-30°C)		Solubility in H2O (mg/L) @25°C (or 20-30°C)		Henry's law constant (atm-m^3/mol)		Diffusivity in air (cm2/sec)		Diffusivity in water (cm2/sec)		Octanol:water partition coefficient (unitless)	LOG Octanol:water partition coefficient
CAS #	Compound name	MW	Note	Tm		Note	Vp		Note	S	Note	H	Note	Da	Note	Dw	Note	Kow	Log Kow
108-86-1	Bromobenzene	157	2	242.4	-30.6	3	5.50E-03	4.18	3	446	2	2.47E-03	3	0.0537	6	9.30E-06	6	9.77E+02	2.99
74-97-5	Bromochloromethane	129	2	185.1	-87.9	3	1.88E-01	142.5	2	1.67E+04	3	1.46E-03	3	0.0688	6	1.00E-05	6	2.57E+01	1.41
104-51-8	Butylbenzene, n-	134	2	185.1	-87.9	3	1.39E-03	1.06	3	11.8	3	1.59E-02	3	0.057	6	8.12E-06	6	2.40E+04	4.38
135-98-8	Butylbenzene, sec	134	3	190.3	-82.7	3	2.30E-03	1.75	3	17.6	3	1.76E-02	3	0.057	6	8.12E-06	6	3.72E+04	4.57
98-06-6	Butylbenzene, tert	134	2	215.2	-57.8	3	2.89E-03	2.2	3	29.5	3	1.32E-02	3	0.0565	6	8.02E-06	6	1.29E+04	4.11
86-74-8	Carbazole	170	1	523	250	1	9.21E-07	7.00E-04	1	1.2	1	8.70E-08	1	3.90E-02	5	7.03E-06	5	5.01E+03	3.7
7440-48-4	Cobalt	59	1	1773	1500	1	0.00E+00	0	43	8.70E+04	24	0	3a	0.0772	6	9.57E-06	6	1.70E+00	0.23
7440-50-8	Copper	64	1	1373	1100	1	5.58E-12	4.24E-09	3	4.21E+05	3	2.50E-02	1	0.0772	6	9.57E-06	6	2.69E-01	-0.57
2303-16-4	Diallate	270	2	300.5	27.5	2	1.97E-07	1.50E-04	2	14	2	3.80E-06	2	0.0213	6	5.27E-06	6	6.31E+04	4.8
132-64-9	Dibenzofuran	170	1	360	87	1	2.37E-07	1.80E-04	1	3.1	1	1.30E-05	1	0.0238	6	6.00E-06	6	1.26E+04	4.1
122-39-4	Diphenylamine	159	2	326.5	53.5	2	8.79E-07	6.68E-04	2	35.7	2	4.96E-07	2	0.058	6	6.31E-06	6	3.16E+03	3.5
1031-07-8	Endosulfan sulfate	423	3	454.5	181.5	3	3.68E-10	2.80E-07	3	0.48	3	3.25E-07	3	0.0182	6	4.45E-06	6	4.57E+03	3.66
7421-93-4	Endrin aldehyde	380	1	420	147	8	2.63E-10	2.00E-07	1	2.40E-02	1	4.20E-06	1	0.019	6	4.37E-06	6	6.31E+04	4.8
53494-70-5	Endrin ketone	381	3	419	146	24	1.21E-07	9.20E-05	24	0.222	3	2.02E-08	3	0.0362	6a	4.19E-06	6a	9.77E+04	4.99

TABLE 1
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		Molecular weight (g/mole)		Melting point (K)	Melting point (oC)		Vapor pressure (atm) @25^{o}C (or 20-30^{o}C)	Vapor pressure (mmHg or Torr) @25^{o}C (or 20-30^{o}C)		Solubility in H2O (mg/L) @25^{o}C (or 20-30^{o}C)		Henry's law constant (atm-m^{3}/mol)		Diffusivity in air (cm2/sec)		Diffusivity in water (cm2/sec)		Octanol:water partition coefficient (unitless)	LOG Octanol:water partition coefficient
CAS #	Compound name	MW	Note	Tm		Note	Vp		Note	S	Note	H	Note	Da	Note	Dw	Note	Kow	Log Kow
76-13-1	Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	187	2	236.6	-36.4	2	4.36E-01	331.6	2	170	2	4.81E-01	2	0.078	6	8.20E-06	6	1.45E+03	3.16
74-88-4	Iodomethane	142	2	206.6	-66.4	2	5.32E-01	404.46	2	13848	2	5.26E-03	2	0.0524	6	7.76E-06	6	3.24E+01	1.51
99-87-6	Isopropyl toluene, p-	134	2	204.1	-68.9	3	1.92E-03	1.46	2	23.4	2	1.10E-02	2	0.056	6	7.33E-06	6	1.26E+04	4.1
7439-96-5	Manganese	55	1	1473	1200	1	5.58E-12	4.24E-09	3	1100	1	0.0245	3	0.0772	6	9.57E-06	6	1.70E+00	0.23
62-75-9	N-nitrosodimethylamine	74	2	223	-50	2	3.55E-03	2.7	2	1.00E+06	8	1.20E-06	2	0.104	6	1.00E-05	6	2.69E-01	-0.57
198-55-0	Perylene	252	3	547	274	3	6.91E-12	5.25E-09	3	0.0004	3	3.65E-06	3	0.0223	6	5.56E-06	6	1.78E+06	6.25
2240-47-3	Phosphine imide, P,P,P-triphenyl	277	24	417	144	24	6.29E-09	4.78E-06	24	0.755	24	1.43E-07	24	0.0447	6a	5.18E-06	6a	1.20E+05	5.08
103-65-1	Propylbenzene, n-	120	2	173.5	-99.5	3	4.50E-03	3.42	2	52.2	2	1.05E-02	2	0.0601	6	7.83E-06	6	3.72E+03	3.57
7440-62-2	Vanadium	51	1	2173	1900	1	0.00E+00	0	43	700	1	0	3a	0.0772	6	9.57E-06	6	1.70E+00	0.23
58-89-9	γ-BHC (Lindane)	290	1	383	110	1	5.39E-07	4.10E-04	1	7.3	1	1.40E-05	2	1.42E-02	5	7.34E-06	5	3.98E+03	3.6
319-86-8	δ-BHC	291	2	415	142	2	4.63E-08	3.52E-05	2	31.4	2	4.29E-07	2	0.0221	6	5.57E-06	6	1.38E+04	4.14
110-54-3	1-Hexane (n-hexane)	86	2	177.7	-95.3	3	1.99E-01	151.3	2	124	2	1.8	3	0.2	6	7.77E-06	6	7.94E+03	3.9
79-10-7	Acrylic Acid	72	2	286.5	13.5	2	5.26E-03	4	2	1.00E+06	8	1.17E-07	2	0.098	6	1.06E-05	6	1.45E+00	0.161
107-21-1	Ethylene Glycol	62	2	260.4	-12.6	2	1.21E-04	0.092	2	1.00E+06	8	6.00E-08	2	0.108	6	1.22E-05	6	4.37E-02	-1.36
80-62-6	Methyl methacrylate	100	2	225	-48	3	5.05E-02	38.4	2	1.50E+04	2	3.37E-04	2	0.077	6	8.60E-06	6	2.40E+01	1.38

TABLE 1
CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

		Molecular weight (g/mole)		Melting point (K)	Melting point (oC)		Vapor pressure (atm) @25^{o}C (or 20-30^{o}C)	Vapor pressure (mmHg or Torr) @25^{o}C (or 20-30^{o}C)		Solubility in H2O (mg/L) @25^{o}C (or 20-30^{o}C)		Henry's law constant (atm-m^{3}/mol)		Diffusivity in air (cm2/sec)		Diffusivity in water (cm2/sec)		Octanol:water partition coefficient (unitless)	LOG Octanol:water partition coefficient
CAS #	Compound name	MW	Note	Tm		Note	Vp		Note	S	Note	H	Note	Da	Note	Dw	Note	Kow	Log Kow
1634-04-4	methyl tert-butyl ether	88	1	163	-110	1	3.29E-01	250	1	5.10E+04	1	5.90E-04	1	0.086	6	1.01E-05	6	1.58E+01	1.2
75-56-9	Propylene oxide	58	2	161	-112	2	7.08E-01	538	2	590000	2	1.23E-04	2	0.104	6	1.00E-05	6	1.07E+00	0.03
33213-65-9	Endosulfan II	407	1	382	109	2	1.3158E-08	1.00E-05	1	0.45	2	1.30E-05	1	0.0346	6a	4.01E-06	6a	6.31E+03	3.8
7446-09-5	Sulfur dioxide	64	3	201	-72	3	3.94868421	3.00E+03	2	1.07E+05	3	8.10E-04	3	0.1188	6a	1.38E-05	6a	6.31E-03	-2.2
10102-44-0	Nitrogen dioxide	46	3	263.7	-9.3	3	1.19460526	9.08E+02	2	1.71E+05	3	2.45E-02	3	0.1480	6a	1.71E-05	6a	2.63E-01	-0.58
Compounds evaluated for fugitive vapor emissions only																			
106-99-0	1,3-Butadiene	54.09	3	164	-109	2	2.77236842	2.11E+03	2	7.35E+02	2	7.36E-02	2	0.1328	6a	1.54E-05	6a	9.77E+01	1.99
110-82-7	Cyclohexane	84.16	3	279.5	6.5	2	0.12736842	9.68E+01	2	5.50E+01	2	1.95E-01	2	0.0989	6a	1.15E-05	6a	2.75E+03	3.44

-- = Not applicable - compound did not have chronic human health toxicity data, or ecological risk assessment toxicity reference values (TRVs), and thus was not evaluated in the multiple pathway fate and transport modeling.

NA = Not applicable. Compound was only evaluated for the inhalation pathway in the human health risk assessment addressing potential fugitive emissions.

TABLE 1
CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

			Soil organic carbon:water partition coefficient (mL H2O/ g soil)	LOG Soil organic carbon:water partition coefficient (Koc) (mL H2O/ g soil)		Soil-water partition coefficient (mL H2O/g soil OR cm3 H2O/g soil)		Suspended sediment-surface water partition coefficient (L H2O/kg suspended sed OR cm3 H2O/g suspended sed)		Bed sediment-pore water partition coefficient (L H2O/kg bottom sed OR cm3 H2O/g bottom sed)		Soil loss constant due to biotic and abiotic degradation (yr-1)		Fraction of air concentration in vapor phase (unitless)	Liquid phase vapor pressure (atm) (used only for compounds that are solids at ambient T)		Root concentration factor (g COPC/g DW plant) / (g COPC/mL soil water)
CAS #	Compound name	Note	Koc	Log Koc	Note	Kd,s	Note	Kd,sw	Note	Kd,bs	Note	Ksg	Note	fv	Vp	Note	RCF DW
563-58-6	1,1-Dichloropropene	3			--		--		--		--	0	44	1.0		16	
95-63-6	1,2,4-Trimethylbenzene	2	1.18E+03	3.0718	10	1.18E+01	13	8.85E+01	14	4.72E+01	15	0	44	1.0		16	1.89E+02
142-28-9	1,3-Dichloropropane	3	9.25E+01	1.9663	9	9.25E-01	13	6.94E+00	14	3.70E+00	15	0	44	1.0		16	8.05E+00
108-60-1	2,2'-oxybis (1-Chloropropane)	2	57		2	5.70E-01	13	4.28E+00	14	2.28E+00	15	0	44	1.0		16	1.89E+01
594-20-7	2,2-Dichloropropane	3	2.46E+02	2.3907	10	2.46E+00	13	1.84E+01	14	9.84E+00	15	0	44	1.0		16	4.12E+01
625-86-5	2,5-Dimethylfuran	3	7.12E+01	1.8523	10	7.12E-01	13	5.34E+00	14	2.85E+00	15	0	44	1.0		16	1.23E+01
2216-30-0	2,5-Dimethylheptane	3	0		--		--		--		--	0	44	1.0		16	
17559-81-8	2,5-Dione, 3-hexene	3	0		--		--		--		--	0	44	1.0		16	
78-93-3	2-Butanone	1	1.93E+00	0.2854	9	0.29	1	1.45E-01	14	7.72E-02	15	0	44	1.0		16	6.70E+00
95-49-8	2-Chlorotoluene	2	550		2	5.50E+00	13	4.13E+01	14	2.20E+01	15	0	44	1.0		16	9.99E+01
591-78-6	2-Hexanone	2	2.27E+01	1.3568	9	2.27E-01	13	1.71E+00	14	9.10E-01	15	0	44	1.0		16	8.99E+00
3221-61-2	2-Methyl octane	3			--		--		--		--	0	44	1.0		16	
91-57-6	2-Methylnaphthalene	1	6.82E+03	3.8340	9	950	1	5.12E+02	14	2.73E+02	15	0	44	1.000E+00	1.10E-04	17,16	2.34E+02
34246-54-3	3-Ethyl benzaldehyde	24	102.2		24		--		--		--	0	44	1.0		16	

TABLE 1
CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

			Soil organic carbon:water partition coefficient (mL H2O/ g soil)	LOG Soil organic carbon:water partition coefficient (Koc) (mL H2O/ g soil)		Soil-water partition coefficient (mL H2O/g soil OR cm3 H2O/g soil)		Suspended sediment-surface water partition coefficient (L H2O/kg suspended sed OR cm3 H2O/g suspended sed)		Bed sediment-pore water partition coefficient (L H2O/kg bottom sed OR cm3 H2O/g bottom sed)		Soil loss constant due to biotic and abiotic degradation (yr-1)		Fraction of air concentration in vapor phase (unitless)	Liquid phase vapor pressure (atm) (used only for compounds that are solids at ambient T)		Root concentration factor (g COPC/g DW plant) / (g COPC/mL soil water)
CAS #	Compound name	Note	Koc	Log Koc	Note	Kd,s	Note	Kd,sw	Note	Kd,bs	Note	Ksg	Note	fv	Vp	Note	RCF DW
763-93-9	3-Hexen-2-one	3			--		--		--		--	0	44	1.0		16	
625-33-2	3-Penten-2-one (ethylidene acetone)	3			--		--		--		--	0	44	1.0		16	
141-79-7	3-Penten-2-one, 4-methyl	3			--		--		--		--	0	44	1.0		16	
534-52-1	4,6-Dinitro-2-methylphenol	2	257		2	2.57E+00	13	1.93E+01	14	1.03E+01	15	0	44	9.996E-01	1.67E-06	17,16	9.96E+00
106-43-4	4-Chlorotoluene	3	5.19E+02	2.7154	10	5.19E+00	13	3.89E+01	14	2.08E+01	15	0	44	1.0		16	8.51E+01
4748-78-1	4-Ethyl benzaldehyde	24	102.2		24		--		--		--	0	44	1.0		16	
301-02-0	9-Octadecenamide (oleamide)	24	1.02E+05		24		--		--		--	0	44	9.942E-01	1.02E-07	17,16	
208-96-8	Acenaphthylene	1	1.07E+04	4.0306	9	1.50E+03	1	8.05E+02	14	4.29E+02	15	0	44	9.999E-01	5.64E-06	17,16	3.33E+02
7429-90-5	Aluminum	24	0		43	9.9	1	9.9	14b	9.9	14b	0	44	0		16a	0
92-87-5	Benzidine	1	4.69E+01	1.6714	9	6.5	1	3.52E+00	14	1.88E+00	15	0.13	45	1.335E-01	9.17E-11	17,16	1.10E+01
192-97-2	Benzo(e)pyrene	3			--		--		--		--	0	44	2.893E-01	2.42E-10	17,16	
191-24-2	Benzo(g,h,i)perylene	1	3.08E+06	6.4881	9	4.50E+05	1	2.31E+05	14	1.23E+05	15	0	44	6.586E-02	4.20E-11	17,16	2.81E+04
93-58-3	Benzoic acid, methyl ester (methyl benzoate)	3	1.21E+02	2.0842	9	1.21E+00	13	9.11E+00	14	4.86E+00	15	0	44	1.0		16	9.96E+00
111-91-1	Bis(2-chloroethoxy) methane	2	61		2	6.10E-01	13	4.58E+00	14	2.44E+00	15	0	44	1.0		16	7.19E+00

TABLE 1
CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

			Soil organic carbon:water partition coefficient (mL H2O/ g soil)	LOG Soil organic carbon:water partition coefficient (Koc) (mL H2O/ g soil)		Soil-water partition coefficient (mL H2O/g soil OR cm3 H2O/g soil)		Suspended sediment-surface water partition coefficient (L H2O/kg suspended sed OR cm3 H2O/g suspended sed)		Bed sediment-pore water partition coefficient (L H2O/kg bottom sed OR cm3 H2O/g bottom sed)		Soil loss constant due to biotic and abiotic degradation (yr-1)		Fraction of air concentration in vapor phase (unitless)	Liquid phase vapor pressure (atm) (used only for compounds that are solids at ambient T)		Root concentration factor (g COPC/g DW plant) / (g COPC/mL soil water)
CAS #	Compound name	Note	Koc	Log Koc	Note	Kd,s	Note	Kd,sw	Note	Kd,bs	Note	Ksg	Note	fv	Vp	Note	RCF DW
108-86-1	Bromobenzene	2	151		2	1.51E+00	13	1.13E+01	14	6.04E+00	15	0	44	1.0		16	4.66E+01
74-97-5	Bromochloromethane	3			--		--		--		--	0	44	1.0		16	
104-51-8	Butylbenzene, n-	3	2512		2		--		--		--	0	44	1.0		16	
135-98-8	Butylbenzene, sec	3	4.98E+03	3.6974	10		--		--		--	0	44	1.0		16	
98-06-6	Butylbenzene, tert	3	2.15E+03	3.3331	10	2.15E+01	13	1.61E+02	14	8.61E+01	15	0	44	1.0		16	3.39E+02
86-74-8	Carbazole	1	3390		5	520	1	2.54E+02	14	1.36E+02	15	0	44	1.000E+00	1.55E-04	17,16	1.64E+02
7440-48-4	Cobalt	1	0		43	45	1	45	14b	45	14b	0	44	0		16a	0
7440-50-8	Copper	1	0		43	430	1	430	14b	430	14b	0	44	0		16a	0
2303-16-4	Diallate	2	273		2		--		--		--	0	44	9.972E-01	2.09E-07	17,16	
132-64-9	Dibenzofuran	1	1.07E+04	4.0306	9	1700	1	8.05E+02	14	4.29E+02	15	0	44	9.994E-01	9.73E-07	17,16	3.33E+02
122-39-4	Diphenylamine	2	600		2	347	2	4.50E+01	14	2.40E+01	15	0	44	9.996E-01	1.68E-06	17,16	1.15E+02
1031-07-8	Endosulfan sulfate	3	3.96E+03	3.5981	9	3.96E+01	13	2.97E+02	14	1.59E+02	15	0	44	9.563E-01	1.30E-08	17,16	1.53E+02
7421-93-4	Endrin aldehyde	1	2.00E+04	4.3	8	8000	1	1.50E+03	14	7.98E+02	15	0	44	8.770E-01	4.24E-09	17,16	1.15E+03
53494-70-5	Endrin ketone	3			--		--		--		--	0	44	9.997E-01	1.91E-06	17,16	

TABLE 1
CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

			Soil organic carbon:water partition coefficient (mL H2O/ g soil)	LOG Soil organic carbon:water partition coefficient (Koc) (mL H2O/ g soil)		Soil-water partition coefficient (mL H2O/g soil OR cm3 H2O/g soil)		Suspended sediment-surface water partition coefficient (L H2O/kg suspended sed OR cm3 H2O/g suspended sed)		Bed sediment-pore water partition coefficient (L H2O/kg bottom sed OR cm3 H2O/g bottom sed)		Soil loss constant due to biotic and abiotic degradation (yr-1)		Fraction of air concentration in vapor phase (unitless)	Liquid phase vapor pressure (atm) (used only for compounds that are solids at ambient T)		Root concentration factor (g COPC/g DW plant) / (g COPC/mL soil water)
CAS #	Compound name	Note	Koc	Log Koc	Note	Kd,s	Note	Kd,sw	Note	Kd,bs	Note	Ksg	Note	fv	Vp	Note	RCF DW
76-13-1	Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	2	372		2	3.72E+00	13	2.79E+01	14	1.49E+01	15	0	44	1.0		16	6.30E+01
74-88-4	Iodomethane	2	158		2	1.58E+00	13	1.19E+01	14	6.32E+00	15	0	44	1.0		16	9.69E+00
99-87-6	Isopropyl toluene, p-	2	2.11E+03	3.3252	10	2.11E+01	13	1.59E+02	14	8.46E+01	15	0	44	1.0		16	3.33E+02
7439-96-5	Manganese	1	0		43	65	1	65	14b	65	14b	0	44	0		16a	0
62-75-9	N-nitrosodimethylamine	2	12		2	1.20E-01	13	9.00E-01	14	4.80E-01	15	0	44	1.0		16	6.39
198-55-0	Perylene	3	8.03E+05		24		--		--		--	0	44	7.716E-01	2.01E-09	17,16	
2240-47-3	Phosphine imide, P,P,P-triphenyl	24	6.96E+05		24		--		--		--	0	44	9.938E-01	9.47E-08	17,16	
103-65-1	Propylbenzene, n-	2	741		2		--		--		--	0	44	1.0		16	
7440-62-2	Vanadium	24	0		43	1000	1	1000	14b	1000	14b	0	44	0		16a	0
58-89-9	γ-BHC (Lindane)	1	1352		5	2.1	1	101.4	14	5.41E+01	15	0	44	9.998E-01	3.74E-06	17,16	1.37E+02
319-86-8	δ-BHC	2	4260		2	4.26E+01	13	3.20E+02	14	1.70E+02	15	0	44	9.991E-01	6.66E-07	17,16	3.58E+02
110-54-3	1-Hexane (n-hexane)	3	1.47E+03	3.1668	10	1.47E+01	13	1.10E+02	14	5.87E+01	15	0	44	1.0		16	2.34E+02
79-10-7	Acrylic Acid	2	1.45E-02	-1.84	12	1.45E-04	13	1.08E-03	14	5.78E-04	15	0	44	1.0		16	6.62E+00
107-21-1	Ethylene Glycol	2	4		2	4.00E-02	13	3.00E-01	14	1.60E-01	15	0	44	1.0		16	6.39
80-62-6	Methyl methacrylate	2	22		2	2.20E-01	13	1.65E+00	14	8.80E-01	15	0	44	1.0		16	8.99E+00

TABLE 1
CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

			Soil organic carbon:water partition coefficient (mL H2O/ g soil)	LOG Soil organic carbon:water partition coefficient (Koc) (mL H2O/ g soil)		Soil-water partition coefficient (mL H2O/g soil OR cm3 H2O/g soil)		Suspended sediment-surface water partition coefficient (L H2O/kg suspended sed OR cm3 H2O/g suspended sed)		Bed sediment-pore water partition coefficient (L H2O/kg bottom sed OR cm3 H2O/g bottom sed)		Soil loss constant due to biotic and abiotic degradation (yr-1)		Fraction of air concentration in vapor phase (unitless)	Liquid phase vapor pressure (atm) (used only for compounds that are solids at ambient T)		Root concentration factor (g COPC/g DW plant) / (g COPC/mL soil water)
CAS #	Compound name	Note	Koc	Log Koc	Note	Kd,s	Note	Kd,sw	Note	Kd,bs	Note	Ksg	Note	fv	Vp	Note	RCF DW
1634-04-4	methyl tert-butyl ether	1	1.51E+01	1.1799	9	8.9	1	1.13E+00	14	6.05E-01	15	0	44	1.0		16	8.26E+00
75-56-9	Propylene oxide	2	25		2	2.50E-01	13	1.88E+00	14	1.00E+00	15	0	44	1.0		16	6.55E+00
33213-65-9	Endosulfan II	1	6770		2	4.3	1	5.08E+02	14	2.71E+02	15	0	44	9.934E-01	8.92E-08	17,16	1.96E+02
7446-09-5	Sulfur dioxide	3	2.99		24	2.99E-02	13	2.24E-01	14	1.20E-01	15	0	44	1.0		16	6.31E+00
10102-44-0	Nitrogen dioxide	3	5.54		24	5.54E-02	13	4.16E-01	14	2.22E-01	15	0	44	1.0		16	6.39E+00
Compounds evaluated for fugitive vap																	
106-99-0	1,3-Butadiene	2	116		2	NA		NA		NA		NA		1.0		16	NA
110-82-7	Cyclohexane	2	482		2	NA		NA		NA		NA		1.0		16	NA

-- = Not applicable - compound did not have chronic human health toxicity data, or ecological risk assessment toxicity reference values (TRVs), and thus was not evaluated in the multiple pathway fate and transport modeling.

NA = Not applicable. Compound was only evaluated for the inhalation pathway in the human health risk assessment addressing potential fugitive emissions.

TABLE 1
CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

		RCF in fresh wt (FW) (g COPC/g FW plant) / (g COPC/mL soil water)		Plant-soil bioconcentration factor for below ground produce (g COPC/g DW plant) / (g COPC/g DW soil) (unitless)		Plant-soil bioconcentration factor for aboveground produce (HHRAP variable = Br_{ag}) (same value used for Br_{grain}) (g COPC/g DW plant) / (g COPC/g DW soil) (unitless)		Plant-soil bioconcentration factor for forage and silage (g COPC/g DW plant) / (g COPC/g DW soil) (unitless)		Air-to-plant biotransfer factor in aboveground produce (HHRAP variable = Bv_{ag}) (g COPC/g DW plant)/ (g COPC/g air) (unitless)	LOG Bvol		Air-to-plant biotransfer factor in forage and silage (g COPC/g DW plant)/ (g COPC/g air) (unitless)	
CAS #	Compound name	RCF FW	Note	Br, root-veg	Note	Br, leafy-veg	Note	Br, forage	Note	Bv, leafy veg	Log Bvol	Note	Bv, forage	Note
563-58-6	1,1-Dichloropropene		--		--	0	--		--			--		--
95-63-6	1,2,4-Trimethylbenzene	2.46E+01	18,20	1.60E+01	22	2.53E-01	25	2.53E-01	25	9.62E-02	2.97E+00	28	9.62E-02	28
142-28-9	1,3-Dichloropropane	1.05E+00	18,20	8.71E+00	22	2.70E+00	25	2.70E+00	25	7.72E-03	1.87E+00	28	7.72E-03	28
108-60-1	2,2'-oxybis (1-Chloropropane)	2.45E+00	18,20	3.31E+01	22	1.43E+00	25	1.43E+00	25	2.09E-01	3.31E+00	28	2.09E-01	28
594-20-7	2,2-Dichloropropane	5.35E+00	18,20	1.67E+01	22	7.95E-01	25	7.95E-01	25	4.47E-03	1.64E+00	28	4.47E-03	28
625-86-5	2,5-Dimethylfuran	1.60E+00	18,20	1.73E+01	22	1.96E+00	25	1.96E+00	25	2.07E-03	1.30E+00	28	2.07E-03	28
2216-30-0	2,5-Dimethylheptane		--		--		--		--	0		--		--
17559-81-8	2,5-Dione, 3-hexene		--		--		--		--	0		--		--
78-93-3	2-Butanone	8.71E-01	19,20	2.31E+01	22	8.38	25a	8.38	25a	2.03E-03	1.29E+00	28	2.03E-03	28
95-49-8	2-Chlorotoluene	1.30E+01	18,20	1.82E+01	22	4.09E-01	25	4.09E-01	25	1.60E-01	3.19E+00	28	1.60E-01	28
591-78-6	2-Hexanone	1.17E+00	19,20	3.95E+01	22	6.17E+00	25	6.17E+00	25	1.77E-02	2.23E+00	28	1.77E-02	28
3221-61-2	2-Methyl octane		--		--		--	0	--			--		--
91-57-6	2-Methylnaphthalene	3.04E+01	18,20	2.46E-01	22	2.16E-01	25	2.16E-01	25	1.53E+00	4.17E+00	28	1.53E+00	28
34246-54-3	3-Ethyl benzaldehyde		--		--		--	0	--			--		--

TABLE 1
CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

		RCF in fresh wt (FW) (g COPC/g FW plant) / (g COPC/mL soil water)		Plant-soil bioconcentration factor for below ground produce (g COPC/g DW plant) / (g COPC/g DW soil) (unitless)		Plant-soil bioconcentration factor for aboveground produce (HHRAP variable = Br_{ag}) (same value used for Br_{grain}) (g COPC/g DW plant) / (g COPC/g DW soil) (unitless)		Plant-soil bioconcentration factor for forage and silage (g COPC/g DW plant) / (g COPC/g DW soil) (unitless)		Air-to-plant biotransfer factor in aboveground produce (HHRAP variable = Bv_{ag}) (g COPC/g DW plant)/ (g COPC/g air) (unitless)	LOG Bvol		Air-to-plant biotransfer factor in forage and silage (g COPC/g DW plant)/ (g COPC/g air) (unitless)	
CAS #	Compound name	RCF FW	Note	Br, root-veg	Note	Br, leafy-veg	Note	Br, forage	Note	Bv, leafy veg	Log Bvol	Note	Bv, forage	Note
763-93-9	3-Hexen-2-one		--		--		--	0	--			--		--
625-33-2	3-Penten-2-one (ethylidene acetone)		--		--		--	0	--			--		--
141-79-7	3-Penten-2-one, 4-methyl		--		--		--		--			--		--
534-52-1	4,6-Dinitro-2-methylphenol	1.30E+00	18,20	3.88E+00	22	2.30E+00	25	2.30E+00	25	2.37E+01	5.36E+00	28	2.37E+01	28
106-43-4	4-Chlorotoluene	1.11E+01	18,20	1.64E+01	22	4.61E-01	25	4.61E-01	25	4.49E-02	2.64E+00	28	4.49E-02	28
4748-78-1	4-Ethyl benzaldehyde		--		--		--		--			--		--
301-02-0	9-Octadecenamide (oleamide)		--		--		--		--			--		--
208-96-8	Acenaphthylene	4.34E+01	18,20	2.22E-01	22	1.65E-01	25	1.65E-01	25	1.18E+01	5.06E+00	28	1.18E+01	28
7429-90-5	Aluminum		21a	6.50E-04	23	0.0011	27	1	26	0		29	0	29
92-87-5	Benzidine	1.44E+00	19,20	1.70E+00	22	4.03E+00	25	4.03E+00	25	9.26E+04	8.95E+00	28	9.26E+04	28
192-97-2	Benzo(e)pyrene		--		--		--	0	--			--		--
191-24-2	Benzo(g,h,i)perylene	3.65E+03	18,20	6.24E-02	22	5.93E-03	25	5.93E-03	25	1.80E+06	1.02E+01	28	1.80E+06	28
93-58-3	Benzoic acid, methyl ester (methyl benzoate)	1.30E+00	18,20	8.21E+00	22	2.30E+00	25	2.30E+00	25	3.12E-01	3.48E+00	28	3.12E-01	28
111-91-1	Bis(2-chloroethoxy) methane	9.34E-01	19,20	1.18E+01	22	8.38	25a	8.38	25a	2.07E+00	4.30E+00	28	2.07E+00	28

TABLE 1
CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

		RCF in fresh wt (FW) (g COPC/g FW plant) / (g COPC/mL soil water)		Plant-soil bioconcentration factor for below ground produce (g COPC/g DW plant) / (g COPC/g DW soil) (unitless)		Plant-soil bioconcentration factor for aboveground produce (HHRAP variable = Br_{ag}) (same value used for Br_{grain}) (g COPC/g DW plant) / (g COPC/g DW soil) (unitless)		Plant-soil bioconcentration factor for forage and silage (g COPC/g DW plant) / (g COPC/g DW soil) (unitless)		Air-to-plant biotransfer factor in aboveground produce (HHRAP variable = Bv_{ag}) (g COPC/g DW plant)/ (g COPC/g air) (unitless)	LOG Bvol		Air-to-plant biotransfer factor in forage and silage (g COPC/g DW plant)/ (g COPC/g air) (unitless)	
CAS #	Compound name	RCF FW	Note	Br, root-veg	Note	Br, leafy-veg	Note	Br, forage	Note	Bv, leafy veg	Log Bvol	Note	Bv, forage	Note
108-86-1	Bromobenzene	6.06E+00	18,20	3.09E+01	22	7.24E-01	25	7.24E-01	25	3.46E-02	2.53E+00	28	3.46E-02	28
74-97-5	Bromochloromethane		--		--		--	0	--	0		--		--
104-51-8	Butylbenzene, n-		--		--		--	0	--	0		--		--
135-98-8	Butylbenzene, sec		--		--		--		--			--		--
98-06-6	Butylbenzene, tert	4.41E+01	18,20	1.58E+01	22	1.63E-01	25	1.63E-01	25	1.01E-01	2.99E+00	28	1.01E-01	28
86-74-8	Carbazole	2.13E+01	18,20	3.16E-01	22	2.81E-01	25	2.81E-01	25	5.60E+03	7.74E+00	28	5.60E+03	28
7440-48-4	Cobalt		21a	7.00E-03	23	0.0086	27	0.02	26	0		29	0	29
7440-50-8	Copper		21a	0.25	23	0.27	27	0.4	26	0		29	0	29
2303-16-4	Diallate		--		--		--		--			--		--
132-64-9	Dibenzofuran	4.34E+01	18,20	1.96E-01	22	1.65E-01	25	1.65E-01	25	9.99E+01	5.99E+00	28	9.99E+01	28
122-39-4	Diphenylamine	1.50E+01	18,20	3.32E-01	22	3.67E-01	25	3.67E-01	25	6.01E+02	6.77E+00	28	6.01E+02	28
1031-07-8	Endosulfan sulfate	1.99E+01	18,20	3.86E+00	22	2.97E-01	25	2.97E-01	25	1.36E+03	7.12E+00	28	1.36E+03	28
7421-93-4	Endrin aldehyde	1.50E+02	18,20	1.44E-01	22	6.51E-02	25	6.51E-02	25	1.72E+03	7.22E+00	28	1.72E+03	28
53494-70-5	Endrin ketone		--		--		--		--			--		--

TABLE 1
CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

		RCF in fresh wt (FW) (g COPC/g FW plant) / (g COPC/mL soil water)		Plant-soil bioconcentration factor for below ground produce (g COPC/g DW plant) / (g COPC/g DW soil) (unitless)		Plant-soil bioconcentration factor for aboveground produce (HHRAP variable = Br_{ag}) (same value used for Br_{grain}) (g COPC/g DW plant) / (g COPC/g DW soil) (unitless)		Plant-soil bioconcentration factor for forage and silage (g COPC/g DW plant) / (g COPC/g DW soil) (unitless)		Air-to-plant biotransfer factor in aboveground produce (HHRAP variable = Bv_{ag}) (g COPC/g DW plant)/ (g COPC/g air) (unitless)	LOG Bvol		Air-to-plant biotransfer factor in forage and silage (g COPC/g DW plant)/ (g COPC/g air) (unitless)	
CAS #	Compound name	RCF FW	Note	Br, root-veg	Note	Br, leafy-veg	Note	Br, forage	Note	Bv, leafy veg	Log Bvol	Note	Bv, forage	Note
76-13-1	Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	8.19E+00	18,20	1.69E+01	22	5.77E-01	25	5.77E-01	25	2.69E-04	4.17E-01	28	2.69E-04	28
74-88-4	Iodomethane	1.26E+00	19,20	6.13E+00	22	5.19E+00	25	5.19E+00	25	4.31E-04	6.21E-01	28	4.31E-04	28
99-87-6	Isopropyl toluene, p-	4.34E+01	18,20	1.58E+01	22	1.65E-01	25	1.65E-01	25	1.18E-01	3.06E+00	28	1.18E-01	28
7439-96-5	Manganese		21a	0.05	23	0.075	27	0.25	26	0		29	0	29
62-75-9	N-nitrosodimethylamine		21	5.33E+01	22	8.38	25a	8.38	25a	1.15E-02	2.05E+00	28	1.15E-02	28
198-55-0	Perylene		--		--		--		--			--		--
2240-47-3	Phosphine imide, P,P,P-triphenyl		--		--		--		--	0		--		--
103-65-1	Propylbenzene, n-		--		--		--		--	0		--		--
7440-62-2	Vanadium		21a	3.00E-03	23	0.0033	27	5.50E-03	26	0		29	0	29
58-89-9	γ-BHC (Lindane)	1.79E+01	18,20	6.54E+01	22	3.22E-01	25	3.22E-01	25	2.72E+01	5.42E+00	28	2.72E+01	28
319-86-8	δ-BHC	4.65E+01	18,20	8.40E+00	22	1.57E-01	25	1.57E-01	25	3.34E+03	7.51E+00	28	3.34E+03	28
110-54-3	1-Hexane (n-hexane)	3.04E+01	18,20	1.59E+01	22	2.16E-01	25	2.16E-01	25	4.42E-04	6.32E-01	28	4.42E-04	28
79-10-7	Acrylic Acid	8.60E-01	19,20	4.58E+04	22	8.38	25a	8.38	25a	7.08E-01	3.84E+00	28	7.08E-01	28
107-21-1	Ethylene Glycol		21	1.60E+02	22	8.38	25a	8.38	25a	3.31E-02	2.51E+00	28	3.31E-02	28
80-62-6	Methyl methacrylate	1.17E+00	19,20	4.09E+01	22	6.17E+00	25	6.17E+00	25	4.89E-03	1.68E+00	28	4.89E-03	28

TABLE 1
CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

		RCF in fresh wt (FW) (g COPC/g FW plant) / (g COPC/mL soil water)		Plant-soil bioconcentration factor for below ground produce (g COPC/g DW plant) / (g COPC/g DW soil) (unitless)		Plant-soil bioconcentration factor for aboveground produce (HHRAP variable = Br_{ag}) (same value used for Br_{grain}) (g COPC/g DW plant) / (g COPC/g DW soil) (unitless)		Plant-soil bioconcentration factor for forage and silage (g COPC/g DW plant) / (g COPC/g DW soil) (unitless)		Air-to-plant biotransfer factor in aboveground produce (HHRAP variable = Bv_{ag}) (g COPC/g DW plant)/ (g COPC/g air) (unitless)	LOG Bvol		Air-to-plant biotransfer factor in forage and silage (g COPC/g DW plant)/ (g COPC/g air) (unitless)	
CAS #	Compound name	RCF FW	Note	Br, root-veg	Note	Br, leafy-veg	Note	Br, forage	Note	Bv, leafy veg	Log Bvol	Note	Bv, forage	Note
1634-04-4	methyl tert-butyl ether	1.07E+00	19,20	9.28E-01	22	7.84E+00	25	7.84E+00	25	1.80E-03	1.24E+00	28	1.80E-03	28
75-56-9	Propylene oxide	8.52E-01	19,20	2.62E+01	22	8.38	25a	8.38	25a	4.89E-04	6.76E-01	28	4.89E-04	28
33213-65-9	Endosulfan II	2.55E+01	18,20	4.56E+01	22	2.46E-01	25	2.46E-01	25	4.79E+01	5.67E+00	28	4.79E+01	28
7446-09-5	Sulfur dioxide	8.21E-01	19,20	2.11E+02	22	7.24E+02	25	7.24E+02	25	3.13E-07	-2.52E+00	28	3.13E-07	28
10102-44-0	Nitrogen dioxide	8.31E-01	19,20	1.15E+02	22	8.38E+01	25	8.38E+01	25	5.50E-07	-2.27E+00	28	5.50E-07	28
Compounds evaluated for fugitive vap														
106-99-0	1,3-Butadiene	NA		NA		NA		NA		NA			NA	
110-82-7	Cyclohexane	NA		NA		NA		NA		NA			NA	

-- = Not applicable - compound did not have chronic human health toxicity data, or ecological risk assessment toxicity reference values (TRVs), and thus was not evaluated in the multiple pathway fate and transport modeling.

NA = Not applicable. Compound was only evaluated for the inhalation pathway in the human health risk assessment addressing potential fugitive emissions.

TABLE 1
CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

		Biotransfer factor in milk (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)	LOG Ba,fat (Ba,fat in mg/kg fat / mg/day)		Biotransfer factor in beef (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)		Biotransfer factor in pork (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)		Bioconcentration factor in fish (L/kg FW OR unitless)	LOG BCF		Bioaccumulation factor in fish (mg COPC/kg FW tissue)/ (mg COPC/L total water column) OR (L water/kg FW tissue)	
CAS #	Compound name	Ba, milk	Log (Ba,fat)	Note	Ba, beef	Note	Ba, pork	Note	BCF, fish	log BCF	Note	BAF, fish	Note
563-58-6	1,1-Dichloropropene			--		--		--			--		--
95-63-6	1,2,4-Trimethylbenzene	4.70E-03	-9.30E-01	30a	2.23E-02	30b	2.70E-02	33	1.62E+02	2.21E+00	40b		
142-28-9	1,3-Dichloropropane	6.11E-04	-1.82E+00	30a	2.90E-03	30b	3.51E-03	33	6.92E+00	8.40E-01	40b		
108-60-1	2,2'-oxybis (1-Chloropropane)	1.22E-03	-1.52E+00	30a	5.80E-03	30b	7.02E-03	33	1.62E+01	1.21E+00	40b		
594-20-7	2,2-Dichloropropane	2.10E-03	-1.28E+00	30a	9.98E-03	30b	1.21E-02	33	3.54E+01	1.55E+00	40b		
625-86-5	2,5-Dimethylfuran	8.75E-04	-1.66E+00	30a	4.16E-03	30b	5.03E-03	33	1.06E+01	1.02E+00	40b		
2216-30-0	2,5-Dimethylheptane			--		--	0	--	0		--		--
17559-81-8	2,5-Dione, 3-hexene			--		--	0	--	0		--		--
78-93-3	2-Butanone	2.21E-05	-3.26E+00	30a	1.05E-04	30b	1.27E-04	33	3.16		40a	0	
95-49-8	2-Chlorotoluene	3.50E-03	-1.06E+00	30a	1.66E-02	30b	2.01E-02	33	8.58E+01	1.93E+00	40b	0	
591-78-6	2-Hexanone	2.14E-04	-2.27E+00	30a	1.02E-03	30b	1.23E-03	33	2.30E+00	3.63E-01	40b		
3221-61-2	2-Methyl octane			--	0	--		--			--		--
91-57-6	2-Methylnaphthalene	5.12E-03	-8.93E-01	30a	2.43E-02	30b	2.94E-02	33	2.01E+02	2.30E+00	40b		
34246-54-3	3-Ethyl benzaldehyde			--	0	--		--			--		--

TABLE 1
CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

		Biotransfer factor in milk (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)	LOG Ba,fat (Ba,fat in mg/kg fat / mg/day)		Biotransfer factor in beef (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)		Biotransfer factor in pork (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)		Bioconcentration factor in fish (L/kg FW OR unitless)	LOG BCF		Bioaccumulation factor in fish (mg COPC/kg FW tissue)/ (mg COPC/L total water column) OR (L water/kg FW tissue)	
CAS #	Compound name	Ba, milk	Log (Ba,fat)	Note	Ba, beef	Note	Ba, pork	Note	BCF, fish	log BCF	Note	BAF, fish	Note
763-93-9	3-Hexen-2-one			--	0	--		--			--		--
625-33-2	3-Penten-2-one (ethylidene acetone)			--	0	--		--			--		--
141-79-7	3-Penten-2-one, 4-methyl			--		--		--			--		--
534-52-1	4,6-Dinitro-2-methylphenol	7.34E-04	-1.74E+00	30a	3.49E-03	30b	4.22E-03	33	8.56E+00	9.32E-01	40b		
106-43-4	4-Chlorotoluene	3.22E-03	-1.09E+00	30a	1.53E-02	30b	1.85E-02	33	7.31E+01	1.86E+00	40b		
4748-78-1	4-Ethyl benzaldehyde			--		--		--			--		--
301-02-0	9-Octadecenamide (oleamide)			--		--		--			--		--
208-96-8	Acenaphthylene	5.82E-03	-8.37E-01	30a	2.76E-02	30b	3.35E-02	33	2.86E+02	2.46E+00	40b		
7429-90-5	Aluminum	0.0002		31	0.0015	31	0	34	500		42		
92-87-5	Benzidine	3.76E-04	-2.03E+00	30a	1.79E-03	30b	2.16E-03	33	4.06E+00	6.09E-01	40b		
192-97-2	Benzo(e)pyrene			--		--		--			--		--
191-24-2	Benzo(g,h,i)perylene	6.19E-03	-8.10E-01	30a	2.94E-02	30b	3.56E-02	33	7.28E+04	4.86E+00	40b +.48		
93-58-3	Benzoic acid, methyl ester (methyl benzoate)	7.34E-04	-1.74E+00	30a	3.49E-03	30b	4.22E-03	33	8.56E+00	9.32E-01	40b		
111-91-1	Bis(2-chloroethoxy) methane	6.15E-05	-2.81E+00	30a	2.92E-04	30b	3.54E-04	33	3.16		40a		

TABLE 1
CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

		Biotransfer factor in milk (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)	LOG Ba,fat (Ba,fat in mg/kg fat / mg/day)		Biotransfer factor in beef (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)		Biotransfer factor in pork (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)		Bioconcentration factor in fish (L/kg FW OR unitless)	LOG BCF		Bioaccumulation factor in fish (mg COPC/kg FW tissue)/ (mg COPC/L total water column) OR (L water/kg FW tissue)	
CAS #	Compound name	Ba, milk	Log (Ba,fat)	Note	Ba, beef	Note	Ba, pork	Note	BCF, fish	log BCF	Note	BAF, fish	Note
108-86-1	Bromobenzene	2.27E-03	-1.25E+00	30a	1.08E-02	30b	1.31E-02	33	4.00E+01	1.60E+00	40b		
74-97-5	Bromochloromethane			--	0	--		--			--		--
104-51-8	Butylbenzene, n-			--	0	--		--			--		--
135-98-8	Butylbenzene, sec			--		--		--			--		--
98-06-6	Butylbenzene, tert	5.85E-03	-8.35E-01	30a	2.78E-02	30b	3.37E-02	33	2.92E+02	2.46E+00	40b		
86-74-8	Carbazole	4.42E-03	-9.56E-01	30a	2.10E-02	30b	2.54E-02	33	1.41E+02	2.15E+00	40b		
7440-48-4	Cobalt	2.00E-03		31	0.02	31	0	34	300		42		
7440-50-8	Copper	1.50E-03		31	0.01	31	0	34	200		42		
2303-16-4	Diallate			--		--		--			--		--
132-64-9	Dibenzofuran	5.82E-03	-8.37E-01	30a	2.76E-02	30b	3.35E-02	33		2.46E+00		3.15E+02	41 (FCM =1.1)
122-39-4	Diphenylamine	3.75E-03	-1.03E+00	30a	1.78E-02	30b	2.16E-02	33	9.89E+01	2.00E+00	40b		
1031-07-8	Endosulfan sulfate	4.29E-03	-9.70E-01	30a	2.04E-02	30b	2.46E-02	33	1.31E+02	2.12E+00	40b		
7421-93-4	Endrin aldehyde	7.89E-03	-7.05E-01	30a	3.75E-02	30b	4.54E-02	33	9.91E+02	3.00E+00	40b		
53494-70-5	Endrin ketone			--		--		--			--		--

TABLE 1
CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

		Biotransfer factor in milk (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)	LOG Ba,fat (Ba,fat in mg/kg fat / mg/day)		Biotransfer factor in beef (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)		Biotransfer factor in pork (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)		Bioconcentration factor in fish (L/kg FW OR unitless)	LOG BCF		Bioaccumulation factor in fish (mg COPC/kg FW tissue)/ (mg COPC/L total water column) OR (L water/kg FW tissue)	
CAS #	Compound name	Ba, milk	Log (Ba,fat)	Note	Ba, beef	Note	Ba, pork	Note	BCF, fish	log BCF	Note	BAF, fish	Note
76-13-1	Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	2.72E-03	-1.17E+00	30a	1.29E-02	30b	1.56E-02	33	5.41E+01	1.73E+00	40b		
74-88-4	Iodomethane	2.70E-04	-2.17E+00	30a	1.28E-03	30b	1.55E-03	33	2.90E+00	4.63E-01	40b		
99-87-6	Isopropyl toluene, p-	5.82E-03	-8.37E-01	30a	2.76E-02	30b	3.35E-02	33	2.86E+02	2.46E+00	40b		
7439-96-5	Manganese	3.50E-04		31	4.00E-04	31	0	34	400		42		
62-75-9	N-nitrosodimethylamine	2.51E-06	-4.20E+00	30a	1.19E-05	30b	1.44E-05	33	3.16		40a		
198-55-0	Perylene			--		--		--			--		--
2240-47-3	Phosphine imide, P,P,P-triphenyl			--		--		--			--	0	--
103-65-1	Propylbenzene, n-			--		--		--			--	0	--
7440-62-2	Vanadium	2.00E-05		31	2.50E-03	31	0	34	0		42a		
58-89-9	γ-BHC (Lindane)	4.08E-03	-9.91E-01	30a	1.94E-02	30b	2.35E-02	33	1.18E+02	2.07E+00	40b		
319-86-8	δ-BHC	5.96E-03	-8.27E-01	30a	2.83E-02	30b	3.43E-02	33	0.00E+00	2.49E+00		3.38E+02	41 (FCM= 1.1)
110-54-3	1-Hexane (n-hexane)	5.12E-03	-8.93E-01	30a	2.43E-02	30b	2.94E-02	33	2.01E+02	2.30E+00	40b		
79-10-7	Acrylic Acid	1.63E-05	-3.39E+00	30a	7.73E-05	30b	9.36E-05	33	3.16		40c		
107-21-1	Ethylene Glycol	2.53E-07	-5.20E+00	30a	1.20E-06	30b	1.46E-06	33	3.16		40a		
80-62-6	Methyl methacrylate	2.14E-04	-2.27E+00	30a	1.02E-03	30b	1.23E-03	33	2.30E+00	3.63E-01	40b		

TABLE 1
CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

		Biotransfer factor in milk (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)	LOG Ba,fat (Ba,fat in mg/kg fat / mg/day)		Biotransfer factor in beef (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)		Biotransfer factor in pork (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)		Bioconcentration factor in fish (L/kg FW OR unitless)	LOG BCF		Bioaccumulation factor in fish (mg COPC/kg FW tissue)/ (mg COPC/L total water column) OR (L water/kg FW tissue)	
CAS #	Compound name	Ba, milk	Log (Ba,fat)	Note	Ba, beef	Note	Ba, pork	Note	BCF, fish	log BCF	Note	BAF, fish	Note
1634-04-4	methyl tert-butyl ether	1.53E-04	-2.42E+00	30a	7.25E-04	30b	8.77E-04	33	1.67E+00	2.24E-01	40b		
75-56-9	Propylene oxide	1.19E-05	-3.53E+00	30a	5.63E-05	30b	6.82E-05	33	3.16		40a		
33213-65-9	Endosulfan II	4.77E-03	-9.24E-01	30a	2.27E-02	30b	2.74E-02	33	1.68E+02	2.23E+00	40b		
7446-09-5	Sulfur dioxide	1.62E-08	-6.39E+00	30a	7.68E-08	30b	9.30E-08	33	3.16		40a		
10102-44-0	Nitrogen dioxide	2.44E-06	-4.21E+00	30a	1.16E-05	30b	1.41E-05	33	3.16		40a		
Compounds evaluated for fugitive vap													
106-99-0	1,3-Butadiene	NA	NA		NA		NA		NA			NA	
110-82-7	Cyclohexane	NA	NA		NA		NA		NA			NA	

-- = Not applicable - compound did not have chronic human health toxicity data, or ecological risk assessment toxicity reference values (TRVs), and thus was not evaluated in the multiple pathway fate and transport modeling.

NA = Not applicable. Compound was only evaluated for the inhalation pathway in the human health risk assessment addressing potential fugitive emissions.

TABLE 1
CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

		Biota-sediment accumulation factor in fish (mg COPC/kg lipid tissue)/(mg COPC/kg sediment) (unitless)		Plant-soil bioconcentration factor for grain (HHRAP variable = Br_{grain}) (same value used for Bra_g) (g COPC/g DW grain) / (g COPC/g DW soil) (unitless)		Biotransfer factor in eggs (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)		Biotransfer factor in chicken (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)	
CAS #	Compound name	BSAF, fish	Note	Br, grain	Note	Ba, egg	Note	Ba, chicken	Note
563-58-6	1,1-Dichloropropene		--		--		--		--
95-63-6	1,2,4-Trimethylbenzene			2.53E-01	37	9.40E-03	35b	1.65E-02	35a
142-28-9	1,3-Dichloropropane			2.70E+00	37	1.22E-03	35b	2.14E-03	35a
108-60-1	2,2'-oxybis (1-Chloropropane)			1.43E+00	37	2.44E-03	35b	4.27E-03	35a
594-20-7	2,2-Dichloropropane			7.95E-01	37	4.20E-03	35b	7.35E-03	35a
625-86-5	2,5-Dimethylfuran			1.96E+00	37	1.75E-03	35b	3.06E-03	35a
2216-30-0	2,5-Dimethylheptane		--		--		--		--
17559-81-8	2,5-Dione, 3-hexene		--		--		--		--
78-93-3	2-Butanone	0		8.38E+00	37	4.42E-05	35b	7.73E-05	35a
95-49-8	2-Chlorotoluene	0		4.09E-01	37	6.99E-03	35b	1.22E-02	35a
591-78-6	2-Hexanone			6.17E+00	37	4.28E-04	35b	7.49E-04	35a
3221-61-2	2-Methyl octane		--		--		--		--
91-57-6	2-Methylnaphthalene			2.16E-01	37	1.02E-02	35b	1.79E-02	35a
34246-54-3	3-Ethyl benzaldehyde		--		--		--		--

TABLE 1
CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

		Biota-sediment accumulation factor in fish (mg COPC/kg lipid tissue)/(mg COPC/kg sediment) (unitless)		Plant-soil bioconcentration factor for grain (HHRAP variable = Br_{grain}) (same value used for Bra_g) (g COPC/g DW grain) / (g COPC/g DW soil) (unitless)		Biotransfer factor in eggs (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)		Biotransfer factor in chicken (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)	
CAS #	Compound name	BSAF, fish	Note	Br, grain	Note	Ba, egg	Note	Ba, chicken	Note
763-93-9	3-Hexen-2-one		--		--		--		--
625-33-2	3-Penten-2-one (ethylidene acetone)		--		--		--		--
141-79-7	3-Penten-2-one, 4-methyl		--		--		--		--
534-52-1	4,6-Dinitro-2-methylphenol			2.30E+00	37	1.47E-03	35b	2.57E-03	35a
106-43-4	4-Chlorotoluene			4.61E-01	37	6.43E-03	35b	1.13E-02	35a
4748-78-1	4-Ethyl benzaldehyde		--		--		--		--
301-02-0	9-Octadecenamide (oleamide)		--		--		--		--
208-96-8	Acenaphthylene			1.65E-01	37	1.16E-02	35b	2.04E-02	35a
7429-90-5	Aluminum			6.50E-04	38	0	36	0	36
92-87-5	Benzidine			4.03E+00	37	7.52E-04	35b	1.32E-03	35a
192-97-2	Benzo(e)pyrene		--		--		--		--
191-24-2	Benzo(g,h,i)perylene			5.93E-03	37	1.24E-02	35b	2.17E-02	35a
93-58-3	Benzoic acid, methyl ester (methyl benzoate)			2.30E+00	37	1.47E-03	35b	2.57E-03	35a
111-91-1	Bis(2-chloroethoxy) methane			8.38E+00	37	1.23E-04	35b	2.15E-04	35a

TABLE 1
CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

		Biota-sediment accumulation factor in fish (mg COPC/kg lipid tissue)/(mg COPC/kg sediment) (unitless)		Plant-soil bioconcentration factor for grain (HHRAP variable = Br_{grain}) (same value used for Bra_g) (g COPC/g DW grain) / (g COPC/g DW soil) (unitless)		Biotransfer factor in eggs (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)		Biotransfer factor in chicken (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)	
CAS #	Compound name	BSAF, fish	Note	Br, grain	Note	Ba, egg	Note	Ba, chicken	Note
108-86-1	Bromobenzene			7.24E-01	37	4.54E-03	35b	7.95E-03	35a
74-97-5	Bromochloromethane		--		--		--		--
104-51-8	Butylbenzene, n-		--		--		--		--
135-98-8	Butylbenzene, sec		--		--		--		--
98-06-6	Butylbenzene, tert			1.63E-01	37	1.17E-02	35b	2.05E-02	35a
86-74-8	Carbazole			2.81E-01	37	8.85E-03	35b	1.55E-02	35a
7440-48-4	Cobalt			7.00E-03	38	0	36	0	36
7440-50-8	Copper			2.50E-01	38	0	36	0	36
2303-16-4	Diallate		--		--		--		--
132-64-9	Dibenzofuran			1.65E-01	37	1.16E-02	35b	2.04E-02	35a
122-39-4	Diphenylamine			3.67E-01	37	7.50E-03	35b	1.31E-02	35a
1031-07-8	Endosulfan sulfate			2.97E-01	37	8.57E-03	35b	1.50E-02	35a
7421-93-4	Endrin aldehyde			6.51E-02	37	1.58E-02	35b	2.76E-02	35a
53494-70-5	Endrin ketone		--		--		--		--

TABLE 1
CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

		Biota-sediment accumulation factor in fish (mg COPC/kg lipid tissue)/(mg COPC/kg sediment) (unitless)		Plant-soil bioconcentration factor for grain (HHRAP variable = Br_{grain}) (same value used for Bra_g) (g COPC/g DW grain) / (g COPC/g DW soil) (unitless)		Biotransfer factor in eggs (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)		Biotransfer factor in chicken (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)	
CAS #	Compound name	BSAF, fish	Note	Br, grain	Note	Ba, egg	Note	Ba, chicken	Note
76-13-1	Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)			5.77E-01	37	5.44E-03	35b	9.52E-03	35a
74-88-4	Iodomethane			5.19E+00	37	5.41E-04	35b	9.46E-04	35a
99-87-6	Isopropyl toluene, p-			1.65E-01	37	1.16E-02	35b	2.04E-02	35a
7439-96-5	Manganese			5.00E-02	38	0	36	0	36
62-75-9	N-nitrosodimethylamine			8.38E+00	37	5.02E-06	35b	8.79E-06	35a
198-55-0	Perylene		--		--		--		--
2240-47-3	Phosphine imide, P,P,P-triphenyl		--		--		--		--
103-65-1	Propylbenzene, n-		--		--		--		--
7440-62-2	Vanadium			3.00E-03	38	0	36	0	36
58-89-9	γ-BHC (Lindane)			3.22E-01	37	8.17E-03	35b	1.43E-02	35a
319-86-8	δ-BHC			1.57E-01	37	1.19E-02	35b	2.09E-02	35a
110-54-3	1-Hexane (n-hexane)			2.16E-01	37	1.02E-02	35b	1.79E-02	35a
79-10-7	Acrylic Acid			8.38E+00	37	3.26E-05	35b	5.70E-05	35a
107-21-1	Ethylene Glycol			8.38E+00	37	5.07E-07	35b	8.87E-07	35a
80-62-6	Methyl methacrylate			6.17E+00	37	4.28E-04	35b	7.49E-04	35a

TABLE 1
CHEMICAL-SPECIFIC PARAMETERS FOR COMPOUNDS NOT IN USEPA'S HHRAP

		Biota-sediment accumulation factor in fish (mg COPC/kg lipid tissue)/(mg COPC/kg sediment) (unitless)		Plant-soil bioconcentration factor for grain (HHRAP variable = Br_{grain}) (same value used for Bra_g) (g COPC/g DW grain) / (g COPC/g DW soil) (unitless)		Biotransfer factor in eggs (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)		Biotransfer factor in chicken (mg COPC/kg FW tissue)/ (mg COPC/day) OR (day/kg FW tissue)	
CAS #	Compound name	BSAF, fish	Note	Br, grain	Note	Ba, egg	Note	Ba, chicken	Note
1634-04-4	methyl tert-butyl ether			7.84E+00	37	3.05E-04	35b	5.34E-04	35a
75-56-9	Propylene oxide			8.38E+00	37	2.37E-05	35b	4.15E-05	35a
33213-65-9	Endosulfan II			2.46E-01	37	9.54E-03	35b	1.67E-02	35a
7446-09-5	Sulfur dioxide			7.24E+02	37	3.24E-08	35b	5.66E-08	35a
10102-44-0	Nitrogen dioxide			8.38E+01	37	4.89E-06	35b	8.56E-06	35a
Compounds evaluated for fugitive vap									
106-99-0	1,3-Butadiene	NA		NA		NA		NA	
110-82-7	Cyclohexane	NA		NA		NA		NA	

-- = Not applicable - compound did not have chronic human health toxicity data, or ecological risk assessment toxicity reference values (TRVs), and thus was not evaluated in the multiple pathway fate and transport modeling.

NA = Not applicable. Compound was only evaluated for the inhalation pathway in the human health risk assessment addressing potential fugitive emissions.

TABLE 2

REFERENCES FOR NOTES INCLUDED IN CHEMICAL-PHYSICAL PROPERTIES TABLE

TABLE 2
REFERENCES FOR NOTES INCLUDED IN CHEMICAL-PHYSICAL PROPERTIES TABLE

Note	Parameter	Description
1	Molecular weight (MW), melting point (Tm), vapor pressure (VP), water solubility (S), Henry's law constant (H), log octanol:water partition coefficient (log Kow), soil:water partition coefficient (Kd)	Superfund Chemical Data Matrix – USEPA (2005) Appendix A-2 recommended source
2	Molecular weight (MW), melting point (Tm), vapor pressure (VP), water solubility (S), Henry's law constant (H), log octanol:water partition coefficient (log Kow)	CHEMFATE (www/esc.syrres.com/eSc/chemfate.htm) – USEPA (2005) Appendix A-2 recommended source
3	Molecular weight (MW), melting point (Tm), vapor pressure (VP), water solubility (S), Henry's law constant (H), log octanol:water partition coefficient (log Kow)	Physprop (www.syrres.com/eSc/physdemo.htm) - USEPA (2005) Appendix A-2 recommended source
3a	Henry's law constant (H)	As directed in HHRAP, for metals, if no value is provided in sources 1, 2 or 3, assign a value of 0 (page A-2-8)
5	Organic carbon:water partition coefficient (Koc), soil:water partition coefficient (Kd)	USEPA's Soil Screening Guidance - USEPA (2005) Appendix A-2 recommended source
6	Air diffusivity (Da), water diffusivity (Dw)	USEPA's Water9 Model - USEPA (2005) Appendix A-2 recommended source
6a	Air diffusivity (Da), water diffusivity (Dw)	Per HHRAP, if no value is available in USEPA's WATER9 model, calculate based on molecular weight - HHRAP Equations A-2-4 and A-2-5
7	Soil:water partition coefficient (Kd)	Baes et al. (1984) - USEPA (2005) Appendix A-2 recommended source
8	Water solubility (S)	For compounds that are miscible, use USEPA default of 1E+6 mg/L
9	Organic carbon:water partition coefficient (Koc)	Calculate according to HHRAP Equation A-2-7

TABLE 2
REFERENCES FOR NOTES INCLUDED IN CHEMICAL-PHYSICAL PROPERTIES TABLE

Note	Parameter	Description
10	Organic carbon:water partition coefficient (Koc)	Calculate according to HHRAP Equation A-2-8
11	Organic carbon:water partition coefficient (Koc)	According to HHRAP, default value for Koc for metals is 0.
12	Organic carbon:water partition coefficient (Koc)	IWEM default chemical properties data. www.epa.gov/epaoswer/non-hw/industd/iwem_tbd.htm.
13	Soil:water partition coefficient (Kd_s)	Calculate according to HHRAP Equation A-2-10
14	Suspended sediment:water partition coefficient (Kd_{sw})	Calculate according to HHRAP Equation A-2-11
14b	Suspended sediment:water partition coefficient (Kd_{sw}), benthic sediment:water partition coefficient (Kd_{bs})	According to HHRAP, for metals, assume Kd_{sw} and $Kd_{bs} = Kd_s$
15	Benthic sediment:water partition coefficient (Kd_{bs})	Calculate according to HHRAP Equation A-2-12
16	Fraction vapor (fv)	Calculate according to HHRAP Equation A-2-1
16a	Fraction vapor (fv)	According to HHRAP, for metals, assume fv = 0
17	Fraction vapor (fv)	Calculate according to HHRAP Equations A-2-2 and A-2-1
18	Log root concentration factor (RCF)	Calculate according to HHRAP Equation A-2-14
19	Log root concentration factor (RCF)	Calculate according to HHRAP Equation A-2-15
20	Root concentration factor (RCF_{FW})	Calculate according to HHRAP Equation A-2-16
21	Root concentration factor (RCF_{FW})	According to HHRAP, set RCF = 6.39 if log Kow < -0.57
21a	Root concentration factor (RCF_{FW})	According to HHRAP, for metals, assume RCF = 0
22	Soil-to-plant bioconcentration factor for below ground produce ($Br_{rootveg}$)	Calculate according to HHRAP Equation A-2-16

TABLE 2
REFERENCES FOR NOTES INCLUDED IN CHEMICAL-PHYSICAL PROPERTIES TABLE

Note	Parameter	Description
23	Soil-to-plant bioconcentration factor for below ground produce ($Br_{rootveg}$)	According to HHRAP, values for metals obtained from Baes et al. 1984
24	Melting point (Tm), vapor pressure (VP), water solubility (S), Henry's law constant (H), log octanol:water partition coefficient (log Kow), organic carbon:water partition coefficient (Koc)	USEPA's EpiSuite™.v3 Program (Estimation Programs Interface) (http://www.epa.gov/oppt/exposure/pubs/episuite.htm)
25	Soil-to-plant bioconcentration factor for aboveground produce (Br_{ag}), soil-to-plant bioconcentration factor for forage and silage (Br_{forage})	Calculate according to HHRAP Equations A-2-17 and A-2-18 (equations are identical for the produce types)
25a	Soil-to-plant bioconcentration factor for aboveground produce (Br_{ag}), soil-to-plant bioconcentration factor for forage and silage (Br_{forage})	According to HHRAP, set Br_{ag} and Br_{forage} = 8.38 if log Kow < 1.15
26	Soil-to-plant bioconcentration factor for forage and silage (Br_{forage})	For metals, use values in Baes et al. 1984 for B_v (vegetative growth-leaves and stems, Figure 2.1 in Baes)
27	Soil-to-plant bioconcentration factor for aboveground produce (Br_{ag})	For metals, use weighted average of values in Baes et al. 1984 for B_v (vegetative growth-leaves and stems) and Br (reproductive growth – fruit, seeds, tubers, Figure 2.2 in Baes), weighting by consumption (pp. A-2-18 to A-2-19)
28	Air-to-plant biotransfer factor in aboveground produce (Bv_{ag}), air-to-plant biotransfer factor for forage and silage (Bv_{forage})	Calculate according to HHRAP Equations A-2-19 and A-2-20
29	Air-to-plant biotransfer factor in aboveground produce (Bv_{ag}), air-to-plant biotransfer factor for forage and silage (Bv_{forage})	According to HHRAP, for metals, assume air-to-leaf transfer = 0

TABLE 2
REFERENCES FOR NOTES INCLUDED IN CHEMICAL-PHYSICAL PROPERTIES TABLE

Note	Parameter	Description
30	Log fat biotransfer coefficient (Ba_{fat})	Calculate according to HHRAP Equation A-2-21
30a	Biotransfer factor in milk (Ba_{milk})	Calculate according to HHRAP Equation A-2-22 (not used because dairy milk pathway was not evaluated – see main text)
30b	Biotransfer factor in beef (Ba_{beef})	Calculate according to HHRAP Equation A-2-23
31	Biotransfer factor in milk (Ba_{milk}), biotransfer factor in beef (Ba_{beef})	According to HHRAP, values for metals obtained from Baes et al. 1984 (Figure 2.25 for beef and Figure 2.24 for milk)
33	Biotransfer factor in pork (Ba_{pork})	Calculate according to HHRAP Equation A-2-26
34	Biotransfer factor in pork (Ba_{pork})	According to HHRAP, values for metals assumed to be 0
35a	Biotransfer factor in chicken/poultry ($Ba_{chicken}$)	Calculate according to HHRAP Equation A-2-27
35b	Biotransfer factor in eggs (Ba_{egg})	Calculate according to HHRAP Equation A-2-28
36	Biotransfer factor in eggs (Ba_{egg}), biotransfer factor in chicken/poultry ($Ba_{chicken}$)	Following HHRAP guidance, for metals, $Ba_{chicken}$ and Ba_{egg} assumed to be 0
37	Soil-to-plant bioconcentration factor for grain (Br_{grain})	Use Br_{forage} values (p. A-2-17)
38	Soil-to-plant bioconcentration factor for grain (Br_{grain})	For metals, use values in Baes et al. for Br (reproductive growth – fruit, seeds, tubers, Figure 2.2 in Baes)
40a	Fish bioconcentration factor (BCF)	Calculate according to HHRAP Equation A-2-27
40b	Fish bioconcentration factor (BCF)	Calculate according to HHRAP Equation A-2-28
40c	Fish bioconcentration factor (BCF)	Calculate according to HHRAP Equation A-2-31
41	Fish bioconcentration factor (BCF)	Calculate according to HHRAP Equation A-2-28 multiplied by a Food Chain Multiplier (FCM) obtained from USEPA's 1999 Screening Level Ecological Risk Assessment Protocol (Table 5-2)
42	Fish bioconcentration factor (BCF)	Values for metals obtained from Oak Ridge National Laboratory, Risk Assessment Information System (RAIS). Rais.ornl.gov/homepage/rap_tool.shtml

TABLE 2
REFERENCES FOR NOTES INCLUDED IN CHEMICAL-PHYSICAL PROPERTIES TABLE

Note	Parameter	Description
42a	Fish bioconcentration factor (BCF)	A bioconcentration factor for vanadium was not provided in RAIS. Fish uptake is low for this compound (Miramand, Fowler and Guary. 2004. Experimental study on vanadium transfer in the benthic fish Gobius minutus. Marine Biol. 114:349-353)
43	Vapor pressure (VP), organic carbon:water partition coefficient (Koc)	Following HHRAP guidance for metals, a default value of 0 is used
44	Soil loss constant due to biotic and abiotic degradation (Ksg)	Assume a conservative default value of 0
45	Soil loss constant due to biotic and abiotic degradation (Ksg)	Calculate according to HHRAP Equation A-2-13, based on data in ATSDR. 2001. Toxicological Profile for Benzidine

APPENDIX E

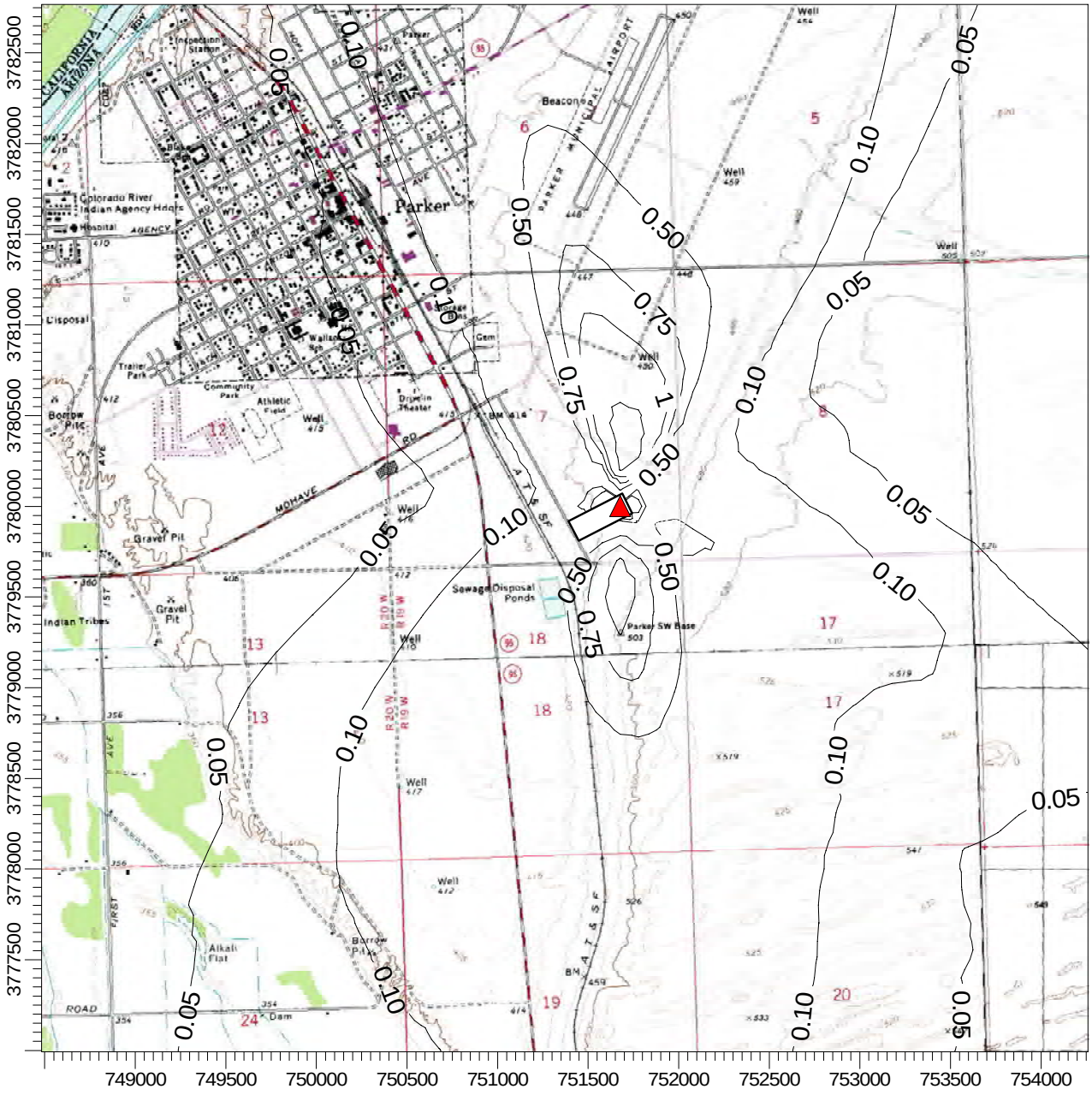
ISOPLETHS OF UNITIZED DISPERSION AND DEPOSITION MODELING RESULTS FOR STACK EMISSIONS

APPENDIX E

ISOPLETHS OF UNITIZED DISPERSION AND DEPOSITION MODELING RESULTS FOR STACK EMISSIONS

LIST OF FIGURES

Unitized Annual Average ISCST3 Modeling Results
Vapor Phase Air Concentrations (ug/m3 per 1 g/sec)



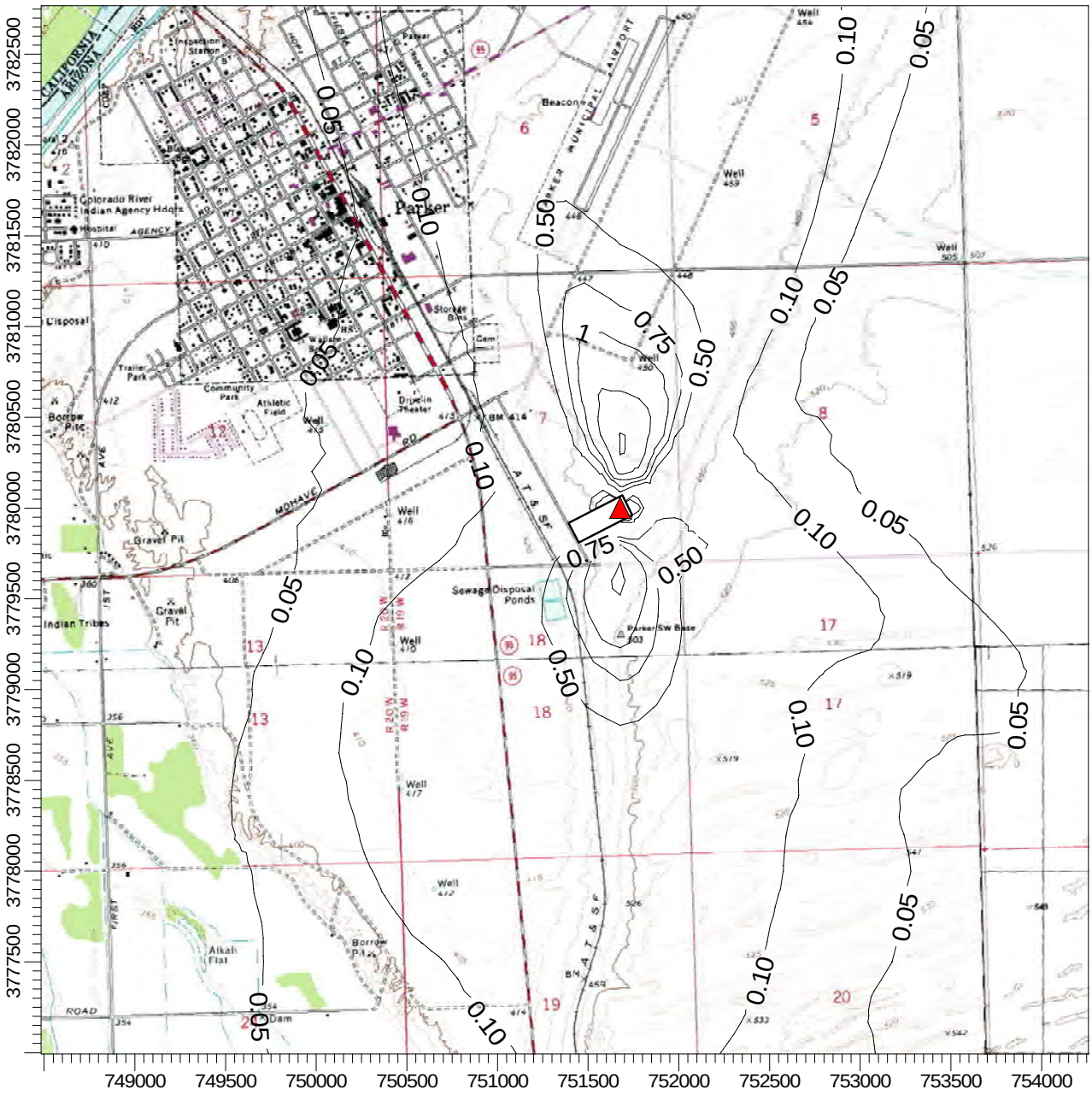
Note: The isopleth lines show results based on a unit, 1 gram per second (1 g/sec), stack emission rate. Chemical-specific results may be calculated by multiplying the unitized results by the gram per second chemical stack emission rate.

SCALE: 1:35,238

0 1 km

7/18/2007

Unitized Annual Average ISCST3 Modeling Results
Particle Phase (Mass Weighted) Air Concentrations (ug/m3 per 1 g/sec)



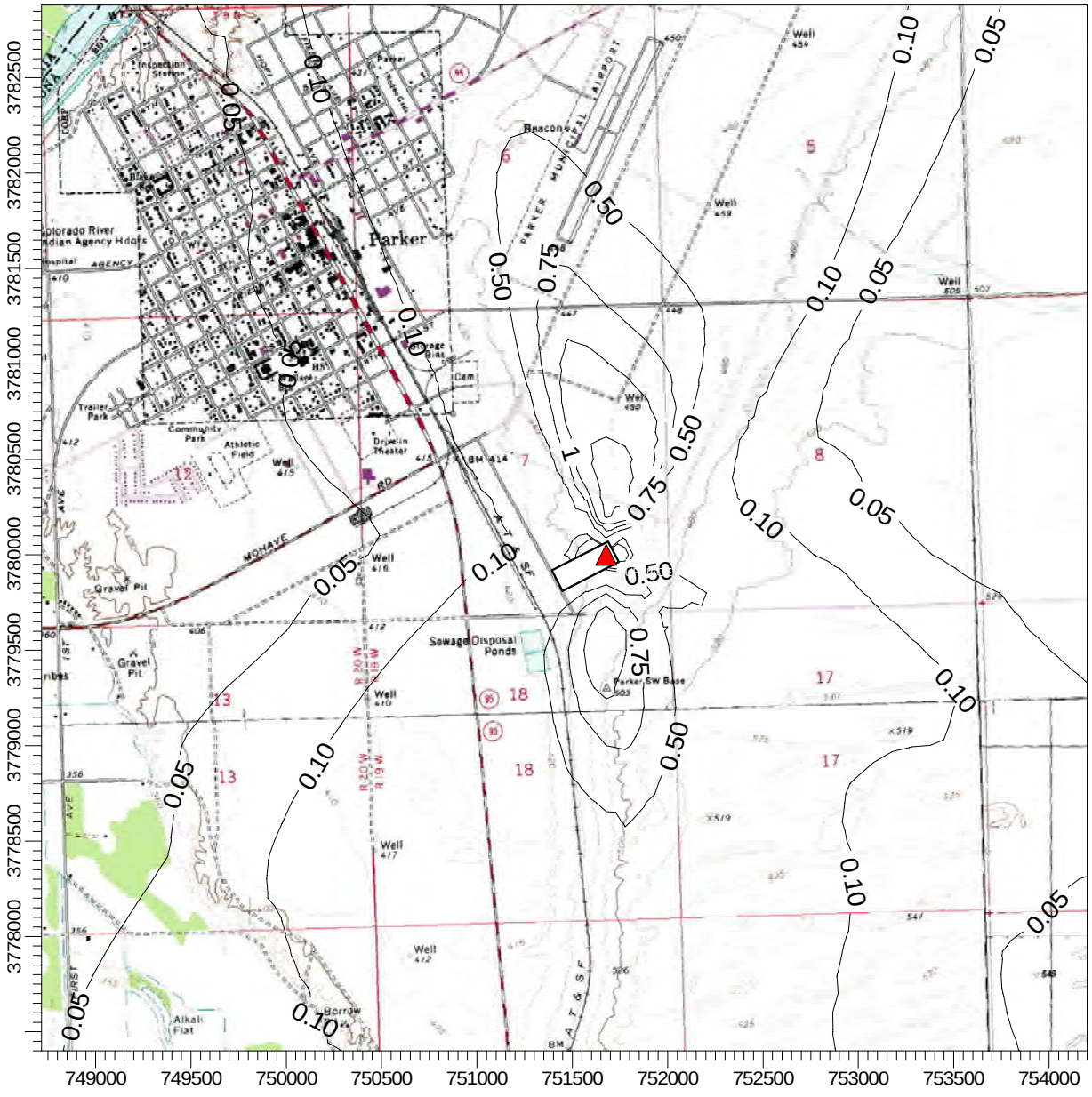
Note: The isopleth lines show results based on a unit, 1 gram per second (1 g/sec), stack emission rate. Chemical-specific results may be calculated by multiplying the unitized results by the gram per second chemical stack emission rate.

SCALE: 1:35,238

0 1 km

7/18/2007

Unitized Annual Average ISCST3 Modeling Results
Particle Bound (Surface Area Weighted) Air Concentrations (ug/m3 per 1 g/sec)



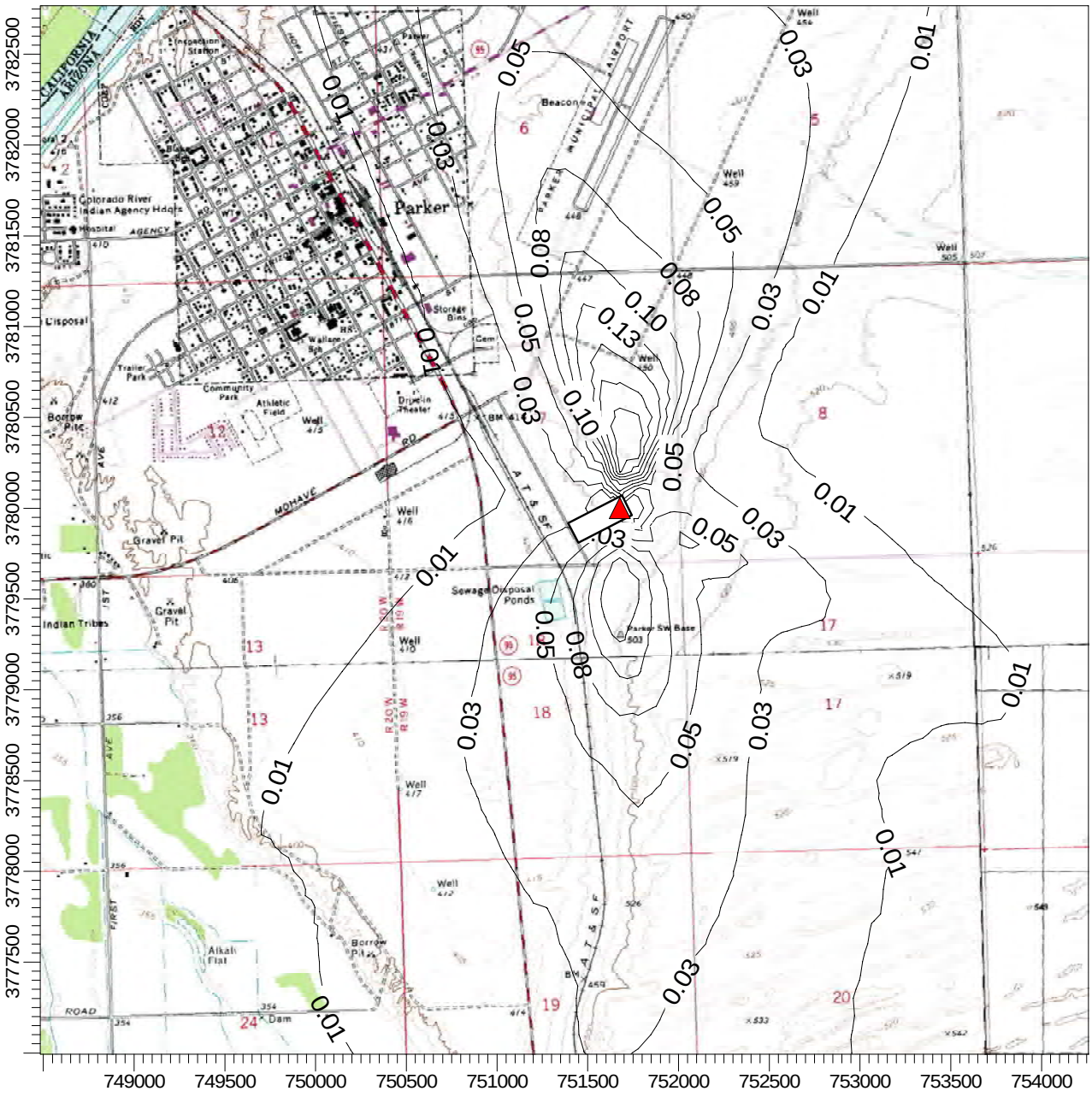
Note: The isopleth lines show results based on a unit, 1 gram per second (1 g/sec), stack emission rate. Chemical-specific results may be calculated by multiplying the unitized results by the gram per second chemical stack emission rate.

SCALE: 1:33,449

0 1 km

7/17/2007

Unitized Annual Average ISCST3 Modeling Results
Dry Deposition Rates for Vapor Phase Emissions (g/m2-yr per 1 g/sec)



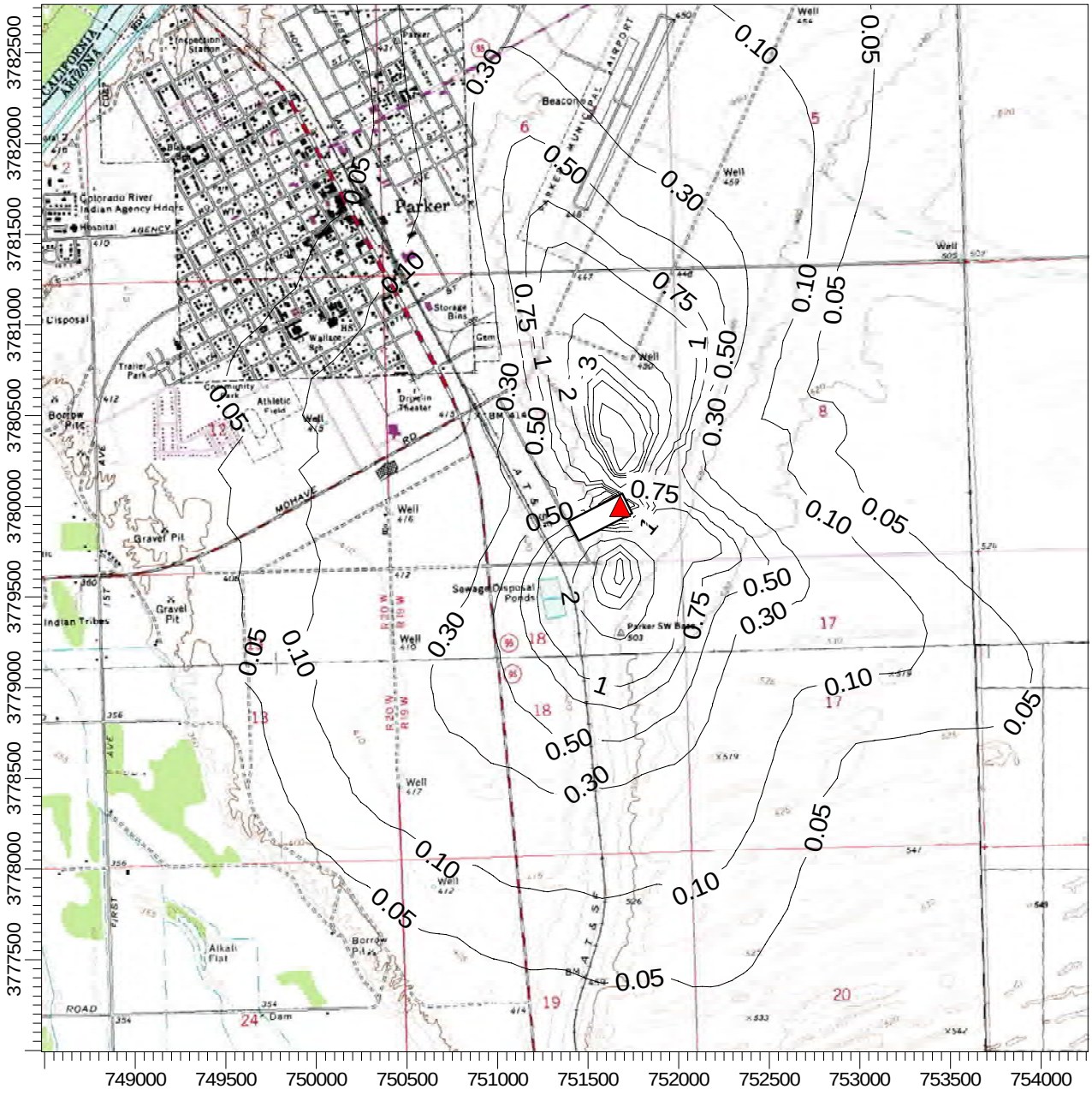
Note: The isopleth lines show results based on a unit, 1 gram per second (1 g/sec), stack emission rate. Chemical-specific results may be calculated by multiplying the unitized results by the gram per second chemical stack emission rate.

SCALE: 1:35,238

0 1 km

7/18/2007

Unitized Annual Average ISCST3 Modeling Results
Dry Deposition Rates for Particle Emissions - Mass Weighted (g/m2-yr per 1 g/sec)



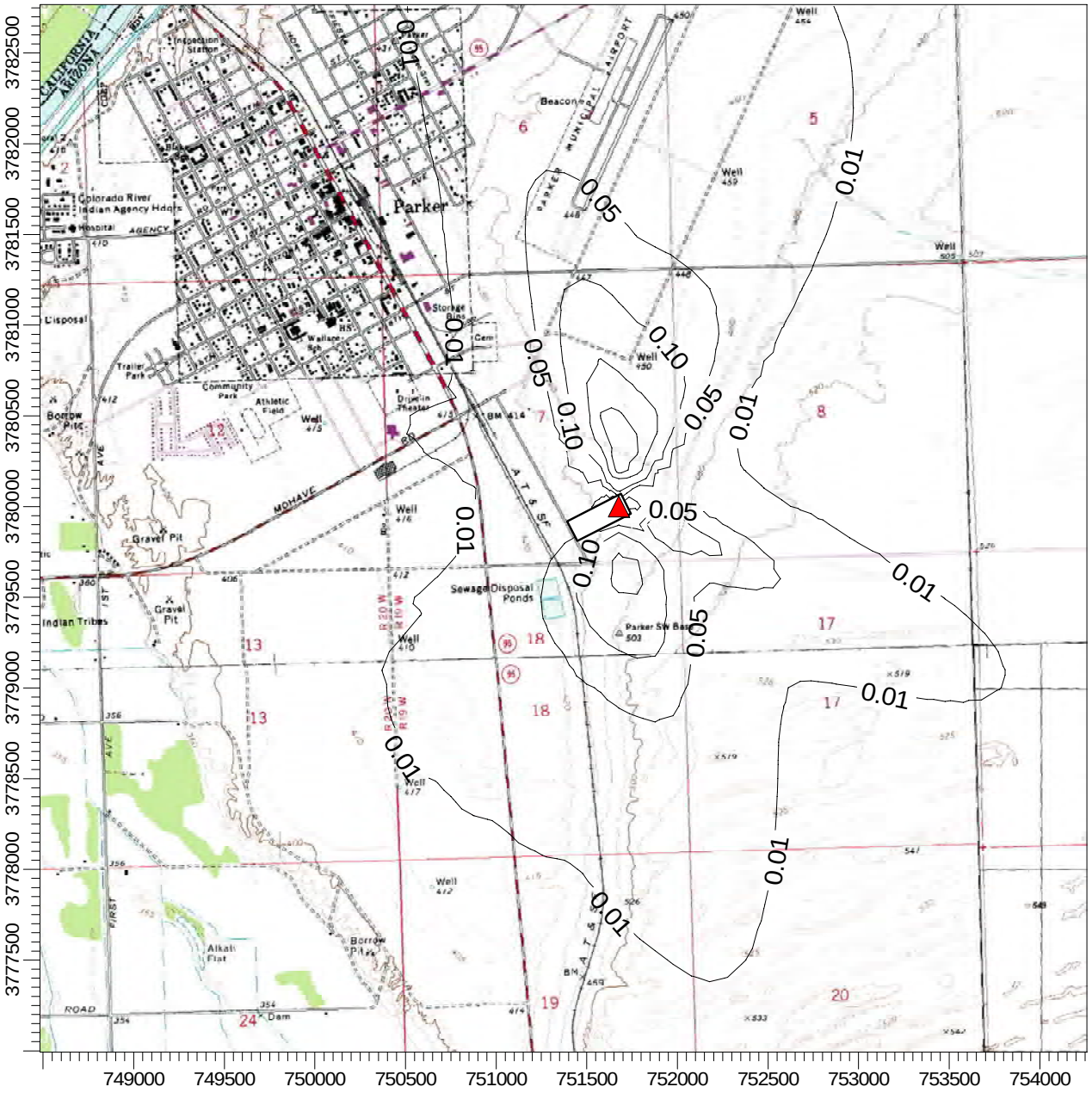
Note: The isopleth lines show results based on a unit, 1 gram per second (1 g/sec), stack emission rate. Chemical-specific results may be calculated by multiplying the unitized results by the gram per second chemical stack emission rate.

SCALE: 1:35,238

0 1 km

7/18/2007

Unitized Annual Average ISCST3 Modeling Results
Dry Deposition Rates for Particles - Surface Area Weighted (g/m2-yr per 1 g/sec)



Note: The isopleth lines show results based on a unit, 1 gram per second (1 g/sec), stack emission rate. Chemical-specific results may be calculated by multiplying the unitized results by the gram per second chemical stack emission rate.

SCALE: 1:35,238

0 1 km

7/18/2007

APPENDIX D

AIR DISPERSION AND DEPOSITION MODELING

APPENDIX D

Air Dispersion and Deposition Modeling for the Siemens Water Technologies Corp. Carbon Reactivation Facility in Parker, Arizona

Prepared For:

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July 2007

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AZMET	Arizona Meteorological Network
ft	Feet
HHRAP	Human Health Risk Assessment Protocol published in 2005 by USEPA
ISCST3	Industrial Source Complex Short-Term 3 air model
km	Kilometer
MPRM	Meteorological Processor for Regulatory Models
NLCD	National Land Cover Data
NWS	National Weather Service
PDT	Performance Demonstration Test
SWT	Siemens Water Technologies Corp.
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey

1.0 INTRODUCTION

This appendix documents the air dispersion and deposition modeling performed to support the human health and ecological risk assessment for the Siemens Water Technologies Corp. (SWT) Carbon Reactivation Facility ("Facility"). The risk assessment, and dispersion and deposition modeling, were performed according to a U.S. Environmental Protection Agency (USEPA) approved Risk Assessment Workplan ("Workplan") developed in 2003, updated by agreement with the USEPA to include elements of more recent 2005 USEPA guidance for risk assessments of waste combustion facilities.

The air modeling conducted for the Facility was prepared using methodologies outlined in an appendix to the 2003 Workplan entitled "Air Dispersion and Deposition Modeling Protocol Report." The modeling was also consistent with the procedures found in USEPA's 2005 guidance entitled "Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities" (HHRAP). The modeling approach was approved in advance by USEPA prior to initiation of this work.

The air modeling analysis for the Facility consisted of modeling stack emissions from the carbon reactivation furnace stack (RF-2) and fugitive air emissions from the outdoor hopper (H-1). The air model used was the most recent version of the Industrial Source Complex Short-Term model available from the USEPA (ISCST3, Version 02035). This model was developed and approved by USEPA. The ISCST3 model was run using unitized (i.e., 1.0 gram per second) emission rates. These unit emission rates were used to calculate hourly and annual average unitized concentrations and deposition rates. Chemical-specific concentrations and deposition rates can be calculated by multiplying the unitized results by chemical-specific emission rates. Consistent with USEPA guidance in HHRAP, modeling results for the stack were calculated to address three types of stack emission characteristics consisting of vapor phase emissions, particle phase emissions distributed by particle mass, and particle phase emissions distributed by particle surface area.

The remainder of this appendix provides additional details about the dispersion and deposition modeling performed for this project.

2.0 FACILITY LOCATION AND LAND USE

The SWT Facility is located at 2523 Mutahar Road, approximately 1 mile southeast of Parker in La Paz County, Arizona. Figure 2-1 presents a portion of the Parker, Arizona 7.5' United States Geological Survey (USGS) quadrangle showing the location of the site and the surrounding terrain. The site is approximately located at Latitude 34^{o} 07' 57" N and Longitude 114^{o} 16' 15" W, North American Datum of 1927.

The ISCST3 model includes dispersion coefficients which vary depending upon whether an area is characterized as primarily rural or urban. This classification was determined for the Facility area by conducting a land use analysis consistent with the procedures contained in the A.H. Auer paper "Correlation of Land Use and Cover with Meteorological Anomalies" (Auer, 1978). This procedure characterizes the uses of various industrial, commercial, residential, and agricultural/natural areas within a 3 km radius circle centered on the site being evaluated. Essentially, if more than 50 percent of the area within this circle is designated I1, I2, C1, R2, and R3 (industrial, light industrial, commercial, and compact residential), urban dispersion parameters should be used; otherwise, the modeling should use rural dispersion parameters.

According to standard USEPA modeling procedures, the land use classification was performed using the most recent available USGS National Land Cover Data (NLCD).[1] In the NLCD, USGS identifies land cover classes based on Landsat Thematic Mapper satellite imagery with a spatial resolution of 30 meters and supplemented by various ancillary data where available. The analysis and interpretation of the satellite imagery is conducted by USGS using very large image mosaics. For this project, the most recent NLCD, from 1992, was obtained for Arizona and its land cover data were used to determine surface characteristics within 3 km of the Facility. A TRC-developed land cover tabulation program was used to read the NLCD tag image file format (TIFF) image file and to extract and sum the land cover categories for each 30 m by 30 m grid cell within each of 12 adjacent 30 degree sectors around the Facility location. The results of this analysis are tabulated in Table 2-1 and are shown in Figure 2-2.

[1] The land cover datasets are provided on the USGS Internet website at http://edcsgs9.cr.usgs.gov/pub/data/landcover/states/.

Figure 2-1: Site Location Map

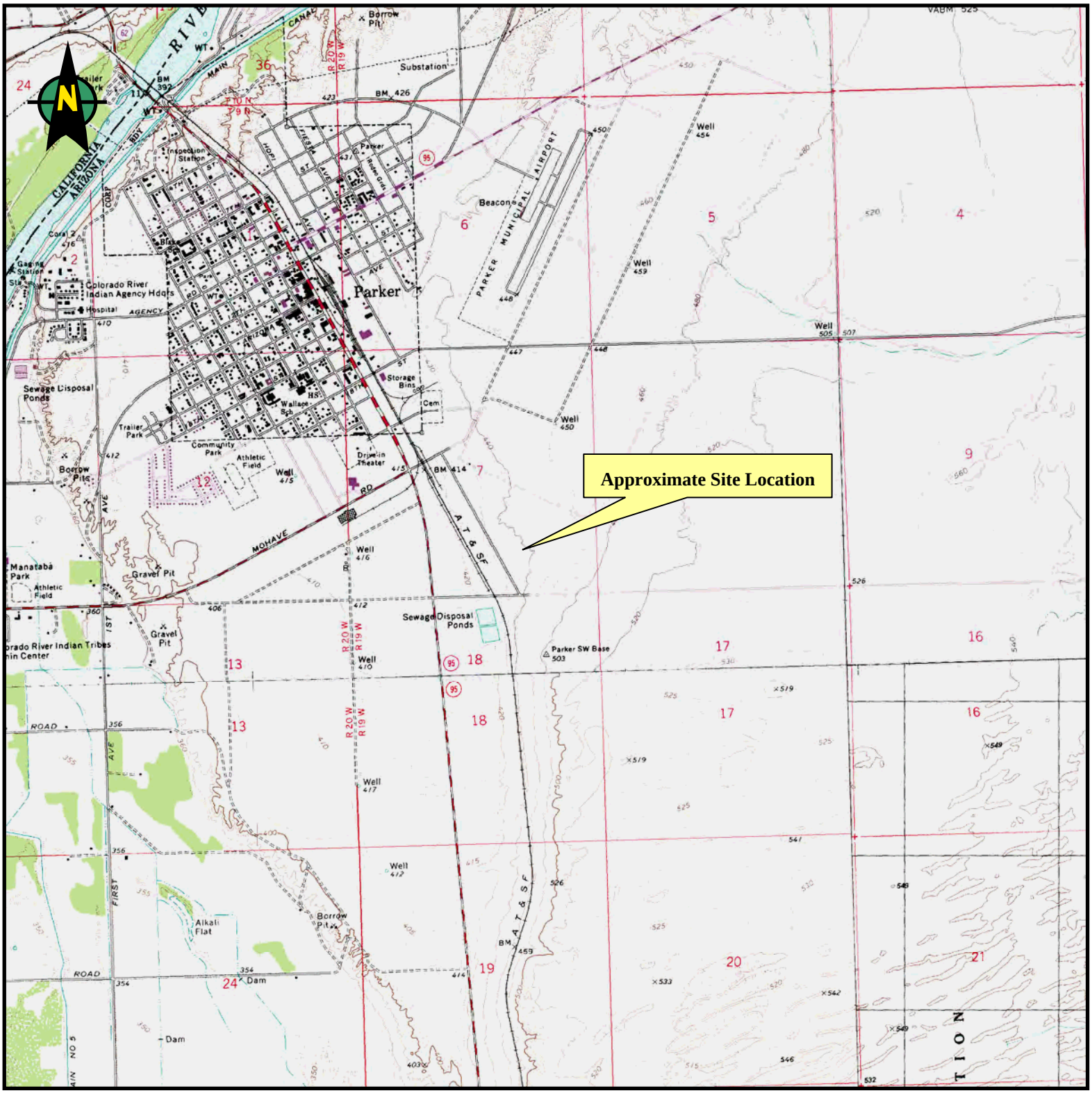
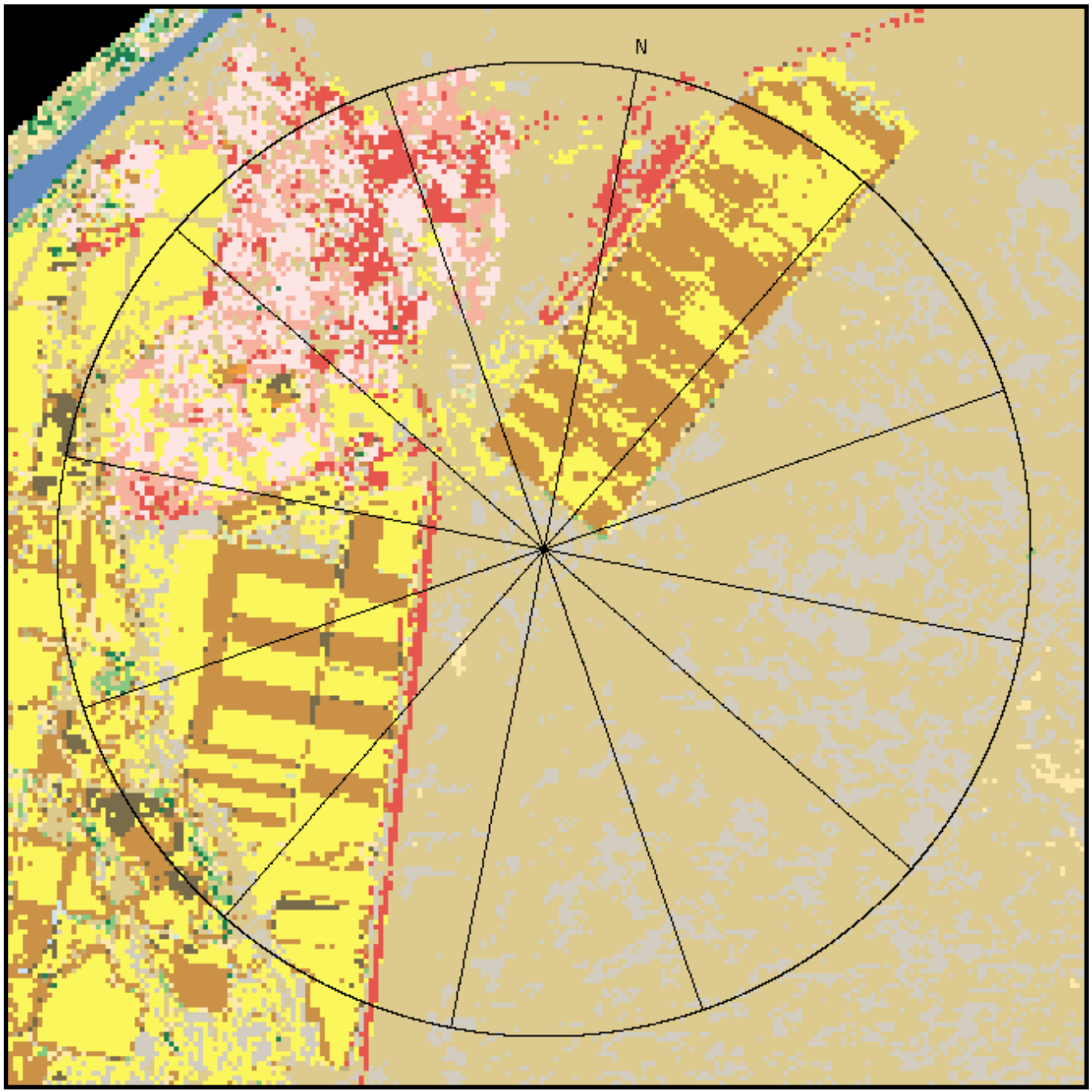


Figure 2-2: Land Use within 3-Kilometers of Facility Site



National Land Cover Dataset Classification System Legend

Color Key	RGB Value	Class Number and Name
	102, 140, 190	11 - Open Water
	255,255,255	12 - Perennial Ice/Snow
	253, 229, 228	21 - Low Intensity Residential
	247, 178, 159	22 - High Intensity Residential
	231, 86, 78	23 - Commerical/Industrial/Transportation
	210, 205, 192	31 - Bare Rock/Sand/Clay
	175, 175, 177	32 - Quarries/Strip Mines, Gravel Pits
	83, 62, 118	33 - Transitional
	134, 200, 127	41 - Deciduous Forest
	26, 129, 78	42 - Evergreen Forest
	212, 231, 177	43 - Mixed Forest
	220, 202, 143	51 - Shrubland
	187, 174, 118	61 - Orchards/Vineyards
	253, 233, 170	71 - Grasslands/Herbaceous
	252, 246, 93	81 - Pasture/Hay
	202, 145, 71	82 - Row Crops
	121, 108, 75	83 - Small Grains
	244, 238, 203	84 - Fallow
	240, 156, 054	85 - Urban/Recreational Grasses
	201, 230, 249	91 - Woody Wetlands
	144, 192, 217	92 - Emergent Herbaceous Wetlands

Approximately 88 percent of the land use surrounding the Facility is classified as agricultural rural, uncultivated, or undeveloped rural (A2, A3, or A4, respectively) according to the Auer classification technique. These classifications are considered rural and thus rural dispersion coefficients were used in the air modeling analysis. While there are some uncertainties in the USGS NLCD land classifications, the overall results are generally consistent with the land uses in the Facility area.

Table 2-1: Auer Land-Use Classifications within 3-Kilometers of the Facility

Description	Percentage within 3-km of Facility	Auer Classification
Open Water	0.0%	Rural
Perennial Ice/Snow	0.0%	Rural
Low Intensity Residential	5.0%	Urban
High Intensity Residential	2.9%	Urban
Commercial/Industrial/Transportation	3.7%	Urban
Bare Rock/Sand/Clay	12.1%	Rural
Quarries/Strip Mines, Gravel Pits	0.0%	Rural
Transitional	0.0%	Rural
Deciduous Forest	0.2%	Rural
Evergreen Forest	0.1%	Rural
Mixed Forest	0.1%	Rural
Shrubland	46.9%	Rural
Orchards/Vineyards	0.2%	Rural
Grasslands/Herbaceous	0.9%	Rural
Pasture/Hay	16.3%	Rural
Row Crops	10.8%	Rural
Small Grains	0.7%	Rural
Fallow	0.0%	Rural
Urban/Recreational Grasses	0.0%	Rural
Woody Wetlands	0.0%	Rural
Emergent Herbaceous Wetlands	0.0%	Rural

Source of land use data: USGS, National Land Cover Data, 1992.

The site is located at approximately 442 feet (ft) above mean sea level near the river plain of the Colorado River. There are terrain features in the vicinity of the plant that rise above stack top. The nearest location where terrain rises above stack top is

approximately 2.6 kilometers to the east-southeast of the Facility. As such, terrain heights were included in the modeling analysis.

3.0 SOURCE DATA AND MODELING PARAMETERS

3.1 Source Parameters

The Facility emission sources included in the modeling analysis were stack air emissions from the carbon reactivation furnace stack and fugitive air emissions from the outdoor hopper. For the stack, which is considered a point source, the ISCST3 model requires the location coordinates, base elevation, and stack parameters including height, diameter, exit gas velocity, and exit gas temperature. The modeled stack parameters were based upon actual stack dimensions and measurements collected from the stack, as presented in Table 3-1.

The outdoor hopper is used for the unloading of bulk containers of spent carbon received at the facility. The hopper is a three-walled building with a fixed roof and heavy plastic sheeting on the front unloading face. During the unloading process, some fugitive air emissions may escape through the plastic sheeting. This source was treated as a volume source in ISCST3 to account for the negligible plume rise associated with fugitive air emissions consistent with USEPA modeling guidelines. The modeled source parameters for a volume source consist of location coordinates, a release height, and the initial lateral and vertical dimensions of the source. The initial lateral and vertical dimensions are based upon the length and height of the source and are calculated using formulas in the ISCST3 Users Guide. The initial lateral dimension is calculated by dividing the source length by 4.3 and the initial vertical dimension is calculated by dividing the source height by 2.15. The volume source parameters for fugitive air emissions from the outdoor hopper are shown in Table 3-1.

As stated earlier, the emission rates used as inputs to the ISCST3 model were set at a unitized value of 1.0 gram per second. For a given source, ISCST3 modeled concentrations and deposition rates are directly proportional to emission rate, and thus modeled unitized concentrations and deposition rates can be adjusted to chemical-specific concentrations and deposition rates by multiplying by the chemical-specific emission rate. For the stack source, the emission rate was assumed to be "on" 24 hours per day, 365 days per year. For the outdoor hopper volume source, the emission rate was assumed to be "on" 365 days per year, for the 7-hour period daily from 7 AM - 2 PM. The emission period was based on the time during typical facility operations that spent carbon

may be unloaded at the outdoor hopper.[2] Accordingly, the ISCST3 modeling for the volume source included the HROFDAY card to account for the specific times of operation.

Table 3-1: Modeled Emission Source Parameters

Point Source	UTM Location Coordinates (NAD27)		Stack Height (above grade)	Stack Inner Diameter	Stack Gas Exit Velocity	Stack Gas Exhaust Temperature
	East	North				
Reactivation Furnace Stack (a)	751,678.4	3,780,000.4	110.0 ft 33.5 m	1.65 ft 0.502 m	57.0 ft/sec 17.37 m/sec	170.0 °F 349.82 K
Volume Source	**UTM Location Coordinates (NAD27)**		**Release Height (above grade)**	**Initial Lateral Dimension**	**Initial Vertical Dimension**	**Exhaust Temperature**
	East	**North**				
Fugitive Air Emissions from Outdoor Hopper (b)	751,663.2	3,780,031.4	7.59 ft 2.31 m	4.20 ft 1.28 m	7.05 ft 2.15 m	NA

(a) Stack height and diameter were based on facility engineering drawings. Stack exit velocity and exit temperature were based on the averages of measurements collected from the facility from February to April, 2007, and were provided by M. McCue, Director of Plant Operations.
(b) Parameters were based on facility engineering drawings.

3.2 Deposition Modeling Parameters

The modeling analysis for the furnace stack included modeling of both dry and wet deposition rates, consistent with HHRAP guidance and the project Workplan. Accordingly, the modeling calculated four possible types of deposition: dry deposition of particles, wet deposition of particles, dry deposition of gases, and wet deposition of gases. (Note that the modeling for the fugitive air emissions volume source included calculation of ambient air concentrations, but did not include deposition modeling as described in the risk assessment report and in the project Workplan.)

[2] Personal communication with M. McCue, Director of Plant Operations, May 7, 2007.

The source inputs needed to model deposition rates in ISCST3 include the particle size distribution of stack emissions and scavenging ratios for modeling wet deposition. The particle size distribution was based on test data collected from the facility stack during the comprehensive Performance Demonstration Test (PDT) conducted in March 2006. Scavenging ratios, which are multiplied by the vertically integrated air concentration in ISCST3 to predict wet deposition rates, were identified based on HHRAP guidance and using the facility-specific particle size distribution.

3.2.1 Vapor Phase Stack Emissions Modeling

ISCST3 modeling of wet and dry deposition of vapor phase emissions from the stack requires a dry deposition velocity and liquid and ice scavenging coefficients. The values recommended in HHRAP were utilized in this analysis, specifically a dry deposition velocity of 0.5 centimeters per second and wet vapor scavenging coefficients of 1.7×10^{-4} $s^{-1}/mm\text{-}h^{-1}$ for the liquid phase and 0.6×10^{-4} $s^{-1}/mm\text{-}h^{-1}$ for the ice phase. (Note that the ice phase was not relevant for this specific geographical location.)

3.2.2 Particle Phase Stack Emissions Modeling

Wet and dry deposition modeling of particles requires information on the size distribution of emitted particles from the stack, which was based on facility-specific measurements collected from the stack. Consistent with HHRAP guidance, the measured particle size distribution was treated in two different ways in the ISCST3 model. A mass-weighted particle size distribution was used to represent emissions of metals (except mercury) that would form particles in the reactivation unit combustion area. A surface area-weighted size distribution was used to reflect organic compounds and mercury that most likely exit the combustion area as gases and then adsorb onto the surface of already-formed particles.

The mass-weighted particle size distribution was calculated using Equation 3-1 from HHRAP and is shown in Table 3-2. Based on the mean particle diameters shown in Table 3-2, individual wet vapor scavenging coefficients for each particle diameter were

then determined, following HHRAP guidance, using the curves developed by Jindal and Heinold (1991) which are located in the ISCST3 Users Guide.

Table 3-2: Particle Size Distribution by Mass for the Furnace Stack

Mean Particle Diameter (um)	Lower Bound of Category (um)	Upper Bound of Category (um)	Percent by Mass
0.34	0.1	0.5	6.9
0.78	0.5	1	2.4
3.39	1	5	34.8
7.77	5	10	17.9
65.25	10	100	38.0

The surface area weighted particle size distribution was also based upon the measured particle size distribution along with HHRAP guidance for apportioning the distribution by surface area. The results of weighting the particle size distribution by surface area according to the HHRAP methodology are shown in Table 3-3. Based on the mean particle diameters in this distribution, individual wet vapor scavenging coefficients for each particle diameter were determined, following HHRAP guidance, using the curves developed by Jindal and Heinold (1991) which are located in the ISCST3 Users Guide.

Table 3-3: Particle Size Distribution by Surface Area for the Furnace Stack

Mean Particle Diameter (um)	Fraction of Total Mass	Proportion of Available Surface Area	Relative Proportion of Surface Area	Fraction of Total Surface Area
0.34	0.069	17.693	1.221	0.556
0.78	0.024	7.724	0.185	0.084
3.39	0.348	1.769	0.616	0.280
7.77	0.179	0.772	0.138	0.063
65.25	0.38	0.092	0.035	0.016

3.3 Modeling Output Files

Taking into account the different types of stack emissions that were modeled, as prescribed in HHRAP and described above, the ISCST3 model runs provided nine different types of outputs that were used in the stack emissions risk assessment, as follows:

- Ambient air concentrations of mass-weighted particles
- Ambient air concentrations of surface area-weighted particles
- Ambient air concentrations of gases
- Dry deposition of mass-weighted particles
- Dry deposition of surface area-weighted particles
- Dry deposition of gases
- Wet deposition of mass-weighted particles
- Wet deposition of surface area-weighted particles
- Wet deposition of gases

For the fugitive air emissions source, the ISCST3 model runs provided ambient air concentrations which were used in the risk assessment. For this source, all emissions were modeled as vapors, which is conservative because no plume depletion due to the deposition of particles is assumed to occur and thus air concentrations will tend to be overestimated for compounds that may be present in a particle phase. Also, because of the nature of the spent carbon material, it is not feasible to measure a particle size distribution for inhalable particles from the fugitive emissions source that was modeled.

The ISCST3 model was run to calculate unitized annual average modeling results and 1-hour average modeling results at all of the modeled off-site receptor locations beyond the property boundary (see next section for discussion of receptor grids). These outputs were specified in the Workplan and were consistent with the needs of the risk assessment. In addition, for the worker evaluation in the risk assessment requested by USEPA Region 9,

the ISCST3 model was also run to calculate unitized 8-hour average results at a series of on-site receptor locations.

4.0 MODELING OVERVIEW

4.1 Good Engineering Practice Stack Height Analysis

The USEPA provides specific guidance for determining good engineering practice (GEP) stack height and for determining whether building downwash will occur in the "Guidance for Determination of Good Engineering Practice Stack Height" (Technical Support Document for the Stack Height Regulations, EPA-450/4-80-023R, June, 1985). GEP is defined as "the height necessary to ensure that emissions from the stack do not result in excessive concentrations of any air pollutant in the immediate vicinity of the source as a result of atmospheric downwash, eddies, and wakes that may be created by the source itself, or nearby structures, or nearby terrain obstacles." The GEP definition is based on the observed phenomenon of atmospheric flow in the immediate vicinity of a structure. It identifies the minimum stack height at which significant adverse aerodynamics (downwash) are avoided.

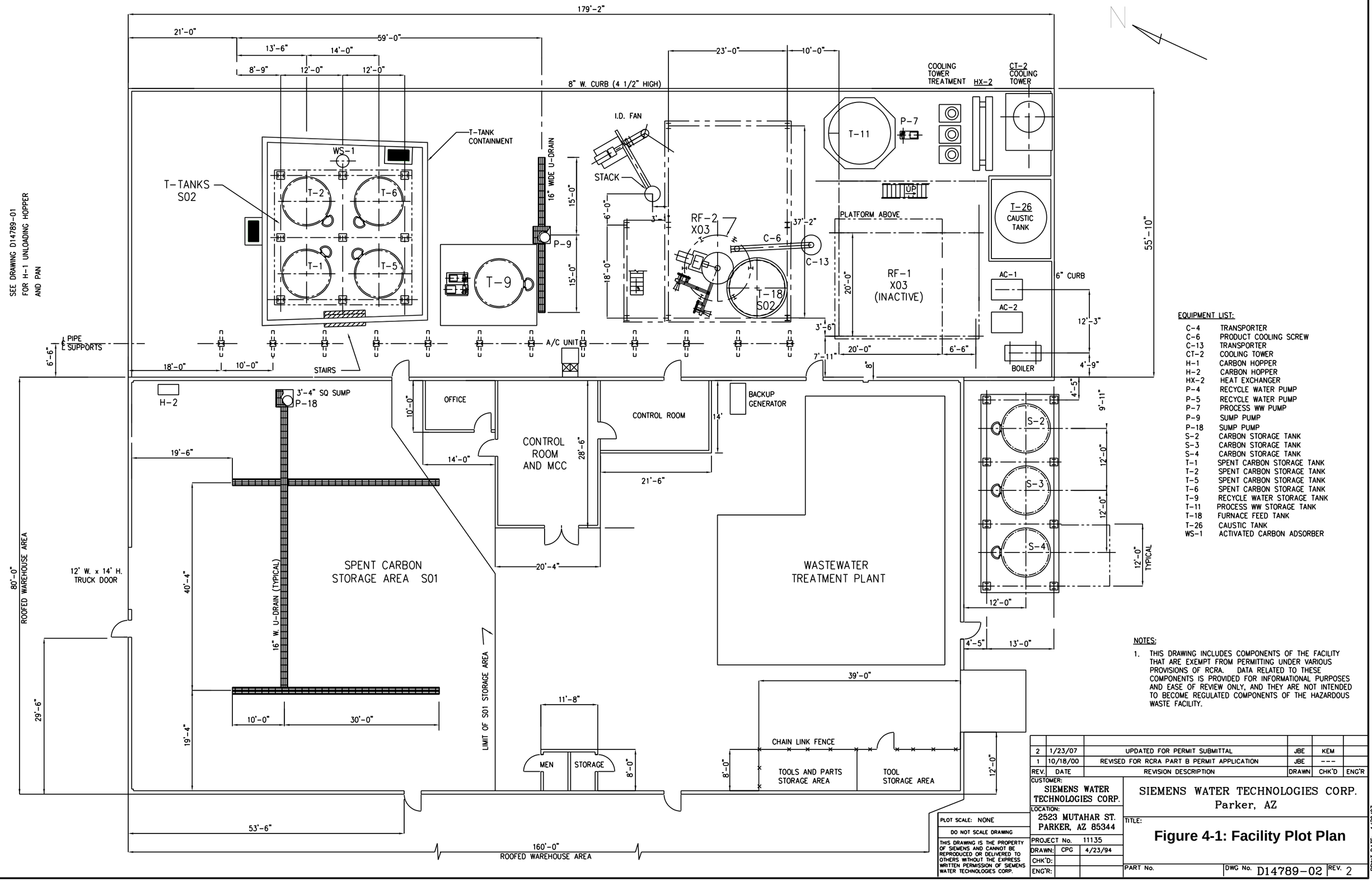
The USEPA GEP stack height regulations specify that the formula GEP stack height be calculated in the following manner:

$$H_{GEP} = H_B + 1.5L$$

where: H_B = the height of adjacent or nearby structures, and
L = the lesser dimension (height or projected width of the adjacent or nearby structures)

A GEP analysis was performed for the carbon reactivation furnace stack located at the Facility. Figure 4-1 includes a general plot plan of the facility while Figure 4-2 shows the locations and heights of buildings included in the GEP analysis as well as the locations of the modeled emission sources. The furnace stack, with a height of 110 ft above grade, is below the formula GEP stack height of 130 ft, which is based upon the height and projected width of the controlling structure, the carbon reactivation furnace building. Based on the configuration of the Facility, the ISCST3 model included directional dependent building dimensions. These dimensions were calculated using the USEPA approved Building Profile Input Program (BPIP, version 04112).

DWG: D14789-02



EQUIPMENT LIST:

C-4	TRANSPORTER
C-6	PRODUCT COOLING SCREW
C-13	TRANSPORTER
CT-2	COOLING TOWER
H-1	CARBON HOPPER
H-2	CARBON HOPPER
HX-2	HEAT EXCHANGER
P-4	RECYCLE WATER PUMP
P-5	RECYCLE WATER PUMP
P-7	PROCESS WW PUMP
P-9	SUMP PUMP
P-18	SUMP PUMP
S-2	CARBON STORAGE TANK
S-3	CARBON STORAGE TANK
S-4	CARBON STORAGE TANK
T-1	SPENT CARBON STORAGE TANK
T-2	SPENT CARBON STORAGE TANK
T-5	SPENT CARBON STORAGE TANK
T-6	SPENT CARBON STORAGE TANK
T-9	RECYCLE WATER STORAGE TANK
T-11	PROCESS WW STORAGE TANK
T-18	FURNACE FEED TANK
T-26	CAUSTIC TANK
WS-1	ACTIVATED CARBON ADSORBER

NOTES:

1. THIS DRAWING INCLUDES COMPONENTS OF THE FACILITY THAT ARE EXEMPT FROM PERMITTING UNDER VARIOUS PROVISIONS OF RCRA. DATA RELATED TO THESE COMPONENTS IS PROVIDED FOR INFORMATIONAL PURPOSES AND EASE OF REVIEW ONLY, AND THEY ARE NOT INTENDED TO BECOME REGULATED COMPONENTS OF THE HAZARDOUS WASTE FACILITY.

REV.	DATE	REVISION DESCRIPTION	DRAWN	CHK'D	ENG'R
2	1/23/07	UPDATED FOR PERMIT SUBMITTAL	JBE	KEM	
1	10/18/00	REVISED FOR RCRA PART B PERMIT APPLICATION	JBE	---	

CUSTOMER: SIEMENS WATER TECHNOLOGIES CORP.

LOCATION: 2523 MUTAHAR ST. PARKER, AZ 85344

PROJECT No. 11135

DRAWN:	CPG	4/23/94
CHK'D:		
ENG'R:		

PLOT SCALE: NONE

DO NOT SCALE DRAWING

SIEMENS WATER TECHNOLOGIES CORP.
Parker, AZ

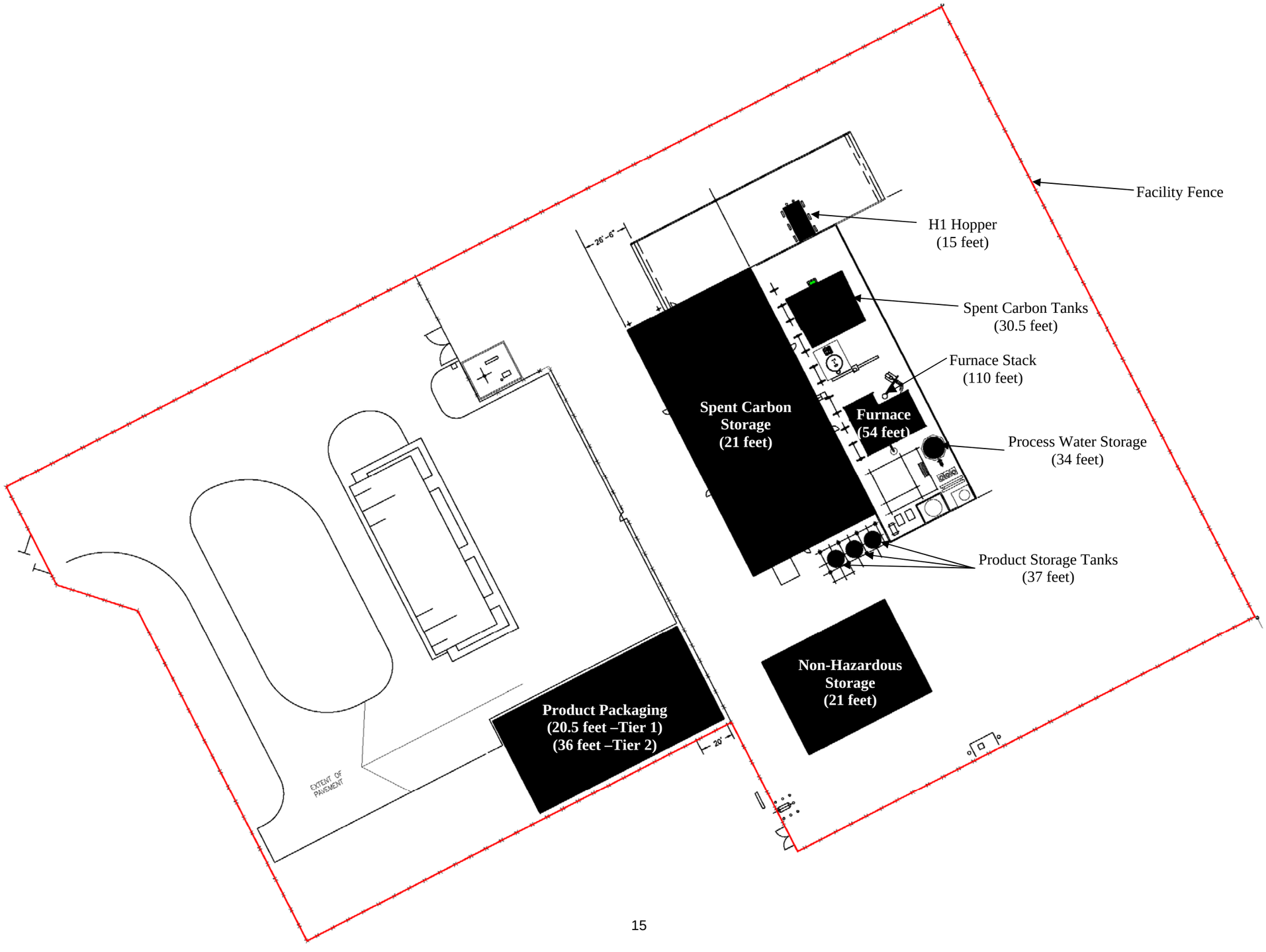
TITLE:

Figure 4-1: Facility Plot Facility

PART No. | DWG No. D14789-02 | REV. 2

PRINT DATE: 4/30/07

Figure 4-2: Facility Site Plan with Building Heights



4.2 Model Selection

The USEPA-developed and approved ISCST3 model (Version 02035) was used to calculate the air concentrations and deposition rates for use in the risk assessment. The ISCST3 model was specified in the USEPA-approved Workplan. As noted earlier, default model options for the stack and volume emission sources were used in the ISCST3 model along with rural dispersion coefficients. For the stack source, direction-specific downwash parameters were also used. The ISCST3 model was considered appropriate for this analysis as it is capable of modeling short-term and long-term average air concentrations, wet and dry deposition rates, and dispersion in rural areas, and it includes algorithms to address terrain and building wake effects.

4.3 Meteorological Data

For any modeling analysis conducted using the ISCST3 model, two meteorological datasets are required: 1) hourly surface data, and 2) upper air sounding data. According to the USEPA "Guideline on Air Quality Models (Revised)" (2005), the meteorological data used in a modeling analysis should be selected based on its spatial and climatological representativeness of a facility site and its ability to accurately characterize the transport and dispersion conditions in the area of concern. The spatial and climatological representativeness of the meteorological data are dependent on four factors:

1. The proximity of the meteorological monitoring site to the area under consideration;
2. The complexity of the terrain;
3. The locational characteristics of the meteorological monitoring site; and
4. The period of time during which data were collected.

Following the air modeling protocol in the Workplan, hourly surface measurments were obtained from the Parker, Arizona meteorological monitor operated by the Arizona Meteorological Network (AZMET). The Parker meteorological data station is approximately 32 km southwest of the Facility. Concurrent twice daily mixing heights were obtained from upper air data collected at the Flagstaff Pulliam Airport operated by the National Weather Service (NWS). A concurrent 5-year dataset from 2001 through 2005 was obtained for the two meteorological stations.

The two meteorological data sets from 2001-2005 were then processed with the USEPA Meteorological Processor for Regulatory Models (MPRM, Version 99349). The resulting meteorological file is then suitable for use in ISCST3 to model both air concentrations and wet and dry deposition rates. The basic meteorological parameters utilized by ISCST3 for predicting ambient air concentrations are wind direction and wind speed, ambient air temperature, atmospheric stability category, and rural and urban mixing heights. The additional parameters required to predict wet and dry deposition rates are the friction velocity, the Monin-Obukhov length (an indicator of atmospheric turbulence), the surface roughness length, the solar radiation, and the precipitation amount each hour. A wind rose for the 5-year meteorological record from 2001-2005 is presented in Figure 4-3. As the figure shows, the predominant wind directions for the facility site are northerly and southerly.

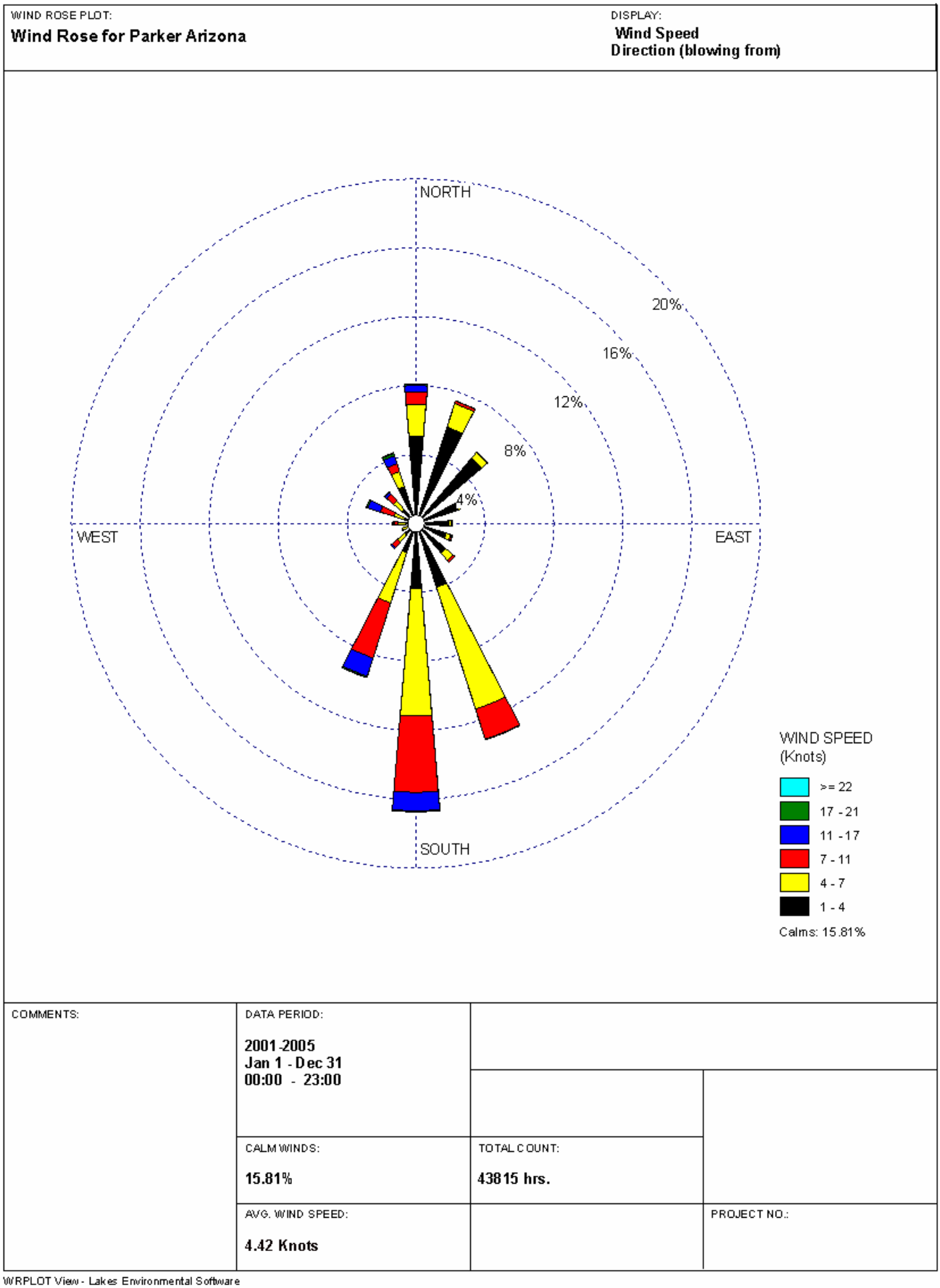
4.4 Land Cover Analyses

The MPRM meteorological processor, in addition to requiring both surface and upper-air meteorological data, requires surface parameters at the meteorological data measurement site to develop a complete ISCST3 meteorological dataset suitable for modeling deposition rates. These parameters are the minimum Monin-Obukhov length, the surface roughness length at the meteorological data measurement site and the Facility site, the noontime albedo, the Bowen ratio, the anthropogenic heat flux, and the fraction of net radiation absorbed at the surface.

For the minimum Monin-Obukhov length, the anthropogenic heat flux and the fraction of net radiation absorbed at the ground, the recommended values listed in HHRAP were used. Specifically, a minimum Monin-Obukhov length of 2 meters was assumed consistent within an open rural landuse, an anthropogenic heat flux of 0.0 watts per square meter was assumed consistent with a rural land use and a fraction of net radiation absorbed by the ground of 0.15 was assumed for a rural land use.

For the remainder of the required parameters (i.e., surface roughness length at the meteorological measurement site and the Facility site, the noontime albedo, and the Bowen ratio), land cover determinations were required. These determinations were made using the 1992 NLCD dataset created by USGS for Arizona.

Figure 4-3: Parker Arizona Wind Rose (2001-2005)



The TRC-developed land cover tabulation program was applied to the Parker Meteorological station to extract and sum land cover categories for each 30 m by 30 m grid cell within each of 12 adjacent 30 degree sectors within a 3-km radius of the station. Basic land cover statistics are illustrated for the Parker meteorological monitoring site in Figure 4-4. The data are presented in tabular form in Table 4-1, which indicates the number of cells by sector (12) and land cover type (8). It should be noted that, for the purposes of this analysis, quarries/strip mines/gravel pits were assumed to be desert shrubland; mixed forests were split 50/50 between coniferous and deciduous forests; and, urban/recreational grasses were assumed to be grassland. Tables 4-2 and 4-3, respectively, provide a breakdown of the 21 land use types in the 1992 NLCD data set and how they were related to the eight (8) MPRM land use categories.

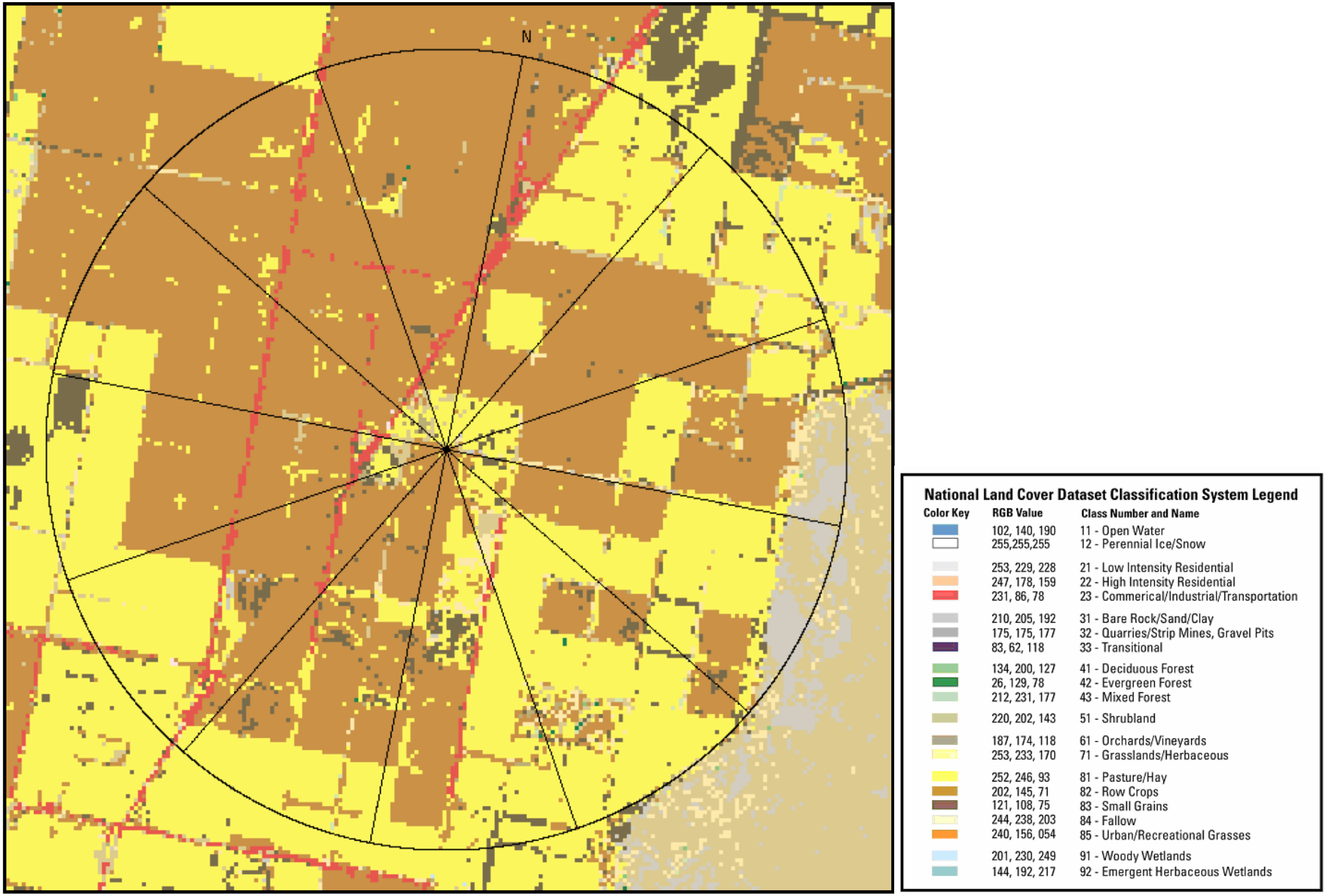
Table 4-1: Parker Arizona Meteorological Station Land Cover Statistics

MPRM Land Use Category	Sector											
	1	2	3	4	5	6	7	8	9	10	11	12
	Cells											
Water	0	0	0	0	0	0	0	0	0	0	0	0
Deciduous Forest	0	4	2	1	5	1	2	0	0	1	0	0
Coniferous Forest	0	4	1	1	10	2	3	0	0	1	0	2
Swamp	1	0	0	0	0	0	0	0	0	0	0	0
Cultivated Land	1,175	1,355	1,351	858	605	1,097	1,685	1,302	1,597	2,180	2,296	2,426
Grassland	1,288	1,201	883	1,318	1,901	1,473	906	1,130	898	369	165	119
Urban	116	0	0	0	11	48	10	134	67	48	109	57
Desert Shrubland	38	46	389	441	79	6	12	44	65	20	40	22

Source: USGS. Arizona National Land Cover Dataset. 1992 Data.

MPRM requires that three surface characteristics (albedo, Bowen ratio, and roughness length) be specified for the surface meteorological measurement site (i.e., the Parker AZMET monitor). USEPA default values for these three surface characteristics for the range of land cover classifications were obtained from HHRAP. Albedo, Bowen ratio, and roughness lengths were then weighted according to the eight MPRM land cover classifications (for each month and each sector). Generally, winter is classified as December, January, and February; spring is classified as March, April, and May; summer is classified as June, July, and August; and autumn is classified as September, October, and November. However, given the climate in the Parker area of Arizona, which doesn't experience northern U.S. winter conditions, autumn default values were substituted for winter values.

Figure 4-4: Land Use within 3-Kilometers of Parker Meteorological Monitoring Station



A summary table by season and sector for each of the required surface parameters is located in Table 4-4. These surface characteristics, in conjunction with the meteorological data, were processed using MPRM to create an ISCST3-ready meteorological data file for use in modeling wet and dry deposition rates.

Table 4-2: 1992 National Land Cover Dataset (NLCD) Land Cover Types

NLCD Type	Description
11	Open Water
12	Perennial Ice/Snow
21	Low Intensity Residential
22	High Intensity Residential
23	Commercial/Industrial/Transportation
31	Bare Rock/Sand/Clay
32	Quarries/Strip Mines, Gravel Pits
33	Transitional
41	Deciduous Forest
42	Evergreen Forest
43	Mixed Forest
51	Shrubland
61	Orchards/Vineyards
71	Grasslands/Herbaceous
81	Pasture/Hay
82	Row Crops
83	Small Grains
84	Fallow
85	Urban/Recreational Grasses
91	Woody Wetlands
92	Emergent Herbaceous Wetlands

Table 4-3: Comparison of USGS National Land Cover Dataset (NLCD) Land Cover Types to USEPA's Meteorological Processor for Regulatory Models (MPRM) Land Use Categories

NLCD Types	MPRM Land Use Category
11,12	Water
41 + ½(43)	Deciduous Forest
42 + ½(43)	Coniferous Forest
91,92	Swamp
61,82,83	Cultivated Land
71,81,84,85	Grassland
21,22,23	Urban
31,32,33,51	Desert Shrubland

Table 4-4: Summary of Meteorological Processor for Regulatory Models (MPRM) Surface Characteristics

Season	Sector	Albedo	Bowen Ratio	Surface Roughness Length (Parker Met. Site)	Surface Roughness Length (Facility Site)	Monin-Obukhov Length	Fraction of Net Radiation Absorbed by Ground	Anthropogenic Heat Flux	Leaf Area Index
1	1	0.19	0.98	0.08	0.11	2.00	0.15	0.00	2.00
1	2	0.19	0.93	0.04	0.26	2.00	0.15	0.00	2.00
1	3	0.20	1.59	0.07	0.30	2.00	0.15	0.00	2.00
1	4	0.21	1.74	0.07	0.30	2.00	0.15	0.00	2.00
1	5	0.20	1.09	0.04	0.30	2.00	0.15	0.00	2.00
1	6	0.19	0.90	0.05	0.30	2.00	0.15	0.00	2.00
1	7	0.19	0.83	0.04	0.24	2.00	0.15	0.00	2.00
1	8	0.19	0.99	0.09	0.12	2.00	0.15	0.00	2.00
1	9	0.19	0.97	0.07	0.18	2.00	0.15	0.00	2.00
1	10	0.18	0.81	0.06	0.47	2.00	0.15	0.00	2.00
1	11	0.18	0.85	0.09	0.66	2.00	0.15	0.00	2.00
1	12	0.18	0.79	0.07	0.43	2.00	0.15	0.00	2.00
2	1	0.16	0.42	0.09	0.12	2.00	0.15	0.00	2.00
2	2	0.16	0.39	0.05	0.26	2.00	0.15	0.00	2.00
2	3	0.18	0.73	0.08	0.30	2.00	0.15	0.00	2.00
2	4	0.19	0.81	0.09	0.30	2.00	0.15	0.00	2.00
2	5	0.17	0.46	0.06	0.30	2.00	0.15	0.00	2.00
2	6	0.16	0.38	0.06	0.30	2.00	0.15	0.00	2.00
2	7	0.15	0.35	0.04	0.24	2.00	0.15	0.00	2.00
2	8	0.16	0.42	0.09	0.13	2.00	0.15	0.00	2.00
2	9	0.16	0.42	0.07	0.20	2.00	0.15	0.00	2.00
2	10	0.15	0.35	0.05	0.48	2.00	0.15	0.00	2.00
2	11	0.14	0.38	0.08	0.66	2.00	0.15	0.00	2.00
2	12	0.14	0.34	0.06	0.43	2.00	0.15	0.00	2.00
3	1	0.19	0.76	0.19	0.22	2.00	0.15	0.00	2.00

Table 4-4: Summary of Meteorological Processor for Regulatory Models (MPRM) Surface Characteristics

Season	Sector	Albedo	Bowen Ratio	Surface Roughness Length (Parker Met. Site)	Surface Roughness Length (Facility Site)	Monin-Obukhov Length	Fraction of Net Radiation Absorbed by Ground	Anthropogenic Heat Flux	Leaf Area Index
3	2	0.19	0.70	0.16	0.28	2.00	0.15	0.00	2.00
3	3	0.21	1.12	0.18	0.30	2.00	0.15	0.00	2.00
3	4	0.20	1.24	0.17	0.30	2.00	0.15	0.00	2.00
3	5	0.19	0.83	0.14	0.30	2.00	0.15	0.00	2.00
3	6	0.19	0.70	0.16	0.30	2.00	0.15	0.00	2.00
3	7	0.19	0.63	0.17	0.27	2.00	0.15	0.00	2.00
3	8	0.19	0.77	0.20	0.21	2.00	0.15	0.00	2.00
3	9	0.19	0.73	0.19	0.27	2.00	0.15	0.00	2.00
3	10	0.20	0.60	0.20	0.51	2.00	0.15	0.00	2.00
3	11	0.20	0.64	0.23	0.67	2.00	0.15	0.00	2.00
3	12	0.20	0.58	0.21	0.45	2.00	0.15	0.00	2.00
4	1	0.19	0.98	0.08	0.11	2.00	0.15	0.00	2.00
4	2	0.19	0.93	0.04	0.26	2.00	0.15	0.00	2.00
4	3	0.20	1.59	0.07	0.30	2.00	0.15	0.00	2.00
4	4	0.21	1.74	0.07	0.30	2.00	0.15	0.00	2.00
4	5	0.20	1.09	0.04	0.30	2.00	0.15	0.00	2.00
4	6	0.19	0.90	0.05	0.30	2.00	0.15	0.00	2.00
4	7	0.19	0.83	0.04	0.24	2.00	0.15	0.00	2.00
4	8	0.19	0.99	0.09	0.12	2.00	0.15	0.00	2.00
4	9	0.19	0.97	0.07	0.18	2.00	0.15	0.00	2.00
4	10	0.18	0.81	0.06	0.47	2.00	0.15	0.00	2.00
4	11	0.18	0.85	0.09	0.66	2.00	0.15	0.00	2.00
4	12	0.18	0.79	0.07	0.43	2.00	0.15	0.00	2.00

Notes: 1. Season 1 is winter (treated as autumn for the Parker area), Season 2 is spring, Season 3 is summer, and Season 4 is autumn .

4.5 Modeled Receptor Grid

A 20 km-by-20 km Cartesian receptor grid with the following receptor spacing was used in the ISCST3 modeling analyses to calculate off-site concentrations and deposition rates:

1. Fine/near grid: Receptors every 100 m out to 3 km; and
2. Coarse/full grid: Receptors every 500 m from 3 km to 10 km.

Receptors were also placed along the Facility fence line every 25 m.

The ISCST3 model requires receptor data consisting of location coordinates and ground-level elevations. The receptor generating program, AERMAP (Version 06341), was used to develop a complete receptor grid to a distance of 10 kilometers from the Facility. AERMAP uses digital elevation model (DEM) data obtained from the United States Geological Survey (USGS). 7.5 minute DEM files were obtained for an area covering at least 10 kilometers in all directions from the proposed facility. AERMAP was then run with these DEM files to determine the representative elevations for each receptor.

Figure 4-5 shows the complete modeled receptor grid overlaid onto the DEM ground-level elevation contours, including both the coarse/full grid and the fine/near grid. Figure 4-6 shows the fine/near receptor grid overlain onto a topographic map of the Facility area.

A separate receptor grid was also developed to model on-site air concentrations from the fugitive emissions hopper volume source for the on-site worker evaluation performed in the risk assessment at the request of USEPA Region 9. This Cartesian receptor grid included on-site receptors every 50 ft excluding locations where buildings are present.

Figure 4-5: Modeled Receptor Grid (Full Grid)

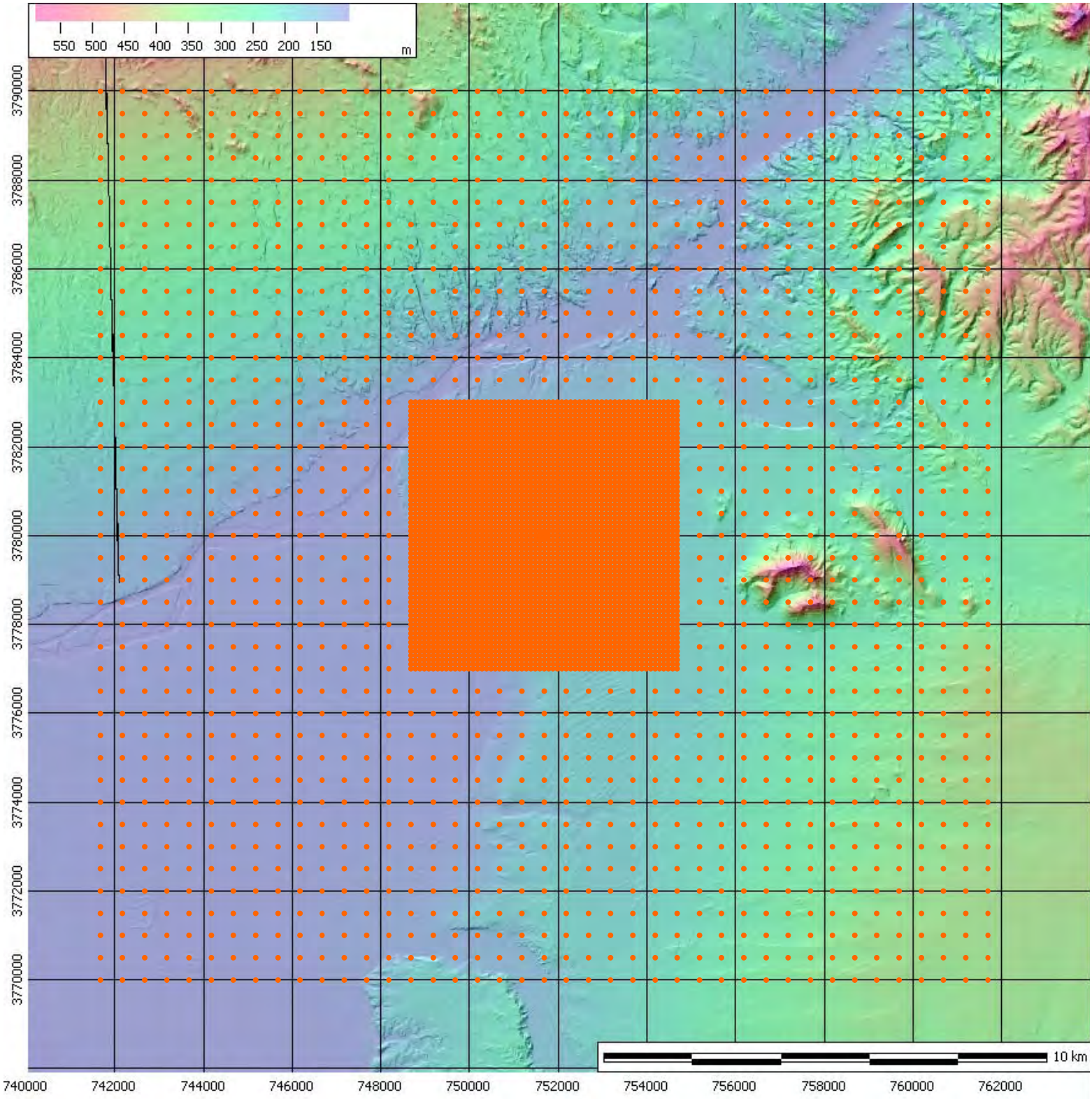
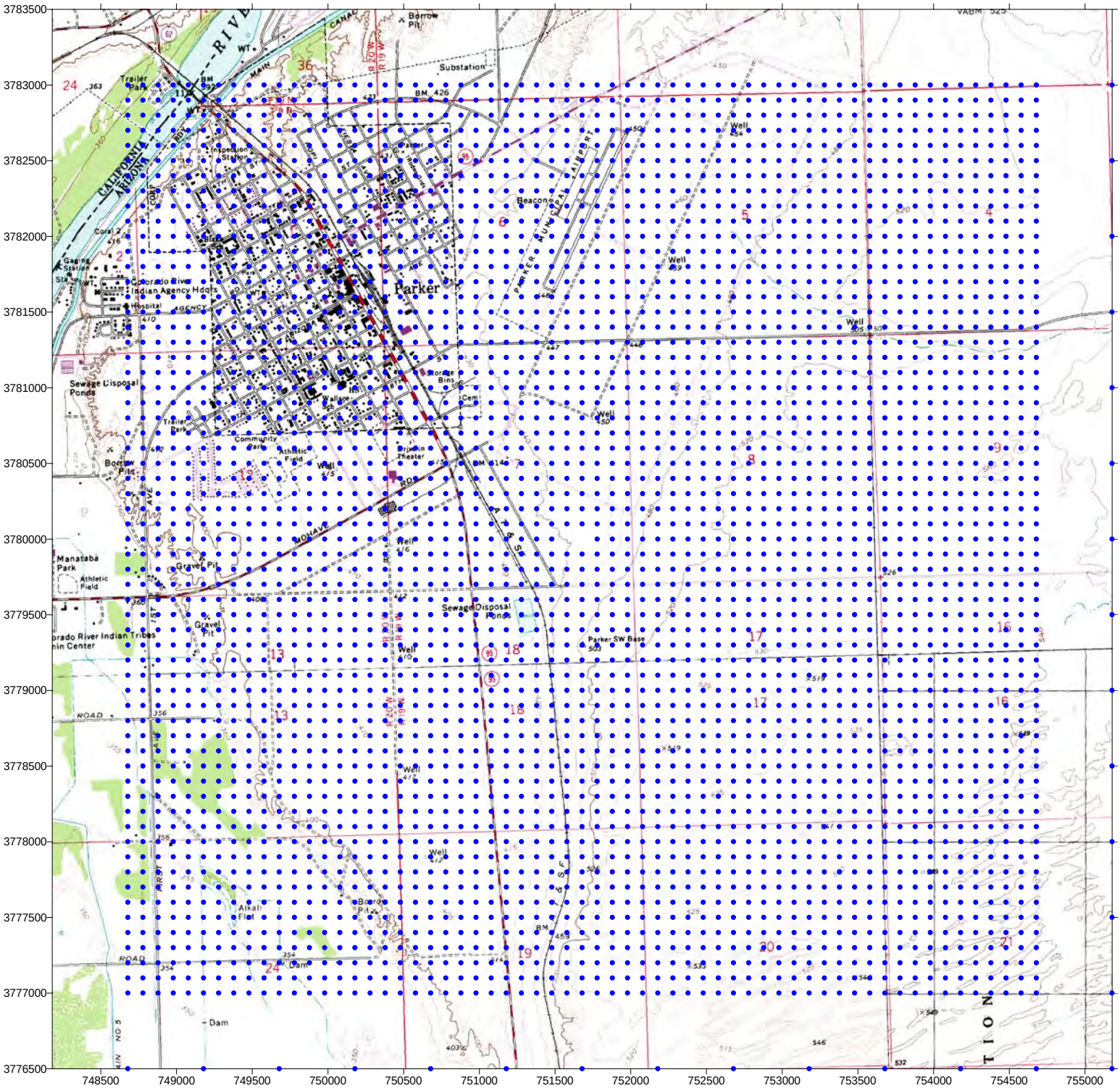


Figure 4-6: Modeled Receptor Grid (Near Grid)



Note: Coordinates in UTM Zone 11, NAD27

5.0 MODELING RESULTS

The ISCST3 modeling results used in the risk assessment included unitized annual average and 1-hour average ambient air concentrations at off-site receptor grid points beyond the property boundary for the stack and fugitive air emissions sources. Off-site unitized annual average deposition rates for the stack source were also used in the risk assessment. Finally, unitized 8-hour average ambient air concentrations associated with the fugitive emissions source at on-site receptor locations were used in the worker evaluation.

Appendix E, referenced in the main risk assessment report, provides figures illustrating the unitized annual average ISCST3 modeled ambient air concentrations and deposition rates associated with the stack source. These isopleth figures are overlain on a USGS topographical map of the Facility area. As the figures show, the maximum unitized annual average air concentrations and deposition rates occur near to, and to the north and south of, the stack, consistent with the predominantly northerly and southerly winds in the Parker area.

The detailed ISCST3 modeling input and output files associated with this project are included in a modeling appendix. These files include the ISCST3 input and output files, plotfiles, BPIP input and output files, and the meteorological data used in the analysis. These files are voluminous and thus are provided on a separate CD.

APPENDIX TO
AIR DISPERSION AND DEPOSITION
MODELING REPORT

ISCST3 MODELING INPUT AND OUTPUT FILES
(ON CDROM)

APPENDIX C

SUPPORTING DATA FOR STACK EMISSION RATES

APPENDIX C

SUPPORTING DATA FOR STACK EMISSION RATES

Chemical emission rates for the reactivation facility stack were calculated by Focus Environmental, Inc. The emission rates were based on either stack exhaust measurements collected during the Performance Demonstration Test (PDT), proposed permit limits or, for a few chemicals that could be present in spent carbon but were not measured during the PDT, long-term average chemical feed rates and a conservative destruction and removal efficiency (DRE) of 99.99%. (Note that the DREs measured during the PDT averaged more than 99.997%).

The individual chemical-specific emission rates used in the risk assessment are summarized Table 4.2-1 in the main body of this report, along with an indication of the basis for each value. This appendix provides the detailed PDT results that were used by Focus to calculate the emission rates for those compounds with emission rates based on the stack test measurements. For compounds that were not detected in the PDT, the listed values were calculated using one-half of the reported detection limit consistent with the risk assessment Workplan. (Note that these tables differ from those in the PDT Report in that one-half the detection limit was used for non-detect results.)

Total Semivolatile and Nonvolatile Organic Emission Results - Run 1

Parameter	Units	Measured Value
Stack Sampling Parameters		
Net sampling time	minutes	240
Stack gas flow rate	dscfm	5,080
	acfm	11,370
	dscm/min	143.87
Stack gas temperature	°F	175
Stack gas velocity	ft/min	3,618
Stack gas sample volume	dscf	134.440
	dscm	3.807
Isokinetic	%	97.7
Stack gas moisture content	vol %	45.5
Stack gas carbon dioxide content	vol %, dry	6.4
Stack gas oxygen content	vol %, dry	9.8
Total Semivolatile Organics by TCO		
Total semivolatiles collected	ug	5320
TCO concentration	ug/dscm	1.40E+03
	ug/dscm @7% O_2	1.75E+03
TCO emission rate	lb/h	2.66E-02
	kg/h	1.21E-02
	g/s	3.35E-03
Total Nonvolatile Organics by GRAV		
Total nonvolatiles collected	ug	3050
GRAV concentration	ug/dscm	8.01E+02
	ug/dscm @7% O_2	1.00E+03
GRAV emission rate	lb/h	1.52E-02
	kg/h	6.92E-03
	g/s	1.92E-03

Note: dscf = Dry standard cubic feet
dscfm = Dry standard cubic feet per minute
acfm = Actual cubic feet per minute
dscm = Dry standard cubic meters

Standard conditions are 68°F, 29.92 in. Hg (20°C, 760 mm Hg)

Total Semivolatile and Nonvolatile Organic Emission Results - Run 2

Parameter	Units	Measured Value
Stack Sampling Parameters		
Net sampling time	minutes	240
Stack gas flow rate	dscfm	3,860
	acfm	8,610
	dscm/min	109.32
Stack gas temperature	°F	174
Stack gas velocity	ft/min	2,742
Stack gas sample volume	dscf	120.300
	dscm	3.407
Isokinetic	%	98.9
Stack gas moisture content	vol %	45.1
Stack gas carbon dioxide content	vol %, dry	7.2
Stack gas oxygen content	vol %, dry	8.9
Total Semivolatile Organics by TCO		
Total semivolatiles collected	ug	2830
TCO concentration	ug/dscm	8.31E+02
	ug/dscm @7% O_2	9.61E+02
TCO emission rate	lb/h	1.20E-02
	kg/h	5.45E-03
	g/s	1.51E-03
Total Nonvolatile Organics by GRAV		
Total nonvolatiles collected	ug	2260
GRAV concentration	ug/dscm	6.63E+02
	ug/dscm @7% O_2	7.68E+02
GRAV emission rate	lb/h	9.59E-03
	kg/h	4.35E-03
	g/s	1.21E-03

Note: dscf = Dry standard cubic feet
dscfm = Dry standard cubic feet per minute
acfm = Actual cubic feet per minute
dscm = Dry standard cubic meters

Standard conditions are 68°F, 29.92 in. Hg (20°C, 760 mm Hg)

Total Semivolatile and Nonvolatile Organic Emission Results - Run 3

Parameter	Units	Measured Value
Stack Sampling Parameters		
Net sampling time	minutes	240
Stack gas flow rate	dscfm	4,060
	acfm	8,890
	dscm/min	114.98
Stack gas temperature	°F	175
Stack gas velocity	ft/min	2,832
Stack gas sample volume	dscf	125.030
	dscm	3.541
Isokinetic	%	97.7
Stack gas moisture content	vol %	44.5
Stack gas carbon dioxide content	vol %, dry	7.1
Stack gas oxygen content	vol %, dry	9.3
Total Semivolatile Organics by TCO		
Total semivolatiles collected	ug	1924
TCO concentration	ug/dscm	5.43E+02
	ug/dscm @7% O_2	6.50E+02
TCO emission rate	lb/h	8.26E-03
	kg/h	3.75E-03
	g/s	1.04E-03
Total Nonvolatile Organics by GRAV		
Total nonvolatiles collected	ug	2250
GRAV concentration	ug/dscm	6.35E+02
	ug/dscm @7% O_2	7.60E+02
GRAV emission rate	lb/h	9.66E-03
	kg/h	4.38E-03
	g/s	1.22E-03

Note: dscf = Dry standard cubic feet
dscfm = Dry standard cubic feet per minute
acfm = Actual cubic feet per minute
dscm = Dry standard cubic meters

Standard conditions are 68°F, 29.92 in. Hg (20°C, 760 mm Hg)

Volatile Organic Emission Results - Run 1

Parameter	Units	Tube Set A	Tube Set B	Tube Set C	Tube Set D
Net sampling time	min	40	40	40	40
Corrected sample volume	liters,dry std.	19.651	19.521	18.94	18.963
Corrected sample volume	dscf	0.694	0.689	0.669	0.670
Corrected sample volume	dscm	0.0197	0.0195	0.0189	0.0190
Analyzed (Y/N)	-	N	Y	Y	Y

Total volume sampled	dscf	2.722
Total volume sampled	dscm	0.0771
Number of tube pairs analyzed	-	3
Total condensate volume	ml	84
Stack gas flow rate	acfm	10,770
Stack gas flow rate	dscfm	4,870

VOST Compound	Mass VOC Compound (ug)					Mass VOC Compound (ug)	Stack Conc. (a,c) (ug/dscm)	Mass Emission Rate (a,b,c) (lb/hr)	Mass Emission Rate (a,b,c) (g/s)
	Tube Set A	Tube Set B	Tube Set C	Tube Set D	Condensate (ug/L)				
Standard Target Analytes									
Acetone	0	< 0.183 J,B	0.55 B	0.554 J,B	4.8 J	< 1.69E+00	< 2.76E+01	< 5.04E-04	< 6.35E-05
Acrylonitrile	0	< 0.152 ND	< 0.152 ND	< 0.152 ND	2.7 ND	< 6.83E-01 ND	< 1.09E+01	< 1.99E-04	< 2.50E-05
Benzene	0	0.0139 J	0.0552 J	< 0.0064 ND	< 0.1 ND	< 8.39E-02	< 1.42E+00	< 2.60E-05	< 3.27E-06
Bromodichloromethane	0	0.05	< 0.0246	< 0.0032 ND	2.2	< 2.63E-01	< 3.75E+00	< 6.85E-05	< 8.63E-06
Bromoform	0	< 0.1366	0.115 J	< 0.0145 J	< 0.14 ND	< 2.78E-01	< 4.79E+00	< 8.73E-05	< 1.10E-05
Bromomethane	0	< 0.064 J,B	< 0.065 J,B	< 0.052 J,B	< 0.38 ND	< 2.13E-01	< 3.57E+00	< 6.51E-05	< 8.20E-06
2-Butanone	0	< 0.07 ND	< 0.07 ND	< 0.07 ND	< 0.75 ND	< 2.73E-01 ND	< 4.47E+00	< 8.16E-05	< 1.03E-05
Carbon Disulfide	0	0.0091 J	< 0.0087 J	< 0.0028 J	< 0.1 ND	< 2.90E-02	< 4.68E-01	< 8.53E-06	< 1.08E-06
Carbon Tetrachloride	0	0.0127 J	< 0.0045 J	< 0.0022 ND	< 0.12 ND	< 2.95E-02	< 4.69E-01	< 8.55E-06	< 1.08E-06
Chlorobenzene	0	5.818 E	3.556 E	0.0323 J	< 0.1 ND	< 9.41E+00	< 1.64E+02	< 2.99E-03	< 3.77E-04
Chlorodibromomethane	0	< 0.096	< 0.073	< 0.02 ND	1	< 2.73E-01	< 4.38E+00	< 7.99E-05	< 1.01E-05
Chloroethane	0	< 0.02 ND	< 0.02 ND	< 0.02 ND	< 0.24 ND	< 8.02E-02 ND	< 1.31E+00	< 2.38E-05	< 3.00E-06
Chloroform	0	0.023 J	0.0183 J	0.0542 J	6.1	6.08E-01	8.31E+00	1.52E-04	1.91E-05
Chloromethane	0	0.4087 J	< 0.5132	< 0.3032	< 0.12 ND	< 1.24E+00	< 2.15E+01	< 3.92E-04	< 4.93E-05
Dibromomethane	0	< 0.02 ND	< 0.02 ND	< 0.02 ND	< 0.21 ND	< 7.76E-02 ND	< 1.27E+00	< 2.32E-05	< 2.93E-06
Dichlorodifluoromethane	0	< 0.0131 J	< 0.015 J	< 0.195	< 0.15 ND	< 2.36E-01	< 4.05E+00	< 7.39E-05	< 9.31E-06
1,1-Dichloroethane	0	< 0.0038 ND	< 0.0038 ND	< 0.0038 ND	< 0.1 ND	< 1.98E-02 ND	< 3.08E-01	< 5.61E-06	< 7.07E-07
1,2-Dichloroethane	0	< 0.0044 ND	< 0.0044 ND	< 0.0044 ND	0.14 J	< 2.50E-02	< 3.82E-01	< 6.98E-06	< 8.79E-07
1,1-Dichloroethene	0	< 0.0046 ND	< 0.0046 ND	< 0.0046 ND	< 0.1 ND	< 2.22E-02 ND	< 3.49E-01	< 6.37E-06	< 8.03E-07
cis-1,2-Dichloroethene	0	< 0.005 ND	< 0.005 ND	< 0.0054 J	< 0.12 ND	< 2.55E-02	< 3.99E-01	< 7.28E-06	< 9.17E-07
trans-1,2-Dichloroethene	0	< 0.0034 ND	< 0.0034 ND	< 0.0034 ND	< 0.1 ND	< 1.86E-02 ND	< 2.87E-01	< 5.23E-06	< 6.59E-07
1,2-Dichloropropane	0	< 0.0054 ND	< 0.0054 ND	< 0.0054 ND	< 0.1 ND	< 2.46E-02 ND	< 3.91E-01	< 7.13E-06	< 8.99E-07
cis-1,3-Dichloropropene	0	< 0.006 ND	< 0.006 ND	< 0.006 ND	< 0.1 ND	< 2.64E-02 ND	< 4.22E-01	< 7.71E-06	< 9.71E-07
trans-1,3-Dichloropropene	0	< 0.004 ND	< 0.004 ND	< 0.004 ND	< 0.11 ND	< 2.12E-02 ND	< 3.29E-01	< 6.00E-06	< 7.56E-07
Ethylbenzene	0	< 0.0026 ND	< 0.0026 ND	< 0.0062 J	< 0.1 ND	< 1.98E-02	< 3.08E-01	< 5.61E-06	< 7.07E-07
2-Hexanone	0	< 0.0198 ND	< 0.0198 ND	< 0.0198 ND	< 0.76 ND	< 1.23E-01 ND	< 1.86E+00	< 3.40E-05	< 4.28E-06
Iodomethane	0	< 0.0156 J,B	< 0.0166 J,B	< 0.0166 J,B	< 0.12 ND	< 5.89E-02	< 9.81E-01	< 1.79E-05	< 2.25E-06
Methylene Chloride	0	0.084 J	< 0.039	0.146	2.3	< 4.62E-01	< 7.19E+00	< 1.31E-04	< 1.65E-05
4-Methyl-2-pentanone (MIBK)	0	< 0.047	< 0.028 ND	< 0.028 ND	< 0.4 ND	< 1.37E-01	< 2.23E+00	< 4.07E-05	< 5.13E-06
Styrene	0	< 0.0034 ND	< 0.0034 ND	< 0.0034 ND	< 0.1 ND	< 1.86E-02 ND	< 2.87E-01	< 5.23E-06	< 6.59E-07
1,1,2,2-Tetrachloroethane	0	< 0.022 ND	< 0.022 ND	< 0.022 ND	< 0.15 ND	< 7.86E-02 ND	< 1.31E+00	< 2.40E-05	< 3.02E-06
Tetrachloroethene	0	4.733 E	0.696	< 0.008 J	< 0.1 ND	< 5.45E+00	< 9.48E+01	< 1.73E-03	< 2.18E-04
Toluene	0	0.0847 J	0.0936 J	< 0.0302	0.19 J	< 2.24E-01	< 3.84E+00	< 7.00E-05	< 8.82E-06
1,1,1-Trichloroethane	0	< 0.0032 ND	< 0.0032 ND	< 0.0032 ND	< 0.1 ND	< 1.80E-02 ND	< 2.76E-01	< 5.04E-06	< 6.35E-07
1,1,2-Trichloroethane	0	< 0.01 ND	< 0.01 ND	< 0.01 ND	< 0.25 ND	< 5.10E-02 ND	< 7.95E-01	< 1.45E-05	< 1.83E-06
Trichloroethene	0	0.0231 J	0.02 J	0.043	0.57 J	1.34E-01	2.12E+00	3.87E-05	4.87E-06
Trichlorofluoromethane	0	< 0.0098 ND	< 0.0098 ND	0.052 J	< 0.12 ND	< 8.17E-02	< 1.38E+00	< 2.51E-05	< 3.17E-06
1,2,3-Trichloropropane	0	< 0.0162 ND	< 0.0162 ND	< 0.0162 ND	< 0.36 ND	< 7.88E-02 ND	< 1.24E+00	< 2.26E-05	< 2.85E-06
Vinyl Acetate	0	< 0.024 ND	< 0.024 ND	< 0.024 ND	< 0.24 ND	< 9.22E-02 ND	< 1.52E+00	< 2.76E-05	< 3.48E-06
Vinyl Chloride	0	< 0.0064 ND	< 0.0064 ND	< 0.0097 J	< 0.24 ND	< 4.27E-02	< 6.53E-01	< 1.19E-05	< 1.50E-06
Xylenes (total)	0	< 0.0097 J	< 0.0096 ND	< 0.0238 J	< 0.3 ND	< 6.83E-02	< 1.08E+00	< 1.97E-05	< 2.48E-06
Special Target Analytes									
Bromobenzene	0	< 0.0072 ND	< 0.0072 ND	< 0.0072 ND	< 0.11 ND	< 3.08E-02 ND	< 4.96E-01	< 9.05E-06	< 1.14E-06
Bromochloromethane	0	< 0.024 ND	< 0.024 ND	< 0.024 ND	< 0.24 ND	< 9.22E-02 ND	< 1.52E+00	< 2.76E-05	< 3.48E-06
n-Butylbenzene	0	< 0.0094 ND	< 0.0094 ND	< 0.0094 ND	< 0.1 ND	< 3.66E-02 ND	< 6.00E-01	< 1.09E-05	< 1.38E-06
sec-Butylbenzene	0	< 0.0072 ND	< 0.0072 ND	< 0.0072 ND	< 0.1 ND	< 3.00E-02 ND	< 4.85E-01	< 8.85E-06	< 1.12E-06
tert-Butylbenzene	0	< 0.006 ND	< 0.006 ND	< 0.006 ND	< 0.24 ND	< 3.82E-02 ND	< 5.75E-01	< 1.05E-05	< 1.32E-06
2-Chlorotoluene	0	< 0.0046 ND	< 0.0046 ND	< 0.0046 ND	< 0.24 ND	< 3.40E-02 ND	< 5.02E-01	< 9.16E-06	< 1.15E-06
4-Chlorotoluene	0	< 0.004 ND	< 0.004 ND	< 0.004 ND	< 0.21 ND	< 2.96E-02 ND	< 4.38E-01	< 7.99E-06	< 1.01E-06
1,2-Dibromo-3-chloropropane	0	< 0.04 ND	< 0.04 ND	< 0.04 ND	< 0.45 ND	< 1.58E-01 ND	< 2.58E+00	< 4.71E-05	< 5.93E-06
1,2-Dibromoethane	0	< 0.02 ND	< 0.02 ND	< 0.02 ND	< 0.24 ND	< 8.02E-02 ND	< 1.31E+00	< 2.38E-05	< 3.00E-06
1,2-Dichlorobenzene	0	< 0.006 ND	< 0.006 ND	< 0.006 ND	< 0.1 ND	< 2.64E-02 ND	< 4.22E-01	< 7.71E-06	< 9.71E-07
1,3-Dichlorobenzene	0	< 0.0062 ND	< 0.0062 ND	< 0.0062 ND	< 0.1 ND	< 2.70E-02 ND	< 4.33E-01	< 7.90E-06	< 9.95E-07
1,4-Dichlorobenzene	0	< 0.0086 ND	< 0.0086 ND	< 0.0086 ND	< 0.12 ND	< 3.59E-02 ND	< 5.80E-01	< 1.06E-05	< 1.33E-06
1,3-Dichloropropane	0	< 0.0036 ND	< 0.0036 ND	< 0.0036 ND	< 0.17 ND	< 2.51E-02 ND	< 3.73E-01	< 6.81E-06	< 8.58E-07
2,2-Dichloropropane	0	< 0.003 ND	< 0.003 ND	< 0.003 ND	< 0.11 ND	< 1.82E-02 ND	< 2.77E-01	< 5.05E-06	< 6.36E-07
1,1-Dichloropropene	0	< 0.002 ND	< 0.002 ND	< 0.002 ND	< 0.1 ND	< 1.44E-02 ND	< 2.13E-01	< 3.89E-06	< 4.91E-07
Hexachlorobutadiene	0	< 0.0096 ND	< 0.0096 ND	< 0.0096 ND	< 0.12 ND	< 3.89E-02 ND	< 6.32E-01	< 1.15E-05	< 1.45E-06
Isopropyl benzene	0	< 0.0046 ND	< 0.0046 ND	< 0.0046 ND	< 0.1 ND	< 2.22E-02 ND	< 3.49E-01	< 6.37E-06	< 8.03E-07
p-Isopropyltoluene	0	< 0.0076 ND	< 0.0076 ND	< 0.0076 ND	< 0.1 ND	< 3.12E-02 ND	< 5.06E-01	< 9.23E-06	< 1.16E-06
Naphthalene	0	< 0.02 ND	< 0.02 ND	< 0.021 J	< 0.17 ND	< 7.53E-02	< 1.25E+00	< 2.28E-05	< 2.87E-06
n-Propylbenzene	0	< 0.0058 ND	< 0.0058 ND	< 0.0058 ND	< 0.1 ND	< 2.58E-02 ND	< 4.12E-01	< 7.52E-06	< 9.47E-07
1,1,1,2-Tetrachloroethane	0	< 0.0038 J	< 0.002 ND	< 0.002 ND	< 0.12 ND	< 1.79E-02	< 2.67E-01	< 4.86E-06	< 6.13E-07
Tetrahydrofuran	0	< 0.062 ND	< 0.062 ND	< 0.062 ND	< 1.2 ND	< 2.87E-01 ND	< 4.55E+00	< 8.30E-05	< 1.05E-05
1,2,3-Trichlorobenzene	0	< 0.028 ND	< 0.028 ND	< 0.028 ND	< 0.23 ND	< 1.03E-01 ND	< 1.71E+00	< 3.13E-05	< 3.94E-06
1,2,4-Trichlorobenzene	0	< 0.006 ND	< 0.006 ND	< 0.006 ND	< 0.15 ND	< 3.06E-02 ND	< 4.77E-01	< 8.70E-06	< 1.10E-06
1,1,2-Trichloro-1,2,2-trifluoroethane	0	< 0.0036 ND	< 0.0036 ND	< 0.0036 ND	< 0.13 ND	< 2.17E-02 ND	< 3.30E-01	< 6.02E-06	< 7.58E-07
1,2,4-Trimethylbenzene	0	< 0.0096 ND	< 0.0096 ND	< 0.0096 ND	< 0.11 ND	< 3.80E-02 ND	< 6.21E-01	< 1.13E-05	< 1.43E-06
1,3,5-Trimethylbenzene	0	< 0.0056 ND	< 0.0056 ND	< 0.0056 ND	< 0.1 ND	< 2.52E-02 ND	< 4.02E-01	< 7.33E-06	< 9.23E-07
m- & p-Xylene	0	< 0.0083 J	< 0.008 J	< 0.0184 J	< 0.2 ND	< 5.15E-02	< 8.22E-01	< 1.50E-05	< 1.89E-06
o-Xylene	0	< 0.0034 ND	< 0.0034 ND	< 0.0053 J	< 0.14 ND	< 2.39E-02	< 3.63E-01	< 6.63E-06	< 8.35E-07
	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tentatively Identified Compounds (TICs)									
Unknown	0	0.068 NJ	0.051 NJ	0	0	1.19E-01	2.07E+00	3.78E-05	4.76E-06
Benzaldehyde	0	0	0.087 NJ	0.078 NJ	0	1.65E-01	2.87E+00	5.24E-05	6.60E-06

(a) Stack gas sample volume (analyzed tubes only)
2.0277 dry std cubic feet
0.0574 dry std cubic meters

(b) Stack gas flow rate
10770 actual cubic feet per minute
5.0835 actual cubic meters per second
4870 dry std cubic feet per minute
2.2987 dry std cubic meters per second

(c) For non-detects, stack concentrations and emissions are calculated using one half of the detection limit.

ND = Not Detected
NA = Not Analyzed
B=present in blank, J=estimated - below quantation limit
E=estimated - above calibration range, SAT=saturated

Volatile Organic Emission Results - Run 2

Parameter	Units	Tube Set A	Tube Set B	Tube Set C	Tube Set D
Net sampling time	min	40	40	40	40
Corrected sample volume	liters,dry std.	19.453	20.223	19.371	19.371
Corrected sample volume	dscf	0.687	0.714	0.684	0.684
Corrected sample volume	dscm	0.0195	0.0202	0.0194	0.0194
Analyzed (Y/N)	-	N	Y	Y	Y

Total volume sampled	dscf	2.769
Total volume sampled	dscm	0.0784
Number of tube pairs analyzed	-	3
Total condensate volume	ml	84
Stack gas flow rate	acfm	8,580
Stack gas flow rate	dscfm	3,880

VOST Compound	Mass VOC Compound (ug)					Mass VOC Compound (ug)	Stack Conc. (a,c) (ug/dscm)	Mass Emission Rate (a,b,c) (lb/hr)	Mass Emission Rate (a,b,c) (g/s)
	Tube Set A	Tube Set B	Tube Set C	Tube Set D	Condensate (ug/L)				
Standard Target Analytes									
Acetone	0	0.697 J,B	0.56 B	0.444 J,B	4.7 J	2.10E+00	3.39E+01	4.92E-04	6.21E-05
Acrylonitrile	0	< 0.152 ND	< 0.152 ND	< 0.152 ND	2.7 ND	< 6.83E-01 ND	< 1.06E+01	< 1.54E-04	< 1.95E-05
Benzene	0	< 0.0094 J	< 0.0126 J	< 0.0312	0.1 ND	< 6.16E-02	< 1.01E+00	< 1.47E-05	< 1.85E-06
Bromodichloromethane	0	< 0.0416	< 0.0346	< 0.0406	0.1 ND	< 1.25E-01	< 2.09E+00	< 3.03E-05	< 3.82E-06
Bromoform	0	< 0.1766	< 0.1466	0.194 J	0.14 ND	< 5.29E-01	< 8.92E+00	< 1.30E-04	< 1.63E-05
Bromomethane	0	< 0.05 J,B	< 0.052 J,B	< 0.046 J,B	0.38 ND	< 1.80E-01	< 2.92E+00	< 4.24E-05	< 5.34E-06
2-Butanone	0	< 0.07 ND	< 0.07 ND	< 0.07 ND	0.75 ND	< 2.73E-01 ND	< 4.36E+00	< 6.34E-05	< 7.99E-06
Carbon Disulfide	0	< 0.0106 J	< 0.009 J	0.0171 J	0.1 ND	< 4.51E-02	< 7.30E-01	< 1.06E-05	< 1.34E-06
Carbon Tetrachloride	0	< 0.006 J	< 0.0056 J	< 0.006 J	0.12 ND	< 2.77E-02	< 4.27E-01	< 6.21E-06	< 7.82E-07
Chlorobenzene	0	1.6028 J	< 0.6513	2.012	0.1 ND	< 4.27E+00	< 7.25E+01	< 1.05E-03	< 1.33E-04
Chlorodibromomethane	0	< 0.13	< 0.106	0.131 J	0.2 ND	< 3.84E-01	< 6.44E+00	< 9.36E-05	< 1.18E-05
Chloroethane	0	< 0.02 ND	< 0.02 ND	< 0.02 ND	0.24 ND	< 8.02E-02 ND	< 1.27E+00	< 1.85E-05	< 2.33E-06
Chloroform	0	0.0349 J	< 0.0239	< 0.0289	0.1 ND	< 9.61E-02	< 1.59E+00	< 2.32E-05	< 2.92E-06
Chloromethane	0	< 0.0642	< 0.3232	< 0.0212 J	0.12 ND	< 4.19E-01	< 7.06E+00	< 1.03E-04	< 1.29E-05
Dibromomethane	0	< 0.02 ND	< 0.02 ND	< 0.02 ND	0.21 ND	< 7.76E-02 ND	< 1.24E+00	< 1.81E-05	< 2.28E-06
Dichlorodifluoromethane	0	< 0.023 J	< 0.0113 J	< 0.015 J	0.15 ND	< 6.19E-02	< 9.97E-01	< 1.45E-05	< 1.83E-06
1,1-Dichloroethane	0	< 0.0038 ND	< 0.0038 ND	< 0.0038 ND	0.1 ND	< 1.98E-02 ND	< 3.00E-01	< 4.37E-06	< 5.50E-07
1,2-Dichloroethane	0	< 0.0044 ND	< 0.0044 ND	< 0.0044 ND	0.12 J	< 2.33E-02	< 3.52E-01	< 5.12E-06	< 6.45E-07
1,1-Dichloroethene	0	< 0.0046 ND	< 0.0046 ND	< 0.0046 ND	0.1 ND	< 2.22E-02 ND	< 3.41E-01	< 4.96E-06	< 6.25E-07
cis-1,2-Dichloroethene	0	< 0.005 ND	< 0.005 ND	< 0.005 ND	0.12 ND	< 2.51E-02 ND	< 3.83E-01	< 5.57E-06	< 7.01E-07
trans-1,2-Dichloroethene	0	< 0.0034 ND	< 0.0034 ND	< 0.0034 ND	0.1 ND	< 1.86E-02 ND	< 2.80E-01	< 4.07E-06	< 5.13E-07
1,2-Dichloropropane	0	< 0.0054 ND	< 0.0054 ND	< 0.0054 ND	0.1 ND	< 2.46E-02 ND	< 3.82E-01	< 5.55E-06	< 6.99E-07
cis-1,3-Dichloropropene	0	< 0.006 ND	< 0.006 ND	< 0.006 ND	0.1 ND	< 2.64E-02 ND	< 4.12E-01	< 5.99E-06	< 7.55E-07
trans-1,3-Dichloropropene	0	< 0.004 ND	< 0.004 ND	< 0.004 ND	0.11 ND	< 2.12E-02 ND	< 3.21E-01	< 4.67E-06	< 5.88E-07
Ethylbenzene	0	< 0.0026 ND	< 0.0026 ND	< 0.0026 ND	0.1 ND	< 1.62E-02 ND	< 2.39E-01	< 3.48E-06	< 4.38E-07
2-Hexanone	0	< 0.0198 ND	< 0.0198 ND	< 0.0198 ND	0.76 ND	< 1.23E-01 ND	< 1.82E+00	< 2.65E-05	< 3.34E-06
Iodomethane	0	< 0.0156 J,B	< 0.0166 J,B	< 0.0156 J,B	0.12 ND	< 5.79E-02	< 9.39E-01	< 1.37E-05	< 1.72E-06
Methylene Chloride	0	0.059 J	< 0.026 ND	< 0.026 ND	1.1 J	< 2.03E-01	< 3.06E+00	< 4.45E-05	< 5.61E-06
4-Methyl-2-pentanone (MIBK)	0	< 0.028 ND	< 0.028 ND	< 0.028 ND	0.4 ND	< 1.18E-01 ND	< 1.85E+00	< 2.69E-05	< 3.39E-06
Styrene	0	< 0.0034 ND	< 0.0034 ND	< 0.0034 ND	0.1 ND	< 1.86E-02 ND	< 2.80E-01	< 4.07E-06	< 5.13E-07
1,1,2,2-Tetrachloroethane	0	< 0.022 ND	< 0.022 ND	< 0.022 ND	0.15 ND	< 7.86E-02 ND	< 1.28E+00	< 1.86E-05	< 2.34E-06
Tetrachloroethene	0	< 0.2321	< 0.0891	< 0.1421	0.1 ND	< 4.72E-01	< 7.96E+00	< 1.16E-04	< 1.46E-05
Toluene	0	0.1734 J	0.0158 J	< 0.0232	0.15 J	< 2.25E-01	< 3.76E+00	< 5.47E-05	< 6.89E-06
1,1,1-Trichloroethane	0	< 0.0032 ND	< 0.0032 ND	< 0.0032 ND	0.1 ND	< 1.80E-02 ND	< 2.70E-01	< 3.92E-06	< 4.94E-07
1,1,2-Trichloroethane	0	< 0.01 ND	< 0.01 ND	< 0.01 ND	0.25 ND	< 5.10E-02 ND	< 7.77E-01	< 1.13E-05	< 1.42E-06
Trichloroethene	0	0.0146 J	< 0.016	0.0135 J	0.1 ND	< 5.25E-02	< 8.55E-01	< 1.24E-05	< 1.57E-06
Trichlorofluoromethane	0	< 0.0098 ND	< 0.0098 ND	< 0.0098 ND	0.12 ND	< 3.95E-02 ND	< 6.27E-01	< 9.12E-06	< 1.15E-06
1,2,3-Trichloropropane	0	< 0.0162 ND	< 0.0162 ND	< 0.0162 ND	0.36 ND	< 7.88E-02 ND	< 1.21E+00	< 1.76E-05	< 2.22E-06
Vinyl Acetate	0	< 0.024 ND	< 0.024 ND	< 0.024 ND	0.24 ND	< 9.22E-02 ND	< 1.48E+00	< 2.15E-05	< 2.71E-06
Vinyl Chloride	0	< 0.0064 ND	< 0.0064 ND	< 0.0064 ND	0.24 ND	< 3.94E-02 ND	< 5.83E-01	< 8.47E-06	< 1.07E-06
Xylenes (total)	0	< 0.0121 J	< 0.0102 J	< 0.0116 J	0.3 ND	< 5.91E-02	< 8.96E-01	< 1.30E-05	< 1.64E-06
Special Target Analytes									
Bromobenzene	0	< 0.0072 ND	< 0.0072 ND	< 0.0072 ND	0.11 ND	< 3.08E-02 ND	< 4.84E-01	< 7.04E-06	< 8.87E-07
Bromochloromethane	0	< 0.024 ND	< 0.024 ND	< 0.024 ND	0.24 ND	< 9.22E-02 ND	< 1.48E+00	< 2.15E-05	< 2.71E-06
n-Butylbenzene	0	< 0.0094 ND	< 0.0094 ND	< 0.0094 ND	0.1 ND	< 3.66E-02 ND	< 5.85E-01	< 8.51E-06	< 1.07E-06
sec-Butylbenzene	0	< 0.0072 ND	< 0.0072 ND	< 0.0072 ND	0.1 ND	< 3.00E-02 ND	< 4.73E-01	< 6.88E-06	< 8.67E-07
tert-Butylbenzene	0	< 0.006 ND	< 0.006 ND	< 0.006 ND	0.24 ND	< 3.82E-02 ND	< 5.62E-01	< 8.17E-06	< 1.03E-06
2-Chlorotoluene	0	< 0.0046 ND	< 0.0046 ND	< 0.0046 ND	0.24 ND	< 3.40E-02 ND	< 4.91E-01	< 7.14E-06	< 8.99E-07
4-Chlorotoluene	0	< 0.004 ND	< 0.004 ND	< 0.004 ND	0.21 ND	< 2.96E-02 ND	< 4.28E-01	< 6.23E-06	< 7.85E-07
1,2-Dibromo-3-chloropropane	0	< 0.04 ND	< 0.04 ND	< 0.04 ND	0.45 ND	< 1.58E-01 ND	< 2.52E+00	< 3.66E-05	< 4.61E-06
1,2-Dibromoethane	0	< 0.02 ND	< 0.02 ND	< 0.02 ND	0.24 ND	< 8.02E-02 ND	< 1.27E+00	< 1.85E-05	< 2.33E-06
1,2-Dichlorobenzene	0	< 0.006 ND	< 0.006 ND	< 0.006 ND	0.1 ND	< 2.64E-02 ND	< 4.12E-01	< 5.99E-06	< 7.55E-07
1,3-Dichlorobenzene	0	< 0.0062 ND	< 0.0062 ND	< 0.0062 ND	0.1 ND	< 2.70E-02 ND	< 4.23E-01	< 6.14E-06	< 7.74E-07
1,4-Dichlorobenzene	0	< 0.0086 ND	< 0.0086 ND	< 0.0086 ND	0.12 ND	< 3.59E-02 ND	< 5.66E-01	< 8.23E-06	< 1.04E-06
1,3-Dichloropropane	0	< 0.0036 ND	< 0.0036 ND	< 0.0036 ND	0.17 ND	< 2.51E-02 ND	< 3.65E-01	< 5.31E-06	< 6.69E-07
2,2-Dichloropropane	0	< 0.003 ND	< 0.003 ND	< 0.003 ND	0.11 ND	< 1.82E-02 ND	< 2.70E-01	< 3.93E-06	< 4.95E-07
1,1-Dichloropropene	0	< 0.002 ND	< 0.002 ND	< 0.002 ND	0.1 ND	< 1.44E-02 ND	< 2.09E-01	< 3.04E-06	< 3.83E-07
Hexachlorobutadiene	0	< 0.0096 ND	< 0.0096 ND	< 0.0096 ND	0.12 ND	< 3.89E-02 ND	< 6.17E-01	< 8.97E-06	< 1.13E-06
Isopropyl benzene	0	< 0.0046 ND	< 0.0046 ND	< 0.0046 J	0.1 ND	< 2.22E-02	< 3.41E-01	< 4.96E-06	< 6.25E-07
p-Isopropyltoluene	0	< 0.0076 ND	< 0.0076 ND	< 0.0076 ND	0.1 ND	< 3.12E-02 ND	< 4.94E-01	< 7.18E-06	< 9.04E-07
Naphthalene	0	< 0.02 ND	< 0.028 J	< 0.02 J	0.17 ND	< 8.23E-02	< 1.34E+00	< 1.94E-05	< 2.45E-06
n-Propylbenzene	0	< 0.0058 ND	< 0.0058 ND	< 0.0058 ND	0.1 ND	< 2.58E-02 ND	< 4.02E-01	< 5.85E-06	< 7.37E-07
1,1,1,2-Tetrachloroethane	0	< 0.002 ND	< 0.002 ND	< 0.002 ND	0.12 ND	< 1.61E-02 ND	< 2.30E-01	< 3.35E-06	< 4.22E-07
Tetrahydrofuran	0	< 0.062 ND	< 0.062 ND	< 0.062 ND	1.2 ND	< 2.87E-01 ND	< 4.44E+00	< 6.45E-05	< 8.13E-06
1,2,3-Trichlorobenzene	0	< 0.028 ND	< 0.028 ND	< 0.028 ND	0.23 ND	< 1.03E-01 ND	< 1.67E+00	< 2.43E-05	< 3.06E-06
1,2,4-Trichlorobenzene	0	< 0.006 ND	< 0.006 ND	< 0.006 ND	0.15 ND	< 3.06E-02 ND	< 4.66E-01	< 6.77E-06	< 8.53E-07
1,1,2-Trichloro-1,2,2-trifluoroethane	0	< 0.0036 ND	< 0.0036 ND	< 0.0036 ND	0.13 ND	< 2.17E-02 ND	< 3.22E-01	< 4.69E-06	< 5.90E-07
1,2,4-Trimethylbenzene	0	< 0.0096 ND	< 0.0096 ND	< 0.0096 ND	0.11 ND	< 3.80E-02 ND	< 6.06E-01	< 8.81E-06	< 1.11E-06
1,3,5-Trimethylbenzene	0	< 0.0056 ND	< 0.0056 ND	< 0.0056 ND	0.1 ND	< 2.52E-02 ND	< 3.92E-01	< 5.70E-06	< 7.18E-07
m- & p-Xylene	0	< 0.0107 J	< 0.0088 J	< 0.0102 J	0.2 ND	< 4.65E-02	< 7.18E-01	< 1.04E-05	< 1.31E-06
o-Xylene	0	< 0.0034 ND	< 0.0034 ND	< 0.0034 ND	0.14 ND	< 2.20E-02 ND	< 3.23E-01	< 4.69E-06	< 5.91E-07
	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tentatively Identified Compounds (TICs)									
Benzaldehyde	0	0	0.04 NJ	0	0	4.00E-02	6.78E-01	9.86E-06	1.24E-06

(a) Stack gas sample volume (analyzed tubes only): 2.0821 dry std cubic feet; 0.059 dry std cubic meters

(b) Stack gas flow rate: 8580 actual cubic feet per minute; 4.0498 actual cubic meters per second; 3880 dry std cubic feet per minute; 1.8314 dry std cubic meters per second

(c) For non-detects, stack concentrations and emissions are calculated using one half of the detection limit.

ND = Not Detected
NA = Not Analyzed

B=present in blank, J=estimated - below quantation limit
E=estimated - above calibration range, SAT=saturated

Volatile Organic Emission Results - Run 3

Parameter	Units	Tube Set A	Tube Set B	Tube Set C	Tube Set D
Net sampling time	min	40	40	40	40
Corrected sample volume	liters,dry std.	20.121	18.453	18.3	18.453
Corrected sample volume	dscf	0.711	0.652	0.646	0.652
Corrected sample volume	dscm	0.0201	0.0185	0.0183	0.0185
Analyzed (Y/N)	-	Y	Y	Y	Y

Total volume sampled	dscf	2.660
Total volume sampled	dscm	0.0753
Number of tube pairs analyzed	-	4
Total condensate volume	ml	84
Stack gas flow rate	acfm	8,850
Stack gas flow rate	dscfm	4,080

VOST Compound	Mass VOC Compound (ug)					Mass VOC Compound (ug)	Stack Conc. (a,c) (ug/dscm)	Mass Emission Rate (a,b,c) (lb/hr)	Mass Emission Rate (a,b,c) (g/s)
	Tube Set A	Tube Set B	Tube Set C	Tube Set D	Condensate (ug/L)				
Standard Target Analytes									
Acetone	< 0.245	0.56 B	0.64 B	0.458 J,B	5.9 J	< 2.40E+00	< 3.18E+01	< 4.87E-04	< 6.13E-05
Acrylonitrile	< 0.152 ND	< 0.152 ND	< 0.152 ND	< 0.152 ND	2.7 ND	< 8.35E-01 ND	< 1.11E+01	< 1.69E-04	< 2.13E-05
Benzene	0.0135 J	< 0.0115 J	< 0.0086 J	< 0.0101 J	< 0.1 ND	< 5.21E-02	< 6.92E-01	< 1.06E-05	< 1.33E-06
Bromodichloromethane	< 0.0396	< 0.0426	< 0.0376	< 0.0416	< 0.1 ND	< 1.70E-01	< 2.25E+00	< 3.45E-05	< 4.34E-06
Bromoform	< 0.1266	< 0.1666	< 0.1566	< 0.1366	< 0.14 ND	< 5.98E-01	< 7.94E+00	< 1.21E-04	< 1.53E-05
Bromomethane	< 0.044 ND	< 0.047 J,B	< 0.048 J,B	< 0.049 J,B	< 0.38 ND	< 2.20E-01	< 2.92E+00	< 4.46E-05	< 5.62E-06
2-Butanone	< 0.07 ND	< 0.07 ND	< 0.07 ND	< 0.07 ND	< 0.75 ND	< 3.43E-01 ND	< 4.55E+00	< 6.96E-05	< 8.77E-06
Carbon Disulfide	0.0124 J	0.0151 J	0.0128 J	0.0187 J	< 0.1 ND	< 6.74E-02	< 8.95E-01	< 1.37E-05	< 1.72E-06
Carbon Tetrachloride	< 0.0049 J	< 0.005 J	< 0.0042 J	< 0.0048 J	< 0.12 ND	< 2.90E-02	< 3.85E-01	< 5.88E-06	< 7.41E-07
Chlorobenzene	2.349 E	3.409 E,J	3.1048 E,J	1.4077 J	< 0.1 ND	< 1.03E+01	< 1.36E+02	< 2.09E-03	< 2.63E-04
Chlorodibromomethane	< 0.11	< 0.13	< 0.11	0.121 J	< 0.2 ND	< 4.88E-01	< 6.48E+00	< 9.90E-05	< 1.25E-05
Chloroethane	< 0.02 ND	< 0.02 ND	< 0.02 ND	< 0.02 ND	< 0.24 ND	< 1.00E-01 ND	< 1.33E+00	< 2.03E-05	< 2.56E-06
Chloroform	< 0.0289	< 0.0299	0.0244 J	< 0.0269	< 0.1 ND	< 1.19E-01	< 1.57E+00	< 2.40E-05	< 3.03E-06
Chloromethane	< 0.2532	< 0.0862	< 0.0242 J	< 0.0542	< 0.12 ND	< 4.28E-01	< 5.68E+00	< 8.68E-05	< 1.09E-05
Dibromomethane	< 0.02 ND	< 0.02 ND	< 0.02 ND	< 0.02 ND	< 0.21 ND	< 9.76E-02 ND	< 1.30E+00	< 1.98E-05	< 2.50E-06
Dichlorodifluoromethane	< 0.0127 J	< 0.0126 J	< 0.0114 J	< 0.0149 J	< 0.15 ND	< 6.42E-02	< 8.52E-01	< 1.30E-05	< 1.64E-06
1,1-Dichloroethane	< 0.0038 ND	< 0.0038 ND	< 0.0038 ND	< 0.0038 ND	< 0.1 ND	< 2.36E-02 ND	< 3.13E-01	< 4.79E-06	< 6.03E-07
1,2-Dichloroethane	< 0.0044 ND	< 0.0044 ND	< 0.0044 ND	< 0.0044 ND	0.11 J	< 2.68E-02	< 3.56E-01	< 5.45E-06	< 6.86E-07
1,1-Dichloroethene	< 0.0046 ND	< 0.0046 ND	< 0.0046 ND	< 0.0046 ND	< 0.1 ND	< 2.68E-02 ND	< 3.56E-01	< 5.44E-06	< 6.85E-07
cis-1,2-Dichloroethene	< 0.005 ND	< 0.005 ND	< 0.005 ND	< 0.005 ND	< 0.12 ND	< 3.01E-02 ND	< 3.99E-01	< 6.10E-06	< 7.69E-07
trans-1,2-Dichloroethene	< 0.0034 ND	< 0.0034 ND	< 0.0034 ND	< 0.0034 ND	< 0.1 ND	< 2.20E-02 ND	< 2.92E-01	< 4.46E-06	< 5.62E-07
1,2-Dichloropropane	< 0.0054 ND	< 0.0054 ND	< 0.0054 ND	< 0.0054 ND	< 0.1 ND	< 3.00E-02 ND	< 3.98E-01	< 6.09E-06	< 7.67E-07
cis-1,3-Dichloropropene	< 0.006 ND	< 0.006 ND	< 0.006 ND	< 0.006 ND	< 0.1 ND	< 3.24E-02 ND	< 4.30E-01	< 6.57E-06	< 8.28E-07
trans-1,3-Dichloropropene	< 0.004 ND	< 0.004 ND	< 0.004 ND	< 0.004 ND	< 0.11 ND	< 2.52E-02 ND	< 3.35E-01	< 5.12E-06	< 6.45E-07
Ethylbenzene	< 0.0031 J	< 0.0026 ND	< 0.0026 ND	< 0.0026 ND	< 0.1 ND	< 1.93E-02	< 2.56E-01	< 3.92E-06	< 4.93E-07
2-Hexanone	< 0.0198 ND	< 0.0198 ND	< 0.0198 ND	< 0.0198 ND	< 0.76 ND	< 1.43E-01 ND	< 1.90E+00	< 2.90E-05	< 3.66E-06
Iodomethane	< 0.0032 ND	< 0.0156 J,B	< 0.0156 J,B	< 0.0156 J,B	0.56 J,B	< 9.70E-02	< 1.29E+00	< 1.97E-05	< 2.48E-06
Methylene Chloride	0.183 J	0.48	0.161	0.295	1.2 J	1.22E+00	1.62E+01	2.47E-04	3.12E-05
4-Methyl-2-pentanone (MIBK)	< 0.028 ND	< 0.028 ND	< 0.028 ND	< 0.028 ND	< 0.4 ND	< 1.46E-01 ND	< 1.93E+00	< 2.95E-05	< 3.72E-06
Styrene	< 0.0034 ND	< 0.0034 ND	< 0.0034 ND	< 0.0034 ND	< 0.1 ND	< 2.20E-02 ND	< 2.92E-01	< 4.46E-06	< 5.62E-07
1,1,2,2-Tetrachloroethane	< 0.022 ND	< 0.022 ND	< 0.022 ND	< 0.022 ND	< 0.15 ND	< 1.01E-01 ND	< 1.34E+00	< 2.04E-05	< 2.57E-06
Tetrachloroethene	0.2332 J	< 2.4021 E	1.1097 J	0.3624 J	< 0.1 ND	< 4.12E+00	< 5.46E+01	< 8.35E-04	< 1.05E-04
Toluene	0.072 J	0.3743 J	0.1233 J	0.1925 J	0.12 J	7.72E-01	1.03E+01	1.57E-04	1.97E-05
1,1,1-Trichloroethane	< 0.0032 ND	< 0.0032 ND	< 0.0032 ND	< 0.0032 ND	< 0.1 ND	< 2.12E-02 ND	< 2.81E-01	< 4.30E-06	< 5.42E-07
1,1,2-Trichloroethane	< 0.01 ND	< 0.01 ND	< 0.01 ND	< 0.01 ND	< 0.25 ND	< 6.10E-02 ND	< 8.10E-01	< 1.24E-05	< 1.56E-06
Trichloroethene	0.0189 J	0.0217 J	< 0.0122 J	< 0.0117 J	< 0.1 ND	< 7.29E-02	< 9.68E-01	< 1.48E-05	< 1.86E-06
Trichlorofluoromethane	< 0.0098 ND	< 0.0098 ND	< 0.0098 ND	< 0.0098 ND	< 0.12 ND	< 4.93E-02 ND	< 6.54E-01	< 1.00E-05	< 1.26E-06
1,2,3-Trichloropropane	< 0.0162 ND	< 0.0162 ND	< 0.0162 ND	< 0.0162 ND	< 0.36 ND	< 9.50E-02 ND	< 1.26E+00	< 1.93E-05	< 2.43E-06
Vinyl Acetate	< 0.024 ND	< 0.024 ND	< 0.024 ND	< 0.024 ND	< 0.24 ND	< 1.16E-01 ND	< 1.54E+00	< 2.36E-05	< 2.97E-06
Vinyl Chloride	< 0.0064 ND	< 0.0064 ND	< 0.0064 ND	< 0.0064 ND	< 0.24 ND	< 4.58E-02 ND	< 6.07E-01	< 9.28E-06	< 1.17E-06
Xylenes (total)	< 0.0148 J	< 0.0113 J	< 0.0109 J	< 0.0097 J	< 0.3 ND	< 7.19E-02	< 9.54E-01	< 1.46E-05	< 1.84E-06
Special Target Analytes									
Bromobenzene	< 0.0072 ND	< 0.0072 ND	< 0.0072 ND	< 0.0072 ND	< 0.11 ND	< 3.80E-02 ND	< 5.05E-01	< 7.72E-06	< 9.72E-07
Bromochloromethane	< 0.024 ND	< 0.024 ND	< 0.024 ND	< 0.024 ND	< 0.24 ND	< 1.16E-01 ND	< 1.54E+00	< 2.36E-05	< 2.97E-06
n-Butylbenzene	< 0.0094 ND	< 0.0094 ND	< 0.0094 ND	< 0.0094 ND	< 0.1 ND	< 4.60E-02 ND	< 6.11E-01	< 9.33E-06	< 1.18E-06
sec-Butylbenzene	< 0.0072 ND	< 0.0072 ND	< 0.0072 ND	< 0.0072 ND	< 0.1 ND	< 3.72E-02 ND	< 4.94E-01	< 7.55E-06	< 9.51E-07
tert-Butylbenzene	< 0.006 ND	< 0.006 ND	< 0.006 ND	< 0.006 ND	< 0.24 ND	< 4.42E-02 ND	< 5.86E-01	< 8.96E-06	< 1.13E-06
2-Chlorotoluene	< 0.0046 ND	< 0.0046 ND	< 0.0046 ND	< 0.0046 ND	< 0.24 ND	< 3.86E-02 ND	< 5.12E-01	< 7.82E-06	< 9.86E-07
4-Chlorotoluene	< 0.004 ND	< 0.004 ND	< 0.004 ND	< 0.004 ND	< 0.21 ND	< 3.36E-02 ND	< 4.47E-01	< 6.83E-06	< 8.60E-07
1,2-Dibromo-3-chloropropane	< 0.04 ND	< 0.04 ND	< 0.04 ND	< 0.04 ND	< 0.45 ND	< 1.98E-01 ND	< 2.63E+00	< 4.01E-05	< 5.06E-06
1,2-Dibromoethane	< 0.02 ND	< 0.02 ND	< 0.02 ND	< 0.02 ND	< 0.24 ND	< 1.00E-01 ND	< 1.33E+00	< 2.03E-05	< 2.56E-06
1,2-Dichlorobenzene	< 0.006 ND	< 0.006 ND	< 0.006 ND	< 0.006 ND	< 0.1 ND	< 3.24E-02 ND	< 4.30E-01	< 6.57E-06	< 8.28E-07
1,3-Dichlorobenzene	< 0.0062 ND	< 0.0062 ND	< 0.0062 ND	< 0.0062 ND	< 0.1 ND	< 3.32E-02 ND	< 4.41E-01	< 6.74E-06	< 8.49E-07
1,4-Dichlorobenzene	< 0.0086 ND	< 0.0086 ND	< 0.0086 ND	< 0.0086 ND	< 0.12 ND	< 4.45E-02 ND	< 5.90E-01	< 9.03E-06	< 1.14E-06
1,3-Dichloropropane	< 0.0036 ND	< 0.0036 ND	< 0.0036 ND	< 0.0036 ND	< 0.17 ND	< 2.87E-02 ND	< 3.81E-01	< 5.82E-06	< 7.33E-07
2,2-Dichloropropane	< 0.003 ND	< 0.003 ND	< 0.003 ND	< 0.003 ND	< 0.11 ND	< 2.12E-02 ND	< 2.82E-01	< 4.31E-06	< 5.43E-07
1,1-Dichloropropene	< 0.002 ND	< 0.002 ND	< 0.002 ND	< 0.002 ND	< 0.1 ND	< 1.64E-02 ND	< 2.18E-01	< 3.33E-06	< 4.19E-07
Hexachlorobutadiene	< 0.0096 ND	< 0.0096 ND	< 0.0096 ND	< 0.0096 ND	< 0.12 ND	< 4.85E-02 ND	< 6.44E-01	< 9.84E-06	< 1.24E-06
Isopropyl benzene	< 0.0046 ND	< 0.0046 ND	< 0.0046 ND	< 0.0046 ND	< 0.1 ND	< 2.68E-02 ND	< 3.56E-01	< 5.44E-06	< 6.85E-07
p-Isopropyltoluene	< 0.0076 ND	< 0.0076 ND	< 0.0076 ND	< 0.0076 ND	< 0.1 ND	< 3.88E-02 ND	< 5.15E-01	< 7.87E-06	< 9.92E-07
Naphthalene	< 0.02 ND	< 0.043	< 0.17	< 0.079	< 0.17 ND	< 3.26E-01	< 4.33E+00	< 6.62E-05	< 8.34E-06
n-Propylbenzene	< 0.0058 ND	< 0.0058 ND	< 0.0058 ND	< 0.0058 ND	< 0.1 ND	< 3.16E-02 ND	< 4.19E-01	< 6.41E-06	< 8.08E-07
1,1,1,2-Tetrachloroethane	< 0.002 ND	< 0.002 ND	< 0.002 ND	< 0.002 ND	< 0.12 ND	< 1.81E-02 ND	< 2.40E-01	< 3.67E-06	< 4.62E-07
Tetrahydrofuran	< 0.062 ND	< 0.062 ND	< 0.062 ND	< 0.062 ND	< 1.2 ND	< 3.49E-01 ND	< 4.63E+00	< 7.08E-05	< 8.92E-06
1,2,3-Trichlorobenzene	< 0.028 ND	< 0.028 ND	< 0.028 ND	< 0.028 ND	< 0.23 ND	< 1.31E-01 ND	< 1.74E+00	< 2.66E-05	< 3.36E-06
1,2,4-Trichlorobenzene	< 0.006 ND	< 0.006 ND	< 0.006 ND	< 0.006 ND	< 0.15 ND	< 3.66E-02 ND	< 4.86E-01	< 7.43E-06	< 9.36E-07
1,1,2-Trichloro-1,2,2-trifluoroethane	< 0.0036 ND	< 0.0036 ND	< 0.0036 ND	< 0.0036 ND	< 0.13 ND	< 2.53E-02 ND	< 3.36E-01	< 5.14E-06	< 6.47E-07
1,2,4-Trimethylbenzene	< 0.0096 ND	< 0.0096 ND	< 0.0096 ND	< 0.0096 ND	< 0.11 ND	< 4.76E-02 ND	< 6.32E-01	< 9.67E-06	< 1.22E-06
1,3,5-Trimethylbenzene	< 0.0056 ND	< 0.0056 ND	< 0.0056 ND	< 0.0056 ND	< 0.1 ND	< 3.08E-02 ND	< 4.09E-01	< 6.25E-06	< 7.87E-07
m- & p-Xylene	< 0.0125 J	< 0.0099 J	< 0.0095 J	< 0.0083 J	< 0.2 ND	< 5.70E-02	< 7.57E-01	< 1.16E-05	< 1.46E-06
o-Xylene	< 0.0034 ND	< 0.0034 ND	< 0.0034 ND	< 0.0034 ND	< 0.14 ND	< 2.54E-02 ND	< 3.37E-01	< 5.15E-06	< 6.48E-07
	0	0	0	0	0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tentatively Identified Compounds (TICs)									
Nonane	0.06 NJ	0	0	0	0	6.00E-02	7.96E-01	1.22E-05	1.53E-06
Benzaldehyde	0	0.074 NJ	0.063 NJ	0.041 NJ	0	1.78E-01	2.36E+00	3.61E-05	4.55E-06

(a) Stack gas sample volume — 2.6599 dry std cubic feet
(analyzed tubes only) — 0.0753 dry std cubic meters

(b) Stack gas flow rate — 8850 actual cubic feet per minute
4.1773 actual cubic meters per second
4080 dry std cubic feet per minute
1.9258 dry std cubic meters per second

(c) For non-detects, stack concentrations and emissions are calculated using one half of the detection limit.

ND = Not Detected
NA = Not Analyzed

B=present in blank, J=estimated - below quantation limit
E=estimated - above calibration range, SAT=saturated

PCDD/PCDF Congener and TEQ Results - CPT Run 1

Congener No.	PCDD/PCDF Compound	Analytical Result (pg/sample) Front Half	Analytical Result (pg/sample) Back Half	Stack (a,b,c) Concentration (ng/dscm)	2,3,7,8-TCDD Toxicity Equivalence Factor	Stack Concentration Toxic Equivalents (ng/dscm)	Emission Rate as 2,3,7,8-TCDD (g/s)
			PCDDs				
1	2,3,7,8-TCDD	10 ND	19 Q	< 4.82E-03	1	< 4.82E-03	< 1.20E-11
	Other TCDD	0	1681	4.26E-01			
	Total TCDD	4 Q,J	1700 Q	4.32E-01			
2	1,2,3,7,8-PeCDD	50 ND	33 J	< 8.37E-03	0.5	< 4.19E-03	< 1.05E-11
	Other PeCDD	0	547	1.39E-01			
	Total PeCDD	8.2 Q,J	580 Q	1.49E-01			
3	1,2,3,4,7,8-HxCDD	50 ND	11 J	< 2.79E-03	0.1	< 2.79E-04	< 6.97E-13
4	1,2,3,6,7,8-HxCDD	50 ND	9.6 J	< 2.43E-03	0.1	< 2.43E-04	< 6.08E-13
5	1,2,3,7,8,9-HxCDD	50 ND	16 J	< 4.06E-03	0.1	< 4.06E-04	< 1.01E-12
	Other HxCDD	0	123.4	3.13E-02			
	Total HxCDD	6.3 Q,J	160 Q	4.22E-02			
6	1,2,3,4,6,7,8-HpCDD	6.7 J	24 B,J	7.79E-03	0.01	7.79E-05	1.94E-13
	Other HpCDD	4.3	20	6.16E-03			
	Total HpCDD	11 J	44 J,B	1.40E-02			
7	OCDD	22 Q,B,J	27 B,J	1.24E-02	0.001	1.24E-05	3.10E-14
Total PCDDs(d)		< 51.5	2511	< 6.50E-01		< 1.00E-02	< 2.50E-11
			PCDFs				
8	2,3,7,8-TCDF	2.4 Q,J	230 Q	5.89E-02	0.1	5.89E-03	1.47E-11
	Other TCDF	12.6	5770	1.47E+00			
	Total TCDF	15 Q,J	6000 Q	1.53E+00			
9	1,2,3,7,8-PeCDF	3.3 Q,J	170 Q	4.40E-02	0.05	2.20E-03	5.49E-12
10	2,3,4,7,8-PeCDF	2.9 Q,J	190	4.89E-02	0.5	2.45E-02	6.11E-11
	Other PeCDF	22.8	2240	5.74E-01			
	Total PeCDF	29 Q	2600 Q	6.67E-01			
11	1,2,3,4,7,8-HxCDF	5.7 Q,J	200 Q	5.22E-02	0.1	5.22E-03	1.30E-11
12	1,2,3,6,7,8-HxCDF	3.7 Q,J	100	2.63E-02	0.1	2.63E-03	6.57E-12
13	2,3,4,6,7,8-HxCDF	2.7 B,J	47 B,J	1.26E-02	0.1	1.26E-03	3.15E-12
14	1,2,3,7,8,9-HxCDF	50 ND	5.5 B,J	< 1.40E-03	0.1	< 1.40E-04	< 3.48E-13
	Other HxCDF	0	477.5	1.21E-01			
	Total HxCDF	21 Q,J,B	830 Q,B	2.16E-01			
15	1,2,3,4,6,7,8-HpCDF	8 Q,B,J	150 B	4.01E-02	0.01	4.01E-04	1.00E-12
16	1,2,3,4,7,8,9-HpCDF	50 ND	10 Q,J	< 2.54E-03	0.01	< 2.54E-05	< 6.33E-14
	Other HpCDF	0	40	1.01E-02			
	Total HpCDF	8 Q,B,J	200 B,Q	5.28E-02			
17	OCDF	8.5 Q,B,J	14 B,J	5.71E-03	0.001	5.71E-06	1.43E-14
Total PCDFs(e)		< 81.5	9644	< 2.47E+00		< 4.22E-02	< 1.05E-10
Total PCDD/PCDF		< 133	12155	< 3.12E+00		< 5.23E-02	< 1.30E-10

NOTE: All concentrations in this table are uncorrected for oxygen concentration.

(a) Stack gas sample volume 139.210 dry standard cubic feet
3.94 dry standard cubic meters

(b) Stack gas flow rate 5,290 dry standard cubic feet per minute
2.50 dry standard cubic meters per second

(c) For non-detects, stack concentrations and emissions are calculated using one half of the detection limit. If the sum of the detection limits of the individual isomers for a given dioxin or furan exceeded the detection limit of the total it was assumed that these individual isomers, when added, constituted the entire total so that any contribution to the total by "other" isomers would be zero.

(d) Total PCDDs = Total TCDD + Total PeCDD + Total HxCDD + Total HpCDD + OCDD

(e) Total PCDFs = Total TCDF + Total PeCDF + Total HxCDF + Total HpCDF + OCDF

PCDD/PCDF Congener and TEQ Results - CPT Run 2

Congener No.	PCDD/PCDF Compound	Analytical Result (pg/sample) Front Half	Analytical Result (pg/sample) Back Half	Stack (a,b,c) Concentration (ng/dscm)	2,3,7,8-TCDD Toxicity Equivalence Factor	Stack Concentration Toxic Equivalents (ng/dscm)	Emission Rate as 2,3,7,8-TCDD (g/s)
			PCDDs				
1	2,3,7,8-TCDD	10 ND	9.2 Q,J	< 2.72E-03	1	< 2.72E-03	< 4.86E-12
	Other TCDD	0	490.8	1.45E-01			
	Total TCDD	10 ND	500 Q	< 1.48E-01			
2	1,2,3,7,8-PeCDD	50 ND	18 J	< 5.33E-03	0.5	< 2.67E-03	< 4.76E-12
	Other PeCDD	0	232	6.87E-02			
	Total PeCDD	1.3 Q,J	250 Q	7.44E-02			
3	1,2,3,4,7,8-HxCDD	50 ND	8.2 J	< 2.43E-03	0.1	< 2.43E-04	< 4.33E-13
4	1,2,3,6,7,8-HxCDD	50 ND	8.5 J	< 2.52E-03	0.1	< 2.52E-04	< 4.49E-13
5	1,2,3,7,8,9-HxCDD	50 ND	13 J	< 3.85E-03	0.1	< 3.85E-04	< 6.87E-13
	Other HxCDD	0	90.3	2.67E-02			
	Total HxCDD	50 ND	120 Q,J	< 3.55E-02			
6	1,2,3,4,6,7,8-HpCDD	50 ND	23 B,J	< 6.81E-03	0.01	< 6.81E-05	< 1.22E-13
	Other HpCDD	0	19	5.63E-03			
	Total HpCDD	2.2 Q,J	42 J,B	1.31E-02			
7	OCDD	17 B,J	24 B,J	1.21E-02	0.001	1.21E-05	2.17E-14
Total PCDDs(d)		< 80.5	936	< 2.83E-01		< 6.35E-03	< 1.13E-11
			PCDFs				
8	2,3,7,8-TCDF	10 ND	130 Q	< 3.85E-02	0.1	< 3.85E-03	< 6.87E-12
	Other TCDF	0	2970	8.80E-01			
	Total TCDF	10 ND	3100 Q	< 9.18E-01			
9	1,2,3,7,8-PeCDF	50 ND	140	< 4.15E-02	0.05	< 2.07E-03	< 3.70E-12
10	2,3,4,7,8-PeCDF	50 ND	150	< 4.44E-02	0.5	< 2.22E-02	< 3.96E-11
	Other PeCDF	0	1710	5.06E-01			
	Total PeCDF	0.8 Q,J	2000 Q	5.93E-01			
11	1,2,3,4,7,8-HxCDF	2.1 Q,J	190	5.69E-02	0.1	5.69E-03	1.02E-11
12	1,2,3,6,7,8-HxCDF	1.6 Q,J	98	2.95E-02	0.1	2.95E-03	5.26E-12
13	2,3,4,6,7,8-HxCDF	50 ND	47 B,J	< 1.39E-02	0.1	< 1.39E-03	< 2.48E-12
14	1,2,3,7,8,9-HxCDF	50 ND	6 Q,B,J	< 1.78E-03	0.1	< 1.78E-04	< 3.17E-13
	Other HxCDF	0	489	1.45E-01			
	Total HxCDF	5.3 J,Q	830 B,Q	2.47E-01			
15	1,2,3,4,6,7,8-HpCDF	3.7 Q,B,J	160 B	4.85E-02	0.01	4.85E-04	8.65E-13
16	1,2,3,4,7,8,9-HpCDF	50 ND	18 J	< 5.33E-03	0.01	< 5.33E-05	< 9.51E-14
	Other HpCDF	0	52	1.54E-02			
	Total HpCDF	3.7 Q,B,J	230 B	6.92E-02			
17	OCDF	4.5 Q,B,J	23 B,J	8.14E-03	0.001	8.14E-06	1.45E-14
Total PCDFs(e)		< 24.3	6183	< 1.84E+00		< 3.89E-02	< 6.94E-11
Total PCDD/PCDF		< 104.8	7119	< 2.12E+00		< 4.52E-02	< 8.07E-11

NOTE: All concentrations in this table are uncorrected for oxygen concentration.

(a) Stack gas sample volume 119.220 dry standard cubic feet
3.38 dry standard cubic meters

(b) Stack gas flow rate 3,780 dry standard cubic feet per minute
1.78 dry standard cubic meters per second

(c) For non-detects, stack concentrations and emissions are calculated using one half of the detection limit. If the sum of the detection limits of the individual isomers for a given dioxin or furan exceeded the detection limit of the total it was assumed that these individual isomers, when added, constituted the entire total so that any contribution to the total by "other" isomers would be zero.

(d) Total PCDDs = Total TCDD + Total PeCDD + Total HxCDD + Total HpCDD + OCDD

(e) Total PCDFs = Total TCDF + Total PeCDF + Total HxCDF + Total HpCDF + OCDF

PCDD/PCDF Congener and TEQ Results - CPT Run 3

Congener No.	PCDD/PCDF Compound	Analytical Result (pg/sample) Front Half	Analytical Result (pg/sample) Back Half	Stack (a,b,c) Concentration (ng/dscm)	2,3,7,8-TCDD Toxicity Equivalence Factor	Stack Concentration Toxic Equivalents (ng/dscm)	Emission Rate as 2,3,7,8-TCDD (g/s)
			PCDDs				
1	2,3,7,8-TCDD	10 ND	12 Q	< 3.36E-03	1	< 3.36E-03	< 6.40E-12
	Other TCDD	0	398	1.11E-01			
	Total TCDD	10 ND	410 Q	< 1.15E-01			
2	1,2,3,7,8-PeCDD	50 ND	22 J	< 6.16E-03	0.5	< 3.08E-03	< 5.87E-12
	Other PeCDD	0	228	6.38E-02			
	Total PeCDD	50 ND	250 Q	< 7.00E-02			
3	1,2,3,4,7,8-HxCDD	50 ND	7.3 Q,J	< 2.04E-03	0.1	< 2.04E-04	< 3.90E-13
4	1,2,3,6,7,8-HxCDD	50 ND	9.7 Q,J	< 2.71E-03	0.1	< 2.71E-04	< 5.18E-13
5	1,2,3,7,8,9-HxCDD	50 ND	16 J	< 4.48E-03	0.1	< 4.48E-04	< 8.54E-13
	Other HxCDD	0	97	2.71E-02			
	Total HxCDD	50 ND	130 Q,J	< 3.64E-02			
6	1,2,3,4,6,7,8-HpCDD	2.2 J	26 B,J	7.89E-03	0.01	7.89E-05	1.50E-13
	Other HpCDD	0	24	6.72E-03			
	Total HpCDD	2.2 J	50 J,B	1.46E-02			
7	OCDD	18 B,J	26 B,J	1.23E-02	0.001	1.23E-05	2.35E-14
Total PCDDs(d)		< 130.2	866	< 2.48E-01		< 7.45E-03	< 1.42E-11
			PCDFs				
8	2,3,7,8-TCDF	10 ND	160 Q	< 4.48E-02	0.1	< 4.48E-03	< 8.54E-12
	Other TCDF	0	3840	1.07E+00			
	Total TCDF	10 ND	4000 Q	< 1.12E+00			
9	1,2,3,7,8-PeCDF	50 ND	190	< 5.32E-02	0.05	< 2.66E-03	< 5.07E-12
10	2,3,4,7,8-PeCDF	50 ND	180	< 5.04E-02	0.5	< 2.52E-02	< 4.80E-11
	Other PeCDF	0	2230	6.24E-01			
	Total PeCDF	2 Q,J	2600	7.28E-01			
11	1,2,3,4,7,8-HxCDF	50 ND	230	< 6.44E-02	0.1	< 6.44E-03	< 1.23E-11
12	1,2,3,6,7,8-HxCDF	50 ND	130	< 3.64E-02	0.1	< 3.64E-03	< 6.94E-12
13	2,3,4,6,7,8-HxCDF	50 ND	56 B	< 1.57E-02	0.1	< 1.57E-03	< 2.99E-12
14	1,2,3,7,8,9-HxCDF	50 ND	8.4 B,J	< 2.35E-03	0.1	< 2.35E-04	< 4.48E-13
	Other HxCDF	0	675.6	1.89E-01			
	Total HxCDF	50 ND	1100 B	< 3.08E-01			
15	1,2,3,4,6,7,8-HpCDF	3.5 Q,B,J	190 B	5.41E-02	0.01	5.41E-04	1.03E-12
16	1,2,3,4,7,8,9-HpCDF	50 ND	21 J	< 5.88E-03	0.01	< 5.88E-05	< 1.12E-13
	Other HpCDF	0	69	1.93E-02			
	Total HpCDF	3.5 Q,B,J	280 B	7.93E-02			
17	OCDF	3.4 Q,B,J	22 B,J	7.11E-03	0.001	7.11E-06	1.36E-14
Total PCDFs(e)		< 68.9	8002	< 2.24E-00		< 4.48E-02	< 8.54E-11
Total PCDD/PCDF		< 199.1	8868	< 2.49E+00		< 5.23E-02	< 9.96E-11

NOTE: All concentrations in this table are uncorrected for oxygen concentration.

(a) Stack gas sample volume 126.180 dry standard cubic feet
3.57 dry standard cubic meters

(b) Stack gas flow rate 4,040 dry standard cubic feet per minute
1.91 dry standard cubic meters per second

(c) For non-detects, stack concentrations and emissions are calculated using one half of the detection limit. If the sum of the detection limits of the individual isomers for a given dioxin or furan exceeded the detection limit of the total it was assumed that these individual isomers, when added, constituted the entire total so that any contribution to the total by "other" isomers would be zero.

(d) Total PCDDs = Total TCDD + Total PeCDD + Total HxCDD + Total HpCDD + OCDD

(e) Total PCDFs = Total TCDF + Total PeCDF + Total HxCDF + Total HpCDF + OCDF

Multiple Metals Results - Run 1

Parameter	Units	Measured Value
Stack Sampling Parameters		
Net sampling time	minutes	120
Stack gas flow rate	dscfm	4,970
	acfm	11,260
	dscm/min	140.75
Stack gas temperature	°F	176
Stack gas velocity	ft/min	3,582
Stack gas sample volume	dscf	76.790
	dscm	2.175
Isokinetic	%	98.2
Stack gas moisture content	vol %	46.2
Stack gas carbon dioxide content	vol %, dry	6.3
Stack gas oxygen content	vol %, dry	9.6
Aluminum		
Metal collected	ug	132.3
Metal concentration	ug/dscm	6.08E+01
	ug/dscm @ 7% O_2	7.47E+01
Metal emission rate	lb/h	1.13E-03
	g/s	1.43E-04
Antimony		
Metal collected	ug	< 5.3
Metal concentration	ug/dscm	< 2.44E+00
	ug/dscm @ 7% O_2	< 2.99E+00
Metal emission rate	lb/h	< 4.54E-05
	g/s	< 5.72E-06
Arsenic		
Metal collected	ug	< 5.9
Metal concentration	ug/dscm	< 2.73E+00
	ug/dscm @ 7% O_2	< 3.35E+00
Metal emission rate	lb/h	< 5.08E-05
	g/s	< 6.40E-06
Barium		
Metal collected	ug	10.2
Metal concentration	ug/dscm	4.69E+00
	ug/dscm @ 7% O_2	5.76E+00
Metal emission rate	lb/h	8.73E-05
	g/s	1.10E-05
Beryllium		
Metal collected	ug	< 0.4
Metal concentration	ug/dscm	< 1.75E-01
	ug/dscm @ 7% O_2	< 2.15E-01
Metal emission rate	lb/h	< 3.25E-06
	g/s	< 4.10E-07
Cadmium		
Metal collected	ug	12.1
Metal concentration	ug/dscm	5.56E+00
	ug/dscm @ 7% O_2	6.83E+00
Metal emission rate	lb/h	1.04E-04
	g/s	1.31E-05
Chromium		
Metal collected	ug	56.0
Metal concentration	ug/dscm	2.58E+01
	ug/dscm @ 7% O_2	3.16E+01
Metal emission rate	lb/h	4.79E-04
	g/s	6.04E-05
Cobalt		
Metal collected	ug	< 1.1
Metal concentration	ug/dscm	< 5.15E-01
	ug/dscm @ 7% O_2	< 6.32E-01
Metal emission rate	lb/h	< 9.59E-06
	g/s	< 1.21E-06
Copper		
Metal collected	ug	167.1
Metal concentration	ug/dscm	7.68E+01
	ug/dscm @ 7% O_2	9.44E+01
Metal emission rate	lb/h	1.43E-03
	g/s	1.80E-04
Iron		
Metal collected	ug	0.0
Metal concentration	ug/dscm	0.00E+00
	ug/dscm @ 7% O_2	0.00E+00
Metal emission rate	lb/h	0.00E+00
	g/s	0.00E+00
Lead		
Metal collected	ug	356.8
Metal concentration	ug/dscm	1.64E+02
	ug/dscm @ 7% O_2	2.01E+02
Metal emission rate	lb/h	3.05E-03
	g/s	3.85E-04
Manganese		
Metal collected	ug	65.8
Metal concentration	ug/dscm	3.03E+01
	ug/dscm @ 7% O_2	3.72E+01
Metal emission rate	lb/h	5.63E-04
	g/s	7.10E-05
Mercury		
Metal collected	ug	< 10.8
Metal concentration	ug/dscm	< 4.98E+00
	ug/dscm @ 7% O_2	< 6.11E+00
Metal emission rate	lb/h	< 9.26E-05
	g/s	< 1.17E-05
Molybdenum		
Metal collected	ug	0.0
Metal concentration	ug/dscm	0.00E+00
	ug/dscm @ 7% O_2	0.00E+00
Metal emission rate	lb/h	0.00E+00
	g/s	0.00E+00
Nickel		
Metal collected	ug	12.0
Metal concentration	ug/dscm	5.52E+00
	ug/dscm @ 7% O_2	6.78E+00
Metal emission rate	lb/h	1.03E-04
	g/s	1.29E-05
Selenium		
Metal collected	ug	4.5
Metal concentration	ug/dscm	2.07E+00
	ug/dscm @ 7% O_2	2.54E+00
Metal emission rate	lb/h	3.85E-05
	g/s	4.85E-06
Silver		
Metal collected	ug	2.6
Metal concentration	ug/dscm	1.20E+00
	ug/dscm @ 7% O_2	1.47E+00
Metal emission rate	lb/h	2.23E-05
	g/s	2.80E-06
Thallium		
Metal collected	ug	< 11.0
Metal concentration	ug/dscm	< 5.06E+00
	ug/dscm @ 7% O_2	< 6.21E+00
Metal emission rate	lb/h	< 9.42E-05
	g/s	< 1.19E-05
Vanadium		
Metal collected	ug	< 3.0
Metal concentration	ug/dscm	< 1.38E+00
	ug/dscm @ 7% O_2	< 1.69E+00
Metal emission rate	lb/h	< 2.57E-05
	g/s	< 3.24E-06
Zinc		
Metal collected	ug	218.4
Metal concentration	ug/dscm	1.00E+02
	ug/dscm @ 7% O_2	1.23E+02
Metal emission rate	lb/h	1.87E-03
	g/s	2.36E-04

Note: dscf = Dry standard cubic feet
dscfm = Dry standard cubic feet per minute
acfm = Actual cubic feet per minute
dscm = Dry standard cubic meters

Standard conditions are 68°F, 29.92 in. Hg (20°C, 760 mm Hg)

Multiple Metals Results - Run 2

Parameter	Units	Measured Value
Stack Sampling Parameters		
Net sampling time	minutes	120
Stack gas flow rate	dscfm	3,860
	acfm	8,600
	dscm/min	109.32
Stack gas temperature	°F	175
Stack gas velocity	ft/min	2,736
Stack gas sample volume	dscf	79.370
	dscm	2.248
Isokinetic	%	102.9
Stack gas moisture content	vol %	45.1
Stack gas carbon dioxide content	vol %, dry	7.0
Stack gas oxygen content	vol %, dry	8.9
Aluminum		
Metal collected	ug	123.2
Metal concentration	ug/dscm	5.48E+01
	ug/dscm @ 7% O_2	6.34E+01
Metal emission rate	lb/h	7.93E-04
	g/s	9.99E-05
Antimony		
Metal collected	ug	< 4.8
Metal concentration	ug/dscm	< 2.14E+00
	ug/dscm @ 7% O_2	< 2.47E+00
Metal emission rate	lb/h	< 3.09E-05
	g/s	< 3.89E-06
Arsenic		
Metal collected	ug	< 2.7
Metal concentration	ug/dscm	< 1.21E+00
	ug/dscm @ 7% O_2	< 1.41E+00
Metal emission rate	lb/h	< 1.76E-05
	g/s	< 2.21E-06
Barium		
Metal collected	ug	9.0
Metal concentration	ug/dscm	4.00E+00
	ug/dscm @ 7% O_2	4.63E+00
Metal emission rate	lb/h	5.79E-05
	g/s	7.30E-06
Beryllium		
Metal collected	ug	< 0.4 ND
Metal concentration	ug/dscm	< 1.60E-01 ND
	ug/dscm @ 7% O_2	< 1.85E-01 ND
Metal emission rate	lb/h	< 2.32E-06 ND
	g/s	< 2.92E-07 ND
Cadmium		
Metal collected	ug	7.9
Metal concentration	ug/dscm	3.51E+00
	ug/dscm @ 7% O_2	4.07E+00
Metal emission rate	lb/h	5.08E-05
	g/s	6.40E-06
Chromium		
Metal collected	ug	20.2
Metal concentration	ug/dscm	8.99E+00
	ug/dscm @ 7% O_2	1.04E+01
Metal emission rate	lb/h	1.30E-04
	g/s	1.64E-05
Cobalt		
Metal collected	ug	< 1.0 ND
Metal concentration	ug/dscm	< 4.45E-01 ND
	ug/dscm @ 7% O_2	< 5.15E-01 ND
Metal emission rate	lb/h	< 6.43E-06 ND
	g/s	< 8.11E-07 ND
Copper		
Metal collected	ug	108.1
Metal concentration	ug/dscm	4.81E+01
	ug/dscm @ 7% O_2	5.56E+01
Metal emission rate	lb/h	6.95E-04
	g/s	8.76E-05
Iron		
Metal collected	ug	0.0
Metal concentration	ug/dscm	0.00E+00
	ug/dscm @ 7% O_2	0.00E+00
Metal emission rate	lb/h	0.00E+00
	g/s	0.00E+00
Lead		
Metal collected	ug	250.4
Metal concentration	ug/dscm	1.11E+02
	ug/dscm @ 7% O_2	1.29E+02
Metal emission rate	lb/h	1.61E-03
	g/s	2.03E-04
Manganese		
Metal collected	ug	42.0
Metal concentration	ug/dscm	1.87E+01
	ug/dscm @ 7% O_2	2.16E+01
Metal emission rate	lb/h	2.70E-04
	g/s	3.40E-05
Mercury		
Metal collected	ug	< 11.3
Metal concentration	ug/dscm	< 5.02E+00
	ug/dscm @ 7% O_2	< 5.81E+00
Metal emission rate	lb/h	< 7.26E-05
	g/s	< 9.15E-06
Molybdenum		
Metal collected	ug	0.0
Metal concentration	ug/dscm	0.00E+00
	ug/dscm @ 7% O_2	0.00E+00
Metal emission rate	lb/h	0.00E+00
	g/s	0.00E+00
Nickel		
Metal collected	ug	11.4
Metal concentration	ug/dscm	5.07E+00
	ug/dscm @ 7% O_2	5.87E+00
Metal emission rate	lb/h	7.33E-05
	g/s	9.24E-06
Selenium		
Metal collected	ug	4.0
Metal concentration	ug/dscm	1.78E+00
	ug/dscm @ 7% O_2	2.06E+00
Metal emission rate	lb/h	2.57E-05
	g/s	3.24E-06
Silver		
Metal collected	ug	5.7
Metal concentration	ug/dscm	2.54E+00
	ug/dscm @ 7% O_2	2.93E+00
Metal emission rate	lb/h	3.67E-05
	g/s	4.62E-06
Thallium		
Metal collected	ug	< 10.6
Metal concentration	ug/dscm	< 4.72E+00
	ug/dscm @ 7% O_2	< 5.46E+00
Metal emission rate	lb/h	< 6.82E-05
	g/s	< 8.59E-06
Vanadium		
Metal collected	ug	< 1.6
Metal concentration	ug/dscm	< 7.12E-01
	ug/dscm @ 7% O_2	< 8.24E-01
Metal emission rate	lb/h	< 1.03E-05
	g/s	< 1.30E-06
Zinc		
Metal collected	ug	136.2
Metal concentration	ug/dscm	6.06E+01
	ug/dscm @ 7% O_2	7.01E+01
Metal emission rate	lb/h	8.76E-04
	g/s	1.10E-04

Note: dscf = Dry standard cubic feet
dscfm = Dry standard cubic feet per minute
acfm = Actual cubic feet per minute
dscm = Dry standard cubic meters

Standard conditions are 68°F, 29.92 in. Hg (20°C, 760 mm Hg)

Multiple Metals Results - Run 3

Parameter	Units	Measured Value
Stack Sampling Parameters		
Net sampling time	minutes	120
Stack gas flow rate	dscfm	4,000
	acfm	8,920
	dscm/min	113.28
Stack gas temperature	°F	175
Stack gas velocity	ft/min	2,838
Stack gas sample volume	dscf	82.610
	dscm	2.340
Isokinetic	%	103.2
Stack gas moisture content	vol %	45.5
Stack gas carbon dioxide content	vol %, dry	7.0
Stack gas oxygen content	vol %, dry	9.3
Aluminum		
Metal collected	ug	125.2
Metal concentration	ug/dscm	5.35E+01
	ug/dscm @ 7% O_2	6.40E+01
Metal emission rate	lb/h	8.02E-04
	g/s	1.01E-04
Antimony		
Metal collected	ug	< 4.9
Metal concentration	ug/dscm	< 2.09E+00
	ug/dscm @ 7% O_2	< 2.51E+00
Metal emission rate	lb/h	< 3.14E-05
	g/s	< 3.95E-06
Arsenic		
Metal collected	ug	< 3.7
Metal concentration	ug/dscm	< 1.59E+00
	ug/dscm @ 7% O_2	< 1.91E+00
Metal emission rate	lb/h	< 2.39E-05
	g/s	< 3.01E-06
Barium		
Metal collected	ug	10.8
Metal concentration	ug/dscm	4.62E+00
	ug/dscm @ 7% O_2	5.52E+00
Metal emission rate	lb/h	6.92E-05
	g/s	8.72E-06
Beryllium		
Metal collected	ug	< 0.4 ND
Metal concentration	ug/dscm	< 1.54E-01 ND
	ug/dscm @ 7% O_2	< 1.84E-01 ND
Metal emission rate	lb/h	< 2.31E-06 ND
	g/s	< 2.91E-07 ND
Cadmium		
Metal collected	ug	9.7
Metal concentration	ug/dscm	4.15E+00
	ug/dscm @ 7% O_2	4.97E+00
Metal emission rate	lb/h	6.22E-05
	g/s	7.84E-06
Chromium		
Metal collected	ug	36.5
Metal concentration	ug/dscm	1.56E+01
	ug/dscm @ 7% O_2	1.87E+01
Metal emission rate	lb/h	2.34E-04
	g/s	2.95E-05
Cobalt		
Metal collected	ug	< 1.0 ND
Metal concentration	ug/dscm	< 4.27E-01 ND
	ug/dscm @ 7% O_2	< 5.11E-01 ND
Metal emission rate	lb/h	< 6.40E-06 ND
	g/s	< 8.07E-07 ND
Copper		
Metal collected	ug	112.4
Metal concentration	ug/dscm	4.80E+01
	ug/dscm @ 7% O_2	5.75E+01
Metal emission rate	lb/h	7.20E-04
	g/s	9.07E-05
Iron		
Metal collected	ug	0.0
Metal concentration	ug/dscm	0.00E+00
	ug/dscm @ 7% O_2	0.00E+00
Metal emission rate	lb/h	0.00E+00
	g/s	0.00E+00
Lead		
Metal collected	ug	694.2
Metal concentration	ug/dscm	2.97E+02
	ug/dscm @ 7% O_2	3.55E+02
Metal emission rate	lb/h	4.45E-03
	g/s	5.60E-04
Manganese		
Metal collected	ug	41.4
Metal concentration	ug/dscm	1.77E+01
	ug/dscm @ 7% O_2	2.12E+01
Metal emission rate	lb/h	2.65E-04
	g/s	3.34E-05
Mercury		
Metal collected	ug	< 14.7
Metal concentration	ug/dscm	< 6.28E+00
	ug/dscm @ 7% O_2	< 7.52E+00
Metal emission rate	lb/h	< 9.42E-05
	g/s	< 1.19E-05
Molybdenum		
Metal collected	ug	0.0
Metal concentration	ug/dscm	0.00E+00
	ug/dscm @ 7% O_2	0.00E+00
Metal emission rate	lb/h	0.00E+00
	g/s	0.00E+00
Nickel		
Metal collected	ug	9.4
Metal concentration	ug/dscm	4.02E+00
	ug/dscm @ 7% O_2	4.81E+00
Metal emission rate	lb/h	6.02E-05
	g/s	7.59E-06
Selenium		
Metal collected	ug	3.9
Metal concentration	ug/dscm	1.68E+00
	ug/dscm @ 7% O_2	2.02E+00
Metal emission rate	lb/h	2.52E-05
	g/s	3.18E-06
Silver		
Metal collected	ug	< 1.9 ND
Metal concentration	ug/dscm	< 8.29E-01 ND
	ug/dscm @ 7% O_2	< 9.92E-01 ND
Metal emission rate	lb/h	< 1.24E-05 ND
	g/s	< 1.57E-06 ND
Thallium		
Metal collected	ug	< 10.7
Metal concentration	ug/dscm	< 4.57E+00
	ug/dscm @ 7% O_2	< 5.47E+00
Metal emission rate	lb/h	< 6.85E-05
	g/s	< 8.64E-06
Vanadium		
Metal collected	ug	< 2.0
Metal concentration	ug/dscm	< 8.55E-01
	ug/dscm @ 7% O_2	< 1.02E+00
Metal emission rate	lb/h	< 1.28E-05
	g/s	< 1.61E-06
Zinc		
Metal collected	ug	133.3
Metal concentration	ug/dscm	5.70E+01
	ug/dscm @ 7% O_2	6.82E+01
Metal emission rate	lb/h	8.54E-04
	g/s	1.08E-04

Note: dscf = Dry standard cubic feet
dscfm = Dry standard cubic feet per minute
acfm = Actual cubic feet per minute
dscm = Dry standard cubic meters

Standard conditions are 68°F, 29.92 in. Hg (20°C, 760 mm Hg)

Particulate, Hydrogen Chloride and Chlorine Results - Run 1

Parameter	Units	Measured Value
Stack Sampling Parameters		
Net sampling time	minutes	120
Stack gas flow rate	dscfm	5,030
	acfm	11,320
	dscm/min	142.45
Stack gas temperature	°F	175
Stack gas velocity	ft/min	3,606
Stack gas sample volume	dscf	72.660
	dscm	2.058
Isokinetic	%	93.7
Stack gas moisture content	vol %	45.9
Stack gas carbon dioxide content	vol %, dry	6.3
Stack gas oxygen content	vol %, dry	9.6
Hydrogen chloride and chlorine		
HCl collected	mg	11.8
Cl_2 collected	mg	1.95
Stack gas HCl concentration	mg/dscm	5.73E+00
	mg/dscm @7% O_2	7.04E+00
Stack gas HCl emission rate	lb/h	1.08E-01
	kg/h	4.90E-02
	g/s	1.36E-02
Stack gas Cl_2 concentration	mg/dscm	9.48E-01
	mg/dscm @7% O_2	1.16E+00
Stack gas Cl_2 emission rate	lb/h	1.79E-02
	kg/h	8.10E-03
	g/s	2.25E-03
Stack gas HCl+Cl_2 concentration	ppmv, dry	4.42E+00
expressed as HCl equivalents	ppmv, dry @7% O_2	5.43E+00
Particulate		
Particulate matter collected	mg	34.3
Particulate concentration	gr/dscf	7.29E-03
	gr/dscf @ 7% O_2	8.95E-03
	mg/dscm	1.67E+01
	mg/dscm @ 7% O_2	2.05E+01
Particulate emission rate	lb/h	3.14E-01
	kg/h	1.42E-01
	g/s	3.96E-02

Note: dscf = Dry standard cubic feet
dscfm = Dry standard cubic feet per minute
acfm = Actual cubic feet per minute
dscm = Dry standard cubic meters

Standard conditions are 68°F, 29.92 in. Hg (20°C, 760 mm Hg)

Particulate, Hydrogen Chloride and Chlorine Results - Run 2

Parameter	Units	Measured Value
Stack Sampling Parameters		
Net sampling time	minutes	120
Stack gas flow rate	dscfm	3,850
	acfm	8,580
	dscm/min	109.03
Stack gas temperature	°F	174
Stack gas velocity	ft/min	2,730
Stack gas sample volume	dscf	74.990
	dscm	2.124
Isokinetic	%	96.0
Stack gas moisture content	vol %	45.1
Stack gas carbon dioxide content	vol %, dry	7.0
Stack gas oxygen content	vol %, dry	8.9
Hydrogen chloride and chlorine		
HCl collected	mg	6.95
Cl_2 collected	mg	2.01
Stack gas HCl concentration	mg/dscm	3.27E+00
	mg/dscm @7% O_2	3.79E+00
Stack gas HCl emission rate	lb/h	4.72E-02
	kg/h	2.14E-02
	g/s	5.95E-03
Stack gas Cl_2 concentration	mg/dscm	9.46E-01
	mg/dscm @7% O_2	1.10E+00
Stack gas Cl_2 emission rate	lb/h	1.37E-02
	kg/h	6.19E-03
	g/s	1.72E-03
Stack gas HCl+Cl_2 concentration	ppmv, dry	2.80E+00
expressed as HCl equivalents	ppmv, dry @7% O_2	3.24E+00
Particulate		
Particulate matter collected	mg	19.4
Particulate concentration	gr/dscf	3.99E-03
	gr/dscf @ 7% O_2	4.62E-03
	mg/dscm	9.13E+00
	mg/dscm @ 7% O_2	1.06E+01
Particulate emission rate	lb/h	1.32E-01
	kg/h	5.98E-02
	g/s	1.66E-02

Note: dscf = Dry standard cubic feet
dscfm = Dry standard cubic feet per minute
acfm = Actual cubic feet per minute
dscm = Dry standard cubic meters

Standard conditions are 68°F, 29.92 in. Hg (20°C, 760 mm Hg)

Particulate, Hydrogen Chloride and Chlorine Results - Run 3

Parameter	Units	Measured Value
Stack Sampling Parameters		
Net sampling time	minutes	120
Stack gas flow rate	dscfm	4,090
	acfm	8,970
	dscm/min	115.83
Stack gas temperature	°F	174
Stack gas velocity	ft/min	2,856
Stack gas sample volume	dscf	79.290
	dscm	2.246
Isokinetic	%	95.7
Stack gas moisture content	vol %	44.8
Stack gas carbon dioxide content	vol %, dry	7.0
Stack gas oxygen content	vol %, dry	9.3
Hydrogen chloride and chlorine		
HCl collected	mg	6.49
Cl_2 collected	mg	1.94
Stack gas HCl concentration	mg/dscm	2.89E+00
	mg/dscm @7% O_2	3.46E+00
Stack gas HCl emission rate	lb/h	4.43E-02
	kg/h	2.01E-02
	g/s	5.58E-03
Stack gas Cl_2 concentration	mg/dscm	8.64E-01
	mg/dscm @7% O_2	1.03E+00
Stack gas Cl_2 emission rate	lb/h	1.32E-02
	kg/h	6.00E-03
	g/s	1.67E-03
Stack gas HCl+Cl_2 concentration	ppmv, dry	2.49E+00
expressed as HCl equivalents	ppmv, dry @7% O_2	2.98E+00
Particulate		
Particulate matter collected	mg	33.6
Particulate concentration	gr/dscf	6.54E-03
	gr/dscf @ 7% O_2	7.83E-03
	mg/dscm	1.50E+01
	mg/dscm @ 7% O_2	1.79E+01
Particulate emission rate	lb/h	2.29E-01
	kg/h	1.04E-01
	g/s	2.89E-02

Note: dscf = Dry standard cubic feet
dscfm = Dry standard cubic feet per minute
acfm = Actual cubic feet per minute
dscm = Dry standard cubic meters

Standard conditions are 68°F, 29.92 in. Hg (20°C, 760 mm Hg)

Hexavalent Chromium Emissions Results - Run 1

Parameter	Units	Measured Value
Stack Sampling Parameters		
Net sampling time	minutes	120
Stack gas flow rate	dscfm	5,120
	acfm	11,160
	dscm/min	145.00
Stack gas temperature	°F	176
Stack gas velocity	ft/min	3,552
Stack gas sample volume	dscf	76.040
	dscm	2.153
Isokinetic	%	93.6
Stack gas moisture content	vol %	44.0
Stack gas carbon dioxide content	vol %, dry	6.3
Stack gas oxygen content	vol %, dry	9.6
Hexavalent chromium		
Metal collected	ug	5.6
Metal concentration	ug/dscm	2.60E+00
	ug/dscm @ 7% O_2	3.19E+00
Metal emission rate	lb/h	4.99E-05
	g/s	6.28E-06

Note: dscf = Dry standard cubic feet
dscfm = Dry standard cubic feet per minute
acfm = Actual cubic feet per minute
dscm = Dry standard cubic meters

Standard conditions are 68°F, 29.92 in. Hg (20°C, 760 mm Hg)

Hexavalent Chromium Emissions Results - Run 2

Parameter	Units	Measured Value
Stack Sampling Parameters		
Net sampling time	minutes	120
Stack gas flow rate	dscfm	3,780
	acfm	8,470
	dscm/min	107.05
Stack gas temperature	°F	175
Stack gas velocity	ft/min	2,694
Stack gas sample volume	dscf	75.030
	dscm	2.125
Isokinetic	%	101.1
Stack gas moisture content	vol %	45.3
Stack gas carbon dioxide content	vol %, dry	7.0
Stack gas oxygen content	vol %, dry	8.9
Hexavalent chromium		
Metal collected	ug	5.9
Metal concentration	ug/dscm	2.78E+00
	ug/dscm @ 7% O_2	3.21E+00
Metal emission rate	lb/h	3.93E-05
	g/s	4.95E-06

Note: dscf = Dry standard cubic feet
dscfm = Dry standard cubic feet per minute
acfm = Actual cubic feet per minute
dscm = Dry standard cubic meters

Standard conditions are 68°F, 29.92 in. Hg (20°C, 760 mm Hg)

Hexavalent Chromium Emissions Results - Run 3

Parameter	Units	Measured Value
Stack Sampling Parameters		
Net sampling time	minutes	120
Stack gas flow rate	dscfm	3,890
	acfm	8,770
	dscm/min	110.17
Stack gas temperature	°F	176
Stack gas velocity	ft/min	2,796
Stack gas sample volume	dscf	78.620
	dscm	2.227
Isokinetic	%	103.1
Stack gas moisture content	vol %	46.1
Stack gas carbon dioxide content	vol %, dry	7.0
Stack gas oxygen content	vol %, dry	9.3
Hexavalent chromium		
Metal collected	ug	7.5
Metal concentration	ug/dscm	3.37E+00
	ug/dscm @ 7% O_2	4.03E+00
Metal emission rate	lb/h	4.91E-05
	g/s	6.18E-06

Note: dscf = Dry standard cubic feet
dscfm = Dry standard cubic feet per minute
acfm = Actual cubic feet per minute
dscm = Dry standard cubic meters

Standard conditions are 68°F, 29.92 in. Hg (20°C, 760 mm Hg)

OCP Compound Emission Results - Run 1

OCP Compound	Front Half Analytical Result (ug/sample)	Back Half Analytical Result (ug/sample)	Condensate Analytical Result (ug/sample)	Stack (a,b,c) Concentration (ug/dscm)	Emission Rate (g/s)
Standard Target Analytes					
Aldrin	0.036 ND	0.014 ND	0.034 ND	< 2.41E-02	< 5.54E-08
a-BHC	0.026 ND	0.022 ND	0.016 ND	< 1.84E-02	< 4.22E-08
b-BHC	0.033 ND	0.063 ND	0.034 ND	< 3.73E-02	< 8.58E-08
g-BHC (Lindane)	0.014 ND	0.014 ND	0.012 ND	< 1.15E-02	< 2.64E-08
d-BHC	0.015 ND	0.022 J,COL	0.025 ND	< 1.78E-02	< 4.09E-08
a-Chlordane	0.013 ND	0.021 J,COL	0.014 ND	< 1.38E-02	< 3.17E-08
g-Chlordane	0.078 ND	0.043 ND	0.018 ND	< 3.99E-02	< 9.17E-08
4,4'-DDD	0.083 ND	0.093 ND	0.14 ND	< 9.07E-02	< 2.09E-07
4,4'-DDE	0.039 ND	0.052 J	0.028 ND	< 3.42E-02	< 7.85E-08
4,4'-DDT	0.023 ND	0.063 J,COL	0.026 J	< 3.22E-02	< 7.39E-08
Dieldrin	0.013 ND	0.015 ND	0.012 ND	< 1.15E-02	< 2.64E-08
Endosulfan I	0.013 ND	0.018 ND	0.014 ND	< 1.29E-02	< 2.97E-08
Endosulfan II	0.014 ND	0.06 J,COL	0.018 ND	< 2.64E-02	< 6.07E-08
Endosulfan sulfate	0.023 ND	0.013 ND	0.016 ND	< 1.49E-02	< 3.43E-08
Endrin	0.05 ND	0.063 ND	0.051 ND	< 4.71E-02	< 1.08E-07
Heptachlor	0.016 ND	0.013 ND	0.02 J,COL	< 1.41E-02	< 3.23E-08
Methoxychlor	0.038 ND	0.11 ND	0.037 ND	< 5.31E-02	< 1.22E-07
Special Target Analytes					
Chlorobenzilate	0.083 ND	0.093 ND	0.15 J,COL	< 9.36E-02	< 2.15E-07
Endrin aldehyde	0.018 ND	0.04 ND	0.02 J,B,COL	< 2.24E-02	< 5.15E-08
Endrin ketone	0.017 ND	0.017 ND	0.025 ND	< 1.69E-02	< 3.89E-08
Heptachlor epoxide	0.015 ND	0.042 J,COL	0.012 ND	< 1.98E-02	< 4.55E-08
Diallate	11 ND	9.7 ND	0.78 ND	< 6.17E+00	< 1.42E-05

Total PAHs	< 11.66	10.591	1.502	< 6.82E+00	< 1.57E-05

NOTE: All concentrations in this table are uncorrected for oxygen concentration.

(a) Stack gas sample volume — 122.990 dry standard cubic feet; 3.48 dry standard cubic meters

(b) Stack gas flow rate — 4,870 dry standard cubic feet per minute; 2.30 dry standard cubic meters per second

(c) For non-detects, stack concentrations and emissions are calculated using one half of the detection limit.

OCP Compound Emission Results - Run 2

OCP Compound	Front Half Analytical Result (ug/sample)	Back Half Analytical Result (ug/sample)	Condensate Analytical Result (ug/sample)	Stack (a,b,c) Concentration (ug/dscm)	Emission Rate (g/s)
Standard Target Analytes					
Aldrin	0.036 ND	0.014 ND	0.034 ND	< 2.52E-02	< 4.62E-08
a-BHC	0.026 ND	0.022 ND	0.023 J	< 2.13E-02	< 3.91E-08
b-BHC	0.033 ND	0.063 ND	0.052 J,COL	< 4.45E-02	< 8.14E-08
g-BHC (Lindane)	0.014 ND	0.014 ND	0.012 ND	< 1.20E-02	< 2.20E-08
d-BHC	0.015 ND	0.019 ND	0.11 COL	< 4.33E-02	< 7.92E-08
a-Chlordane	0.013 ND	0.028 J,COL	0.014 ND	< 1.65E-02	< 3.03E-08
g-Chlordane	0.078 ND	0.043 ND	0.018 ND	< 4.18E-02	< 7.65E-08
4,4'-DDD	0.083 ND	0.093 ND	0.14 ND	< 9.49E-02	< 1.74E-07
4,4'-DDE	0.039 ND	0.052 J	0.028 ND	< 3.57E-02	< 6.55E-08
4,4'-DDT	0.023 ND	0.012 ND	0.022 ND	< 1.71E-02	< 3.14E-08
Dieldrin	0.013 ND	0.015 ND	0.012 ND	< 1.20E-02	< 2.20E-08
Endosulfan I	0.013 ND	0.018 ND	0.014 ND	< 1.35E-02	< 2.48E-08
Endosulfan II	0.014 ND	0.023 ND	0.018 ND	< 1.65E-02	< 3.03E-08
Endosulfan sulfate	0.023 ND	0.013 ND	0.016 ND	< 1.56E-02	< 2.86E-08
Endrin	0.05 ND	0.063 ND	0.051 ND	< 4.93E-02	< 9.02E-08
Heptachlor	0.016 ND	0.013 ND	0.11 COL	< 4.18E-02	< 7.65E-08
Methoxychlor	0.038 ND	0.11 ND	0.035 ND	< 5.50E-02	< 1.01E-07
Special Target Analytes					
Chlorobenzilate	0.083 ND	0.093 ND	0.13 ND	< 9.19E-02	< 1.68E-07
Endrin aldehyde	0.018 ND	0.04 ND	0.18 B,COL	< 7.15E-02	< 1.31E-07
Endrin ketone	0.017 ND	0.017 ND	0.025 ND	< 1.77E-02	< 3.25E-08
Heptachlor epoxide	0.015 ND	0.015 ND	0.025 J,COL	< 1.65E-02	< 3.03E-08
Diallate	11 ND	9.7 ND	0.78 ND	< 6.45E+00	< 1.18E-05
Total PAHs	< 11.66	10.48	1.849	< 7.21E+00	< 1.32E-05

NOTE: All concentrations in this table are uncorrected for oxygen concentration.

(a) Stack gas sample volume — 117.540 dry standard cubic feet; 3.33 dry standard cubic meters

(b) Stack gas flow rate — 3,880 dry standard cubic feet per minute; 1.83 dry standard cubic meters per second

(c) For non-detects, stack concentrations and emissions are calculated using one half of the detection limit.

OCP Compound Emission Results - Run 3

OCP Compound	Front Half Analytical Result (ug/sample)	Back Half Analytical Result (ug/sample)	Condensate Analytical Result (ug/sample)	Stack (a,b,c) Concentration (ug/dscm)	Emission Rate (g/s)
Standard Target Analytes					
Aldrin	0.036 ND	0.014 ND	0.034 ND	< 2.36E-02	< 4.54E-08
a-BHC	0.026 ND	0.022 ND	0.016 ND	< 1.80E-02	< 3.46E-08
b-BHC	0.033 ND	0.074 J,COL	0.035 J,COL	< 3.99E-02	< 7.68E-08
g-BHC (Lindane)	0.014 ND	0.014 ND	0.012 ND	< 1.12E-02	< 2.16E-08
d-BHC	0.015 ND	0.019 ND	0.078 J,COL	< 3.15E-02	< 6.06E-08
a-Chlordane	0.013 ND	0.016 ND	0.014 ND	< 1.21E-02	< 2.33E-08
g-Chlordane	0.078 ND	0.043 ND	0.018 ND	< 3.90E-02	< 7.52E-08
4,4'-DDD	0.083 ND	0.26 J,COL	0.14 ND	< 1.36E-01	< 2.61E-07
4,4'-DDE	0.039 ND	0.047 ND	0.028 ND	< 3.20E-02	< 6.17E-08
4,4'-DDT	0.023 ND	0.021 ND	0.023 ND	< 1.88E-02	< 3.62E-08
Dieldrin	0.013 ND	0.015 ND	0.012 ND	< 1.12E-02	< 2.16E-08
Endosulfan I	0.013 ND	0.018 ND	0.014 ND	< 1.26E-02	< 2.43E-08
Endosulfan II	0.014 ND	0.023 ND	0.018 ND	< 1.54E-02	< 2.98E-08
Endosulfan sulfate	0.023 ND	0.013 ND	0.016 ND	< 1.46E-02	< 2.81E-08
Endrin	0.05 ND	0.063 ND	0.051 ND	< 4.61E-02	< 8.87E-08
Heptachlor	0.016 ND	0.013 ND	0.056 J,COL	< 2.39E-02	< 4.60E-08
Methoxychlor	0.038 ND	0.11 ND	0.037 ND	< 5.20E-02	< 1.00E-07
Special Target Analytes					
Chlorobenzilate	0.083 ND	0.097 J,COL	0.14 ND	< 8.99E-02	< 1.73E-07
Endrin aldehyde	0.018 ND	0.04 ND	0.022 J,B,COL	< 2.25E-02	< 4.33E-08
Endrin ketone	0.017 ND	0.017 ND	0.025 ND	< 1.66E-02	< 3.19E-08
Heptachlor epoxide	0.015 ND	0.015 ND	0.013 J,COL	< 1.21E-02	< 2.33E-08
Diallate	11 ND	9.7 ND	0.78 ND	< 6.03E+00	< 1.16E-05
	0	0	0	0.00E+00	0.00E+00
	0	0	0	0.00E+00	0.00E+00
	0	0	0	0.00E+00	0.00E+00
	0	0	0	0.00E+00	0.00E+00
	0	0	0	0.00E+00	0.00E+00
	0	0	0	0.00E+00	0.00E+00
	0	0	0	0.00E+00	0.00E+00
	0	0	0	0.00E+00	0.00E+00
	0	0	0	0.00E+00	0.00E+00
	0	0	0	0.00E+00	0.00E+00
Total PAHs	< 11.66	10.654	1.582	< 6.71E+00	< 1.29E-05

NOTE: All concentrations in this table are uncorrected for oxygen concentration.

(a) Stack gas sample volume — 125.710 dry standard cubic feet; 3.56 dry standard cubic meters

(b) Stack gas flow rate — 4,080 dry standard cubic feet per minute; 1.93 dry standard cubic meters per second

(c) For non-detects, stack concentrations and emissions are calculated using one half of the detection limit.

PAH Compound Emission Results - Run 1

PAH Compound	Front Half Analytical Result (ng/sample)	Back Half Analytical Result (ng/sample)	Condensate Analytical Result (ng/sample)	Stack (a,b,c) Concentration (ug/dscm)	Emission Rate (g/s)
Standard Target Analytes					
Acenaphthene	3.4 BJ	3.5 BJ	1.5 J	2.29E-03	5.51E-09
Acenaphthylene	9.1 J	14 J	0.29 ND	< 6.39E-03	< 1.53E-08
Anthracene	4 J	28	7.8 J	1.09E-02	2.61E-08
Benzo(a)anthracene	1.7 BJ	5.4 J	0.48 ND	< 2.07E-03	< 4.97E-09
Benzo(b)fluoranthene	4.2 BJ	40 B	5.8 J	1.37E-02	3.28E-08
Benzo(k)fluoranthene	3.1 BJ	4.3 J	5.5 J	3.52E-03	8.46E-09
Benzo(g,h,i)perylene	5.6 J	4 J	15 BJ	6.72E-03	1.61E-08
Benzo(a)pyrene	2.7 BJ	2.2 BJ	3.4 BJ	2.27E-03	5.45E-09
Benzo(e)pyrene	4.5 BJ	4.4 BJ	5.1 BJ	3.82E-03	9.18E-09
Chrysene	3.5 BJ	18 J	4.7 BJ	7.15E-03	1.72E-08
Dibenzo(a,h)anthracene	0.32 ND	0.5 ND	0.65 ND	< 4.01E-04	< 9.64E-10
Fluoranthene	27 B	100 B	26 B	4.18E-02	1.00E-07
Fluorene	15 BJ	11 BJ	3.3 J	8.00E-03	1.92E-08
Indeno(1,2,3-cd)pyrene	3.3 BJ	3.8 J	4.7 BJ	3.22E-03	7.74E-09
2-Methylnaphthalene	31 BJ	80 BJ	13 BJ	3.39E-02	8.13E-08
Naphthalene	40 BJ	880 B	30 BJ	2.59E-01	6.23E-07
Phenanthrene	140 B	300 B	39 BJ	1.31E-01	3.14E-07
Pyrene	25 BJ	110 B	20 BJ	4.23E-02	1.02E-07
Special Target Analytes					
Perylene	0.91 ND	3.5 BJ	1.7 ND	< 1.67E-03	< 4.01E-09
Total PAHs	< 324.33	1612.6	187.92	< 5.80E-01	< 1.39E-06

NOTE: All concentrations in this table are uncorrected for oxygen concentration.

(a) Stack gas sample volume — 129.310 dry standard cubic feet; 3.66 dry standard cubic meters

(b) Stack gas flow rate — 5,090 dry standard cubic feet per minute; 2.40 dry standard cubic meters per second

(c) For non-detects, stack concentrations and emissions are calculated using one half of the detection limit.

PAH Compound Emission Results - Run 2

PAH Compound	Front Half Analytical Result (ng/sample)	Back Half Analytical Result (ng/sample)	Condensate Analytical Result (ng/sample)	Stack (a,b,c) Concentration (ug/dscm)	Emission Rate (g/s)
Standard Target Analytes					
Acenaphthene	1.1 BJ	3.3 BJ	1.5 J	1.67E-03	3.05E-09
Acenaphthylene	0.28 ND	7.8 J	0.23 ND	< 2.35E-03	< 4.29E-09
Anthracene	0.44 ND	8.1 J	3.5 J	< 3.41E-03	< 6.22E-09
Benzo(a)anthracene	0.36 ND	0.35 ND	0.45 ND	< 3.28E-04	< 5.99E-10
Benzo(b)fluoranthene	0.83 ND	55 B	3.9 J	< 1.69E-02	< 3.09E-08
Benzo(k)fluoranthene	1.1 ND	4.6 J	1.2 ND	< 1.95E-03	< 3.57E-09
Benzo(g,h,i)perylene	0.75 ND	4.4 J	18 BJ	< 6.55E-03	< 1.20E-08
Benzo(a)pyrene	1.4 ND	1.7 ND	2.7 BJ	< 1.64E-03	< 3.00E-09
Benzo(e)pyrene	1.1 ND	1.5 ND	5.3 BJ	< 2.23E-03	< 4.08E-09
Chrysene	0.39 ND	21	3.1 BJ	< 6.93E-03	< 1.27E-08
Dibenzo(a,h)anthracene	0.41 ND	0.92 ND	0.45 ND	< 5.04E-04	< 9.20E-10
Fluoranthene	4.4 BJ	32 B	18 BJ	1.54E-02	2.81E-08
Fluorene	3.3 BJ	10 BJ	2.8 J	4.55E-03	8.32E-09
Indeno(1,2,3-cd)pyrene	0.76 ND	1.4 ND	5.3 BJ	< 2.11E-03	< 3.86E-09
2-Methylnaphthalene	12 BJ	52 BJ	13 BJ	2.18E-02	3.98E-08
Naphthalene	23 BJ	1900 B	34 BJ	5.54E-01	1.01E-06
Phenanthrene	25 BJ	96 B	27 BJ	4.19E-02	7.65E-08
Pyrene	6.4 BJ	30 BJ	15 BJ	1.45E-02	2.66E-08
Special Target Analytes					
Perylene	1.4 ND	1.6 ND	1.3 ND	< 1.22E-03	< 2.22E-09
Total PAHs	< 84.42	2231.67	156.73	< 7.00E-01	< 1.28E-06

NOTE: All concentrations in this table are uncorrected for oxygen concentration.

(a) Stack gas sample volume — 124.810 dry standard cubic feet; 3.53 dry standard cubic meters

(b) Stack gas flow rate — 3,870 dry standard cubic feet per minute; 1.83 dry standard cubic meters per second

(c) For non-detects, stack concentrations and emissions are calculated using one half of the detection limit.

PAH Compound Emission Results - Run 3

PAH Compound	Front Half Analytical Result (ng/sample)	Back Half Analytical Result (ng/sample)	Condensate Analytical Result (ng/sample)	Stack (a,b,c) Concentration (ug/dscm)	Emission Rate (g/s)
Standard Target Analytes					
Acenaphthene	2 BJ	6.5 BJ	1.3 ND	< 2.87E-03	< 5.22E-09
Acenaphthylene	3.3 J	5.9 J	0.32 ND	< 2.79E-03	< 5.07E-09
Anthracene	0.37 ND	11 J	0.41 ND	< 3.45E-03	< 6.27E-09
Benzo(a)anthracene	0.21 ND	6.1 J	0.37 ND	< 1.96E-03	< 3.56E-09
Benzo(b)fluoranthene	4.1 BJ	40 B	2.3 J	1.36E-02	2.47E-08
Benzo(k)fluoranthene	1.1 ND	3.9 J	4.7 J	< 2.84E-03	< 5.16E-09
Benzo(g,h,i)perylene	7.5 J	3.7 J	0.67 ND	< 3.48E-03	< 6.32E-09
Benzo(a)pyrene	4.3 BJ	1.1 ND	1.9 ND	< 2.14E-03	< 3.89E-09
Benzo(e)pyrene	3.2 BJ	2.5 BJ	1.6 ND	< 2.14E-03	< 3.89E-09
Chrysene	0.23 ND	5.7 J	0.43 ND	< 1.86E-03	< 3.39E-09
Dibenzo(a,h)anthracene	0.35 ND	0.72 ND	0.65 ND	< 5.04E-04	< 9.16E-10
Fluoranthene	7.3 BJ	25 B	3.4 BJ	1.05E-02	1.90E-08
Fluorene	6.4 BJ	11 BJ	1.8 J	5.63E-03	1.02E-08
Indeno(1,2,3-cd)pyrene	4.1 BJ	3.1 J	0.68 J	2.31E-03	4.20E-09
2-Methylnaphthalene	17 BJ	67 BJ	15 BJ	2.90E-02	5.27E-08
Naphthalene	35 BJ	17000 B	72 BJ	5.01E+00	9.11E-06
Phenanthrene	49 B	65 B	5.8 BJ	3.51E-02	6.38E-08
Pyrene	5 BJ	28 BJ	3.1 BJ	1.06E-02	1.92E-08
Special Target Analytes					
Perylene	1.1 ND	66 B	1.8 ND	< 2.02E-02	< 3.67E-08
Total PAHs	< 151.56	17352.22	118.23	< 5.16E+00	< 9.38E-06

NOTE: All concentrations in this table are uncorrected for oxygen concentration.

(a) Stack gas sample volume — 120.520 dry standard cubic feet; 3.41 dry standard cubic meters

(b) Stack gas flow rate — 3,850 dry standard cubic feet per minute; 1.82 dry standard cubic meters per second

(c) For non-detects, stack concentrations and emissions are calculated using one half of the detection limit.

PCB Compound Emission Results - Run 1

PCB Compound	Front Half Analytical Result (ng/sample)	Back Half Analytical Result (ng/sample)	Condensate Analytical Result (ng/sample)	Stack (a,b,c) Concentration (ng/dscm)	Emission Rate (g/s)
Co-Planar PCBs					
3,4,3',4'-Tetrachlorobiphenyl (IUPAC 77)	0.03 QB	0.36	0.021 QJ	1.12E-01	2.70E-10
3,4,4',5-Tetrachlorobiphenyl (IUPAC 81)	0.0083 ND	0.06 QJ	0.01 ND	< 2.14E-02	< 5.14E-11
2,3,4,3',4'-Pentachlorobiphenyl (IUPAC 105)	0.022 QJ	0.067 J	0.035 BJ	3.39E-02	8.13E-11
2,3,4,5,4'-Pentachlorobiphenyl (IUPAC 114)	0.0069 ND	0.011 ND	0.0065 ND	< 6.66E-03	< 1.60E-11
2,4,5,3',4'-Pentachlorobiphenyl (IUPAC 118)	0.087 J	0.13 J	0.078 QBJ	8.06E-02	1.94E-10
3,4,5,2',4'-Pentachlorobiphenyl (IUPAC 123)	0.0075 ND	0.022 J	0.0067 ND	< 9.88E-03	< 2.37E-11
3,4,5,3',4'-Pentachlorobiphenyl (IUPAC 126)	0.0073 ND	0.091 QJ	0.0072 ND	< 2.88E-02	< 6.92E-11
2,3,4,5,3',4'-Hexachlorobiphenyl (IUPAC 156)	0.01 ND	0.061 QCJ	0.013 ND	< 2.29E-02	< 5.51E-11
2,3,4,3',4',5'-Hexachlorobiphenyl (IUPAC 157)	0.01 ND	0.061 QCJ	0.013 ND	< 2.29E-02	< 5.51E-11
2,4,5,3',4',5'-Hexachlorobiphenyl (IUPAC 167)	0.0073 ND	0.027 J	0.0091 ND	< 1.19E-02	< 2.85E-11
3,4,5,3',4',5'-Hexachlorobiphenyl (IUPAC 169)	0.0073 ND	0.02 ND	0.0098 ND	< 1.01E-02	< 2.43E-11
2,3,4,5,3',4',5'-Heptachlorobiphenyl (IUPAC 189)	0.0066 ND	0.013 ND	0.0061 ND	< 7.02E-03	< 1.69E-11
Total PCB Homologs					
Total Monochlorobiphenyls	0.67 B	6 B	0.23 BJ	1.88E+00	4.53E-09
Total Dichlorobiphenyls	9.6 QB	9.8 QB	2 BQ	5.84E+00	1.40E-08
Total Trichlorobiphenyls	11 QB	8 QB	3.8 BQ	6.23E+00	1.50E-08
Total Tetrachlorobiphenyls	2.2 QB	4 BQ	2.5 BQ	2.38E+00	5.71E-09
Total Pentachlorobiphenyls	0.49 QJB	1 QB	0.75 JQB	6.12E-01	1.47E-09
Total Hexachlorobiphenyls	0.093 QJ	0.33 QBJ	0.23 QBJ	1.78E-01	4.28E-10
Total Heptachlorobiphenyls	0.21 ND	0.13 QJ	0.024 QBJ	< 9.94E-02	< 2.39E-10
Total Octachlorobiphenyls	0.1 ND	0.16 ND	0.14 ND	< 1.09E-01	< 2.62E-10
Total Nonachlorobiphenyls	0.029 ND	0.054 ND	0.05 ND	< 3.63E-02	< 8.73E-11
Total Decachlorobiphenyl	0.0096 ND	0.016 ND	0.025 ND	< 1.38E-02	< 3.32E-11
Total PCBs	< 24.4016	29.49	9.749	< 1.74E+01	< 4.18E-08

NOTE: All concentrations in this table are uncorrected for oxygen concentration.

(a) Stack gas sample volume — 129.310 dry standard cubic feet; 3.66 dry standard cubic meters

(b) Stack gas flow rate — 5,090 dry standard cubic feet per minute; 2.40 dry standard cubic meters per second

(c) For non-detects, stack concentrations and emissions are calculated using one half of the detection limit.

PCB Compound Emission Results - Run 2

PCB Compound	Front Half Analytical Result (ng/sample)	Back Half Analytical Result (ng/sample)	Condensate Analytical Result (ng/sample)	Stack (a,b,c) Concentration (ng/dscm)	Emission Rate (g/s)
Co-Planar PCBs					
3,4,3',4'-Tetrachlorobiphenyl (IUPAC 77)	0.0073 ND	0.17 J	0.018 QJ	< 5.53E-02	< 1.01E-10
3,4,4',5-Tetrachlorobiphenyl (IUPAC 81)	0.0068 ND	0.019 QJ	0.0058 ND	< 8.94E-03	< 1.63E-11
2,3,4,3',4'-Pentachlorobiphenyl (IUPAC 105)	0.0061 ND	0.049 QJ	0.039 BJ	< 2.66E-02	< 4.86E-11
2,3,4,5,4'-Pentachlorobiphenyl (IUPAC 114)	0.0058 ND	0.01 ND	0.0075 QJ	< 6.59E-03	< 1.20E-11
2,4,5,3',4'-Pentachlorobiphenyl (IUPAC 118)	0.018 QJ	0.097 QJ	0.076 BJ	5.40E-02	9.87E-11
3,4,5,2',4'-Pentachlorobiphenyl (IUPAC 123)	0.0063 ND	0.01 ND	0.0036 ND	< 5.63E-03	< 1.03E-11
3,4,5,3',4'-Pentachlorobiphenyl (IUPAC 126)	0.0062 ND	0.069 J	0.0041 ND	< 2.24E-02	< 4.10E-11
2,3,4,5,3',4'-Hexachlorobiphenyl (IUPAC 156)	0.0091 ND	0.048 CJ	0.0069 ND	< 1.81E-02	< 3.31E-11
2,3,4,3',4',5'-Hexachlorobiphenyl (IUPAC 157)	0.0091 ND	0.048 CJ	0.0069 ND	< 1.81E-02	< 3.31E-11
2,4,5,3',4',5'-Hexachlorobiphenyl (IUPAC 167)	0.0063 ND	0.024 J	0.0049 ND	< 9.96E-03	< 1.82E-11
3,4,5,3',4',5'-Hexachlorobiphenyl (IUPAC 169)	0.0062 ND	0.019 ND	0.006 ND	< 8.83E-03	< 1.61E-11
2,3,4,5,3',4',5'-Heptachlorobiphenyl (IUPAC 189)	0.006 ND	0.011 ND	0.0034 ND	< 5.77E-03	< 1.05E-11
Total PCB Homologs					
Total Monochlorobiphenyls	0.061 QBJ	1.2 B	0.24 BJ	4.25E-01	7.76E-10
Total Dichlorobiphenyls	1.5 QB	6.4 QB	1.6 QB	2.69E+00	4.91E-09
Total Trichlorobiphenyls	1.6 BJQ	5.5 QB	2.9 BQ	2.83E+00	5.17E-09
Total Tetrachlorobiphenyls	0.38 QJB	2.8 BQ	2.1 BQ	1.49E+00	2.73E-09
Total Pentachlorobiphenyls	0.03 QJ	0.74 JQB	0.74 JQB	4.27E-01	7.80E-10
Total Hexachlorobiphenyls	0.028 QJ	0.43 BJQ	0.27 BJQ	2.06E-01	3.76E-10
Total Heptachlorobiphenyls	0.19 ND	0.16 QJ	0.03 JQB	< 1.08E-01	< 1.96E-10
Total Octachlorobiphenyls	0.089 ND	0.014 QJ	0.0099 QJ	< 3.19E-02	< 5.83E-11
Total Nonachlorobiphenyls	0.028 ND	0.039 ND	0.027 ND	< 2.66E-02	< 4.86E-11
Total Decachlorobiphenyl	0.0082 ND	0.02 QJ	0.011 ND	< 1.11E-02	< 2.03E-11
Total PCBs	< 3.9142	17.303	7.9279	< 8.25E+00	< 1.51E-08

NOTE: All concentrations in this table are uncorrected for oxygen concentration.

(a) Stack gas sample volume — 124.810 dry standard cubic feet; 3.53 dry standard cubic meters

(b) Stack gas flow rate — 3,870 dry standard cubic feet per minute; 1.83 dry standard cubic meters per second

(c) For non-detects, stack concentrations and emissions are calculated using one half of the detection limit.

PCB Compound Emission Results - Run 3

PCB Compound	Front Half Analytical Result (ng/sample)	Back Half Analytical Result (ng/sample)	Condensate Analytical Result (ng/sample)	Stack (a,b,c) Concentration (ng/dscm)	Emission Rate (g/s)
Co-Planar PCBs					
3,4,3',4'-Tetrachlorobiphenyl (IUPAC 77)	0.017 QJ	0.12 QJ	0.0071 ND	< 4.22E-02	< 7.67E-11
3,4,4',5-Tetrachlorobiphenyl (IUPAC 81)	0.0079 ND	0.061 ND	0.0064 ND	< 2.21E-02	< 4.01E-11
2,3,4,3',4'-Pentachlorobiphenyl (IUPAC 105)	0.0069 ND	0.093 J	0.017 QBJ	< 3.42E-02	< 6.22E-11
2,3,4,5,4'-Pentachlorobiphenyl (IUPAC 114)	0.0066 ND	0.012 ND	0.0081 QJ	< 7.82E-03	< 1.42E-11
2,4,5,3',4'-Pentachlorobiphenyl (IUPAC 118)	0.031 J	0.16 J	0.023 QBJ	6.27E-02	1.14E-10
3,4,5,2',4'-Pentachlorobiphenyl (IUPAC 123)	0.0069 ND	0.012 ND	0.017 QBJ	< 1.05E-02	< 1.91E-11
3,4,5,3',4'-Pentachlorobiphenyl (IUPAC 126)	0.0074 ND	0.043 QJ	0.0053 ND	< 1.63E-02	< 2.97E-11
2,3,4,5,3',4'-Hexachlorobiphenyl (IUPAC 156)	0.0091 ND	0.056 CJ	0.012 QCJ	< 2.26E-02	< 4.10E-11
2,3,4,3',4',5'-Hexachlorobiphenyl (IUPAC 157)	0.0091 ND	0.056 CJ	0.012 QCJ	< 2.26E-02	< 4.10E-11
2,4,5,3',4',5'-Hexachlorobiphenyl (IUPAC 167)	0.0067 ND	0.021 QJ	0.0058 ND	< 9.81E-03	< 1.78E-11
3,4,5,3',4',5'-Hexachlorobiphenyl (IUPAC 169)	0.0078 ND	0.021 ND	0.0083 ND	< 1.09E-02	< 1.98E-11
2,3,4,5,3',4',5'-Heptachlorobiphenyl (IUPAC 189)	0.0065 ND	0.013 ND	0.0045 ND	< 7.03E-03	< 1.28E-11
Total PCB Homologs					
Total Monochlorobiphenyls	0.18 QBJ	0.91 B	0.19 BJ	3.75E-01	6.81E-10
Total Dichlorobiphenyls	2.6 BQ	4.9 QB	0.68 QBJ	2.40E+00	4.36E-09
Total Trichlorobiphenyls	2.6 BQ	6.1 BQ	0.88 QBJ	2.81E+00	5.10E-09
Total Tetrachlorobiphenyls	0.51 QBJ	2.9 BQ	0.73 JQB	1.21E+00	2.20E-09
Total Pentachlorobiphenyls	0.058 QJ	0.95 JQB	0.28 QJB	3.77E-01	6.86E-10
Total Hexachlorobiphenyls	0.047 JQ	0.47 QBJ	0.1 QBJ	1.81E-01	3.29E-10
Total Heptachlorobiphenyls	0.2 ND	0.15 QJ	0.21 ND	< 1.64E-01	< 2.98E-10
Total Octachlorobiphenyls	0.094 ND	0.15 ND	0.1 ND	< 1.01E-01	< 1.83E-10
Total Nonachlorobiphenyls	0.03 ND	0.052 ND	0.032 ND	< 3.34E-02	< 6.07E-11
Total Decachlorobiphenyl	0.0086 ND	0.015 ND	0.013 ND	< 1.07E-02	< 1.95E-11
Total PCBs	< 6.3276	16.597	3.215	< 7.66E+00	< 1.39E-08

NOTE: All concentrations in this table are uncorrected for oxygen concentration.

(a) Stack gas sample volume — 120.520 dry standard cubic feet; 3.41 dry standard cubic meters

(b) Stack gas flow rate — 3,850 dry standard cubic feet per minute; 1.82 dry standard cubic meters per second

(c) For non-detects, stack concentrations and emissions are calculated using one half of the detection limit.

Semivolatile Organic Compound Emission Results - Run 1

Semivolatile Compound	Front Half Analytical Result (ug/sample)	Back Half Analytical Result (ug/sample)	Condensate Analytical Result (ug/sample)	Stack (a,b,c) Concentration (ug/dscm)	Emission Rate (g/s)
Standard Target Analytes					
Acenaphthene	0.5 ND	0.5 ND	1.8 ND	< 8.04E-01	< 1.85E-06
Acenaphthylene	0.5 ND	0.5 ND	1.5 ND	< 7.18E-01	< 1.65E-06
Benzyl alcohol	35 ND	35 ND	1.8 ND	< 2.06E+01	< 4.74E-05
Bis(2-chloroethoxy) methane	0.59 ND	0.5 ND	1.8 ND	< 8.30E-01	< 1.91E-06
Bis-(2-chloroethyl) ether	0.76 ND	0.56 ND	1.5 ND	< 8.10E-01	< 1.86E-06
Bis(2-ethylhexyl) phthalate	5.7 J	10 ND	18 J	< 9.68E+00	< 2.22E-05
4-Bromophenyl-phenyl ether	0.53 ND	0.5 ND	1.3 ND	< 6.69E-01	< 1.54E-06
Butylbenzylphthalate	1.1 ND	0.61 ND	2.1 ND	< 1.09E+00	< 2.51E-06
4-Chloroaniline	1.2 ND	6 ND	7.3 ND	< 4.16E+00	< 9.57E-06
4-Chloro-3-methylphenol	1 ND	0.62 ND	6 ND	< 2.19E+00	< 5.03E-06
2-Chloronaphthalene	0.5 ND	0.5 ND	1.3 ND	< 6.60E-01	< 1.52E-06
2-Chlorophenol	0.98 ND	0.5 ND	1.5 ND	< 8.56E-01	< 1.97E-06
4-Chlorophenyl-phenyl ether	0.51 ND	0.5 ND	2.9 ND	< 1.12E+00	< 2.58E-06
Dibenzofuran	0.53 ND	0.5 ND	2.7 ND	< 1.07E+00	< 2.46E-06
Di-n-butylphthalate	0.71 ND	10 ND	2.1 ND	< 3.68E+00	< 8.45E-06
1,2-Dichlorobenzene	0.84 ND	0.51 ND	1.6 ND	< 8.47E-01	< 1.95E-06
1,3-Dichlorobenzene	1.2 ND	0.57 ND	1.3 ND	< 8.81E-01	< 2.03E-06
1,4-Dichlorobenzene	1.1 ND	0.53 ND	1.9 ND	< 1.01E+00	< 2.33E-06
3,3'-Dichlorobenzidine	2.7 ND	7.4 ND	7.1 ND	< 4.94E+00	< 1.14E-05
2,4-Dichlorophenol	1.5 ND	0.5 ND	2.1 ND	< 1.18E+00	< 2.71E-06
Diethyl phthalate	1.5 ND	0.73 ND	1.3 ND	< 1.01E+00	< 2.33E-06
2,4-Dimethylphenol	2.9 ND	6.3 ND	1.4 ND	< 3.04E+00	< 7.00E-06
Dimethylphthalate	0.63 ND	0.5 ND	1.2 ND	< 6.69E-01	< 1.54E-06
4,6-Dinitro-2-methylphenol	5 ND	8.7 ND	1.3 ND	< 4.31E+00	< 9.90E-06
2,4-Dinitrophenol	5.9 ND	22 ND	3.7 ND	< 9.07E+00	< 2.09E-05
2,4-Dinitrotoluene	1.6 ND	0.5 ND	2.5 ND	< 1.32E+00	< 3.04E-06
2,6-Dinitrotoluene	1.3 ND	0.5 ND	1.9 ND	< 1.06E+00	< 2.44E-06
Di-n-octyl phthalate	2.1 ND	0.56 ND	2.3 ND	< 1.42E+00	< 3.27E-06
Hexachlorobenzene	0.56 ND	0.5 ND	2.4 ND	< 9.93E-01	< 2.28E-06
Hexachlorobutadiene	1.4 ND	0.74 ND	1.8 ND	< 1.13E+00	< 2.60E-06
Hexachlorocyclo-pentadiene	10 ND	10 ND	6 ND	< 7.46E+00	< 1.72E-05
Hexachloroethane	2.5 ND	0.54 ND	1.8 ND	< 1.39E+00	< 3.19E-06
Isophrone	0.66 ND	0.5 ND	1.6 ND	< 7.92E-01	< 1.82E-06
2-Methylphenol	2.3 ND	3 ND	1.9 ND	< 2.07E+00	< 4.75E-06
2-Nitroaniline	0.56 ND	0.5 ND	2.6 ND	< 1.05E+00	< 2.42E-06
3-Nitroaniline	3.8 ND	2 ND	4.3 ND	< 2.90E+00	< 6.67E-06
4-Nitroaniline	2.3 ND	2 ND	3.5 ND	< 2.24E+00	< 5.15E-06
Nitrobenzene	0.73 ND	0.5 ND	1.5 ND	< 7.84E-01	< 1.80E-06
2-Nitrophenol	3.2 ND	0.5 ND	2.4 ND	< 1.75E+00	< 4.03E-06
4-Nitrophenol	3.3 ND	3.3 ND	3.5 ND	< 2.90E+00	< 6.67E-06
N-Nitrosodiphenylamine	0.6 ND	0.87 ND	1.3 ND	< 7.95E-01	< 1.83E-06
N-Nitroso-di-n-propylamine	0.73 ND	0.5 ND	2.1 ND	< 9.56E-01	< 2.20E-06
2,2'-oxybis (1-Chloropropane)	1 ND	0.76 ND	1.6 ND	< 9.65E-01	< 2.22E-06
Pentachlorophenol	25 ND	25 ND	3.2 ND	< 1.53E+01	< 3.51E-05
Phenol	1.1 ND	0.9 ND	2 ND	< 1.15E+00	< 2.64E-06
1,2,4-Trichlorobenzene	0.73 ND	0.59 ND	2 ND	< 9.53E-01	< 2.19E-06
2,4,5-Trichlorophenol	2.3 ND	1.3 ND	2 ND	< 1.61E+00	< 3.70E-06
2,4,6-Trichlorophenol	1.4 ND	0.75 ND	2.3 ND	< 1.28E+00	< 2.94E-06
	0	0	0	0.00E+00	0.00E+00
Special Target Analytes					
Acetophenone	0.77 ND	3.9 J	2.4 ND	< 2.03E+00	< 4.67E-06
Aniline	0.95 ND	7.3 ND	17 ND	< 7.25E+00	< 1.67E-05
Anthracene	0.51 ND	0.5 ND	1.5 ND	< 7.21E-01	< 1.66E-06
Benzaldehyde	2.6 ND	6.4 J	2 ND	< 3.16E+00	< 7.26E-06
Benzidine	51 ND	51 ND	60 ND	< 4.65E+01	< 1.07E-04
Benzo(a)anthracene	0.82 ND	0.58 ND	1.6 ND	< 8.61E-01	< 1.98E-06
Benzo(b)fluoranthene	1.4 ND	1.1 ND	3.9 ND	< 1.84E+00	< 4.22E-06
Benzo(k)fluoranthene	2.1 ND	1.6 ND	2.7 ND	< 1.84E+00	< 4.22E-06
Benzoic acid	42 ND	46 ND	8.7 ND	< 2.78E+01	< 6.38E-05
Benzonitrile	2.4 ND	1.7 ND	2.4 ND	< 1.87E+00	< 4.29E-06
Benzo(ghi)perylene	2.8 ND	0.62 ND	2 ND	< 1.56E+00	< 3.58E-06
Benzo(a)pyrene	1 ND	0.5 ND	1.6 ND	< 8.90E-01	< 2.05E-06
Carbazole	0.76 ND	0.64 ND	2 ND	< 9.76E-01	< 2.24E-06
Chrysene	0.88 ND	0.64 ND	1.2 ND	< 7.81E-01	< 1.80E-06
Dibenz(ah)anthracene	2 ND	0.6 ND	2.6 ND	< 1.49E+00	< 3.43E-06
1,3-Dinitrobenzene	0.59 ND	0.52 ND	2.7 ND	< 1.09E+00	< 2.51E-06
Diphenylamine	0.5 ND	0.5 ND	2.7 ND	< 1.06E+00	< 2.44E-06
1,2-Diphenylhydrazine	0.63 ND	0.5 ND	1.3 ND	< 6.98E-01	< 1.60E-06
Fluoranthene	0.5 ND	0.5 ND	1.6 ND	< 7.46E-01	< 1.72E-06
Fluorene	0.51 ND	0.5 ND	2.5 ND	< 1.01E+00	< 2.32E-06
Indeno(1,2,3-cd)pyrene	2.1 ND	0.54 ND	2.1 ND	< 1.36E+00	< 3.13E-06
2-Methylnaphthalene	0.56 ND	0.5 ND	2.1 ND	< 9.07E-01	< 2.09E-06
3 & 4-Methylphenol	2.3 ND	2 ND	2 ND	< 1.81E+00	< 4.16E-06
Naphthalene	0.5 ND	0.6 ND	1.6 ND	< 7.75E-01	< 1.78E-06
N-Nitrosodimethylamine	0.72 ND	0.5 ND	2 ND	< 9.24E-01	< 2.13E-06
Pentachlorobenzene	0.52 ND	0.5 ND	2.1 ND	< 8.96E-01	< 2.06E-06
Pentachloronitrobenzene	0.76 ND	0.5 ND	2.4 ND	< 1.05E+00	< 2.42E-06
Phenanthrene	0.51 ND	0.5 ND	1.7 ND	< 7.78E-01	< 1.79E-06
Pyrene	0.74 ND	0.53 ND	1.3 ND	< 7.38E-01	< 1.70E-06
Pyridine	0.89 ND	0.74 ND	4.9 ND	< 1.87E+00	< 4.31E-06
1,2,4,5-Tetrachlorobenzene	0.87 ND	0.5 ND	2 ND	< 9.68E-01	< 2.22E-06
Tentatively Identified Compounds					
3-Penten-2-one, 4-methyl-	95 NJ	0	230 NJ	9.33E+01	2.14E-04
Unknown (2.5254)	4.5 NJ	0	40 NJ	1.28E+01	2.94E-05
Unknown (2.7017)	7.4 NJ	0	0	2.12E+00	4.88E-06
Unknown (2.7428)	52 NJ	0	0	1.49E+01	3.43E-05
Unknown (2.9132)	5.3 NJ	0	0	1.52E+00	3.50E-06
Unknown (2.1494)	0	70 NJ	0	2.01E+01	4.62E-05
Toluene	0	26 NJ	0	7.46E+00	1.72E-05
Methane, dibromochloro-	0	9.7 NJ	0	2.78E+00	6.40E-06
Tetrachloroethylene	0	75 NJ	0	2.15E+01	4.95E-05
Unknown (2.6018)	0	4.1 NJ	0	1.18E+00	2.71E-06
Unknown (2.6547)	0	9.3 NJ	0	2.67E+00	6.14E-06
Heptane, 2,5-dimethyl-	0	18 NJ	24 NJ	1.21E+01	2.77E-05
Unknown (2.7781)	0	590 NJ	1400 NJ	5.71E+02	1.31E-03
Benzene, chloro-	0	420 NJ	0	1.21E+02	2.77E-04
Methane, tribromo-	0	10 NJ	0	2.87E+00	6.60E-06
Benzaldehyde, 4-ethyl-	0	5.9 NJ	0	1.69E+00	3.89E-06
Phosphine imide, P,P,P-triphen	0	4.8 NJ	0	1.38E+00	3.17E-06
3-Penten-2-one, (E)-	0	0	22 NJ	6.32E+00	1.45E-05
Unknown (2.5724)	0	0	18 NJ	5.17E+00	1.19E-05
Octane, 2-methyl-	0	0	13 NJ	3.73E+00	8.58E-06
Unknown (4.5642)	0	0	47 NJ	1.35E+01	3.10E-05
Total Semivolatiles	< 431.94	1546.65	2073.6	< 1.16E+03	< 2.67E-03

NOTE: All concentrations in this table are uncorrected for oxygen concentration.

(a) Stack gas sample volume — 122.990 dry standard cubic feet; 3.48 dry standard cubic meters

(b) Stack gas flow rate — 4,870 dry standard cubic feet per minute; 2.30 dry standard cubic meters per second

(c) For non-detects, stack concentrations and emissions are calculated using one half of the detection limit.

Semivolatile Organic Compound Emission Results - Run 2

Semivolatile Compound	Front Half Analytical Result (ug/sample)	Back Half Analytical Result (ug/sample)	Condensate Analytical Result (ug/sample)	Stack (a,b,c) Concentration (ug/dscm)	Emission Rate (g/s)
Standard Target Analytes					
Acenaphthene	0.5 ND	0.5 ND	1.7 ND	< 8.11E-01	< 1.49E-06
Acenaphthylene	0.5 ND	0.5 ND	1.4 ND	< 7.21E-01	< 1.32E-06
Benzyl alcohol	35 ND	35 ND	1.7 ND	< 2.15E+01	< 3.94E-05
Bis(2-chloroethoxy) methane	0.59 ND	0.5 ND	1.7 ND	< 8.38E-01	< 1.53E-06
Bis-(2-chloroethyl) ether	0.76 ND	0.56 ND	1.4 ND	< 8.17E-01	< 1.50E-06
Bis(2-ethylhexyl) phthalate	3.3 ND	10 ND	29	< 1.27E+01	< 2.33E-05
4-Bromophenyl-phenyl ether	0.53 ND	0.5 ND	1.2 ND	< 6.70E-01	< 1.23E-06
Butylbenzylphthalate	1.1 ND	0.61 ND	1.9 ND	< 1.08E+00	< 1.99E-06
4-Chloroaniline	1.2 ND	6 ND	6.8 ND	< 4.21E+00	< 7.70E-06
4-Chloro-3-methylphenol	1 ND	0.62 ND	5.6 ND	< 2.17E+00	< 3.97E-06
2-Chloronaphthalene	0.5 ND	0.5 ND	1.2 ND	< 6.61E-01	< 1.21E-06
2-Chlorophenol	0.98 ND	0.5 ND	1.4 ND	< 8.65E-01	< 1.58E-06
4-Chlorophenyl-phenyl ether	0.51 ND	0.5 ND	2.7 ND	< 1.11E+00	< 2.04E-06
Dibenzofuran	0.53 ND	0.5 ND	2.5 ND	< 1.06E+00	< 1.94E-06
Di-n-butylphthalate	0.71 ND	10 ND	1.9 ND	< 3.79E+00	< 6.94E-06
1,2-Dichlorobenzene	0.84 ND	0.51 ND	1.5 ND	< 8.56E-01	< 1.57E-06
1,3-Dichlorobenzene	1.2 ND	0.57 ND	1.2 ND	< 8.92E-01	< 1.63E-06
1,4-Dichlorobenzene	1.1 ND	0.53 ND	1.7 ND	< 1.00E+00	< 1.83E-06
3,3'-Dichlorobenzidine	2.7 ND	7.4 ND	6.6 ND	< 5.02E+00	< 9.19E-06
2,4-Dichlorophenol	1.5 ND	0.5 ND	2 ND	< 1.20E+00	< 2.20E-06
Diethyl phthalate	1.5 ND	0.73 ND	1.2 ND	< 1.03E+00	< 1.89E-06
2,4-Dimethylphenol	2.9 ND	6.3 ND	1.3 ND	< 3.15E+00	< 5.78E-06
Dimethylphthalate	0.63 ND	0.5 ND	1.1 ND	< 6.70E-01	< 1.23E-06
4,6-Dinitro-2-methylphenol	5 ND	8.7 ND	1.2 ND	< 4.48E+00	< 8.20E-06
2,4-Dinitrophenol	5.9 ND	22 ND	3.4 ND	< 9.40E+00	< 1.72E-05
2,4-Dinitrotoluene	1.6 ND	0.5 ND	2.3 ND	< 1.32E+00	< 2.42E-06
2,6-Dinitrotoluene	1.3 ND	0.5 ND	1.8 ND	< 1.08E+00	< 1.98E-06
Di-n-octyl phthalate	2.1 ND	0.56 ND	2.1 ND	< 1.43E+00	< 2.62E-06
Hexachlorobenzene	0.56 ND	0.5 ND	2.3 ND	< 1.01E+00	< 1.85E-06
Hexachlorobutadiene	1.4 ND	0.74 ND	1.6 ND	< 1.12E+00	< 2.06E-06
Hexachlorocyclo-pentadiene	10 ND	10 ND	5.6 ND	< 7.69E+00	< 1.41E-05
Hexachloroethane	2.5 ND	0.54 ND	1.7 ND	< 1.42E+00	< 2.61E-06
Isophrone	0.66 ND	0.5 ND	1.5 ND	< 7.99E-01	< 1.46E-06
2-Methylphenol	2.3 ND	3 ND	1.8 ND	< 2.13E+00	< 3.91E-06
2-Nitroaniline	0.56 ND	0.5 ND	2.4 ND	< 1.04E+00	< 1.90E-06
3-Nitroaniline	3.8 ND	2 ND	4 ND	< 2.94E+00	< 5.39E-06
4-Nitroaniline	2.3 ND	2 ND	3.3 ND	< 2.28E+00	< 4.18E-06
Nitrobenzene	0.73 ND	0.5 ND	1.4 ND	< 7.90E-01	< 1.45E-06
2-Nitrophenol	3.2 ND	0.5 ND	2.3 ND	< 1.80E+00	< 3.30E-06
4-Nitrophenol	3.3 ND	3.3 ND	3.3 ND	< 2.97E+00	< 5.45E-06
N-Nitrosodiphenylamine	0.6 ND	0.87 ND	1.2 ND	< 8.02E-01	< 1.47E-06
N-Nitroso-di-n-propylamine	0.73 ND	0.5 ND	2 ND	< 9.70E-01	< 1.78E-06
2,2'-oxybis (1-Chloropropane)	1 ND	0.76 ND	1.5 ND	< 9.79E-01	< 1.79E-06
Pentachlorophenol	25 ND	25 ND	2.9 ND	< 1.59E+01	< 2.91E-05
Phenol	1.1 ND	0.9 ND	1.8 ND	< 1.14E+00	< 2.09E-06
1,2,4-Trichlorobenzene	0.73 ND	0.59 ND	1.8 ND	< 9.37E-01	< 1.72E-06
2,4,5-Trichlorophenol	2.3 ND	1.3 ND	1.8 ND	< 1.62E+00	< 2.97E-06
2,4,6-Trichlorophenol	1.4 ND	0.75 ND	2.1 ND	< 1.28E+00	< 2.34E-06
	0	0	0	0.00E+00	0.00E+00
Special Target Analytes					
Acetophenone	0.77 ND	4 J	2.2 ND	< 2.09E+00	< 3.83E-06
Aniline	0.95 ND	7.3 ND	16 ND	< 7.28E+00	< 1.33E-05
Anthracene	0.51 ND	0.5 ND	1.4 ND	< 7.24E-01	< 1.33E-06
Benzaldehyde	2.6 ND	5.1 J	1.8 ND	< 2.85E+00	< 5.23E-06
Benzidine	51 ND	51 ND	56 ND	< 4.75E+01	< 8.69E-05
Benzo(a)anthracene	0.82 ND	0.58 ND	1.5 ND	< 8.71E-01	< 1.60E-06
Benzo(b)fluoranthene	1.4 ND	1.1 ND	3.6 ND	< 1.83E+00	< 3.36E-06
Benzo(k)fluoranthene	2.1 ND	1.6 ND	2.5 ND	< 1.86E+00	< 3.41E-06
Benzoic acid	42 ND	46 ND	8 ND	< 2.88E+01	< 5.28E-05
Benzonitrile	2.4 ND	1.7 ND	2.2 ND	< 1.89E+00	< 3.47E-06
Benzo(ghi)perylene	2.8 ND	0.62 ND	1.8 ND	< 1.57E+00	< 2.87E-06
Benzo(a)pyrene	1 ND	0.5 ND	1.5 ND	< 9.01E-01	< 1.65E-06
Carbazole	0.76 ND	0.64 ND	1.9 ND	< 9.91E-01	< 1.82E-06
Chrysene	0.88 ND	0.64 ND	1.1 ND	< 7.87E-01	< 1.44E-06
Dibenz(ah)anthracene	2 ND	0.6 ND	2.4 ND	< 1.50E+00	< 2.75E-06
1,3-Dinitrobenzene	0.59 ND	0.52 ND	2.5 ND	< 1.08E+00	< 1.99E-06
Diphenylamine	0.5 ND	0.5 ND	2.5 ND	< 1.05E+00	< 1.93E-06
1,2-Diphenylhydrazine	0.63 ND	0.5 ND	1.2 ND	< 7.00E-01	< 1.28E-06
Fluoranthene	0.5 ND	0.5 ND	1.5 ND	< 7.51E-01	< 1.38E-06
Fluorene	0.51 ND	0.5 ND	2.3 ND	< 9.94E-01	< 1.82E-06
Indeno(1,2,3-cd)pyrene	2.1 ND	0.54 ND	1.9 ND	< 1.36E+00	< 2.50E-06
2-Methylnaphthalene	0.56 ND	0.5 ND	1.9 ND	< 8.89E-01	< 1.63E-06
3 & 4-Methylphenol	2.3 ND	2 ND	1.9 ND	< 1.86E+00	< 3.41E-06
Naphthalene	0.5 ND	0.6 ND	1.5 ND	< 7.81E-01	< 1.43E-06
N-Nitrosodimethylamine	0.72 ND	0.5 ND	1.9 ND	< 9.37E-01	< 1.72E-06
Pentachlorobenzene	0.52 ND	0.5 ND	1.9 ND	< 8.77E-01	< 1.61E-06
Pentachloronitrobenzene	0.76 ND	0.5 ND	2.2 ND	< 1.04E+00	< 1.90E-06
Phenanthrene	0.51 ND	0.5 ND	1.6 ND	< 7.84E-01	< 1.44E-06
Pyrene	0.74 ND	0.53 ND	1.2 ND	< 7.42E-01	< 1.36E-06
Pyridine	0.89 ND	0.74 ND	4.5 ND	< 1.84E+00	< 3.37E-06
1,2,4,5-Tetrachlorobenzene	0.87 ND	0.5 ND	1.8 ND	< 9.52E-01	< 1.74E-06
Tentatively Identified Compounds					
Furan, 2,5-dimethyl-	4.6 NJ	0	0	1.38E+00	2.53E-06
Unknown (1.9671)	5.4 NJ	0	0	1.62E+00	2.97E-06
Unknown (2.5253)	4.8 NJ	0	38 NJ	1.29E+01	2.35E-05
Unknown (2.6545)	8.6 NJ	0	0	2.58E+00	4.73E-06
Heptane, 2,5-dimethyl-	18 NJ	12 NJ	11 NJ	1.23E+01	2.26E-05
Unknown (2.7485)	82 NJ	0	0	2.46E+01	4.51E-05
3-Hexene-2,5-dione	5.2 NJ	0	0	1.56E+00	2.86E-06
Unknown (2.1492)	0	54 NJ	0	1.62E+01	2.97E-05
Toluene	0	20 NJ	0	6.01E+00	1.10E-05
Methane, dibromochloro-	0	8 NJ	0	2.40E+00	4.40E-06
Octane, 2-methyl-	0	6.1 NJ	0	1.83E+00	3.36E-06
Unknown (2.7721)	0	550 NJ	0	1.65E+02	3.03E-04
Benzene, chloro-	0	82 NJ	0	2.46E+01	4.51E-05
Methane, tribromo-	0	10 NJ	0	3.00E+00	5.50E-06
Benzoic acid, methyl ester	0	4.4 NJ	0	1.32E+00	2.42E-06
Benzaldehyde, 3-ethyl-	0	5.9 NJ	0	1.77E+00	3.25E-06
Unknown (2.0259)	0	0	21 NJ	6.31E+00	1.16E-05
3-Hexen-2-one	0	0	620 NJ	1.86E+02	3.41E-04
Unknown (2.7486)	0	0	400 NJ	1.20E+02	2.20E-04
Unknown (2.9542)	0	0	17 NJ	5.11E+00	9.35E-06
Unknown (3.1657)	0	0	11 NJ	3.30E+00	6.05E-06
Unknown (4.8579)	0	0	16 NJ	4.81E+00	8.80E-06

Total Semivolatiles	< 393.94	1055.05	1406	< 8.58E+02	< 1.57E-03

NOTE: All concentrations in this table are uncorrected for oxygen concentration.

(a) Stack gas sample volume
117.540 dry standard cubic feet
3.33 dry standard cubic meters

(b) Stack gas flow rate
3,880 dry standard cubic feet per minute
1.83 dry standard cubic meters per second

(c) For non-detects, stack concentrations and emissions are calculated using one half of the detection limit.

Semivolatile Organic Compound Emission Results - Run 3

Semivolatile Compound	Front Half Analytical Result (ug/sample)	Back Half Analytical Result (ug/sample)	Condensate Analytical Result (ug/sample)	Stack (a,b,c) Concentration (ug/dscm)	Emission Rate (g/s)
Standard Target Analytes					
Acenaphthene	0.5 ND	0.5 ND	1.7 ND	< 7.58E-01	< 1.46E-06
Acenaphthylene	0.5 ND	0.5 ND	1.5 ND	< 7.02E-01	< 1.35E-06
Benzyl alcohol	35 ND	35 ND	1.8 ND	< 2.02E+01	< 3.88E-05
Bis(2-chloroethoxy) methane	0.59 ND	0.5 ND	1.8 ND	< 8.12E-01	< 1.56E-06
Bis-(2-chloroethyl) ether	0.76 ND	0.56 ND	1.5 ND	< 7.92E-01	< 1.53E-06
Bis(2-ethylhexyl) phthalate	3.3 ND	10 ND	16 J	< 8.23E+00	< 1.58E-05
4-Bromophenyl-phenyl ether	0.53 ND	0.5 ND	1.3 ND	< 6.54E-01	< 1.26E-06
Butylbenzylphthalate	1.1 ND	0.61 ND	2 ND	< 1.04E+00	< 2.01E-06
4-Chloroaniline	1.2 ND	6 ND	7.1 ND	< 4.02E+00	< 7.74E-06
4-Chloro-3-methylphenol	1 ND	0.62 ND	5.8 ND	< 2.08E+00	< 4.01E-06
2-Chloronaphthalene	0.5 ND	0.5 ND	1.2 ND	< 6.18E-01	< 1.19E-06
2-Chlorophenol	0.98 ND	0.5 ND	1.5 ND	< 8.37E-01	< 1.61E-06
4-Chlorophenyl-phenyl ether	0.51 ND	0.5 ND	2.8 ND	< 1.07E+00	< 2.06E-06
Dibenzofuran	0.53 ND	0.5 ND	2.6 ND	< 1.02E+00	< 1.96E-06
Di-n-butylphthalate	0.71 ND	10 ND	2 ND	< 3.57E+00	< 6.88E-06
1,2-Dichlorobenzene	0.84 ND	0.51 ND	1.5 ND	< 8.01E-01	< 1.54E-06
1,3-Dichlorobenzene	1.2 ND	0.57 ND	1.3 ND	< 8.62E-01	< 1.66E-06
1,4-Dichlorobenzene	1.1 ND	0.53 ND	1.8 ND	< 9.63E-01	< 1.86E-06
3,3'-Dichlorobenzidine	2.7 ND	7.4 ND	6.9 ND	< 4.78E+00	< 9.20E-06
2,4-Dichlorophenol	1.5 ND	0.5 ND	2.1 ND	< 1.15E+00	< 2.22E-06
Diethyl phthalate	1.5 ND	0.73 ND	1.2 ND	< 9.63E-01	< 1.86E-06
2,4-Dimethylphenol	2.9 ND	6.3 ND	1.4 ND	< 2.98E+00	< 5.73E-06
Dimethylphthalate	0.63 ND	0.5 ND	1.2 ND	< 6.54E-01	< 1.26E-06
4,6-Dinitro-2-methylphenol	5 ND	8.7 ND	1.3 ND	< 4.21E+00	< 8.11E-06
2,4-Dinitrophenol	5.9 ND	22 ND	3.6 ND	< 8.85E+00	< 1.70E-05
2,4-Dinitrotoluene	1.6 ND	0.5 ND	2.4 ND	< 1.26E+00	< 2.43E-06
2,6-Dinitrotoluene	1.3 ND	0.5 ND	1.8 ND	< 1.01E+00	< 1.95E-06
Di-n-octyl phthalate	2.1 ND	0.56 ND	2.2 ND	< 1.37E+00	< 2.63E-06
Hexachlorobenzene	0.56 ND	0.5 ND	2.4 ND	< 9.72E-01	< 1.87E-06
Hexachlorobutadiene	1.4 ND	0.74 ND	1.7 ND	< 1.08E+00	< 2.08E-06
Hexachlorocyclo-pentadiene	10 ND	10 ND	5.8 ND	< 7.25E+00	< 1.40E-05
Hexachloroethane	2.5 ND	0.54 ND	1.7 ND	< 1.33E+00	< 2.56E-06
Isophrone	0.66 ND	0.5 ND	1.6 ND	< 7.75E-01	< 1.49E-06
2-Methylphenol	2.3 ND	3 ND	1.9 ND	< 2.02E+00	< 3.89E-06
2-Nitroaniline	0.56 ND	0.5 ND	2.5 ND	< 1.00E+00	< 1.93E-06
3-Nitroaniline	3.8 ND	2 ND	4.2 ND	< 2.81E+00	< 5.41E-06
4-Nitroaniline	2.3 ND	2 ND	3.4 ND	< 2.16E+00	< 4.17E-06
Nitrobenzene	0.73 ND	0.5 ND	1.5 ND	< 7.67E-01	< 1.48E-06
2-Nitrophenol	3.2 ND	0.5 ND	2.4 ND	< 1.71E+00	< 3.30E-06
4-Nitrophenol	3.3 ND	3.3 ND	3.4 ND	< 2.81E+00	< 5.41E-06
N-Nitrosodiphenylamine	0.6 ND	0.87 ND	1.2 ND	< 7.50E-01	< 1.44E-06
N-Nitroso-di-n-propylamine	0.73 ND	0.5 ND	2.1 ND	< 9.35E-01	< 1.80E-06
2,2'-oxybis (1-Chloropropane)	1 ND	0.76 ND	1.6 ND	< 9.44E-01	< 1.82E-06
Pentachlorophenol	25 ND	25 ND	3.1 ND	< 1.49E+01	< 2.87E-05
Phenol	1.1 ND	0.9 ND	1.9 ND	< 1.10E+00	< 2.11E-06
1,2,4-Trichlorobenzene	0.73 ND	0.59 ND	1.9 ND	< 9.04E-01	< 1.74E-06
2,4,5-Trichlorophenol	2.3 ND	1.3 ND	1.9 ND	< 1.54E+00	< 2.98E-06
2,4,6-Trichlorophenol	1.4 ND	0.75 ND	2.2 ND	< 1.22E+00	< 2.35E-06
	0	0	0	0.00E+00	0.00E+00
Special Target Analytes					
Acetophenone	0.77 ND	5.1 J	2.3 ND	< 2.29E+00	< 4.42E-06
Aniline	0.95 ND	7.3 ND	16 ND	< 6.81E+00	< 1.31E-05
Anthracene	0.51 ND	0.5 ND	1.5 ND	< 7.05E-01	< 1.36E-06
Benzaldehyde	2.6 ND	6.9 J	1.9 ND	< 3.20E+00	< 6.17E-06
Benzidine	51 ND	51 ND	58 ND	< 4.49E+01	< 8.65E-05
Benzo(a)anthracene	0.82 ND	0.58 ND	1.5 ND	< 8.15E-01	< 1.57E-06
Benzo(b)fluoranthene	1.4 ND	1.1 ND	3.8 ND	< 1.77E+00	< 3.41E-06
Benzo(k)fluoranthene	2.1 ND	1.6 ND	2.6 ND	< 1.77E+00	< 3.41E-06
Benzoic acid	42 ND	46 ND	8.4 ND	< 2.71E+01	< 5.21E-05
Benzonitrile	2.4 ND	1.7 ND	2.3 ND	< 1.80E+00	< 3.46E-06
Benzo(ghi)perylene	2.8 ND	0.62 ND	1.9 ND	< 1.49E+00	< 2.88E-06
Benzo(a)pyrene	1 ND	0.5 ND	1.6 ND	< 8.71E-01	< 1.68E-06
Carbazole	0.76 ND	0.64 ND	2 ND	< 9.55E-01	< 1.84E-06
Chrysene	0.88 ND	0.64 ND	1.2 ND	< 7.64E-01	< 1.47E-06
Dibenz(ah)anthracene	2 ND	0.6 ND	2.5 ND	< 1.43E+00	< 2.76E-06
1,3-Dinitrobenzene	0.59 ND	0.52 ND	2.6 ND	< 1.04E+00	< 2.01E-06
Diphenylamine	0.5 ND	0.5 ND	2.6 ND	< 1.01E+00	< 1.95E-06
1,2-Diphenylhydrazine	0.63 ND	0.5 ND	1.3 ND	< 6.83E-01	< 1.31E-06
Fluoranthene	0.5 ND	0.5 ND	1.6 ND	< 7.30E-01	< 1.41E-06
Fluorene	0.51 ND	0.5 ND	2.5 ND	< 9.86E-01	< 1.90E-06
Indeno(1,2,3-cd)pyrene	2.1 ND	0.54 ND	2 ND	< 1.30E+00	< 2.51E-06
2-Methylnaphthalene	0.56 ND	0.5 ND	2 ND	< 8.60E-01	< 1.66E-06
3 & 4-Methylphenol	2.3 ND	2 ND	2 ND	< 1.77E+00	< 3.41E-06
Naphthalene	0.5 ND	9.9 J	1.6 ND	< 3.37E+00	< 6.49E-06
N-Nitrosodimethylamine	0.72 ND	0.5 ND	1.9 ND	< 8.76E-01	< 1.69E-06
Pentachlorobenzene	0.52 ND	0.5 ND	2 ND	< 8.48E-01	< 1.63E-06
Pentachloronitrobenzene	0.76 ND	0.5 ND	2.3 ND	< 1.00E+00	< 1.93E-06
Phenanthrene	0.51 ND	0.5 ND	1.7 ND	< 7.61E-01	< 1.47E-06
Pyrene	0.74 ND	0.53 ND	1.3 ND	< 7.22E-01	< 1.39E-06
Pyridine	0.89 ND	0.74 ND	4.7 ND	< 1.78E+00	< 3.42E-06
1,2,4,5-Tetrachlorobenzene	0.87 ND	0.5 ND	1.9 ND	< 9.18E-01	< 1.77E-06
Tentatively Identified Compounds					
Unknown (2.7427)	23 NJ	0	0	6.46E+00	1.24E-05
9-Octadecenamide, (Z)-	14 NJ	0	0	3.93E+00	7.57E-06
Unknown (12.701)	5.7 NJ	0	0	1.60E+00	3.08E-06
Unknown (2.1492)	0	70 NJ	0	1.97E+01	3.79E-05
Toluene	0	55 NJ	0	1.54E+01	2.98E-05
Methane, dibromochloro-	0	9.9 NJ	0	2.78E+00	5.36E-06
Tetrachloroethylene	0	21 NJ	0	5.90E+00	1.14E-05
Unknown (2.7779)	0	630 NJ	0	1.77E+02	3.41E-04
Benzene, chloro-	0	260 NJ	0	7.30E+01	1.41E-04
Methane, tribromo-	0	14 NJ	0	3.93E+00	7.57E-06
Benzaldehyde, 3-ethyl-	0	7.2 NJ	0	2.02E+00	3.89E-06
3-Penten-2-one, 4-methyl-	0	0	120 NJ	3.37E+01	6.49E-05
Unknown (2.5254)	0	0	37 NJ	1.04E+01	2.00E-05
Unknown (2.7428)	0	0	34 NJ	9.55E+00	1.84E-05
Total Semivolatiles	< 308.04	1381.95	460.2	< 6.04E+02	< 1.16E-03

NOTE: All concentrations in this table are uncorrected for oxygen concentration.

(a) Stack gas sample volume — 125.710 dry standard cubic feet; 3.56 dry standard cubic meters

(b) Stack gas flow rate — 4,080 dry standard cubic feet per minute; 1.93 dry standard cubic meters per second

(c) For non-detects, stack concentrations and emissions are calculated using one half of the detection limit.

Total Volatile (C1 - C7) Organic Compound Emission Results - Run 1

Volatile Compound	Bag Analytical Result (ppmv, dry)	Condensate Analytical Result (ug/sample)	Stack (a,b,c) Concentration (ppmv, dry)	Stack (a,b,c) Concentration (ug/dscm)	Emission Rate (g/s)
Total C1	1.72	0	1.72E+00	1.15E+03	2.76E-03
Total C2	0.083 ND	0	< 8.30E-02	< 1.04E+02	< 2.49E-04
Total C3	0.11 ND	0	< 1.10E-01	< 2.02E+02	< 4.85E-04
Total C4	0.08 ND	0.042 ND	< 8.08E-02	< 1.96E+02	< 4.69E-04
Total C5	0.14 ND	0.02436 J,B	< 1.40E-01	< 4.22E+02	< 1.01E-03
Total C6	0.13 ND	0.03108 J	< 1.30E-01	< 4.68E+02	< 1.12E-03
Total C7	0.18 ND	0.0042 ND	< 1.80E-01	< 7.52E+02	< 1.80E-03
Total Volatile Organics	< 2.443	0.10164	< 2.44E+00	< 3.29E+03	< 7.90E-03

NOTE: All concentrations in this table are uncorrected for oxygen concentration.

(a) Stack gas sample volume 0.759 dry standard cubic feet
0.02 dry standard cubic meters

(b) Stack gas flow rate 5,080 dry standard cubic feet per minute
2.40 dry standard cubic meters per second

(c) For non-detects, stack concentrations and emissions are calculated using one half of the detection limit.

Total Volatile (C1 - C7) Organic Compound Emission Results - Run 3

Volatile Compound	Bag Analytical Result (ppmv, dry)	Condensate Analytical Result (ug/sample)	Stack (a,b,c) Concentration (ppmv, dry)	Stack (a,b,c) Concentration (ug/dscm)	Emission Rate (g/s)
Total C1	1.76	0	1.76E+00	1.18E+03	2.14E-03
Total C2	0.083 ND	0	< 8.30E-02	< 1.04E+02	< 1.89E-04
Total C3	0.11 ND	0	< 1.10E-01	< 2.02E+02	< 3.68E-04
Total C4	0.08 ND	0.042 ND	< 8.07E-02	< 1.95E+02	< 3.56E-04
Total C5	0.14 ND	0.01386 J,B	< 1.40E-01	< 4.21E+02	< 7.68E-04
Total C6	0.13 ND	0.03654 J	< 1.30E-01	< 4.68E+02	< 8.53E-04
Total C7	0.18 ND	0.0042 ND	< 1.80E-01	< 7.52E+02	< 1.37E-03
Total Volatile Organics	< 2.483	0.0966	< 2.48E+00	< 3.32E+03	< 6.05E-03

NOTE: All concentrations in this table are uncorrected for oxygen concentration.

(a) Stack gas sample volume 0.894 dry standard cubic feet
0.03 dry standard cubic meters

(b) Stack gas flow rate 3,860 dry standard cubic feet per minute
1.82 dry standard cubic meters per second

(c) For non-detects, stack concentrations and emissions are calculated using one half of the detection limit.

Total Volatile (C1 - C7) Organic Compound Emission Results - Run 3

Volatile Compound	Bag Analytical Result (ppmv, dry)	Condensate Analytical Result (ug/sample)	Stack (a,b,c) Concentration (ppmv, dry)	Stack (a,b,c) Concentration (ug/dscm)	Emission Rate (g/s)
Total C1	1.68	0	1.68E+00	1.12E+03	2.15E-03
Total C2	0.083 ND	0	< 8.30E-02	< 1.04E+02	< 1.99E-04
Total C3	0.11 ND	0	< 1.10E-01	< 2.02E+02	< 3.87E-04
Total C4	0.08 ND	0.042 ND	< 8.06E-02	< 1.95E+02	< 3.74E-04
Total C5	0.14 ND	0.0126 J,B	< 1.40E-01	< 4.21E+02	< 8.07E-04
Total C6	0.13 ND	0.03906 J	< 1.30E-01	< 4.68E+02	< 8.97E-04
Total C7	0.18 ND	0.0042 ND	< 1.80E-01	< 7.52E+02	< 1.44E-03
Total Volatile Organics	< 2.403	0.09786	< 2.40E+00	< 3.26E+03	< 6.26E-03

NOTE: All concentrations in this table are uncorrected for oxygen concentration.

(a) Stack gas sample volume 1.065 dry standard cubic feet
0.03 dry standard cubic meters

(b) Stack gas flow rate 4,060 dry standard cubic feet per minute
1.92 dry standard cubic meters per second

(c) For non-detects, stack concentrations and emissions are calculated using one half of the detection limit.

APPENDIX B

CHRONIC AND ACUTE TOXICITY CRITERIA COMPILED FOR COMPOUNDS NOT INCLUDED IN USEPA'S HHRAP

APPENDIX B

CHRONIC AND ACUTE HUMAN HEALTH TOXICITY CRITERIA COMPILED FOR COMPOUNDS NOT INCLUDED IN USEPA'S HHRAP

Human health toxicity criteria were used in the risk assessment to evaluate the potential for both long-term, chronic and short-term, acute health risks. The chronic toxicity criteria used in the risk assessment included oral cancer slope factors and inhalation unit risk factors for predicting excess lifetime cancer risks, and oral reference doses (RfDs) and inhalation reference concentrations (RfCs) for predicting the potential for long-term non-cancer effects. The acute toxicity criteria consisted of acute reference air concentrations.

The toxicity criteria were compiled, where available, for each evaluated compound directly from the 2005 U.S. Environmental Protection Agency (USEPA) Human Health Risk Assessment Protocol (HHRAP) chemical-specific database. The information in this USEPA database is programmed into the IRAP software.[1] If toxicity criteria were not available from HHRAP, they were compiled using a hierarchy of toxicity data sources recommended by HHRAP.

This appendix presents the toxicity criteria that were compiled for compounds not already in USEPA's HHRAP database. Table 1 lists the chronic human health toxicity criteria compiled for this project, as well as the basis for each value. Table 2 lists the acute reference air concentrations compiled for this project, also including the basis for each value.

In addition, the oral cancer slope factors for two hexachlorodibenzodioxin congeners (1,2,3,6,7,8-HxCDD and 1,2,3,7,8,9-HxCDD) were corrected from the values listed in HHRAP (and which were entered in the IRAP software exactly as indicated in HHRAP). HHRAP and IRAP include an oral cancer slope factor of 0.0062 $(mg/kg\text{-}day)^{-1}$ for these two PCDD/PCDF congeners, however, USEPA's Integrated Risk Information System (IRIS) lists the slope factor as 6,200 $(mg/kg\text{-}day)^{-1}$. The IRIS value was thus entered into IRAP.

Finally, three additional toxicity values were entered into the IRAP software for compounds discussed in HHRAP, but for which the HHRAP chemical-specific database lists "no data". A "no data" entry in HHRAP results in a "0" entry in the IRAP software. First, the USEPA-specified 2,3,7,8-TCDD oral cancer slope factor of 1.5E+5 $(mg/kg\text{-}day)^{-1}$ was entered as the oral cancer slope factor for all PCDD/PCDF congeners (except the two HxCDDs noted above). This enabled the IRAP program to calculate oral cancer risks for the mixture of PCDDs/PCDFs using the 2,3,7,8-TCDD slope factor in conjunction with 2,3,7,8-TCDD toxic equivalency factors. Second, an inhalation unit risk factor for 2,3,7,8-TCDD of 33 $(\mu g/m^3)^{-1}$ from USEPA's 1997 Health Effects Assessment Summary Tables was entered for all PCDD/PCDF congeners (except the two

[1] The IRAP software, which was programmed by Lakes Environmental to implement the 2005 HHRAP methodology, was used to perform the risk assessment calculations for stack and fugitive air emissions.

HxCDDs noted above which have their own IRIS-identified inhalation values of 1.3 $(\mu g/m^3)^{-1}$). Third, the oral cancer slope factor of 2 $(mg/kg\text{-}day)^{-1}$ for Aroclor 1254 identified in the HHRAP report but not in its chemical-specific database was entered into IRAP. Polychlorinated biphenyls (PCBs) were evaluated in the risk assessment as Aroclor 1254 based on an evaluation of the PCB homologue distribution measured during the Performance Demonstration Test in accordance with HHRAP guidance. Additionally, Aroclor 1254 was selected over Aroclor 1016 because it has more conservative toxicity criteria.

Table 1
Compilation of Chronic Human Health Toxicity Criteria for Compounds Not Included in USEPA's 2005 HHRAP (a)

Toxicity Criteria							Sources for Toxicity Criteria				
CAS #	Compound name	Oral RfD (mg/kg/day)	Oral cancer slope factor $(mg/kg/day)^{-1}$	Inhalation RfC (mg/m^3)	Inhalation unit risk factor $(ug/m^3)^{-1}$	Health endpoint(s)	Oral RfD (mg/kg/day)	Oral cancer slope factor $(mg/kg/day)^{-1}$	Inhalation RfC (mg/m^3)	Inhalation Unit risk factor (ug/m^3) [1]	Health endpoint(s)
563-58-6	1,1-Dichloropropene	NA	NA	NA	NA	NA					
95-63-6	1,2,4-Trimethylbenzene	NA	NA	NA	NA	NA					
142-28-9	1,3-Dichloropropane	0.02	NA	0.07	NA	Liver/ Kidney	PPRTV		RTR (b)		PPRTV
108-60-1	2,2'-oxybis (1-Chloropropane)	0.04	NA	0.14	NA	Blood	IRIS		RTR (b)		IRIS
594-20-7	2,2-Dichloropropane	NA	NA	NA	NA	NA					
625-86-5	2,5-Dimethylfuran	NA	NA	NA	NA	NA					
2216-30-0	2,5-Dimethylheptane	NA	NA	NA	NA	NA					
17559-81-8	2,5-Dione, 3-hexene	NA	NA	NA	NA	NA					
78-93-3	2-Butanone	0.6	NA	5	NA	Developmental/ Reproductive System	IRIS		IRIS		IRIS
95-49-8	2-Chlorotoluene	0.02	NA	0.07	NA	Body Weight	IRIS		RTR (b)		IRIS
591-78-6	2-Hexanone	NA	NA	NA	NA	NA					
3221-61-2	2-Methyl octane	NA	NA	NA	NA	NA					
91-57-6	2-Methylnaphthalene	0.004	NA	0.014	NA	Respiratory tract	IRIS		RTR (b)		IRIS
34246-54-3	3-Ethyl benzaldehyde	NA	NA	NA	NA	NA					
763-93-9	3-Hexen-2-one	NA	NA	NA	NA	NA					
625-33-2	3-Penten-2-one (ethylidene acetone)	NA	NA	NA	NA	NA					
141-79-7	3-Penten-2-one, 4-methyl	NA	NA	NA	NA	NA					
534-52-1	4,6-Dinitro-2-methylphenol	0.004	NA	0.014	NA	Nervous System	ATSDR		RTR (b)		ASTDR
106-43-4	4-Chlorotoluene	0.07	NA	0.245	NA	Liver/ Kidney	PPRTV		RTR (b)		PPRTV
4748-78-1	4-Ethyl benzaldehyde	NA	NA	NA	NA	NA					
301-02-0	9-Octadecenamide (oleamide)	NA	NA	NA	NA	NA					
208-96-8	Acenaphthylene	NA	NA	NA	NA	NA					
7429-90-5	Aluminum	1	NA	0.005	NA	Developmental/ Nervous system	PPRTV		PPRTV		PPRTV
92-87-5	Benzidine	0.003	230	NA	0.067	Urinary/ Nervous System/ Liver	IRIS	IRIS		IRIS	IRIS
192-97-2	Benzo(e)pyrene	NA	NA	NA	NA	NA					
191-24-2	Benzo(g,h,i)perylene	NA	NA	NA	NA	NA					
93-58-3	Benzoic acid, methyl ester (methyl benzoate)	NA	NA	NA	NA	NA					
111-91-1	Bis(2-chloroethoxy) methane	0.003	NA	0.0105	NA	Liver	PPRTV		RTR (b)		PPRTV
108-86-1	Bromobenzene	NA	NA	NA	NA	NA					
74-97-5	Bromochloromethane	NA	NA	NA	NA	NA					
104-51-8	Butylbenzene, n-	NA	NA	NA	NA	NA					
135-98-8	Butylbenzene, sec	NA	NA	NA	NA	NA					
98-06-6	Butylbenzene, tert	NA	NA	NA	NA	NA					
86-74-8	Carbazole	NA	NA	NA	NA	NA					
7440-48-4	Cobalt	0.01	NA	0.0001	NA	Respiratory tract/ Blood	ATSDR		ASTDR		ATSDR
7440-50-8	Copper	0.01	NA	0.035	NA	Gastrointestinal	ATSDR		RTR (b)		ATSDR
2303-16-4	Diallate	NA	NA	NA	NA	NA					
132-64-9	Dibenzofuran	0.001	NA	0.0035	NA	Organ (weight)	PPRTV		RTR (b)		PPRTV
122-39-4	Diphenylamine	0.025	NA	0.0875	NA	Body Weight/ Kidney/ Liver	IRIS		RTR (b)		IRIS

Table 1
Compilation of Chronic Human Health Toxicity Criteria for Compounds Not Included in USEPA's 2005 HHRAP (a)

Toxicity Criteria							Sources for Toxicity Criteria				
CAS #	Compound name	Oral RfD (mg/kg/day)	Oral cancer slope factor $(mg/kg/day)^{-1}$	Inhalation RfC (mg/m^3)	Inhalation unit risk factor $(ug/m^3)^{-1}$	Health endpoint(s)	Oral RfD (mg/kg/day)	Oral cancer slope factor $(mg/kg/day)^{-1}$	Inhalation RfC (mg/m^3)	Inhalation Unit risk factor (ug/m^3) [1]	Health endpoint(s)
1031-07-8	Endosulfan sulfate	NA	NA	NA	NA	NA					
7421-93-4	Endrin aldehyde	NA	NA	NA	NA	NA					
53494-70-5	Endrin ketone	NA	NA	NA	NA	NA					
76-13-1	Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	3	NA	10.5	NA	Nervous System	IRIS		RTR (b)		IRIS
74-88-4	Iodomethane	NA	NA	NA	NA	NA					
99-87-6	Isopropyl toluene, p-	NA	NA	NA	NA	NA					
7439-96-5	Manganese	0.14	NA	0.00005	NA	Nervous System	IRIS		IRIS		IRIS
62-75-9	N-nitrosodimethylamine	NA	51	NA	0.014	Liver		IRIS		IRIS	IRIS
198-55-0	Perylene	NA	NA	NA	NA	NA					
2240-47-3	Phosphine imide, P,P,P-triphenyl	NA	NA	NA	NA	NA					
103-65-1	Propylbenzene, n-	NA	NA	NA	NA	NA					
7440-62-2	Vanadium	0.003	NA	0.0002	NA	Respiratory tract/ Kidney	ATSDR		ATSDR		ATSDR
58-89-9	γ-BHC (Lindane)	0.0047	NA	NA	NA	Liver/blood	OPPTS HED (c)	OPPTS HED (c)		OPPTS HED (c)	OPPTS HED (c)
319-86-8	δ-BHC	0.083	NA	NA	NA	Liver	CPF (d)				CPF (d)
110-54-3	1-Hexane (n-hexane)	0.06	NA	0.7	NA	Nervous System	HEAST		IRIS		IRIS/HEAST
79-10-7	Acrylic Acid	0.5	NA	0.001	NA	Developmental/ Respiratory Tract	IRIS		IRIS		IRIS
107-21-1	Ethylene Glycol	2	NA	1.3	NA	Kidney	IRIS		ATSDR		IRIS
80-62-6	Methyl methacrylate	1.4	NA	0.7	NA	Organ(weight)/ Respiratory Tract	IRIS		IRIS		IRIS
1634-04-4	methyl tert-butyl ether	0.3	NA	3	NA	Liver/Kidney	ATSDR		IRIS		IRIS
75-56-9	Propylene oxide	NA	0.24	0.03	0.0000037	Gastrointestinal/ Respiratory Tract		IRIS	IRIS	IRIS	IRIS
33213-65-9	Endosulfan II	NA	NA	NA	NA	NA					
7446-09-5	Sulfur dioxide	NA	NA	0.078	NA	Respiratory Tract			NAAQS (e)		
10102-44-0	Nitrogen oxides	NA	NA	0.1	NA	Respiratory Tract			NAAQS (e)		
Additional Compounds Addressed in Fugitive Air Emissions Inhalation Risk Assessment											
106-99-0	1,3-Butadiene	--	--	2.00E-03	3.00E-05				IRIS	IRIS	
110-82-7	Cyclohexane	--	--	6	NA				IRIS		

NA = not available

-- = not applicable. Only the inhalation pathway of exposure was evaluated.

(a) Heirarchy for chronic toxicity data, based on 2005 HHRAP: 1) EPA's Integrated Risk Information System (IRIS); 2) EPA's provisional peer-reviewed toxicity values (PPRTV); 3) Other - a) CALEPA (California Environmental Protection Agency) chronic reference exposure level (REL) and unit risk factor (URF); b) Agency for Toxic Substances and Disease Registry (ATSDR) chronic minimum risk level (MRL); c) USEPA's 1997 Health Effects Assessment Summary Tables (HEAST).

(b) RTR = route to route extrapolation, based on Appendix A-2 of USEPA's 2005 HHRAP. RTR was conducted if an oral toxicity value was available but no inhalation toxicity value was available. Inhal RfC (mg/m3) = Oral RfD (mg/kg-day) * 70 kg BW / 20 m3/day. This assumes that the toxicity of the compound is equivalent when inhaled or ingested; this is used as an initial screening tool.

(c) OPPTS HED = USEPA's Office of Prevention, Pesticides and Toxic Substances, Health Effects Division. 2002. Revised HED Risk Assessment for Lindane. DP Barcode D280622. Reregistration case #0315. January 30, 2002.

(d) CPF = CPF Associates, Inc. 2006. Comments on Assessment of Lindane and Other Hexachlorocyclohexane Isomers. EPA-HQ-OPP-2006-0034. www.cpfassociates.com/pdf/HCH_Assessment_Comments_2006.pdf.

(e) NAAQS = National Ambient Air Quality Standard set under the U.S. Clean Air Act

Table 2

Compilation of Acute Inhalation Toxicity Criteria for Compounds Not Included in USEPA'S 2005 HHRAP

CAS Number	Compound	Toxicity Criteria Data Sources (a)				Acute Inhalation Reference Air Concentration Used in Risk Assessment (mg/m^3)
		AEGL-1 (mg/m^3) (b)	ERPG-1 (mg/m^3)	TEEL-1 (mg/m^3)	CALEPA Acute REL (mg/m^3)	
563-58-6	1,1-Dichloropropene			12.5		12.5
95-63-6	1,2,4-Trimethylbenzene	687		150		687
142-28-9	1,3-Dichloropropane			75		75
108-60-1	2,2'-oxybis (1-Chloropropane)			75		75
594-20-7	2,2-Dichloropropane			60		60
625-86-5	2,5-Dimethylfuran					NA
2216-30-0	2,5-Dimethylheptane			350 (d)		350
17559-81-8	2,5-Dione, 3-hexene					NA
78-93-3	2-Butanone (MEK)	589			13	13
95-49-8	2-Chlorotoluene			400		400
591-78-6	2-Hexanone			40		40
3221-61-2	2-Methyl octane					NA
91-57-6	2-Methylnaphthalene			20		20
34246-54-3	3-Ethyl benzaldehyde			150 (c)		150
763-93-9	3-Hexen-2-one					NA
625-33-2	3-Penten-2-one (ethylidene acetone)					NA
141-79-7	3-Penten-2-one, 4-methyl (mesityl oxide)			100		100
534-52-1	4,6-Dinitro-2-methylphenol (4,6-dinitro-o-cresol)			0.2		0.2
106-43-4	4-Chlorotoluene			350		350
4748-78-1	4-Ethyl benzaldehyde			150 (c)		150
301-02-0	9-Octadecenamide (oleamide)					NA
208-96-8	Acenaphthylene			0.2		0.2
7429-90-5	Aluminum			30		30
92-87-5	Benzidine			0.5		0.5
192-97-2	Benzo(e)pyrene					NA
191-24-2	Benzo(g,h,i)perylene			30		30
93-58-3	Benzoic acid, methyl ester (methyl benzoate)					NA
111-91-1	Bis(2-chloroethoxy) methane			15		15
108-86-1	Bromobenzene			15		15
74-97-5	Bromochloromethane			3000		3000
104-51-8	Butylbenzene, n-			125		125
135-98-8	Butylbenzene, sec			25		25
98-06-6	Butylbenzene, tert			125		125
86-74-8	Carbazole			2.5		2.5
7440-48-4	Cobalt			3		3
7440-50-8	Copper				0.1	0.1
2303-16-4	Diallate					NA
132-64-9	Dibenzofuran			30		30
122-39-4	Diphenylamine			30		30
1031-07-8	Endosulfan sulfate					NA
7421-93-4	Endrin aldehyde					NA
53494-70-5	Endrin ketone					NA
76-13-1	Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)			10000		10000
74-88-4	Iodomethane (methyl iodide)		145			145
99-87-6	Isopropyl toluene, p-					NA
7439-96-5	Manganese			3		3
62-75-9	N-nitrosodimethylamine			10		10
198-55-0	Perylene					NA

Table 2

Compilation of Acute Inhalation Toxicity Criteria for Compounds Not Included in USEPA'S 2005 HHRAP

CAS Number	Compound	Toxicity Criteria Data Sources (a)				Acute Inhalation Reference Air Concentration Used in Risk Assessment (mg/m^3)
		AEGL-1 (mg/m^3) (b)	ERPG-1 (mg/m^3)	TEEL-1 (mg/m^3)	CALEPA Acute REL (mg/m^3)	
2240-47-3	Phosphine imide, P,P,P-triphenyl					NA
103-65-1	Propylbenzene, n- (isocumene)			400		400
7440-62-2	Vanadium			0.15		0.15
58-89-9	γ-BHC (Lindane)			1.5		1.5
319-86-8	δ-BHC					NA
110-54-3	1-Hexane (n-hexane)			1,500		1,500
79-10-7	Acrylic Acid	4.4	5.9		6	6.0
107-21-1	Ethylene Glycol			100		100
80-62-6	Methyl methacrylate	70				70
1634-04-4	methyl tert-butyl ether	180				180
75-56-9	Propylene oxide	173			3.1	3.1
7446-09-5	Sulfur dioxide				0.66	0.66
10102-44-0	Nitrogen dioxide				0.47	0.47
33213-65-9	Endosulfan II					NA
Additional Compounds Addressed in Fugitive Air Emissions Inhalation Risk Assessment						
106-99-0	1,3-Butadiene	1,480				1,480
110-82-7	Cyclohexane			1,000		1,000

Abbreviations:

HHRAP = USEPA's 2005 Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities.

NA = Acute inhalation values were not available from the referenced data sources.

(a) Hierarchy for acute inhalation toxicity criteria, based on 2005 HHRAP: 1) CALEPA RELs, 2) USEPA AEGL-1, 3) ERPG-1, and 4) TEEL-1. Definitions are provided below:

CALEPA REL = California Environmental Protection Agency Acute Reference Exposure Level. The acute REL is the concentration level at or below which no adverse health effects are anticipated for a 1-hour exposure duration.

USEPA AEGL-1 = Acute exposure guideline level developed by USEPA. The AEGL-1 is the 1-hour average concentration in air below which mild transient effects (e.g., irritation) are not expected to occur in the general population, including susceptible individuals, but above which such transient effects might occur. AEGLs are developed to evaluate intermittent, short-term exposures.

ERPG-1: The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing other than mild transient adverse health effects or perceiving a clearly defined, objectionable odor.

TEEL-1: The maximum airborne concentration below which it is believed that nearly all individuals could be exposed without experiencing other than mild transient adverse health effects or perceiving a clearly defined, objectionable odor.

(b) All listed AEGLs are interim values except for methyl tert butyl ether and 1,2,4-trimethylbenzene which are proposed AEGLs.

(c) TEEL-1 is for 2-ethyl benzaldehyde, no value was available for 3- or 4-ethyl benzaldehyde.

(d) TEEL-1 is for 2,2-dimethylheptane, no value was available for 2,5-dimethylheptane.

APPENDIX A

BIOGRAPHIES OF STUDY PARTICIPANTS

CPF ASSOCIATES, INC

Sarah A. Foster

EDUCATION

M.S., Environmental Health Sciences, Air Pollution Control Program Harvard University School of Public Health, Cambridge, MA (1985).

B.A., Political Science (Environmental Law/Energy Policy), Williams College, Williamstown, MA (1981).

EXPERIENCE

Ms. Foster is a founding member of CPF Associates, Inc. She has over 20 years of consulting experience in environmental health sciences, with expertise in developing strategies for and conducting exposure and risk analyses related to environmental issues and commercial and consumer products. Previously, Ms. Foster was a Senior Consultant with The Weinberg Group, a Project Manager at the Clement Division of ICF/Kaiser, an Environmental Analyst with the U.S. Environmental Protection Agency's Office of Policy Analysis, and a researcher for the Harvard Public Health School's Six City Study. Her areas of specialty include the application of quantitative methods for evaluating potential risks, including multiple chemical, multiple exposure pathway risk assessments for waste management technologies, air toxics sources and waste sites, Monte Carlo simulation, environmental epidemiology, and good risk assessment practice principles. She has managed and performed over 100 comprehensive risk assessment projects for combustion sources, waste sites and consumer and commercial products, with specialized knowledge in the conduct of risk assessments for municipal solid waste combustors, hazardous waste incinerators, landfills and emissions reported under SARA Title III. She has developed and applied a wide variety of environmental fate and transport models, and critically analyzed and compiled a broad array of human activity pattern data, in exposure assessment projects involving multiple inhalation, ingestion and dermal pathways as well as the use of household tap water. She has also developed and applied innovative risk assessment methods to assess risks from combustion sources, indoor water use, waste sites, pesticides and anti-microbial materials. Ms. Foster has analyzed issues regarding contaminated site remedy selection, cleanup goals, and the historical state-of-knowledge of toxicological and environmental health sciences. Ms. Foster has numerous publications focusing on risk assessment, air toxics and emissions from industrial sources and is a member of several professional societies. She also has considerable experience in developing and conducting risk assessment training courses.

CPF ASSOCIATES, INC.

Paul C. Chrostowski, Ph.D., QEP, FRSH

EDUCATION

Ph.D. Environmental Engineering and Science, Drexel University, Philadelphia, PA (1981).

M.S. Environmental Science, Drexel University, Philadelphia, PA (Environmental Chemistry and Health Specializations, USPHS Traineeship) (1979).

B.S. Chemistry, University of California, Berkeley, California (American Chemical Society Certified, Honors) (1976).

PROFESSIONAL CERTIFICATION

Dr. Chrostowski is a Qualified Environmental Professional (QEP) (#02970014) and a Fellow of the Royal Society of Health (FRSH).

EXPERIENCE

Dr. Chrostowski is a founding member of CPF Associates, Inc. He is an environmental health scientist with over 30 years experience in environmental science and engineering work on behalf of both government and private clients. Previously, he was Director of Environment, Health & Safety programs at The Weinberg Group, Vice President and Senior Science Advisor at ICF/Clement, Senior Scientist at EA Engineering, Science & Technology, Assistant Professor at Vassar College, a consultant in private practice and a pollution control/industrial hygiene technician in industry. He has specialized experience in the scientific and technical aspects of federal, state, and international regulatory programs including the CAA, CERCLA/SARA, RCRA, TSCA, FIFRA, OSHA, waste management technologies and ecological assessment. In addition to EPA and OSHA programs, Dr. Chrostowski has developed substantial expertise in indoor air quality, odor analysis, microbiological risk assessment, the risk analysis of hazardous material transportation, and the risk analysis of FDA-regulated products. Dr. Chrostowski has conducted research into environmentally-friendly new product development and has directed registration and approval petition processes for the environmental and occupational aspects of new products, pesticides, and pharmaceuticals. Dr. Chrostowski's research interests include the behavior of complex mixtures, pharmacokinetics, application of quantitative management tools to environmental strategy development and evaluation, biomonitoring, use of epidemiology in risk assessment, mass transfer phenomena, applied statistics, and mathematical modeling for risk management decision making. Dr. Chrostowski is active in numerous professional societies and expert panels and has authored or co-authored over 100 publications or presentations in the environmental field. In addition to his technical work, Dr. Chrostowski has taught university-level environmental sciences and has presented expert testimony in litigation cases, regulatory, and permitting hearings and public meetings and has conducted technical negotiations on behalf of private and governmental clients. Dr. Chrostowski was a member of the National Research Council's committee on Health Effects of Waste Incineration and assisted the presidential/Congressional Commission on Risk Assessment and Risk Management regarding risk assessment of municipal waste combustors.

FOCUS ENVIRONMENTAL, INC.
ANTHONY R. EICHER

Mr. Eicher is a chemical engineer and Principal of Focus Environmental, Inc., with over 26 years of project management and engineering experience in the design, evaluation, operation, and testing of hazardous materials treatment systems and air pollution control devices. Mr. Eicher's responsibilities include providing a full range of engineering services, from waste or emissions characterizations and feasibility studies through complete process design and detailed design reviews to permitting, startup assistance, troubleshooting, performance testing, and operator training. He has prepared and assisted clients in developing permit applications and supporting documents for RCRA, TSCA, NPDES, PSD, and state air and state solid waste permits and has represented clients in permitting negotiations with federal and state regulators, and in public hearings. He has participated in over 150 trial burn and compliance testing projects and has managed the implementation of numerous comprehensive testing programs. These projects have been conducted across 28 states (plus Puerto Rico), all 10 EPA regions, and 4 countries. Mr. Eicher has developed process designs and control strategies for a variety of processes and components including combustion systems; liquid, solid, and semi-solid material handling; energy recovery; wet and dry air pollution control systems; non-electrical utilities distribution (air, water, steam, etc.); vent controls; and several separation processes (air and steam stripping, liquid extraction, thin film evaporation). He has been involved in numerous new facility designs, upgrades of existing systems, and demonstration of emerging technologies. This experience has spanned a wide range of industries and applications including chemical and petrochemical processing, pharmaceuticals, metals and minerals, power generation, commercial waste treatment, mixed radioactive and hazardous waste management, as well as hazardous materials emergency response and waste site remediation. Mr. Eicher has authored or co-authored over 20 technical papers that have been presented in a variety of symposia or published in national and international journals. He served a two-year term as the Technical Chair for the International Conference on Incineration and Thermal Treatment Technologies, sponsored annually by the University of Maryland, College Park, and remains as an active member of the Conference Executive Committee and Program Advisory Committee. Mr. Eicher is recognized internationally for his expertise in the hazardous waste thermal treatment industry, especially in the areas of regulatory compliance and performance testing.

FOCUS ENVIRONMENTAL, INC.
TERESA BALES

Ms. Bales has over 24 years experience working in the environmental industry. She has experience with RCRA, NPDES, IATA, and DOT regulations. She has extensive experience reviewing analytical data for CLP, HAZWRAP, and project specific quality objectives. She has participated in CPT testing as the independent Quality Assurance Officer this is required by the regulatory agency. Ms. Bales has also developed field sampling and analysis plans (SAP) Feedstream Analysis Plans (FAP), and quality assurance project plans (QAPP) for a variety of projects. Her experience also includes project management and obtaining and managing grant moneys.

MACTEC

TONY RODOLAKIS

Mr. Rodolakis specializes in ecological risk assessment and other hazardous waste and environmental quality projects. He has over 14 years of experience in the environmental field. Mr. Rodolakis performs ecological risk assessments following state and federal guidelines, including Resource Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and advises clients on compliance issues and state and federal regulations. Mr. Rodolakis specializes in landfills, industrial, and commercial sites. Mr. Rodolakis earned a bachelors degree in Biology form Tufts University and a Masters of Environmental Science in Aquatic Science from the Yale School of Forestry and Environmental Studies. His specialized skill areas include RCRA, CERCLA, ecological risk assessment, remedial investigations, habitat assessments, permitting, and amphibian monitoring.

ToxServices, Inc.

Dr. Margaret H. Whittaker has over a decade of experience in both the performance and management of toxicology and human health risk assessment-related projects. She is currently the Chief Toxicologist and President of ToxServices LLC, a Washington, D.C.-based consulting firm that provides toxicology and risk assessment consulting services to private industry and the Federal government. Dr. Whittaker is Diplomate of the American Board of Toxicology who earned a Ph.D. in Toxicology from The University of Maryland, Baltimore and an M.P.H. in Environmental Health from The University of Michigan. Dr. Whittaker has extensive technical experience in hazard identification and noncancer and cancer dose-response assessment, including the preparation of quantitative risk assessments for carcinogens and noncarcinogens. She formed ToxServices in 2003 after working at two of the country's leading toxicology and risk assessment consulting firms (The ENVIRON Corporation and The Weinberg Group), and has successfully developed both a loyal client base and a growing staff of multidisciplinary toxicologists.

ToxServices, Inc.

Ms. Elizabeth Engimann is an Associate Toxicologist who earned her M.H.S. in Environmental Health Sciences from the Johns Hopkins University, Baltimore, Maryland, Bloomberg School of Public Health. Since joining ToxServices, Ms. Engimann has developed numerous human health risk assessments of direct and indirect additives extracting from drinking water distribution systems and drinking water treatment units. She has also performed initial and final toxicological reviews for products being evaluated under various NSF standards. Ms. Engimann has extensive laboratory experience in both *in vivo* and *in vitro* investigational techniques, and has over a decade of experience performing toxicity studies on mammalian and non-mammalian species. Ms. Engimann performs literature searches for EPA risk assessments and technical guidance documents, ATSDR Toxicological Profiles, and international toxicological evaluations, including NICNAS, BUA, WHO (INCHEM, JECFA, IPCS), BIBRA, and Japanese Ministry of Health and Welfare reports. She excels in searching online databases such as ChemIDplus, HSDB, MEDLINE, BIOSIS, TOXLINE, GENETOX, CCRIS, IARC, HPV, and TSCATS for epidemiological and toxicological data and reports. Ms. Engimann also is proficient at using NEMI to identify appropriate test methods for analyzing contaminants in water media.

ToxServices, Inc.

Lisa Marie Egner is a Research Associate who received her Bachelor's degree in Engineering Physics from the University of Illinois. Ms. Egner is an accomplished Research Associate who performs comprehensive literature searches in databases specializing in environmental quality or sustainability issues, such as Dialog's ENVIROLINE, INSIDE CONFERENCES, SCISEARCH, and WASTEINFO databases. Ms. Egner also assists ToxServices with her technical skills using Graphics in AutoCAD & AutoDesk Inventor, Numerical methods in MATLAB and EXCEL, and Programming in C and MATLAB.

TRC
THEODORE MAIN

EDUCATION
B.S., Meteorology, Pennsylvania State University, 1978

AREAS OF EXPERTISE
Mr. Theodore Main has program management and technical experience in the following general areas:

- Project Management
- Air Quality Dispersion Modeling
- Air Quality Permitting
- Air Quality/New Source Review Permitting
- Title V Permitting
- New York Article X Permitting
- Environmental Impact Studies
- Cooling tower and Visible Plume Studies
- EPA Program Management
- Air Quality/Environmental Due Diligence
- Air Quality Monitoring
- Expert Testimony
- Air Quality/Meteorology Computer Applications
- Computer Programming
- Technical Consultant for Software Applications

REPRESENTATIVE EXPERIENCE
Mr. Main has over 28 years of experience in preparing and supervising the preparation of air quality, meteorological and environmental impact studies performing air quality diffusion modeling, and additional environmental analyses. Mr. Main has also provided expert testimony regarding air quality issues in support of permit applications. His experience includes development, adaptation and operation of computer programs for environmental analyses; specification and installation of meteorological and air quality monitoring equipment; preparation and supervision of preparation of licensing documents and fugitive particulate studies performed for cogeneration facilities, fossil fuel steam electric generating facilities, steam heating plants, industrial process boilers, and municipal incinerators. Mr. Main is presently manager of the air quality modeling group within the TRC Lyndhurst, New Jersey office. In this capacity, he supervises the air quality modeling and analytical analysis support for air quality permits and environmental studies.

TRC
DARIN J. OMETZ

EDUCATION

Graduate Studies in Meteorology (The Pennsylvania State University)
B.S., Meteorology, The Pennsylvania State University, 2000

TECHNICAL SPECIALTIES

Mr. Ometz has over 5 years experience encompassing:

- New Source Review – Prevention of Significant Deterioration (PSD) Modeling
- Regional Haze (Visibility and Long-Range Transport) Modeling
- Toxic Air Pollutant Modeling
- Risk Management Plans/Modeling
- Health Risk Assessments
- Mobile Source Modeling (Roadway Assessments)
- Air Emissions Inventories and Regulatory Assessments
- Construction Permits and Operating Permit Applications

REPRESENTATIVE EXPERIENCE

Mr. Ometz has conducted air quality analyses for several electric power generating facilities. These facilities were located in EPA regions II and IV. He has worked with EPA guideline models such as the Industrial Source Complex Short-Term (ISCST3) model, AERMOD, CAL3QHC roadway screening model, CTSCREEN and SCREEN3, and ALOHA, as well as, non-EPA guideline models such as CALPUFF. Mr. Ometz provides modeling and engineering support for a variety of industrial clients including independent power/cogeneration development, manufacturing, and retail development.

APPENDIX M

SUPPORTING INFORMATION FOR THE ECOLOGICAL RISK ASSESSMENT

APPENDIX M

SUPPORTING INFORMATION FOR THE ECOLOGICAL RISK ASSESSMENT

This appendix includes supporting information related to the ecological risk assessment, as follows:

Section 1
Compilation of Toxicity Reference Values (TRVs) for the Ecological Risk Assessment

Section 2
Technical Approach for Calculating Doses to Wildlife Species

Section 3
Methods Used to Address Mixtures of PCDDs/PCDFs in the Ecological Risk Assessment

Section 4
Detailed Ecological Risk Assessment Results

APPENDIX M
SECTION 1

COMPILATION OF TOXICITY REFERENCE VALUES (TRVs) FOR THE ECOLOGICAL RISK ASSESSMENT

Toxicity reference values (TRVs) are the estimated dose or exposure level at which no adverse effects are expected to occur. For this project, TRVs were obtained from USEPA's 1999 *Screening Level Ecological Risk Protocol for Hazardous Waste Combustion Facilities* ("Screening Level Protocol") or, in the absence of data from this report, from standards, criteria, guidance, or ecological benchmarks from the data sources listed below (and in the project Working Draft Risk Assessment Workplan), in order of preference, as follows:

Birds & Mammals
- CalTox database (CEPA 2002)
- Sample et al. (1996)
- Schafer et al. (1983), Schafer and Bowles (1985)

Reptiles
- CalTox database (CEPA 2002)
- Reptile and Amphibian Toxicity Literature (RATL) database (EC 2000)

Plants
- Efromyson et al. (1997)
- USEPA Region V Ecological Screening Levels (USEPA 2003)

Aquatic Life – Surface Water
- AZDEQ water quality standards (AZDEQ 2003)
- USEPA (2005)
- USEPA (1996)
- Mayer and Ellersieck (1986)
- USEPA (2007)

Aquatic Life – Sediment
- NOAA (2006)
- MacDonald (2000)

If available and appropriate, TRVs which were associated with chronic exposures (i.e., long duration exposures) and which reported no-adverse-effects levels (NOAELs)

relating to reproduction or mortality were selected. If only acute toxicity data were available, chronic values were estimated by dividing the acute value by 100, as recommended in USEPA (1999) guidance. In some cases, TRVs with endpoints relating to reproduction or mortality were not available in the literature. In such cases, TRVs associated with other sub-lethal effects were assumed to indirectly affect survival or reproductive capacity and were therefore appropriate. Studies were also selected based on similarity of test species to the receptors considered in the risk assessment. In some cases, a TRV could not be identified. Use of TRVs assumes that the bioavailability, uptake efficiency, uptake mechanism, and toxicity mechanism of the chemical used in the TRV study is similar to the chemical form which occurs at the project site.

The TRVs compiled for this project, for compounds not already included in USEPA's Screening Level Protocol, are presented in this appendix in a series of tables. Table 1 summarizes all the TRVs that were compiled for the various ecological receptor groups. Table 2 lists the data sources for the compiled TRVs for mammals, birds and plants. Tables 3 and 4 present detailed supporting data on the TRVs compiled from Sample et al. (1996) for mammalian and avian receptors, respectively. Table 5 lists the data sources for the surface water and sediment TRVs that were compiled. Table 6 presents detailed supporting data for the aquatic TRVs compiled from Mayer and Ellersieck (1986). Table 7 presents detailed supporting data for the aquatic TRVs compiled from USEPA's Ecotox Database. It should also be noted that Arizona Water Quality Criteria took precedence over surface water TRVs available in USEPA's Screening Level Protocol.

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MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystem. Archives of Environmental Contamination and Toxicology 39:20-31.

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U.S. Environmental Protection Agency (USEPA). 2003. Region 5, RCRA Ecological Screening Levels. August 22, 2003.

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U.S. Environmental Protection Agency (USEPA). 2007. EcoTox Database. http://www.epa.gov/ecotox.

Table 1
Toxicity Reference Values (TRVs) for Compounds Not Included in
USEPA's 1999 Screening Level Ecological Risk Assessment Protocol

Compound (a)	CAS NO.	Freshwater TRVs mg/L	Freshwater Sediment TRVs mg/kg (dry weight)	Terrestrial Plant TRVs mg/kg (dry weight soil)	Mammal TRVs mg/kg BW-day	Bird TRVs mg/kg BW-day
Inorganic Compounds						
Cobalt	7440-48-4	0.003	N/D	20	N/D	N/D
Manganese	7439-96-5	0.08	N/D	500	88	977
Vanadium	7440-62-2	0.019	N/D	2	0.21	11.4
Organic Compounds						
1,1-Dichloropropene	563-58-6	N/D	N/D	N/D	N/D	N/D
1,2,4-Trimethylbenzene	95-63-6	0.077	N/D	N/D	N/D	N/D
1,2-Dichloroethene	540-59-0	1.4	N/D	N/D	N/D	N/D
1,3-Dichloropropane	142-28-9	1.3	N/D	N/D	N/D	N/D
1,3-Dichloropropene (trans)	10061-02-6	N/D	N/D	N/D	N/D	N/D
1-Hexane (n-hexane)	110-54-3	0.025	N/D	N/D	N/D	N/D
2,2'-oxybis (1-Chloropropane)	108-60-1	N/D	N/D	20	N/D	N/D
2,2-Dichloropropane	594-20-7	0.39	N/D	N/D	N/D	N/D
2,5-Dimethylfuran	625-86-5	0.71	N/D	N/D	N/D	N/D
2,5-Dimethylheptane	2216-30-0	N/D	N/D	N/D	N/D	N/D
2,5-Dione, 3-hexene	17559-81-8	N/D	N/D	N/D	N/D	N/D
2-Chlorotoluene	95-49-8	0.14	N/D	N/D	N/D	N/D
2-Hexanone	591-78-6	4.28	N/D	13	N/D	N/D
2-Methyl octane	3221-61-2	N/D	N/D	N/D	N/D	N/D
3-Ethyl benzaldehyde	34246-54-3	N/D	N/D	N/D	N/D	N/D
3-Hexen-2-one	763-93-9	N/D	N/D	N/D	N/D	N/D
3-Penten-2-one (ethylidene acetone)	625-33-2	N/D	N/D	N/D	N/D	N/D
3-Penten-2-one, 4-methyl	141-79-7	N/D	N/D	N/D	N/D	N/D
4,6-Dinitro-2-methylphenol	534-52-1	0.024	N/D	0.14	N/D	N/D
4-Chlorotoluene	106-43-4	3.4	N/D	N/D	N/D	N/D
4-Ethyl benzaldehyde	4748-78-1	N/D	N/D	N/D	N/D	N/D
9-Octadecenamide (oleamide)	301-02-0	N/D	N/D	N/D	N/D	N/D
Acenaphthylene	208-96-8	N/D	N/D	680	N/D	N/D
Acrylic Acid	79-10-7	3.8	N/D	N/D	N/D	N/D
Benzidine	92-87-5	0.089	N/D	N/D	N/D	N/D
Benzo(e)pyrene	192-97-2	N/D	N/D	N/D	N/D	N/D
Benzo(g,h,i)perylene	191-24-2	N/D	N/D	120	N/D	N/D
Benzoic acid, methyl ester (methyl benzoate)	93-58-3	2.3	N/D	N/D	N/D	N/D
BHC, delta (δ-hexachlorocyclohexane)	319-86-8	0.13	N/D	9.9	N/D	N/D
BHC, gamma (Lindane; γ-hexachlorocyclohexane)	58-89-9	0.00028	0.00032	0.005	8	2
Bis(2-chloroethoxy) methane	111-91-1	1.8	N/D	0.3	N/D	N/D
Bromobenzene	108-86-1	0.056	N/D	N/D	N/D	N/D
Bromochloromethane	74-97-5	N/D	N/D	N/D	N/D	N/D
Butylbenzene, n-	104-51-8	N/D	N/D	N/D	N/D	N/D
Butylbenzene, sec	135-98-8	N/D	N/D	N/D	N/D	N/D
Butylbenzene, tert	98-06-6	0.65	N/D	N/D	N/D	N/D
Carbazole	86-74-8	0.015	N/D	N/D	N/D	N/D
Chlordane, cis (α-chlordane)	5103-71-9	0.000071	0.0032	N/D	4.58	2.14
Chlordane, trans (β-chlordane)	5103-74-2	0.0005	0.0032	N/D	N/D	N/D
Dibenzofuran	132-64-9	0.02	N/D	N/D	N/D	N/D
Diphenylamine	122-39-4	0.038	N/D	1	N/D	N/D
Endosulfan II	33213-65-9	0.000056	N/D	0.12	N/D	N/D
Endosulfan sulfate	1031-07-8	0.000060	N/D	N/D	N/D	N/D
Endrin aldehyde	7421-93-4	0.000080	N/D	0.011	N/D	N/D
Endrin ketone	53494-70-5	N/D	N/D	N/D	N/D	N/D
Ethylene Glycol	107-21-1	1000	N/D	N/D	N/D	N/D
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	76-13-1	N/D	N/D	N/D	N/D	N/D
Iodomethane	74-88-4	N/D	N/D	1.2	N/D	N/D
Isopropyl toluene, p-	99-87-6	0.046	N/D	N/D	N/D	N/D
Methyl methacrylate	80-62-6	3.37	N/D	980	N/D	N/D
methyl tert-butyl ether	1634-04-4	100	N/D	N/D	N/D	N/D
Methylnaphthalene, 2-	91-57-6	0.014	N/D	3.2	N/D	N/D
N-nitrosodimethylamine	62-44-2	1.41	N/D	12	N/D	N/D
Perylene	198-55-0	N/D	N/D	N/D	N/D	N/D
Phosphine imide, P,P,P-triphenyl	2240-47-3	N/D	N/D	N/D	N/D	N/D
Propylbenzene, n-	103-65-1	0.016	N/D	N/D	N/D	N/D
Propylene oxide	75-56-9	N/D	N/D	N/D	N/D	N/D
Xylenes (mixed isomers)	1330-20-7	8.60E-02	N/D	10	N/D	N/D

BW = body weight.
N/D = no data were available from the reviewed databases and TRV sources.

(a) Listed compounds consist of those selected for consideration in the ecological risk assessment that are not addressed by USEPA in its 1999 Screening Level Ecological Risk Assessment Protocol.

Table 2
Mammal, Bird and Plant Toxicity Reference Values for Compounds Not Included in USEPA's Screening Level Ecological Risk Assessment Protocol

Compound	CAS NO.	Mammals & Birds								Plants	
		CalTox [a]		Sample, 1996 [b]		Schafer		HSDB		Efroymson [e]	EPA Reg V [f]
		Mammal	Bird	Mammal (mg/kg-d)	Bird (mg/kg-d)	Mammal [c]	Bird [d]	Mammal	Bird	(mg/kg)	(mg/kg)
Cobalt	7440-48-4	-	-	-	-	-	-			20	0.14
Manganese	7439-96-5	-	-	88	977	-	-			500	-
Vanadium	7440-62-2	-	-	0.21	11.4	-	-			2	1.59
1,1-Dichloropropene	563-58-6	-	-	-	-	-	-			-	-
1,2,4-Trimethylbenzene	95-63-6	-	-	-	-	-	-			-	-
1,2-Dichloroethene	540-59-0	-	-	-	-	-	-			-	-
1,3-Dichloropropane	142-28-9	-	-	-	-	-	-			-	-
trans-1,3-Dichloropropene	10061-02-6	-	-	-	-	-	-			-	-
1-Hexane	110-54-3	-	-	-	-	-	-			-	-
2,2'-oxybis (1-Chloropropane)	108-60-1	-	-	-	-	-	-			-	19.9
2,2-Dichloropropane	594-20-7	-	-	-	-	-	-			-	-
2,5-Dimethylfuran	625-86-5	-	-	-	-	-	-			-	-
2,5-Dimethylheptane	2216-30-0	-	-	-	-	-	-			-	-
2,5-Dione, 3-hexene	17559-81-8	-	-	-	-	-	-			-	-
2-Chlorotoluene	95-49-8	-	-	-	-	-	-			-	-
2-Hexanone	591-78-6	-	-	-	-	-	-			-	12.6
2-Methyl octane	3221-61-2	-	-	-	-	-	-			-	-
3-Ethyl benzaldehyde	34246-54-3	-	-	-	-	-	-			-	-
3-Hexen-2-one	763-93-9	-	-	-	-	-	-			-	-
3-Penten-2-one (ethylidene acetone)	625-33-2	-	-	-	-	-	-			-	-
3-Penten-2-one, 4-methyl	141-79-7	-	-	-	-	-	-			-	-
4,6-Dinitro-2-methylphenol	534-52-1	-	-	-	-	-	-			-	0.144
4-Chlorotoluene	106-43-4	-	-	-	-	-	-			-	-
4-Ethyl benzaldehyde	4748-78-1	-	-	-	-	-	-			-	-
9-Octadecenamide (oleamide)	301-02-0	-	-	-	-	-	-			-	-
Acenaphthylene	208-96-8	-	-	-	-	-	-			-	682
Acrylic Acid	79-10-7	-	-	-	-	-	-			-	-
Benzidine	92-87-5	-	-	-	-	-	-			-	-
Benzo(e)pyrene	192-97-2	-	-	-	-	-	-			-	-
Benzo(g,h,i)perylene	191-24-2	-	-	-	-	-	-			-	119
Benzoic acid, methyl ester (methyl benzoate)	93-58-3	-	-	-	-	-	-			-	-
delta-BHC	319-86-8	-	-	-	-	-	-			-	9.94
BHC, gamma (Lindane; γ-hexachlorocyclohexane)	58-89-9	-	-	8	2	-	-			-	0.005
Bis(2-chloroethoxy)methane	111-91-1	-	-	-	-	-	-			-	0.302
Bromobenzene	108-86-1	-	-	-	-	-	-			-	-
Bromochloromethane	74-97-5	-	-	-	-	-	-			-	-
n-Butylbenzene	104-51-8	-	-	-	-	-	-			-	-
sec-Butylbenzene	135-98-8	-	-	-	-	-	-			-	-
tert-Butylbenzene	98-06-6	-	-	-	-	-	-			-	-
Carbazole	86-74-8	-	-	-	-	-	-			-	-
alpha-Chlordane	5103-71-9	-	-	4.58	2.14	-	-			-	-
beta-Chlordane	5103-74-2	-	-	-	-	-	-			-	-
Dibenzofuran	132-64-9	-	-	-	-	-	-			-	-
Diphenylamine	122-39-4	-	-	-	-	-	-			-	1.01
Endosulfan II	33213-65-9	-	-	-	-	-	-			-	0.119
Endosulfan sulfate	1031-07-8	-	-	-	-	-	-			-	-
Endrin aldehyde	7421-93-4	-	-	-	-	-	-			-	0.0105
Endrin ketone	53494-70-5	-	-	-	-	-	-			-	-
Ethylene Glycol	107-21-1	-	-	-	-	-	-			-	-
Freon 133 (1,1,2-Trichloro-1,2,2-trifluoroethane)	76-13-1	-	-	-	-	-	-			-	-
Iodomethane	74-88-4	-	-	-	-	-	-			-	1.23
p-Isopropyltoluene	99-87-6	-	-	-	-	-	-			-	-
Methyl methacrylate	80-62-6	-	-	-	-	-	-			-	984
Methyl tert-Butyl Ether	1634-04-4	-	-	-	-	-	-			-	-
2-Methylnaphthalene	91-57-6	-	-	-	-	-	-			-	3.24
N-nitrosodimethylamine	62-44-2	-	-	-	-	-	-			-	11.7
Perylene	198-55-0	-	-	-	-	-	-			-	-
Phosphine imide, P,P,P-triphenyl	2240-47-3	-	-	-	-	-	-			-	-
n-Propylbenzene	103-65-1	-	-	-	-	-	-			-	-
Propylene Oxide	75-56-9	-	-	-	-	-	-			-	-
Xylene (mixed isomers)	1330-20-7	-	-	2.1	-	-	-			-	10

- = no benchmarks available

Notes:

[a] CalTox Database. California Environmental Protection Agency (CEPA). 2002. California Wildlife Exposure Factor and Toxicity Database (CalTox). Office of Environmental Health Hazard Assessment. http://www.oehha.org/cal_ecotox. Accessed May 23, 2007.

[b] Sample, B., Opresko, D., Suter, G. 1996. Toxicological Benchmarks for Wildlife. 1996 Revision. ES/ER/TM-86/R3.

[c] Schafer, E.W., and Bowles, W.A. 1985. Acute oral toxicity and repellency of 933 chemicals to house mice and deer mice. Arch. Environ. Contam. Toxicol. 14(1):111-129.

[d] Schafer, E.W., Bowles, W.A., and Hurlbut, J. 1983. The acute oral toxicity, repellency, and hazard potential of 998 chemicals to one or more species of wild and domestic birds. Arch. Envriron. Contam. Toxicol. 12:355-382.

[e] Efroymson, R.A, M. E. Will, G. W. Suter II, and A. C. Wooten. 1997. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision. Prepared for the U.S. Department of Energy. ES/ER/TM-85/R3. November 1997.

[f] USEPA. 2003. USEPA, Region V, RCRA Ecological Screening Levels. August 22, 2003.

Table 3
Detailed Summary of Mammal Benchmarks from Sample *et al* . 1996

Compound	CAS NO.	Test Species	NOAEL (mg/kg-d)	Endpoint	Duration
Cobalt	7440-48-4	-	-	-	-
Manganese	7439-96-5	Rat	88	Reproduction	Chronic
Vanadium	7440-62-2	Rat	0.21	Reproduction	Chronic
1,1-Dichloropropene	563-58-6	-	-	-	-
1,2,4-Trimethylbenzene	95-63-6	-	-	-	-
1,2-Dichloroethene	540-59-0	-	-	-	-
1,3-Dichloropropane	142-28-9	-	-	-	-
trans-1,3-Dichloropropene	10061-02-6	-	-	-	-
1-Hexane	110-54-3	-	-	-	-
2,2'-oxybis (1-Chloropropane)	108-60-1	-	-	-	-
2,2-Dichloropropane	594-20-7	-	-	-	-
2,5-Dimethylfuran	625-86-5	-	-	-	-
2,5-Dimethylheptane	2216-30-0	-	-	-	-
2,5-Dione, 3-hexene	17559-81-8	-	-	-	-
2-Chlorotoluene	95-49-8	-	-	-	-
2-Hexanone	591-78-6	-	-	-	-
2-Methyl octane	3221-61-2	-	-	-	-
3-Ethyl benzaldehyde	34246-54-3	-	-	-	-
3-Hexen-2-one	763-93-9	-	-	-	-
3-Penten-2-one (ethylidene acetone)	625-33-2	-	-	-	-
3-Penten-2-one, 4-methyl	141-79-7	-	-	-	-
4,6-Dinitro-2-methylphenol	534-52-1	-	-	-	-
4-Chlorotoluene	106-43-4	-	-	-	-
4-Ethyl benzaldehyde	4748-78-1	-	-	-	-
9-Octadecenamide (oleamide)	301-02-0	-	-	-	-
Acenaphthylene	208-96-8	-	-	-	-
Acrylic Acid	79-10-7	-	-	-	-
Benzidine	92-87-5	-	-	-	-
Benzo(e)pyrene	192-97-2	-	-	-	-
Benzo(g,h,i)perylene	191-24-2	-	-	-	-
Benzoic acid, methyl ester (methyl benzoate)	93-58-3	-	-	-	-
delta-BHC	319-86-8	-	-	-	-
BHC, gamma (Lindane; γ-hexachlorocyclohexane)	58-89-9	Rat	8	Reproduction	Chronic
Bis(2-chloroethoxy)methane	111-91-1	-	-	-	-
Bromobenzene	108-86-1	-	-	-	-
Bromochloromethane	74-97-5	-	-	-	-
n-Butylbenzene	104-51-8	-	-	-	-
sec-Butylbenzene	135-98-8	-	-	-	-
tert-Butylbenzene	98-06-6	-	-	-	-
Carbazole	86-74-8	-	-	-	-
alpha-Chlordane	5103-71-9	Mouse	4.58	Reproduction	Chronic
beta-Chlordane	5103-74-2	-	-	-	-
Dibenzofuran	132-64-9	-	-	-	-
Diphenylamine	122-39-4	-	-	-	-
Endosulfan II	33213-65-9	-	-	-	-
Endosulfan sulfate	1031-07-8	-	-	-	-
Endrin aldehyde	7421-93-4	-	-	-	-
Endrin ketone	53494-70-5	-	-	-	-
Ethylene Glycol	107-21-1	-	-	-	-
Freon 133 (1,1,2-Trichloro-1,2,2-trifluoroethane)	76-13-1	-	-	-	-
Iodomethane	74-88-4	-	-	-	-
p-Isopropyltoluene	99-87-6	-	-	-	-
Methyl methacrylate	80-62-6	-	-	-	-
Methyl tert-Butyl Ether	1634-04-4	-	-	-	-
2-Methylnaphthalene	91-57-6	-	-	-	-
N-nitrosodimethylamine	62-44-2	-	-	-	-
Perylene	198-55-0	-	-	-	-
Phosphine imide, P,P,P-triphenyl	2240-47-3	-	-	-	-
n-Propylbenzene	103-65-1	-	-	-	-
Propylene Oxide	75-56-9	-	-	-	-
Xylene (mixed isomers)	1330-20-7	Mouse	2.1	Reproduction	Chronic

- = no data available.

Table 4
Detailed Summary of Avian Benchmarks from Sample *et al* . 1996

Compound	CAS NO.	Test Species	NOAEL (mg/kg-d)	Endpoint	Duration
Cobalt	7440-48-4	-	-	-	-
Manganese	7439-96-5	Japanese quail	977	Growth	Chronic
Vanadium	7440-62-2	Mallard	11.4	Mortality	Chronic
1,1-Dichloropropene	563-58-6	-	-	-	-
1,2,4-Trimethylbenzene	95-63-6	-	-	-	-
1,2-Dichloroethene	540-59-0	-	-	-	-
1,3-Dichloropropane	142-28-9	-	-	-	-
trans-1,3-Dichloropropene	10061-02-6	-	-	-	-
1-Hexane	110-54-3	-	-	-	-
2,2'-oxybis (1-Chloropropane)	108-60-1	-	-	-	-
2,2-Dichloropropane	594-20-7	-	-	-	-
2,5-Dimethylfuran	625-86-5	-	-	-	-
2,5-Dimethylheptane	2216-30-0	-	-	-	-
2,5-Dione, 3-hexene	17559-81-8	-	-	-	-
2-Chlorotoluene	95-49-8	-	-	-	-
2-Hexanone	591-78-6	-	-	-	-
2-Methyl octane	3221-61-2	-	-	-	-
3-Ethyl benzaldehyde	34246-54-3	-	-	-	-
3-Hexen-2-one	763-93-9	-	-	-	-
3-Penten-2-one (ethylidene acetone)	625-33-2	-	-	-	-
3-Penten-2-one, 4-methyl	141-79-7	-	-	-	-
4,6-Dinitro-2-methylphenol	534-52-1	-	-	-	-
4-Chlorotoluene	106-43-4	-	-	-	-
4-Ethyl benzaldehyde	4748-78-1	-	-	-	-
9-Octadecenamide (oleamide)	301-02-0	-	-	-	-
Acenaphthylene	208-96-8	-	-	-	-
Acrylic Acid	79-10-7	-	-	-	-
Benzidine	92-87-5	-	-	-	-
Benzo(e)pyrene	192-97-2	-	-	-	-
Benzo(g,h,i)perylene	191-24-2	-	-	-	-
Benzoic acid, methyl ester (methyl benzoate)	93-58-3	-	-	-	-
delta-BHC	319-86-8	-	-	-	-
BHC, gamma (Lindane; γ-hexachlorocyclohexane)	58-89-9	Mallard	2	Reproduction	Chronic
Bis(2-chloroethoxy)methane	111-91-1	-	-	-	-
Bromobenzene	108-86-1	-	-	-	-
Bromochloromethane	74-97-5	-	-	-	-
n-Butylbenzene	104-51-8	-	-	-	-
sec-Butylbenzene	135-98-8	-	-	-	-
tert-Butylbenzene	98-06-6	-	-	-	-
Carbazole	86-74-8	-	-	-	-
alpha-Chlordane	5103-71-9	Redwinged blackbird	2.14	Mortality	Chronic
beta-Chlordane	5103-74-2	-	-	-	-
Dibenzofuran	132-64-9	-	-	-	-
Diphenylamine	122-39-4	-	-	-	-
Endosulfan II	33213-65-9	-	-	-	-
Endosulfan sulfate	1031-07-8	-	-	-	-
Endrin aldehyde	7421-93-4	-	-	-	-
Endrin ketone	53494-70-5	-	-	-	-
Ethylene Glycol	107-21-1	-	-	-	-
Freon 133 (1,1,2-Trichloro-1,2,2-trifluoroethane)	76-13-1	-	-	-	-
Iodomethane	74-88-4	-	-	-	-
p-Isopropyltoluene	99-87-6	-	-	-	-
Methyl methacrylate	80-62-6	-	-	-	-
Methyl tert-Butyl Ether	1634-04-4	-	-	-	-
2-Methylnaphthalene	91-57-6	-	-	-	-
N-nitrosodimethylamine	62-44-2	-	-	-	-
Perylene	198-55-0	-	-	-	-
Phosphine imide, P,P,P-triphenyl	2240-47-3	-	-	-	-
n-Propylbenzene	103-65-1	-	-	-	-
Propylene Oxide	75-56-9	-	-	-	-
Xylene (mixed isomers)	1330-20-7	-	-	-	-

- = no data available.

Table 5
Summary of Surface Water and Sediment Toxicity Reference Values for Aquatic Life
for Compounds Not Included in USEPA's Screening Level Ecological Risk Assessment Protocol

Compound	CAS NO.	Surface Water (ug/L)						Sediment (mg/kg)		
		ADEQ WQS [a]	NRWQC [b]	ETs [c]	Mayer & Ellersieck [d]	Ecotox Database [e]	Final Benchmark [f]	NOAA [h]	MacDonald TECs [g]	Final Benchmark [f]
Cobalt	7440-48-4	-	-	3	-	-	3	-	-	-
Manganese	7439-96-5	-	-	80	-	-	80	-	-	-
Vanadium	7440-62-2	-	-	19	-	-	19	-	-	-
1,1-Dichloropropene	563-58-6	-	-	-	-	-	-	-	-	-
1,2,4-Trimethylbenzene	95-63-6	-	-	-	-	77.2	77.2	-	-	-
1,2-Dichloroethene	540-59-0	-	-	-	-	1,400	1,400	-	-	-
1,3-Dichloropropane	142-28-9	-	-	-	-	1,310	1,310	-	-	-
trans-1,3-Dichloropropene	10061-02-6	-	-	-	-	-	-	-	-	-
1-Hexane	110-54-3	-	-	-	-	25	25	-	-	-
2,2'-oxybis (1-Chloropropane)	108-60-1	-	-	-	-	-	-	-	-	-
2,2-Dichloropropane	594-20-7	-	-	-	-	390	390	-	-	-
2,5-Dimethylfuran	625-86-5	-	-	-	-	711	711	-	-	-
2,5-Dimethylheptane	2216-30-0	-	-	-	-	-	-	-	-	-
2,5-Dione, 3-hexene	17559-81-8	-	-	-	-	-	-	-	-	-
2-Chlorotoluene	95-49-8	-	-	-	-	140	140	-	-	-
2-Hexanone	591-78-6	-	-	-	-	4,280	4,280	-	-	-
2-Methyl octane	3221-61-2	-	-	-	-	-	-	-	-	-
3-Ethyl benzaldehyde	34246-54-3	-	-	-	-	-	-	-	-	-
3-Hexen-2-one	763-93-9	-	-	-	-	-	-	-	-	-
3-Penten-2-one (ethylidene acetone)	625-33-2	-	-	-	-	-	-	-	-	-
3-Penten-2-one, 4-methyl	141-79-7	-	-	-	-	-	-	-	-	-
4,6-Dinitro-2-methylphenol	534-52-1	24	-	-	-	-	24	-	-	-
4-Chlorotoluene	106-43-4	-	-	-	-	3,400	3,400	-	-	-
4-Ethyl benzaldehyde	4748-78-1	-	-	-	-	-	-	-	-	-
9-Octadecenamide (oleamide)	301-02-0	-	-	-	-	-	-	-	-	-
Acenaphthylene	208-96-8	-	-	-	-	-	-	-	-	-
Acrylic Acid	79-10-7	-	-	-	-	3,800	3,800	-	-	-
Benzidine	92-87-5	89	-	-	-	-	89	-	-	-
Benzo(e)pyrene	192-97-2	-	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	191-24-2	-	-	-	-	-	-	-	-	-
Benzoic acid, methyl ester (methyl benzoate)	93-58-3	-	-	-	-	2,331	2,331	-	-	-
delta-BHC	319-86-8	130	-	-	-	-	130	-	-	-
BHC, gamma (Lindane; γ-hexachlorocyclohexane)	58-89-9	0.28	-	0.08	-	-	0.28	0.00032	0.00237	0.00032
Bis(2-chloroethoxy)methane	111-91-1	-	-	-	-	1,840	1,840	-	-	-
Bromobenzene	108-86-1	-	-	-	-	56	56	-	-	-
Bromochloromethane	74-97-5	-	-	-	-	-	-	-	-	-
n-Butylbenzene	104-51-8	-	-	-	-	-	-	-	-	-
sec-Butylbenzene	135-98-8	-	-	-	-	-	-	-	-	-
tert-Butylbenzene	98-06-6	-	-	-	-	650	650	-	-	-
Carbazole	86-74-8	-	-	-	-	14.9	14.9	-	-	-
alpha-Chlordane	5103-71-9	-	-	-	0.0709	-	0.0709	-	0.00324	0.00324
beta-Chlordane	5103-74-2	-	-	-	0.505	-	0.505	-	0.00324	0.00324
Dibenzofuran	132-64-9	-	-	20	-	-	20	-	-	-
Diphenylamine	122-39-4	-	-	-	-	37.9	37.9	-	-	-
Endosulfan II	33213-65-9	-	0.056	0.051	-	-	0.056	-	-	-
Endosulfan sulfate	1031-07-8	0.06	-	-	-	-	0.06	-	-	-
Endrin aldehyde	7421-93-4	0.08	-	-	-	-	0.08	-	-	-

Table 5
Summary of Surface Water and Sediment Toxicity Reference Values for Aquatic Life
for Compounds Not Included in USEPA's Screening Level Ecological Risk Assessment Protocol

Compound	CAS NO.	Surface Water (ug/L)						Sediment (mg/kg)		
		ADEQ WQS [a]	NRWQC [b]	ETs [c]	Mayer & Ellersieck [d]	Ecotox Database [e]	Final Benchmark [f]	NOAA [h]	MacDonald TECs [g]	Final Benchmark [f]
Endrin ketone	53494-70-5	-	-	-	-	-	-	-	-	-
Ethylene Glycol	107-21-1	-	-	-	1,000,000	-	1,000,000	-	-	-
Freon 133 (1,1,2-Trichloro-1,2,2-trifluoro	76-13-1	-	-	-	-	-	-	-	-	-
Iodomethane	74-88-4	-	-	-	-	-	-	-	-	-
p-Isopropyltoluene	99-87-6	-	-	-	-	46	46	-	-	-
Methyl methacrylate	80-62-6	-	-	-	-	3,370	3370	-	-	-
Methyl tert-Butyl Ether	1634-04-4	-	-	-	-	100,000	100000	-	-	-
2-Methylnaphthalene	91-57-6	-	-	-	-	14.56	14.56	-	-	-
N-nitrosodimethylamine	62-44-2	-	-	-	-	1,410	1,410	-	-	-
Perylene	198-55-0	-	-	-	-	-	-	-	-	-
Phosphine imide, P,P,P-triphenyl	2240-47-3	-	-	-	-	-	-	-	-	-
n-Propylbenzene	103-65-1	-	-	-	-	15.5	15.5	-	-	-
Propylene Oxide	75-56-9	-	-	-	-	-	-	-	-	-
Xylene (mixed isomers)	1330-20-7	-	-	-	86	-	86	-	-	-

- = no benchmarks available.

[a] Arizona Department of Environmental Quality. 2003. Title 18, Chapter 11. ADEQ Water Quality Standards. http://www.azsos.gov/public_services/Title_18/18-11.htm

[b] U.S. Environmental Protection Agency (EPA). 2005. National Recommended Water Quality Criteria: 2005. www.epa.gov/waterscience/criteria/wqcriteria.html.

[c] U.S. Environmental Protection Agency (USEPA). 1996. Eco Update. Ecotox Thresholds. Office of Solid Waste and Emergency Response. EPA 540/F-95/038.

[d] Mayer, F.L. and Ellersieck, M.R. 1986. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. U.S. Fish and Wildlife Service, Washington, DC. Resource Publication 160.

[e] U.S. Environmental Protection Agency (USEPA). 2007. EcoTox Database. http://www.epa.gov/ecotox. Accessed May 22, 2007.

[f] Final benchmark selected according to project data source hierarchy.

[g] MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000. Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystem. Archives of Environmental Contamination and Toxicology 39:20-31.

[h] National Oceanic and Atomospheric Administration (NOAA). 2006. Screening Quick Reference Table (SQuiRTs). Hazmat Report 99-1.

Table 6
Summary of Aquatic Toxicity Values from Mayer & Ellersieck (1986)

Compound	CAS NO	Test Species	Effect	Duration	Concentration (ug/L)	Adjustment [a]	Final Benchmark	Page
Cobalt	7440-48-4	-	-	-	-	-	-	-
Manganese	7439-96-5	-	-	-	-	-	-	-
Vanadium	7440-62-2	-	-	-	-	-	-	-
1,1-Dichloropropene	563-58-6	-	-	-	-	-	-	-
1,2,4-Trimethylbenzene	95-63-6	-	-	-	-	-	-	-
1,2-Dichloroethene	540-59-0	-	-	-	-	-	-	-
1,3-Dichloropropane	142-28-9	-	-	-	-	-	-	-
trans-1,3-Dichloropropene	10061-02-6	-	-	-	-	-	-	-
1-Hexane	110-54-3	-	-	-	-	-	-	-
2,2'-oxybis (1-Chloropropane)	108-60-1	-	-	-	-	-	-	-
2,2-Dichloropropane	594-20-7	-	-	-	-	-	-	-
2,5-Dimethylfuran	625-86-5	-	-	-	-	-	-	-
2,5-Dimethylheptane	2216-30-0	-	-	-	-	-	-	-
2,5-Dione, 3-hexene	17559-81-8	-	-	-	-	-	-	-
2-Chlorotoluene	95-49-8	-	-	-	-	-	-	-
2-Hexanone	591-78-6	-	-	-	-	-	-	-
2-Methyl octane	3221-61-2	-	-	-	-	-	-	-
3-Ethyl benzaldehyde	34246-54-3	-	-	-	-	-	-	-
3-Hexen-2-one	763-93-9	-	-	-	-	-	-	-
3-Penten-2-one (ethylidene acetone)	625-33-2	-	-	-	-	-	-	-
3-Penten-2-one, 4-methyl	141-79-7	-	-	-	-	-	-	-
4,6-Dinitro-2-methylphenol	534-52-1	-	-	-	-	-	-	-
4-Chlorotoluene	106-43-4	-	-	-	-	-	-	-
4-Ethyl benzaldehyde	4748-78-1	-	-	-	-	-	-	-
9-Octadecenamide (oleamide)	301-02-0	-	-	-	-	-	-	-
Acenaphthylene	208-96-8	-	-	-	-	-	-	-
Acrylic Acid	79-10-7	-	-	-	-	-	-	-
Benzidine	92-87-5	-	-	-	-	-	-	-
Benzo(e)pyrene	192-97-2	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	191-24-2	-	-	-	-	-	-	-
Benzoic acid, methyl ester (methyl benzoate)	93-58-3	-	-	-	-	-	-	-
delta-BHC	319-86-8	-	-	-	-	-	-	-
BHC, gamma (Lindane; γ-hexachlorocyclohexane)	58-89-9	-	-	-	-	-	-	-
Bis(2-chloroethoxy)methane	111-91-1	-	-	-	-	-	-	-
Bromobenzene	108-86-1	-	-	-	-	-	-	-
Bromochloromethane	74-97-5	-	-	-	-	-	-	-

Table 6
Summary of Aquatic Toxicity Values from Mayer & Ellersieck (1986)

Compound	CAS NO	Test Species	Effect	Duration	Concentration (ug/L)	Adjustment [a]	Final Benchmark	Page
n-Butylbenzene	104-51-8	-	-	-	-	-	-	-
sec-Butylbenzene	135-98-8	-	-	-	-	-	-	-
tert-Butylbenzene	98-06-6	-	-	-	-	-	-	-
Carbazole	86-74-8	-	-	-	-	-	-	-
alpha-Chlordane	5103-71-9	Bluegill	LC50	96-hr	7.09	100	0.0709	80
beta-Chlordane	5103-74-2	Bluegill	LC50	96 hr	50.5	100	0.505	82
Dibenzofuran	132-64-9	-	-	-	-	-	-	-
Diphenylamine	122-39-4	-	-	-	-	-	-	-
Endosulfan II	33213-65-9	-	-	-	-	-	-	-
Endosulfan sulfate	1031-07-8	-	-	-	-	-	-	-
Endrin aldehyde	7421-93-4	-	-	-	-	-	-	-
Endrin ketone	53494-70-5	-	-	-	-	-	-	-
Ethylene Glycol	107-21-1	Bluegill	LC50	96	100,000,000	100	1,000,000	218
Freon 133 (1,1,2-Trichloro-1,2,2-trifluoroethane)	76-13-1	-	-	-	-	-	-	-
Iodomethane	74-88-4	-	-	-	-	-	-	-
p-Isopropyltoluene	99-87-6	-	-	-	-	-	-	-
Methyl methacrylate	80-62-6	-	-	-	-	-	-	-
Methyl tert-Butyl Ether	1634-04-4	-	-	-	-	-	-	-
2-Methylnaphthalene	91-57-6	-	-	-	-	-	-	-
N-nitrosodimethylamine	62-44-2	-	-	-	-	-	-	-
Perylene	198-55-0	-	-	-	-	-	-	-
Phosphine imide, P,P,P-triphenyl	2240-47-3	-	-	-	-	-	-	-
n-Propylbenzene	103-65-1	-	-	-	-	-	-	-
Propylene Oxide	75-56-9	-	-	-	-	-	-	-
Xylene (mixed isomers)	1330-20-7	Bluegill	LC50	96	8600	100	86	502

- = no benchmarks available.
[a] An adjustment factor of 100 was applied in converting acute concentrations to chronic concentrations.

Source:
Mayer, F.L. and Ellersieck, M.R. 1986. Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals. U.S. Fish and Wildlife Service, Washington, DC. Resource Publication 160.

Table 7
Summary of Aquatic Toxicity Values from the Ecotox Database

Constituent	CAS NO.	Species name	Common Name	Group	Endpoint	Effect	Exposure Duration (days)	Concentration (ug/L)	Adjustment [a]	Final Benchmark (ug/L)
Cobalt	7440-48-4	-	-	-	-	-	-	-	-	-
Manganese	7439-96-5	-	-	-	-	-	-	-	-	-
Vanadium	7440-62-2	-	-	-	-	-	-	-	-	-
1,1-Dichloropropene	563-58-6	-	-	-	-	-	-	-	-	-
1,2,4-Trimethylbenzene	95-63-6	*Pimephales promelas*	Fathead minnow	Fish	LC50	Mortality	4	7,720	100	77.2
1,2-Dichloroethene	540-59-0	*Lepomis macrochirus*	Bluegill	Fish	LC50	Mortality	4	140,000	100	1,400
1,3-Dichloropropane	142-28-9	*Pimephales promelas*	Fathead minnow	Fish	LC50	Mortality	4	131,000	100	1,310
trans-1,3-Dichloropropene	10061-02-6	-	-	-	-	-	-	-	-	-
1-Hexane	110-54-3	*Pimephales promelas*	Fathead minnow	Fish	LC50	Mortality	4	2,500	100	25
2,2'-oxybis (1-Chloropropane)	108-60-1	-	-	-	-	-	-	-	-	-
2,2-Dichloropropane	594-20-7	*Scenedesmus subpicatus*	Green algae	Algae	EC50	Mortality	4	39,000	100	390
2,5-Dimethylfuran	625-86-5	*Pimephales promelas*	Fathead minnow	Fish	LC50	Mortality	4	71,100	100	711
2,5-Dimethylheptane	2216-30-0	-	-	-	-	-	-	-	-	-
2,5-Dione, 3-hexene	17559-81-8	-	-	-	-	-	-	-	-	-
2-Chlorotoluene	95-49-8	*Daphnia magna*	Water flea	Crustaceans	NOEC	Reproduction	21	140	1	140
2-Hexanone	591-78-6	*Pimephales promelas*	Fathead minnow	Fish	LC50	Mortality	4	428,000	100	4,280
2-Methyl octane	3221-61-2	-	-	-	-	-	-	-	-	-
3-Ethyl benzaldehyde	34246-54-3	-	-	-	-	-	-	-	-	-
3-Hexen-2-one	763-93-9	-	-	-	-	-	-	-	-	-
3-Penten-2-one (ethylidene acetone)	625-33-2	-	-	-	-	-	-	-	-	-
3-Penten-2-one, 4-methyl	141-79-7	-	-	-	-	-	-	-	-	-
4,6-Dinitro-2-methylphenol	534-52-1	-	-	-	-	-	-	-	-	-
4-Chlorotoluene	106-43-4	*Danio rerio*	Zebra danio	Fish	NOEC	Reproduction	28	3,400	1	3,400
4-Ethyl benzaldehyde	4748-78-1	-	-	-	-	-	-	-	-	-
9-Octadecenamide (oleamide)	301-02-0	-	-	-	-	-	-	-	-	-
Acenaphthylene	208-96-8	-	-	-	-	-	-	-	-	-
Acrylic Acid	79-10-7	*Daphnia magna*	Water flea	Crustaceans	NOEC	Reproduction	21	3,800	1	3,800
Benzidine	92-87-5	-	-	-	-	-	-	-	-	-
Benzo(e)pyrene	192-97-2	-	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	191-24-2	-	-	-	-	-	-	-	-	-
Benzoic acid, methyl ester (methyl benzoate)	93-58-3	*Ptychocheilus oregonensis*	Northern squawfish	Fish	IC50	Population	2	233,130	100	2331.3
delta-BHC	319-86-8	-	-	-	-	-	-	-	-	-
BHC, gamma (Lindane; γ-hexachlorocyclohexane)	58-89-9	-	-	-	-	-	-	-	-	-
Bis(2-chloroethoxy)methane	111-91-1	*Pimephales promelas*	Fathead minnow	Fish	LC50	Mortality	4	184,000	100	1,840
Bromobenzene	108-86-1	*Pimephales promelas*	Fathead minnow	Fish	LC50	Mortality	4	5,600	100	56
Bromochloromethane	74-97-5	-	-	-	-	-	-	-	-	-
n-Butylbenzene	104-51-8	-	-	-	-	-	-	-	-	-
sec-Butylbenzene	135-98-8	-	-	-	-	-	-	-	-	-
tert-Butylbenzene	98-06-6	*Leuciscus idus melanotus*	Carp	Fish	LC50	Mortality	2	65,000	100	650
Carbazole	86-74-8	*Pimephales promelas*	Fathead minnow	Fish	LC50	Mortality	4	1,490	100	14.9
alpha-Chlordane	5103-71-9	-	-	-	-	-	-	-	-	-
beta-Chlordane	5103-74-2	-	-	-	-	-	-	-	-	-
Dibenzofuran	132-64-9	-	-	-	-	-	-	-	-	-
Diphenylamine	122-39-4	*Pimephales promelas*	Fathead minnow	Fish	LC50	Mortality	4	3,790	100	37.9

Table 7
Summary of Aquatic Toxicity Values from the Ecotox Database

Constituent	CAS NO.	Species name	Common Name	Group	Endpoint	Effect	Exposure Duration (days)	Concentration (ug/L)	Adjustment [a]	Final Benchmark (ug/L)
Endosulfan II	33213-65-9	-	-	-	-	-	-	-	-	-
Endosulfan sulfate	1031-07-8	-	-	-	-	-	-	-	-	-
Endrin aldehyde	7421-93-4	-	-	-	-	-	-	-	-	-
Endrin ketone	53494-70-5	-	-	-	-	-	-	-	-	-
Ethylene Glycol	107-21-1	-	-	-	-	-	-	-	-	-
Freon 133 (1,1,2-Trichloro-1,2,2-trifluoroethane)	76-13-1	-	-	-	-	-	-	-	-	-
Iodomethane	74-88-4	-	-	-	-	-	-	-	-	-
p-Isopropyltoluene	99-87-6	*Daphnia magna*	Water flea	Crustaceans	LC50	Mortality	2	4,600	100	46
Methyl methacrylate	80-62-6	*[b]*	[b]	[b]	[b]	[b]	4	337,000	100	3,370
Methyl tert-Butyl Ether	1634-04-4	*Rana temporaria*	Frog	Amphibians	NOEC	Development	45	100,000	1	100,000
2-Methylnaphthalene	91-57-6	*Onocorynchus mykiss*	Rainbow trout	Fish	LC50	Mortality	4	1,456	100	14.56
N-nitrosodimethylamine	62-44-2	*Gambusia affinis*	Western mosquitofish	Fish	LC50	Mortality	4	141,000	100	1,410
Perylene	198-55-0	-	-	-	-	-	-	-	-	-
Phosphine imide, P,P,P-triphenyl	2240-47-3	-	-	-	-	-	-	-	-	-
n-Propylbenzene	103-65-1	*Onocorynchus mykiss*	Rainbow trout	Fish	LC50	Mortality	4	1,550	100	15.5
Propylene Oxide	75-56-9	-	-	-	-	-	-	-	-	-
Xylene (mixed isomers)	1330-20-7	-	-	-	-	-	-	-	-	-

- = no benchmarks available.
[a] Acute (i.e. LC50, IC50) values were divided by 100 to estimate chronic values.

[b] Effects concentration for CAS# 80-62-6 was derived by calculating the average (mean) effects concentrations of the numerous studies presented in the database with warm water fish, 4-day LC50 tests with mortality endpoints.

Source: U.S. Environmental Protection Agency (USEPA). 2007. EcoTox Database. http://www.epa.gov/ecotox. Accessed May 22, 2007.

APPENDIX M
SECTION 2

TECHNICAL APPROACH FOR CALCULATING DOSES TO WILDLIFE SPECIES

This appendix presents the technical approach used to model exposures to receptor species via food chain pathways for the Siemens Water Technologies Corp. Carbon Reactivation Facility ("Facility") ecological risk assessment. The food chain models follow the approach outlined in USEPA's 1999 "*Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combus*tion *Facilities*" ("Protocol"). This appendix first describes the wildlife receptor species which were evaluated using food chain models. It then presents the food chain modeling equations. Finally, this appendix discusses specific input parameters and summarizes important input assumptions incorporated in the food chain models.

1.0 SELECTION OF WILDLIFE SPECIES

Receptor species which were selected for the food chain modeling are representative of various taxonomic groups, trophic levels, and feeding strategies which may occur within the variety of habitats in the Facility vicinity. The main risk assessment report, and the Working Draft Risk Assessment Workplan prepared for this project, provide more information on the approach used to select wildlife species for detailed evaluation. The wildlife species that were selected for evaluation using food chain models, and the habitat areas for each, consisted of the following:

- Badger – creosote bush scrub area
- Gambel's quail – creosote bush scrub area, agricultural area, riparian corridor area
- Great horned owl – creosote bush scrub area
- Burrowing owl – agricultural area
- Southwestern willow flycatcher – riparian corridor area
- Double crested cormorant – Colorado River area, Main Drain area
- Yuma clapper rail – riparian backwater area
- Mule deer – Main Drain area

2.0 DAILY DOSE CALCULATIONS

Exposures to the selected receptors were assessed by quantifying the daily dose of each evaluated chemical of potential concern (COPC) ingested through consumption of potentially impacted

food items (plants, terrestrial invertebrates, benthic invertebrates, fish, and animal prey) and environmental media (soil, sediment, and surface water). The following general equation was used to calculate the COPC daily dose for each receptor species (see Equation 5-1 in USEPA 1999):

$$DD = DD_{Tplant} + DD_{invert} + DD_{fish} + DD_{animal} + DD_{soil} + DD_{sed} + DD_{water} \qquad \text{(Equation 1)}$$

where

DD = total daily dose of COPC ingested per day (mg COPC/kg body weight-day)
DD_{Tplant} = amount of COPC ingested from terrestrial plants (mg COPC/kg body weight-day)
DD_{invert} = amount of COPC ingested from terrestrial or benthic invertebrate prey (mg COPC/kg body weight-day)
DD_{fish} = amount of COPC ingested from fish prey (mg COPC/kg body weight-day)
DD_{animal} = amount of COPC ingested from animal prey (mg COPC/kg body weight-day)
DD_{soil} = amount of COPC ingested from soil (mg COPC/kg body weight-day)
DD_{sed} = amount of COPC ingested from sediment (mg COPC/kg body weight-day)
DD_{water} = amount of COPC ingested from surface water (mg COPC/kg body weight-day)

Each of the terms in this equation are discussed in detail below.

2.1 Daily Doses from Incidental Ingestion of Environmental Media

This section presents equations for calculating daily doses from incidental ingestion of environmental media, specifically soil, sediment, and surface water.

Dose From Soil. Receptors may be exposed to COPCs through the incidental ingestion of soil while foraging. Doses of COPCs from soil were calculated using the following general equation (see Equation 5-1 in USEPA 1999):

$$DD_{soil} = IR_{soil} * C_{soil} * P_{soil} \qquad \text{(Equation 2)}$$

where

DD_{soil} = amount of COPC ingested from soil (mg COPC/kg body weight-day)
IR_{soil} = ingestion rate of soil (kg/kg body weight-day)
C_{soil} = concentration of COPC in soil (mg COPC/kg)
P_{soil} = proportion of ingested soil which is potentially contaminated (unitless)

Dose From Sediment. Receptors may be exposed to COPCs through the incidental ingestion of sediment while foraging. Doses of COPCs from sediment were calculated using the following general equation (see Equation 5-1 in USEPA 1999):

$$DD_{sed} = IR_{sed} * C_{sed} * P_{sed} \qquad \text{(Equation 3)}$$

where

DD_{sed} = amount of COPC ingested from sediment (mg COPC/kg body weight-day)
IR_{sed} = ingestion rate of sediment (kg/kg body weight-day)
C_{sed} = concentration of COPC in sediment (mg COPC/kg)
P_{sed} = proportion of ingested sediment which is potentially contaminated (unitless)

Dose from Surface Water. Receptors may also be exposed to COPCs through the ingestion of surface water. COPC doses from surface water were calculated using the following general equation:

$$DD_{water} = IR_{water} * C_{water} * P_{water} \qquad \text{(Equation 4)}$$

where

DD_{water} = amount of COPC ingested from water (mg COPC/kg body weight-day)
IR_{water} = surface water ingestion rate (L/kg body weight-day)
C_{water} = concentration (total) of COPC in surface water (mg COPC/L)
P_{water} = proportion of ingested surface water which is potentially contaminated (unitless)

2.2 Daily Doses from Consumption of Food

This section presents equations for estimating daily doses from ingestion of food items, including terrestrial plants, terrestrial and aquatic invertebrates, fish, and animal prey.

Dose From Terrestrial Plants. Receptors may be exposed to COPCs through ingestion of terrestrial plant material. COPC doses from terrestrial plants were calculated using the following general equation (see Equation 5-1 in USEPA 1999):

$$DD_{Tplant} = FIR * C_{Tplant} * P_{Tplant} * F_{Tplant} \qquad \text{(Equation 5)}$$

where

DD_{Tplant} = wet weight amount of COPC ingested from terrestrial plants (mg COPC/kg body weight-day)
FIR = food ingestion rate (kg wet weight/kg body weight-day)

C_{Tplant} = wet weight COPC concentration in terrestrial plant tissue (mg/kg WW)
P_{Tplant} = proportion of ingested plant material which is contaminated (unitless)
F_{Tplant} = fraction of diet from terrestrial plants

The concentrations of COPCs in plant tissue were modeled using the following general equation (see equation 5-6 in USEPA 1999):

$$C_{Tplant} = (P_d + P_v + P_r) * CF_{WW\text{-}Tplant} \qquad \text{(Equation 6)}$$

where

C_{Tplant} = wet weight COPC concentration in terrestrial plant tissue (mg COPC/kg)
P_d = COPC concentration in terrestrial plant tissue due to direct deposition (mg COPC/kg)
P_v = COPC concentration in terrestrial plant tissue due to air-to-plant transfer (mg COPC/kg)
P_r = COPC concentration in terrestrial plant tissue due to root-uptake (mg COPC/kg)
$CF_{WW\text{-}Tplant}$ = conversion factor from dry weight to wet weight (unitless)

The concentrations for P_d , P_v , and P_r were calculated according to equations presented in USEPA's 2005 Human Health Risk Assessment Protocol (HHRAP) and implemented using the IRAP software, as described in the human health risk assessment section of the main risk assessment report. Terrestrial plant concentrations used in the food chain model were calculated using the IRAP software. Terrestrial plant concentrations were converted from a dry weight to wet weight because the food ingestion rates used in the models require inputs in terms of wet weight.

Dose From Invertebrates. Receptors may be exposed to COPCs through ingestion of invertebrate prey. COPC doses from benthic and terrestrial invertebrates were calculated using the following general equation (see Equation 5-1 in USEPA 1999):

$$DD_{invert} = FIR * C_{invert} * P_{invert} * F_{invert} \qquad \text{(Equation 7)}$$

where

DD_{invert} = amount of COPC ingested from invertebrates (mg COPC/kg body weight-day)
FIR = food ingestion rate (kg wet weight/kg bodyweight-day)
C_{invert} = wet weight COPC concentration in invertebrate tissue (mg/kg)
P_{invert} = proportion of ingested invertebrate prey which is potentially contaminated (unitless)
F_{invert} = fraction of diet from invertebrates (unitless)

The concentrations of COPCs in terrestrial and benthic invertebrate tissue were modeled using the following general equation (see Equation 5-3 in USEPA 1999):

$$C_{invert} = C_{soil/sed} * BCF_{invert} * CF_{WW\text{-}invert} \quad \text{(Equation 8)}$$

where

C_{invert} = wet weight concentration in benthic or terrestrial invertebrate tissue (mg COPC/kg WW)
$C_{soil/sed}$ = measured concentration of COPC in soil or sediment (mg COPC/kg)
BCF_{invert} = bioconcentration factor in benthic or terrestrial invertebrates (unitless)
$CF_{WW\text{-}invert}$ = conversion factor from dry weight to wet weight (unitless)

Invertebrate concentrations were converted from a dry weight to wet weight because the food ingestion rates used in the models require inputs in terms of wet weight.

Invertebrate BCFs for organic COPCs were calculated using the following equation from Southworth *et al*. (1978) (see Equations C-1-1 and C-1-9 in USEPA 1999):

$$\log BCF_{invert} = 0.819 \times \log K_{ow} - 1.146 \quad \text{(Equation 9)}$$

where

BCF_{invert} = bioconcentration factor in invertebrates (unitless)
K_{ow} = octanol-water partition coefficient (unitless)

Inorganic BCFs for terrestrial invertebrates were obtained from USEPA's Protocol (see Table C-1 in USEPA 1999); if a value was not provided, then the arithmetic average of the available BCFs for other inorganic COPCs (0.22) was used, as directed by the Protocol (see Section C-1.1 in USEPA 1999).

Inorganic BCFs for benthic invertebrates were also obtained from the Protocol (see Table C-6 in USEPA 1999); similarly, if a value was not provided, then the arithmetic average of the available BCFs for other inorganic COPCs (0.90) was used, as directed by the Protocol (see Section C-1.6 in USEPA 1999).

Crayfish, which are the primary prey item for the Yuma clapper rail, were generally treated as benthic invertebrates. However, the BCFs for PCDDs/PCDFs listed in the Protocol were refined for this study. USEPA's default BCFs for PCDDs/PCDFs in benthic invertebreates are based on the over 15-year old non-specific regression equation published by Southworth et al. (1978)

which is based on the Kow. For this project, and as described in the main risk assessment report, a review of recently published literature was performed to identify a more appropriate (i.e., based on experimental data) sediment-to-benthic invertebrate BCF specific to crayfish. The most recent and directly applicable study identified in the published literature evaluated bioaccumulation of 2,3,7,8-TCDF in crayfish from sediment (Currie et al., 2000). This study identified mean biota-to-sediment accumulation factors (BSAFs) ranging from 0.06 - 5.23 g/kg lipid per g/kg sediment organic carbon. The highest value provided in the Currie study was used to derive a sediment-to-benthic invertebrate (i.e., crayfish) BCF of 0.4 g 2,3,7,8-TCDF/kg tissue fresh weight per g/kg dry sediment, using the study's reported crayfish lipid content of 0.17%, USEPA's HHRAP default sediment organic carbon fraction of 0.04 (USEPA 2005), and a crayfish moisture content of 82% from the U.S. Department of Agriculture's National Nutrient Database.[1] Congener specific sediment-to-benthic crayfish BCFs were then derived for the other PCDD/PCDF congeners, except 2,3,7,8-TCDF, using the methodology presented in USEPA's Protocol (USEPA 1999) which relies on USEPA (1995) bioaccumulation equivalency factors (BEFs). Table 1 presents the PCDD/PCDF benthic invertebrate BSAFs calculated for this assessment.

Dose From Fish. Receptors may be exposed to COPCs through ingestion of fish prey. COPC doses from fish were calculated using the following general equation (see Equation 5-1 in USEPA 1999):

$$DD_{fish} = FIR * C_{fish} * P_{fish} * F_{fish} \qquad \text{(Equation 10)}$$

where

DD_{fish} = amount of COPC ingested from fish (mg COPC/kg body weight-day)
FIR = food ingestion rate (kg wet weight/kg bodyweight-day)
C_{fish} = wet weight COPC concentration in fish tissue (mg/kg)
P_{fish} = proportion of ingested fish which is potentially contaminated (unitless)
F_{fish} = fraction of diet from fish (unitless)

Fish tissue concentrations were calculated according to equations presented in USEPA's 2005 Human Health Risk Assessment Protocol (HHRAP) and implemented using the IRAP software, as described in the human health risk assessment section of the main risk assessment report.

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[1] U.S. Department of Agriculture Nutrient Database, Release 19. 2006. http://riley.nal.usda.gov/NDL.

Table 1
Derivation of Sediment-to-Benthic Crayfish PCDD/PCDF Bioconcentration Factors

Congener	USEPA (1999) Default BEF	Currie et al. 2000 (a)		Calculated Congener Specific BCF (c)
		Reported BSAF (g/kg lipid / g/kg sed OC)	Calculated Sediment-to-Benthic Organism BCF (g/kg tissue WW/ g/kg dry sed) (b)	
2,3,7,8-TCDD	1		0.50	0.5
1,2,3,7,8-PeCDD	0.9			0.45
1,2,3,4,7,8-HxCDD	0.3			0.15
1,2,3,7,8,9-HxCDD	0.1			0.05
1,2,3,6,7,8-HxCDD	0.1			0.05
1,2,3,4,6,7,8-HpCDD	0.051			0.0255
OCDD	0.012			0.006
2,3,7,8-TCDF	0.8	5.23	0.40	0.4
1,2,3,7,8-PeCDF	0.2			0.1
2,3,4,7,8-PeCDF	1.6			0.8
1,2,3,4,7,8-HxCDF	0.08			0.04
1,2,3,7,8,9-HxCDF	0.6			0.3
1,2,3,6,7,8-HxCDF	0.2			0.1
2,3,4,6,7,8-HxCDF	0.7			0.35
1,2,3,4,6,7,8-HpCDF	0.01			0.005
1,2,3,4,7,8,9-HpCDF	0.4			0.2
OCDF	0.016			0.008
fraction lipid (d)			0.017	
sediment foc (USEPA HHRAP 2005 default)			0.04	
crayfish moisture content (USDA Nat'l Nutrient Database)			0.82	

BCF - Bioaccumulation factor; BEF - Bioaccumulation equivalency factor; BSAF = Biota-to-sediment accumulation factor

DW - dry weight; WW = wet weight

foc - fraction organic carbon

g/kg - grams per kilogram; mg/kg - milligrams per kilogram

USEPA HHRAP = U.S. Environmental Protection Agency Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities

(a) Value from Currie et al. (2000) was highest value reported during the study duration

(b) Sediment-to-benthic organism BCF (g/kg tissue WW / g/kg dry sed) = BSAF (g/kg lipid / g/kg sed OC) * kg lipid/kg tissue DW * (1-moisture fraction, kg DW tissue/kg WW tissue) / (foc, kg sed OC/kg sed DW)

(c) Congener specific BCFs were calculated using the crayfish-specific TCDD BCF (0.5) and the USEPA (1999) default BEF (BCF=0.5 x BEF), except for 2,3,7,8-TCDF for which a congener-specific BCF (0.4) was obtained from the literature.

(d) Listed value reported by Currie et al. (2000).

Dose from Animal Prey. Receptors may be exposed to COPCs through ingestion of animal prey. COPC doses from animal prey were calculated using the following general equation (see Equation 5-1 in USEAP, 1999):

$$DD_{animal} = FIR * C_{animal} * P_{animal} * F_{animal} \quad \text{(Equation 11)}$$

where

DD_{animal} = amount of COPC ingested from animal prey (mg COPC/kg-day)
FIR = food ingestion rate (kg wet weight/kg bodyweight-day)
C_{animal} = wet weight concentration of COPC in animal prey tissue (mg/kg)
P_{animal} = proportion of ingested animal prey which is contaminated (unitless)
F_{animal} = fraction of diet from animal prey (unitless)

Animal prey concentrations were calculated using the following general equation (see USEPA 1999, Equation 5-11):

$$C_{animal} = C_{Tplant} * BCF_{animal} * P_{Tplant} * F_{Tplant} \quad \text{(Equation 12)}$$

where

C_{animal} = modeled wet weight concentration of COPC in animal prey tissue (mg/kg)
C_{Tplant} = wet weight concentration in terrestrial plant consumed by animal prey (mg/kg)
BCF_{animal} = bioconcentration factor in herbivorous animal prey (unitless)
P_{Tplant} =proportion of ingested terrestrial plant in animal prey diet which is potentially contaminated (unitless)
F_{Tplant} = fraction of diet from terrestrial vegetation in animal prey (unitless)

Plant concentrations were converted from a dry weight to wet weight because the food ingestion rates used in the models require inputs in terms of wet weight.

It was assumed that animal prey generally consist of rodents or other small mammals which themselves are primarily herbivores (USEPA 1993), thus F_{Tplant} was assumed to be 100 percent. It was assumed that prey obtain all water metabolically. It was also assumed that incidental ingestion of soil was negligible. Therefore, Equation 13 does not contain components for incidental ingestion of surface water or soil. The white footed mouse was used to represent rodents and small mammals in the food chain models. The white footed mouse was selected because they inhabit Arizona and dietary information and ingestion rates are provided in USEPA's Protocol for this mammal.

BCFs for herbivorous prey (white footed mouse) were obtained from USEPA's Protocol (see Table D-1 in USEPA 1999). If BCFs for animal prey were not provided, then BCFs were calculated using the following equation (see USEPA 1999, Equation D-1-1):

$$BCF_{animal} = Ba_{animal} * FIR \qquad \text{(Equation 13)}$$

where

BCF_{animal} = bioconcentration factor in animal prey (unitless)
Ba_{animal} = Ba_A = COPC-specific biotransfer factor applicable to animal prey (unitless)
FIR = food ingestion rate for the white footed mouse (0.614 kg WW/kg BW-day, see Table 5-1 in USEPA 1999)

Ba_{animal} values for herbivorous prey for evaluated organic COPCs not included in USEPA's Protocol were calculated using the following equation form Travis and Arms (1988) (see Equation D-1-4 in USEPA 1999)

$$\log Ba_{animal} = -7.6 + \text{Log } K_{ow} \qquad \text{(Equation 14)}$$

where

Ba_{animal} = COPC-specific biotransfer factor applicable to animal prey (unitless)
K_{ow} = octanol-water partition coefficient (unitless)

BCFs for inorganic COPCs not provided in the Protocol were derived from ingestion-to-beef transfer coefficients in Baes *et* al. (1984), as directed by the Protocol (see Section D-1.1 in USEPA 1999).

3.0 MODEL PARAMETERS AND ASSUMPTIONS

This section discusses sources and values of food chain model inputs and explains important assumptions adopted by the food chain model.

3.1 Exposure Point Concentrations

COPC exposure point concentrations (EPCs) in surface water, sediment, soil, plants and fish were modeled using fate and transport equations specified in USEPA's HHRAP, and implemented using the IRAP software (see main report text for additional information). The EPCs were based

on the calculated maximum annual concentrations rather than long-term multiyear averages, both of which are outputs of the IRAP software.

3.2 Dietary Parameters

Dietary parameters were selected from a range of values available in the published scientific literature, including USEPA (1999), USEPA (1993), and Beyer (1994). For each selected receptor, the food chain models evaluated only the predominant food source (i.e. exclusive diets). For example, the model assumed that 100% of the diet of the badger consisted of small mammals but no other food type. The food chain models also included incidental ingestion of environmental media.

Ingestion rates for food, soil, sediment, and surface water were calculated following the methodology used by USEPA in its Protocol (see Table 5-2 in USEPA 1999). In some cases, soil and sediment ingestion rates were not specific to the receptor species but instead were based on literature values for surrogate species with similar feeding strategies. For all terrestrial species except mule deer, receptors were assumed to obtain water metabolically. Table 5.2-1 in the main risk assessment report presents the detailed calculations and sources used to derive the dietary and environmental media ingestion rates.

Log K_{ow} values were used in some cases to calculate bioconcentration and biotransfer factors. The Kow values were obtained from HHRAP or from the values compiled for this project for compounds not addressed in HHRAP (see Appendix F).

Conversion factors used to adjust dry weight concentrations to wet weight concentrations were based on default values provided in USEPA's Protocol as follows:

Tissue Type	Conversion Factor	Source
Terrestrial Plant	0.12	Table 5-1 (USEPA 1999)
Terrestrial Invertebrate	0.167	Appendix C-1.1 (USEPA 1999)
Aquatic Invertebrate	0.167	Appendix C-1.6 (USEPA 1999)
Fish Tissue	0.20	Appendix C-1.5 (USEPA 1999)
Animal Tissue	0.32	Table 5-1 (USEPA 1999)

3.3 Exposure Parameters

The models assumed that 100% of the chemical ingested in the diet is bioavailable. The models also assumed that receptor species spend their entire life cycle in potentially impacted areas, and do not migrate to, nest in, or forage from sources outside the project study area boundaries.

4.0 REFERENCES

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APPENDIX M
SECTION 3

METHODS USED TO ADDRESS MIXTURES OF PCDDS/PCDFS IN THE ECOLOGICAL RISK ASSESSMENT

Introduction

This appendix provides information regarding methods used to evaluate mixtures of PCDDs/PCDFs in the ecological risk assessment. Two types of information are presented below. First, the method used to calculate PCDD/PCDF toxic equivalent (TEQ) concentrations is described, along with supporting tables. Second, the method used to calculate PCDD/PCDF concentrations in dietary prey species for input to the food chain modeling is presented, along with supporting tables.

Calculation of PCDD/PCDF Toxic Equivalent Concentrations

As noted in the main risk assessment report, PCDDs/PCDFs were evaluated using a toxicity reference value (TRV) based on 2,3,7,8-TCDD. Congener-specific toxic equivalency factors (TEFs) for fish, birds, and mammals were used to relate the toxicity of each congener to the toxicity of 2,3,7,8-TCDD. The USEPA-approved TEFs used in this assessment were presented in the project Workplan and were developed by the World Health Organization.

To apply the TEF concept in the ecological risk assessment, the congener-specific TEF was multiplied by its respective concentration in a given medium and the products were summed to obtain the total TCDD toxic equivalents (TEQs) of the mixture. This calculation was performed for each environmental medium and each food item addressed in the ecological risk assessment. The tables that follow present the results of these calculations. Table 1 presents the calculated TEF concentrations for the agricultural area, the creosote bush scrub area and the riparian corridor area. Table 2 presents the analogous concentrations for the Colorado River and Main Drain areas.

Calculation of Congener-Specific PCDD/PCDF Prey Concentrations

Exposures to PCDDs/PCDFs via the food chain were evaluated by calculating the concentration of each PCDD/PCDF congener in a number of prey items. The general approach for calculating concentrations in prey involved multiplying the environmental media concentration of each PCDD/PCDF congener (e.g., sediment, plant, or soil) by its congener-specific bioaccumulation factor (BCF). Once the prey concentrations were calculated for each PCDD/PCDF congener, then toxic equivalent concentrations reflecting the entire PCDD/PCDF mixture were calculated as described above.

The environmental media concentrations used to calculate prey concentrations were obtained from fate and transport modeling results which were determined according to USEPA's Human Health Risk Assessment Protocol (HHRAP) equations as implemented

by the IRAP software program. More information on the calculation of environmental media concentrations is provided in the main risk assessment report.

The congener-specific bioaccumulation factors for PCDDs/PCDFs were obtained from USEPA's 1999 Screening Level Ecological Risk Assessment Protocol for mammalian prey and terrestrial invertebrates. As described in the food chain modeling discussion elsewhere in this appendix and in the main risk assessment report, congener specific BCFs for benthic invertebrates were derived following the USEPA 1999 methodology, but were based on a recent published scientific study from which BCFs for crayfish were derived rather than the USEPA default BCF values. Crayfish were selected as the basis of the BCF because crayfish are the primary diet item for the Yuma clapper rail. The crayfish-specific BCFs were calculated using a 2,3,7,8-TCDD BCF (0.5 g/kg tissue WW/ g/kg dry sediment) and the congener-specific bioequivalence factors (BEFs) from USEPA 1999, except for 2,3,7,8-TCDF for which a congener-specific BCF (0.4 g/kg tissue WW/ g/kg dry sediment) was obtained directly from the published scientific study.

The tables that follow show the resulting congener-specific PCDD/PCDF concentrations that were calculated in each prey item considered in the ecological risk assessment. Table 3 presents the mammalian BCFs and the calculated tissue concentrations in mammalian prey. Table 4 presents the terrestrial invertebrate BCFs and the calculated terrestrial invertebrate tissue concentrations. Table 5 present the benthic invertebrate BCFs and the calculated benthic invertebrate tissue concentrations.

Table 1
Calculation of PCDD/PCDF Toxic Equivalent Concentrations - Agricultural, Creosote Bush Scrub, Riparian Corridor Areas

				Agricultural Area (b)			Creosote Bush Scrub Area (b)			Riparian Corridor Area (b)		
Parameter	TEF Mammals (a)	TEF Birds (a)	TEF Fish (a)	Soil Concentration (mg/kg)	Plant Concentration (mg/kg)	Mammalian Prey Concentration (mg/kg)	Soil Concentration (mg/kg)	Plant Concentration (mg/kg)	Mammalian Prey Concentration (mg/kg)	Soil Concentration (mg/kg)	Plant Concentration (mg/kg)	Terrestrial Invertebrate Prey Concentration (mg/kg)
2,3,7,8-TCDD	1	1	1	8.7E-12	7.4E-14	1.1E-17	6.0E-10	8.4E-13	1.2E-16	9.0E-11	1.1E-13	1.4E-10
1,2,3,7,8-PeCDD	1	1	1	8.5E-12	1.8E-13	2.5E-17	1.5E-09	3.4E-12	4.5E-16	1.4E-10	3.2E-13	2.0E-10
1,2,3,4,7,8-HxCDD	0.1	0.05	0.5	4.1E-12	9.1E-14	4.1E-18	1.0E-09	1.9E-12	8.7E-17	8.2E-11	1.6E-13	4.0E-11
1,2,3,7,8,9-HxCDD	0.1	0.01	0.01	4.7E-12	9.6E-14	2.0E-18	1.2E-09	2.3E-12	4.7E-17	9.5E-11	1.9E-13	2.1E-11
1,2,3,6,7,8-HxCDD	0.1	0.1	0.01	4.3E-12	9.8E-14	1.7E-18	1.0E-09	2.0E-12	3.6E-17	8.3E-11	1.8E-13	1.6E-11
1,2,3,4,6,7,8-HpCDD	0.01	0.001	0.001	3.9E-12	7.0E-14	5.3E-19	1.1E-09	1.9E-12	1.4E-17	8.2E-11	1.5E-13	6.6E-12
OCDD	0.0001	--	--	4.9E-12	9.7E-14	1.7E-19	1.4E-09	2.4E-12	4.2E-18	1.0E-10	1.9E-13	2.0E-12
2,3,7,8-TCDF	0.1	1	0.05	9.3E-11	6.2E-13	7.2E-17	6.1E-09	9.5E-12	1.1E-15	9.6E-10	1.4E-12	1.2E-09
1,2,3,7,8-PeCDF	0.05	0.1	0.05	4.6E-11	6.1E-13	2.0E-17	5.8E-09	1.1E-11	3.4E-16	6.3E-10	1.1E-12	2.0E-10
2,3,4,7,8-PeCDF	0.5	1	0.5	4.3E-11	5.9E-13	1.4E-16	6.0E-09	1.2E-11	2.8E-15	6.1E-10	1.2E-12	1.6E-09
1,2,3,4,7,8-HxCDF	0.1	0.1	0.1	2.9E-11	5.1E-13	5.7E-18	6.6E-09	1.3E-11	1.4E-16	5.5E-10	1.0E-12	6.6E-11
1,2,3,7,8,9-HxCDF	0.1	0.1	0.1	4.9E-12	8.6E-14	8.0E-18	9.6E-10	1.8E-12	1.7E-16	8.4E-11	1.6E-13	8.4E-11
1,2,3,6,7,8-HxCDF	0.1	0.1	0.1	1.6E-11	2.8E-13	7.8E-18	3.6E-09	6.9E-12	1.9E-16	3.0E-10	5.7E-13	9.0E-11
2,3,4,6,7,8-HxCDF	0.1	0.1	0.1	9.2E-12	1.6E-13	1.6E-17	2.0E-09	3.9E-12	3.8E-16	1.7E-10	3.2E-13	1.8E-10
1,2,3,4,6,7,8-HpCDF	0.01	0.01	0.01	1.9E-11	4.1E-13	6.6E-19	5.1E-09	9.7E-12	1.6E-17	4.0E-10	8.1E-13	6.8E-12
1,2,3,4,7,8,9-HpCDF	0.01	0.01	0.01	5.7E-12	2.1E-13	1.2E-17	1.2E-09	2.9E-12	1.7E-16	1.0E-10	3.0E-13	6.5E-11
OCDF	0.0001	0.0001	0.0001	2.7E-12	5.3E-14	1.3E-19	7.5E-10	1.3E-12	3.1E-18	5.8E-11	1.1E-13	1.5E-12
Toxic Equivalents - Mammals (TEQM)				5.8E-11	7.8E-13	NA	7.74E-09	1.49E-11	2.21E-15	NA	NA	NA
Toxic Equivalents - Birds (TEQB)				1.65E-10	1.65E-12	2.53E-16	1.63E-08	2.97E-11	4.62E-15	1.99E-09	3.33E-12	3.19E-09
Toxic Equivalents - Fish (TEQF)				NA	NA	NA	NA	NA	NA	NA	NA	NA

-- - A TEF is not available.
NA - Not Applicable
TEF - Toxic Equivalency Factor
TEQ - Toxic Equivalents
mg/kg - milligrams per kilogram
mg/L - milligrams per liter
TEQM is calculated by multiplying each congener concentration by its corresponding mammal TEF then summing all of the results.
TEQB is calculated by multiplying each congener concentration by its corresponding bird TEF then summing all of the results.
TEQF is calculated by multiplying each congener concentration by its corresponding fish TEF then summing all of the results.
(a) World Health Organization (WHO). 1998. WHO toxic equivalency factors (TEFs) for dioxin-like compounds for humans and wildlife.
Prepared by Younes, M. Summary of WHO meeting in Stockholm, Sweden on June 15-18, 1998. International Programme on Chemical Safety.
(b) Soil and plant tissue concentrations were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.

Table 2
Calculation of PCDD/PCDF Toxic Equivalent Concentrations - Colorado River and Main Drain Areas

				Colorado River Area (b) (c)					Main Drain Area (b)			
Parameter	TEF Mammals (a)	TEF Birds (a)	TEF Fish (a)	Sediment Concentration (mg/kg)	Dissolved Surface Water Concentration (mg/L)	Total Surface Water Concentration (mg/L)	Benthic Invertebrate (Crayfish) Concentrations (mg/L)	Fish Tissue Concentration (mg/kg)	Sediment Concentration (mg/kg)	Total Surface Water Concentration (mg/L)	Dissolved Surface Water Concentration (mg/L)	Fish Tissue Concentration (mg/kg)
2,3,7,8-TCDD	1	1	1	1.1E-10	7.3E-16	1.3E-15	5.7E-11	1.8E-11	2.1E-10	2.4E-15	1.3E-15	3.3E-11
1,2,3,7,8-PeCDD	1	1	1	2.0E-10	1.9E-15	2.8E-15	9.0E-11	3.1E-11	2.1E-10	3.0E-15	1.9E-15	3.3E-11
1,2,3,4,7,8-HxCDD	0.1	0.05	0.5	4.2E-10	2.7E-16	2.3E-15	6.3E-11	3.0E-11	1.2E-10	6.5E-16	7.5E-17	8.2E-12
1,2,3,7,8,9-HxCDD	0.1	0.01	0.01	3.6E-10	7.3E-16	2.5E-15	1.8E-11	2.5E-11	1.3E-10	9.0E-16	2.6E-16	9.1E-12
1,2,3,6,7,8-HxCDD	0.1	0.1	0.01	3.1E-10	6.3E-16	2.1E-15	1.6E-11	2.2E-11	1.2E-10	8.1E-16	2.4E-16	8.2E-12
1,2,3,4,6,7,8-HpCDD	0.01	0.001	0.001	4.6E-10	1.9E-16	2.4E-15	1.2E-11	4.1E-12	1.1E-10	5.9E-16	4.5E-17	9.7E-13
OCDD	0.0001	--	--	6.2E-10	1.6E-16	3.2E-15	3.7E-12	1.1E-13	1.4E-10	7.3E-16	3.6E-17	2.5E-14
2,3,7,8-TCDF	0.1	1	0.05	3.4E-10	1.1E-14	1.3E-14	1.4E-10	5.4E-11	1.6E-09	6.1E-14	5.3E-14	2.6E-10
1,2,3,7,8-PeCDF	0.05	0.1	0.05	1.0E-09	6.6E-15	1.2E-14	1.0E-10	1.6E-10	1.2E-09	1.4E-14	7.8E-15	1.9E-10
2,3,4,7,8-PeCDF	0.5	1	0.5	6.3E-10	8.1E-15	1.1E-14	5.1E-10	9.9E-11	1.0E-09	1.8E-14	1.3E-14	1.6E-10
1,2,3,4,7,8-HxCDF	0.1	0.1	0.1	1.4E-09	5.8E-15	1.3E-14	5.7E-11	1.0E-10	7.8E-10	7.0E-15	3.2E-15	5.5E-11
1,2,3,7,8,9-HxCDF	0.1	0.1	0.1	2.1E-10	8.6E-16	1.9E-15	6.3E-11	1.5E-11	1.3E-10	1.2E-15	5.3E-16	9.2E-12
1,2,3,6,7,8-HxCDF	0.1	0.1	0.1	7.8E-10	3.2E-15	7.0E-15	7.8E-11	5.5E-11	4.3E-10	3.9E-15	1.8E-15	3.0E-11
2,3,4,6,7,8-HxCDF	0.1	0.1	0.1	4.4E-10	1.8E-15	3.9E-15	1.5E-10	3.1E-11	2.5E-10	2.2E-15	1.0E-15	1.7E-11
1,2,3,4,6,7,8-HpCDF	0.01	0.01	0.01	1.7E-09	2.7E-15	1.1E-14	8.4E-12	1.5E-11	5.4E-10	3.5E-15	8.8E-16	4.8E-12
1,2,3,4,7,8,9-HpCDF	0.01	0.01	0.01	4.1E-10	6.6E-16	2.7E-15	8.2E-11	3.6E-12	1.6E-10	1.0E-15	2.6E-16	1.4E-12
OCDF	0.0001	0.0001	0.0001	3.3E-10	1.3E-16	1.7E-15	2.6E-12	5.8E-14	7.8E-11	4.1E-16	3.2E-17	1.4E-14
Toxic Equivalents - Mammals (TEQM)				NA	NA	NA	NA	NA	NA	2.27E-14	NA	NA
Toxic Equivalents - Birds (TEQB)				1.75E-09	NA	3.23E-14	8.41E-10	2.43E-10	3.37E-09	8.70E-14	NA	5.16E-10
Toxic Equivalents - Fish (TEQF)				1.22E-09	8.86E-15	NA	NA	NA	1.29E-09	NA	1.35E-14	NA

-- - A TEF is not available.
NA - Not Applicable
TEF - Toxic Equivalency Factor
TEQ - Toxic Equivalents
mg/kg - milligrams per kilogram
mg/L - milligrams per liter
TEQM is calculated by multiplying each congener concentration by its corresponding mammal TEF then summing all of the results.
TEQB is calculated by multiplying each congener concentration by its corresponding bird TEF then summing all of the results.
TEQF is calculated by multiplying each congener concentration by its corresponding fish TEF then summing all of the results.
(a) World Health Organization (WHO). 1998. WHO toxic equivalency factors (TEFs) for dioxin-like compounds for humans and wildlife.
Prepared by Younes, M. Summary of WHO meeting in Stockholm, Sweden on June 15-18, 1998. International Programme on Chemical Safety.
(b) Sediment, surface water (total and dissolved), and fish tissue concentrations were calculated using USEPA's
HHRAP fate and transport equations, using the IRAP software program.
(c) Colorado River sediment concentrations were used to estimate benthic invertebrate (crayfish) tissue concentrations in the Riparian Backwater Area.

Table 3
Mammalian Prey PCDD/PCFD Bioconcentration Factors and Tissue Concentrations

Congener	USEPA (1999) default BCF (a)	Agricultural Area		Creosote Bush Scrub Area	
		Plant Tissue Concentration (mg/kg) (b)	Prey Tissue Concentration (mg/kg) (c)	Plant Tissue Concentration (mg/kg) (b)	Prey Tissue Concentration (mg/kg) (c)
2,3,7,8-TCDD	1.47E-04	7.4E-14	1.1E-17	8.42E-13	1.24E-16
1,2,3,7,8-PeCDD	1.35E-04	1.8E-13	2.5E-17	3.35E-12	4.53E-16
1,2,3,4,7,8-HxCDD	4.55E-05	9.1E-14	4.1E-18	1.91E-12	8.69E-17
1,2,3,7,8,9-HxCDD	2.05E-05	9.6E-14	2.0E-18	2.30E-12	4.71E-17
1,2,3,6,7,8-HxCDD	1.76E-05	9.8E-14	1.7E-18	2.04E-12	3.59E-17
1,2,3,4,6,7,8-HpCDD	7.48E-06	7.0E-14	5.3E-19	1.85E-12	1.39E-17
OCDD	1.76E-06	9.7E-14	1.7E-19	2.39E-12	4.21E-18
2,3,7,8-TCDF	1.17E-04	6.2E-13	7.2E-17	9.54E-12	1.12E-15
1,2,3,7,8-PeCDF	3.23E-05	6.1E-13	2.0E-17	1.05E-11	3.41E-16
2,3,4,7,8-PeCDF	2.35E-04	5.9E-13	1.4E-16	1.19E-11	2.80E-15
1,2,3,4,7,8-HxCDF	1.12E-05	5.1E-13	5.7E-18	1.26E-11	1.41E-16
1,2,3,7,8,9-HxCDF	9.24E-05	8.6E-14	8.0E-18	1.85E-12	1.71E-16
1,2,3,6,7,8-HxCDF	2.79E-05	2.8E-13	7.8E-18	6.87E-12	1.92E-16
2,3,4,6,7,8-HxCDF	9.83E-05	1.6E-13	1.6E-17	3.86E-12	3.79E-16
1,2,3,4,6,7,8-HpCDF	1.61E-06	4.1E-13	6.6E-19	9.73E-12	1.57E-17
1,2,3,4,7,8,9-HpCDF	5.72E-05	2.1E-13	1.2E-17	2.89E-12	1.65E-16
OCDF	2.35E-06	5.3E-14	1.3E-19	1.33E-12	3.14E-18

BCF - Bioaccumulation Factor
mg/kg - milligrams per kilogram
(a) BCF values for mammalian prey (white-footed mouse) were obtained from Table D-1 in USEPA, 1999. It was assumed that the prey diet consists 100% of plant material.
(b) Plant tissue concentrations were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.
(c) Prey tissue concentration = Plant concentration X BCF.

Table 4
Terrestrial Invertebrate PCDD/PCDF Bioconcentration Factors and Tissue Concentrations

Congener	USEPA (1999) default BCF (a)	Riparian Corridor	
		Soil Concentration (mg/kg)	Terrestrial Invertebrate Tissue Concentration (mg/kg) (b)
2,3,7,8-TCDD	1.59	8.95E-11	1.42E-10
1,2,3,7,8-PeCDD	1.46	1.39E-10	2.02E-10
1,2,3,4,7,8-HxCDD	0.49	8.20E-11	4.02E-11
1,2,3,7,8,9-HxCDD	0.22	9.52E-11	2.09E-11
1,2,3,6,7,8-HxCDD	0.19	8.32E-11	1.58E-11
1,2,3,4,6,7,8-HpCDD	0.081	8.20E-11	6.64E-12
OCDD	0.019	1.05E-10	1.99E-12
2,3,7,8-TCDF	1.27	9.60E-10	1.22E-09
1,2,3,7,8-PeCDF	0.32	6.29E-10	2.01E-10
2,3,4,7,8-PeCDF	2.54	6.14E-10	1.56E-09
1,2,3,4,7,8-HxCDF	0.121	5.47E-10	6.62E-11
1,2,3,7,8,9-HxCDF	1	8.44E-11	8.44E-11
1,2,3,6,7,8-HxCDF	0.3	3.00E-10	8.99E-11
2,3,4,6,7,8-HxCDF	1.07	1.69E-10	1.81E-10
1,2,3,4,6,7,8-HpCDF	0.017	4.03E-10	6.85E-12
1,2,3,4,7,8,9-HpCDF	0.62	1.04E-10	6.46E-11
OCDF	0.025	5.80E-11	1.45E-12

mg/kg - milligrams per kilogram
(a) Bioaccumulation Factor (BCF) values for terrestrial invertebrates were obtained from Table C-1 in USEPA, 1999
(b) Terrestrial invertebrate tissue concentration = BCF X soil concentration

Table 5
Benthic Invertebrate (Crayfish) PCDD/PCDF Bioconcentration Factors and Tissue Concentrations
Concentrations for Yuma Clapper Rail Analysis

Congener	Congener Specific BCF (a)	Colorado River Area Sediment Concentration (mg/kg) (b)	Benthic Invertebrate Tissue Concentration (mg/kg) (c)
2,3,7,8-TCDD	0.5	1.1E-10	5.7E-11
1,2,3,7,8-PeCDD	0.45	2.0E-10	9.0E-11
1,2,3,4,7,8-HxCDD	0.15	4.2E-10	6.3E-11
1,2,3,7,8,9-HxCDD	0.05	3.6E-10	1.8E-11
1,2,3,6,7,8-HxCDD	0.05	3.1E-10	1.6E-11
1,2,3,4,6,7,8-HpCDD	0.0255	4.6E-10	1.2E-11
OCDD	0.006	6.2E-10	3.7E-12
2,3,7,8-TCDF	0.4	3.4E-10	1.4E-10
1,2,3,7,8-PeCDF	0.1	1.0E-09	1.0E-10
2,3,4,7,8-PeCDF	0.8	6.3E-10	5.1E-10
1,2,3,4,7,8-HxCDF	0.04	1.4E-09	5.7E-11
1,2,3,7,8,9-HxCDF	0.3	2.1E-10	6.3E-11
1,2,3,6,7,8-HxCDF	0.1	7.8E-10	7.8E-11
2,3,4,6,7,8-HxCDF	0.35	4.4E-10	1.5E-10
1,2,3,4,6,7,8-HpCDF	0.005	1.7E-09	8.4E-12
1,2,3,4,7,8,9-HpCDF	0.2	4.1E-10	8.2E-11
OCDF	0.008	3.3E-10	2.6E-12

BEF - Bioaccumulation equivalency factor
BCF - Bioaccumulation factor
foc - fraction organic carbon
DW - dry weight
WW - wet weight
g/kg - grams per kilogram
mg/kg - milligrams per kilogram
(a) Congener specific BCFs were calculated using the crayfish-specific TCDD BCF (0.5) and the USEPA (1999) default BEF (BCF=0.5 x BEF), except for 2,3,7,8-TCDF for which a congener-specific BCF (0.4) was obtained from the literature.
(b) Sediment concentrations were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.
(c) Benthic invertebrate tissue concentrations = BCF X sediment concentration

APPENDIX M
SECTION 4

DETAILED ECOLOGICAL RISK ASSESSMENT RESULTS

Table 1
Calculation of Hazard Quotients for Badger - Creosote Bush Scrub Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg WW) (c)	Kow	Biotransfer Factor (BaA) (d)	BCF plant-herbivore (e)	Mammal Prey Tissue Concentration (mg/kg) (f)	Daily Dose from Prey (mg/kg-BW-d) (g)	Daily Dose from Soil (mg/kg-BW-d) (h)	Total Daily Dose (mg/kg-BW-d) (i)	TRV (mg/kg-BW-d) (j)	Hazard Quotient (k)
Acetone	1.63E-08	1.64E-08			9.3E-09	1.5E-16	2.3E-17	6.5E-13	6.5E-13	1.0E+01	6.5E-14
Acrylonitrile	2.62E-10	2.64E-10			2.8E-08	7.3E-18	1.1E-18	1.0E-14	1.0E-14	4.6E-01	2.3E-14
Aluminum	6.52E-03	3.49E-05		8.0E-04	4.9E-04	1.7E-08	2.6E-09	2.6E-07	2.6E-07	1.9E+00	1.4E-07
Antimony	1.36E-09	5.20E-12			6.1E-04	3.2E-15	4.9E-16	5.4E-14	5.4E-14	6.6E-02	8.2E-13
Aroclor 1254	3.61E-07	1.80E-10			2.5E-02	4.5E-12	6.9E-13	1.4E-11	1.5E-11	2.1E-04	7.3E-08
Arsenic	1.06E-08	3.73E-05			1.2E-03	4.6E-08	7.1E-09	4.2E-13	7.1E-09	1.3E+00	5.7E-09
Barium	1.44E-03	5.98E-06			9.2E-05	5.5E-10	8.5E-11	5.7E-08	5.7E-08	5.1E-01	1.1E-07
Benzo(a)Anthracene	5.51E-09	4.79E-11			7.4E-03	3.5E-13	5.4E-14	2.2E-13	2.7E-13	1.7E-01	1.6E-12
Benzo(a)pyrene	5.17E-09	8.48E-11			2.1E-02	1.8E-12	2.7E-13	2.0E-13	4.8E-13	1.0E-01	4.8E-12
Beryllium	1.48E-05	3.72E-05			6.1E-04	2.3E-08	3.5E-09	5.9E-10	4.1E-09	6.6E-01	6.2E-09
Cadmium	1.69E-06	9.20E-05			7.4E-05	6.8E-09	1.0E-09	6.7E-11	1.1E-09	2.5E-02	4.4E-08
Chloroform (Trichloromethane)	2.57E-11	8.61E-12			1.4E-06	1.2E-17	1.8E-18	1.0E-15	1.0E-15	6.0E+01	1.7E-17
Chromium, hexavalent	5.76E-04	1.94E-06			3.4E-03	6.6E-09	1.0E-09	2.3E-08	2.4E-08	3.5E+00	6.8E-09
Copper	4.61E-06	3.56E-05		8.0E-02	4.9E-02	1.7E-06	2.7E-07	1.8E-10	2.7E-07	1.2E+01	2.2E-08
DDE, 4,4'-	6.13E-07	9.06E-10			2.8E-02	2.5E-11	3.9E-12	2.4E-11	2.8E-11	1.0E+00	2.8E-11
Dibenz(a,h)anthracene	1.50E-08	2.84E-10			5.4E-02	1.5E-11	2.4E-12	5.9E-13	3.0E-12	2.0E-03	1.5E-09
Dinitrobenzene, 1,3-	4.81E-07	2.98E-07			4.8E-07	1.4E-13	2.2E-14	1.9E-11	1.9E-11	1.1E+00	1.8E-11
Dinitrotoluene, 2,4-	2.52E-07	8.53E-08			1.5E-06	1.3E-13	2.0E-14	1.0E-11	1.0E-11	7.0E-01	1.4E-11
Dinitrotoluene, 2,6-	2.05E-07	9.61E-08			1.2E-06	1.1E-13	1.8E-14	8.1E-12	8.1E-12	4.0E-01	2.0E-11
Di-n-octylphthalate	1.21E-07	7.97E-08			3.3E+01	2.6E-06	4.1E-07	4.8E-12	4.1E-07	7.5E+03	5.4E-11
Dioxane, 1,4-	1.21E-14	1.22E-14			8.4E-09	1.0E-22	1.6E-23	4.8E-19	4.8E-19	1.1E+02	4.5E-21
Ethylhexyl phthalate, bis-2-	1.03E-06	3.78E-07			2.5E-03	9.3E-10	1.4E-10	4.1E-11	1.8E-10	6.0E+01	3.1E-12
gamma-BHC (Lindane)	1.62E-09	6.78E-11	4.0E+03	1.0E-04	6.1E-05	4.2E-15	6.4E-16	6.4E-14	6.5E-14	8.0E+00	8.1E-15
Heptachlor	7.17E-10	1.09E-11			1.6E-03	1.7E-14	2.7E-15	2.8E-14	3.1E-14	2.5E-03	1.2E-11
Hexachlorobenzene	2.33E-08	9.68E-11			4.9E-03	4.8E-13	7.3E-14	9.2E-13	9.9E-13	1.6E+00	6.2E-13
Hexachlorocyclopentadiene	2.80E-07	1.59E-09			1.3E-03	2.0E-12	3.1E-13	1.1E-11	1.1E-11	3.8E+00	3.0E-12
Lead	2.51E-05	9.22E-05			1.8E-04	1.7E-08	2.6E-09	9.9E-10	3.6E-09	3.8E-02	9.6E-08
Manganese	2.75E-07	1.37E-05		5.0E-02	3.1E-02	4.2E-07	6.5E-08	1.1E-11	6.5E-08	8.8E+01	7.4E-10
Mercuric chloride	5.18E-04	9.92E-07			3.2E-03	3.2E-09	4.9E-10	2.1E-08	2.1E-08	1.0E+00	2.1E-08
Methyl mercury	1.05E-05	1.71E-07			4.8E-04	8.2E-11	1.3E-11	4.2E-10	4.3E-10	3.2E-02	1.3E-08
Nickel	5.75E-08	2.92E-06			3.7E-03	1.1E-08	1.7E-09	2.3E-12	1.7E-09	5.0E+01	3.3E-11
Pentachlorobenzene	2.79E-07	1.32E-09			1.9E-03	2.5E-12	3.8E-13	1.1E-11	1.1E-11	7.3E+00	1.6E-12
Pentachloronitrobenzene (PCNB)	1.95E-06	1.74E-08			6.8E-04	1.2E-11	1.8E-12	7.7E-11	7.9E-11	4.6E+02	1.7E-13
Pentachlorophenol	4.55E-06	1.74E-06			1.9E-03	3.2E-09	5.0E-10	1.8E-10	6.8E-10	3.0E-01	2.3E-09
Selenium	4.36E-09	1.12E-06			1.4E-03	1.6E-09	2.4E-10	1.7E-13	2.4E-10	7.6E-02	3.2E-09
Silver	1.30E-04	2.58E-06			1.8E-03	4.8E-09	7.3E-10	5.1E-09	5.9E-09	3.8E-01	1.6E-08
Dioxin - TEQM	7.74E-09	1.49E-11			(l)	2.2E-15	3.4E-16	3.1E-13	3.1E-13	1.0E-06	3.1E-07
Thallium (l)	1.82E-03	2.83E-06			2.5E-02	7.0E-08	1.1E-08	7.2E-08	8.3E-08	1.3E-02	6.3E-06
Vanadium	6.50E-04	8.53E-07		1.1E-03	6.8E-04	5.8E-10	8.9E-11	2.6E-08	2.6E-08	2.1E-01	1.2E-07
Vinyl Chloride	1.31E-13	9.50E-14			2.2E-07	2.1E-20	3.2E-21	5.2E-18	5.2E-18	1.7E-01	3.0E-17
Xylene, m-	1.38E-11	1.11E-12	1.6E+03	4.0E-05	2.4E-05	2.7E-17	4.2E-18	5.4E-16	5.5E-16	2.1E+00	2.6E-16
Xylene, o-	8.94E-12	8.10E-13	1.3E+03	3.2E-05	1.9E-05	1.6E-17	2.4E-18	3.5E-16	3.6E-16	2.1E+00	1.7E-16
Xylene, p-	1.14E-11	1.01E-12	1.3E+03	3.2E-05	1.9E-05	2.0E-17	3.0E-18	4.5E-16	4.6E-16	2.1E+00	2.2E-16
Zinc	8.37E-07	4.46E-05			5.5E-05	2.5E-09	3.8E-10	3.3E-11	4.1E-10	1.0E+01	4.0E-11
										Cumulative HI (m) :	**7E-06**

Table 1
Calculation of Hazard Quotients for Badger - Creosote Bush Scrub Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg WW) (c)	Kow	Biotransfer Factor (BaA) (d)	BCF plant-herbivore (e)	Mammal Prey Tissue Concentration (mg/kg) (f)	Daily Dose from Prey (mg/kg-BW-d) (g)	Daily Dose from Soil (mg/kg-BW-d) (h)	Total Daily Dose (mg/kg-BW-d) (i)	TRV (mg/kg-BW-d) (j)	Hazard Quotient (k)

(a) Only those compounds with TRVs are listed in this table.
(b) Soil concentrations (Csoil) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.
(c) Plant concentrations (Cplant) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program. Wet weight plant concentrations were calculated from the IRAP outputs dry weight concentrations using a moisture content of 88% as specified in USEPA's 1999 Screening Ecological Risk Assessment Protocol. (USEPA, 1999)
(d) For organic compounds not included in USEPA, 1999, the BaA was calculated using Travis & Arms equation: logBaA = -7.6 + logKow
For inorganic compounds not included in USEPA, 1999, the BaA was taken from Baes 1984.
(e) Bioconcentration Factors (BCFs) in prey items are based on the white footed mouse and were obtained from Appendix D of USEPA's 1999 Screening Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. If a BCF was not available then it was calculated using the following equation:
BCFplant-herbivore = BaA X Food IR, Food Ingestion Rate for mouse = 0.614 (kg WW/kg BW-d)
(f) Prey tissue concentration = plant tissue concentration X BCFplant-herbivore; except for Dioxin - TEQM which is calculated on a congener-specific basis and is shown elsewhere in this appendix.
(g) DDdiet = Cprey x Food IR; assumes that 100% of ingested prey is potentially contaminated
(h) DDsoil = Csoil x Soil IR; assumes that 100% of ingested soil is potentially contaminated
(i) Total Daily Dose = DDdiet + DDsoil
(j) Toxicity Reference Values (TRVs) are discussed in the text.
(k) Hazard Quotients (HQ) are calculated by dividing the daily dose by the TRV.
(l) BCFs were calculated for individual congeners using bioaccumulation equivalency factors (BEFs) from Appendix D of USEPA (1999).
See elsewhere in this appendix for more information.
(m) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQM is the Toxic Equivalents (TEQ) for mammals calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results.
This calculation is presented elsewhere in this appendix.
Food IR - Food ingestion rate as shown in Table 5.2-2
Soil IR - Soil ingestion rate as shown in Table 5.2-2

mg - milligrams
kg - kilograms
BW - body weight
WW- wet weight
d - day
DD - daily dose
Kow - octanol-water partition coefficient

Table 2
Calculation of Hazard Quotients for Gambel's Quail - Creosote Bush Scrub Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg WW) (c)	Daily Dose from Diet (mg/kg BW-d) (d)	Daily Dose from Soil (mg/kg BW-d) (e)	Total Daily Dose (mg/kg bw-d) (f)	TRV (Bird) (mg/kg bw-d) (g)	Hazard Quotient (h)
Acetone	1.63E-08	1.64E-08	7.8E-09	2.8E-11	2.4E-08	5.2E+01	4.7E-10
Aluminum	6.52E-03	3.49E-05	1.7E-05	1.1E-05	6.3E-05	1.0E+02	6.3E-07
Aroclor 1254	3.61E-07	1.80E-10	8.6E-11	6.2E-10	8.9E-10	7.2E-02	1.2E-08
Arsenic	1.06E-08	3.73E-05	1.8E-05	1.8E-11	5.5E-05	2.5E+00	2.2E-05
Barium	1.44E-03	5.98E-06	2.9E-06	2.5E-06	1.1E-05	2.1E+01	5.4E-07
Benzo(a)Anthracene	5.51E-09	4.79E-11	2.3E-11	9.5E-12	8.0E-11	7.9E-04	1.0E-07
Benzo(a)pyrene	5.17E-09	8.48E-11	4.1E-11	8.9E-12	1.3E-10	1.0E-03	1.3E-07
Benzo(b)fluoranthene	5.60E-08	9.89E-11	4.7E-11	9.7E-11	2.4E-10	1.4E-04	1.7E-06
Benzo(k)fluoranthene	3.04E-08	1.71E-10	8.2E-11	5.3E-11	3.1E-10	1.4E-04	2.2E-06
Cadmium	1.69E-06	9.20E-05	4.4E-05	2.9E-09	1.4E-04	1.5E+00	9.4E-05
Chromium, hexavalent	5.76E-04	1.94E-06	9.3E-07	1.0E-06	3.9E-06	1.0E+00	3.9E-06
Chrysene	3.31E-08	1.29E-10	6.2E-11	5.7E-11	2.5E-10	1.0E-03	2.5E-07
Copper	4.61E-06	3.56E-05	1.7E-05	8.0E-09	5.3E-05	4.7E+01	1.1E-06
DDE, 4,4'-	6.13E-07	9.06E-10	4.3E-10	1.1E-09	2.4E-09	8.5E-01	2.8E-09
Dibenz(a,h)anthracene	1.50E-08	2.84E-10	1.4E-10	2.6E-11	4.5E-10	3.9E-04	1.1E-06
Dinitrobenzene, 1,3-	4.81E-07	2.98E-07	1.4E-07	8.3E-10	4.4E-07	4.2E-04	1.0E-03
Ethylhexyl phthalate, bis-2-	1.03E-06	3.78E-07	1.8E-07	1.8E-09	5.6E-07	1.1E+02	5.1E-09
gamma-BHC (Lindane)	1.62E-09	6.78E-11	3.2E-11	2.8E-12	1.0E-10	2.0E+00	5.1E-11
Heptachlor	7.17E-10	1.09E-11	5.2E-12	1.2E-12	1.7E-11	6.5E-02	2.7E-10
Hexachloro-1,3-butadiene (Perchlorobutadiene)	1.94E-07	1.50E-09	7.2E-10	3.4E-10	2.6E-09	3.2E+00	8.0E-10
Hexachlorobenzene	2.33E-08	9.68E-11	4.6E-11	4.0E-11	1.8E-10	2.3E-01	8.2E-10
Indeno(1,2,3-cd) pyrene	1.32E-07	1.60E-09	7.6E-10	2.3E-10	2.6E-09	1.0E-03	2.6E-06
Lead	2.51E-05	9.22E-05	4.4E-05	4.3E-08	1.4E-04	2.5E-02	5.5E-03
Manganese	2.75E-07	1.37E-05	6.6E-06	4.8E-10	2.0E-05	9.8E+02	2.1E-08
Mercuric chloride	5.18E-04	9.92E-07	4.7E-07	9.0E-07	2.4E-06	3.3E+00	7.3E-07
Methyl mercury	1.05E-05	1.71E-07	8.2E-08	1.8E-08	2.7E-07	6.4E-03	4.2E-05
Nickel	5.75E-08	2.92E-06	1.4E-06	1.0E-10	4.3E-06	6.5E+01	6.6E-08
Pentachloronitrobenzene (PCNB)	1.95E-06	1.74E-08	8.3E-09	3.4E-09	2.9E-08	6.9E+01	4.2E-10
Pentachlorophenol	4.55E-06	1.74E-06	8.3E-07	7.9E-09	2.6E-06	4.0E+00	6.4E-07
Selenium	4.36E-09	1.12E-06	5.3E-07	7.6E-12	1.7E-06	5.0E-01	3.3E-06
Silver	1.30E-04	2.58E-06	1.2E-06	2.2E-07	4.0E-06	1.8E+02	2.3E-08
Dioxin - TEQB	1.63E-08	2.97E-11	1.4E-11	2.8E-11	7.2E-11	1.0E-05	7.2E-06
Thallium (l)	1.82E-03	2.83E-06	1.4E-06	3.2E-06	7.3E-06	3.5E-01	2.1E-05
Vanadium	6.50E-04	8.53E-07	4.1E-07	1.1E-06	2.4E-06	1.1E+01	2.1E-07
Zinc	8.37E-07	4.46E-05	2.1E-05	1.4E-09	6.6E-05	1.3E+02	5.0E-07
						Cumulative HI (i):	**7E-03**

(a) Only those compounds with TRVs are listed in this table.
(b) Soil concentrations (Csoil) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.
(c) Plant concentrations (Cplant) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program. Wet weight plant concentrations were calculated from the IRAP outputs dry weight concentrations using a moisture content of 88% as specified in USEPA's 1999 Screening Ecological Risk Assessment Protocol.
(d) DDdiet = Cplant x Food IR; assumes that 100% of ingested plant material is potentially contaminated
(e) DDsoil = Csoil x Soil IR; assumes that 100% of ingested soil is potentially contaminated
(f) Total Daily Dose = DDdiet + DDsoil

Table 2
Calculation of Hazard Quotients for Gambel's Quail - Creosote Bush Scrub Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg WW) (c)	Daily Dose from Diet (mg/kg BW-d) (d)	Daily Dose from Soil (mg/kg BW-d) (e)	Total Daily Dose (mg/kg bw-d) (f)	TRV (Bird) (mg/kg bw-d) (g)	Hazard Quotient (h)

(g) Toxicity Reference Values (TRVs) are discussed in the text

(h) Hazard Quotients (HQ) are calculated by dividing the daily dose by the TRV.

(i) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQB is the Toxic Equivalents (TEQ) for birds calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.

Food IR - Food ingestion rate as shown in Table 5.2-2

Soil IR - Soil ingestion rate as shown in Table 5.2-2

mg - milligrams

kg - kilograms

BW - body weight

d - day

DD - daily dose

Table 3
Calculation of Hazard Quotients for Great Horned Owl - Creosote Bush Scrub Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg) (c)	Biotrasfer Factor (BaA) (d)	BCF plant-herbivore (e)	Mammal Prey Tissue Concentration (mg/kg) (f)	Daily Dose from Prey (mg/kg-BW-d) (g)	Daily Dose from Soil (mg/kg-BW-d) (h)	Total Daily Dose (mg/kg-BW-d) (i)	TRV (mg/kg-BW-d) (j)	Hazard Quotient (k)
Acetone	1.63E-08	1.64E-08		9.3E-09	1.5E-16	2.9E-17	1.7E-10	1.7E-10	5.2E+01	3.3E-12
Aluminum	6.52E-03	3.49E-05	8.0E-04	4.9E-04	1.7E-08	3.2E-09	6.8E-05	6.8E-05	1.0E+02	6.8E-07
Aroclor 1254	3.61E-07	1.80E-10		2.5E-02	4.5E-12	8.4E-13	3.8E-09	3.8E-09	7.2E-02	5.3E-08
Arsenic	1.06E-08	3.73E-05		1.2E-03	4.6E-08	8.6E-09	1.1E-10	8.7E-09	2.5E+00	3.5E-09
Barium	1.44E-03	5.98E-06		9.2E-05	5.5E-10	1.0E-10	1.5E-05	1.5E-05	2.1E+01	7.3E-07
Benzo(a)Anthracene	5.51E-09	4.79E-11		7.4E-03	3.5E-13	6.6E-14	5.8E-11	5.8E-11	7.9E-04	7.3E-08
Benzo(a)pyrene	5.17E-09	8.48E-11		2.1E-02	1.8E-12	3.3E-13	5.4E-11	5.5E-11	1.0E-03	5.5E-08
Benzo(b)fluoranthene	5.60E-08	9.89E-11		2.5E-02	2.4E-12	4.6E-13	5.9E-10	5.9E-10	1.4E-04	4.2E-06
Benzo(k)fluoranthene	3.04E-08	1.71E-10		2.4E-02	4.2E-12	7.8E-13	3.2E-10	3.2E-10	1.4E-04	2.3E-06
Cadmium	1.69E-06	9.20E-05		7.4E-05	6.8E-09	1.3E-09	1.8E-08	1.9E-08	1.5E+00	1.3E-08
Chromium, hexavalent	5.76E-04	1.94E-06		3.4E-03	6.6E-09	1.2E-09	6.0E-06	6.0E-06	1.0E+00	6.0E-06
Chrysene	3.31E-08	1.29E-10		8.5E-03	1.1E-12	2.1E-13	3.5E-10	3.5E-10	1.0E-03	3.5E-07
Copper	4.61E-06	3.56E-05	8.0E-02	4.9E-02	1.7E-06	3.3E-07	4.8E-08	3.8E-07	4.7E+01	8.0E-09
DDE, 4,4'-	6.13E-07	9.06E-10		2.8E-02	2.5E-11	4.7E-12	6.4E-09	6.4E-09	8.5E-01	7.6E-09
Dibenz(a,h)anthracene	1.50E-08	2.84E-10		5.4E-02	1.5E-11	2.9E-12	1.6E-10	1.6E-10	3.9E-04	4.1E-07
Dinitrobenzene, 1,3-	4.81E-07	2.98E-07		4.8E-07	1.4E-13	2.7E-14	5.0E-09	5.0E-09	4.2E-04	1.2E-05
Ethylhexyl phthalate, bis-2-	1.03E-06	3.78E-07		2.5E-03	9.3E-10	1.8E-10	1.1E-08	1.1E-08	1.1E+02	9.9E-11
gamma-BHC (Lindane)	1.62E-09	6.78E-11	1.0E-04	6.1E-05	4.2E-15	7.8E-16	1.7E-11	1.7E-11	2.0E+00	8.5E-12
Heptachlor	7.17E-10	1.09E-11		1.6E-03	1.7E-14	3.3E-15	7.5E-12	7.5E-12	6.5E-02	1.2E-10
Hexachloro-1,3-butadiene (Perchlorobutadiene)	1.94E-07	1.50E-09		8.3E-04	1.2E-12	2.3E-13	2.0E-09	2.0E-09	3.2E+00	6.4E-10
Hexachlorobenzene	2.33E-08	9.68E-11		4.9E-03	4.8E-13	8.9E-14	2.4E-10	2.4E-10	2.3E-01	1.1E-09
Indeno(1,2,3-cd) pyrene	1.32E-07	1.60E-09		1.3E-01	2.0E-10	3.8E-11	1.4E-09	1.4E-09	1.0E-03	1.4E-06
Lead	2.51E-05	9.22E-05		1.8E-04	1.7E-08	3.2E-09	2.6E-07	2.7E-07	2.5E-02	1.1E-05
Manganese	2.75E-07	1.37E-05	5.0E-02	3.1E-02	4.2E-07	7.9E-08	2.9E-09	8.2E-08	9.8E+02	8.4E-11
Mercuric chloride	5.18E-04	9.92E-07		3.2E-03	3.2E-09	6.0E-10	5.4E-06	5.4E-06	3.3E+00	1.7E-06
Methyl mercury	1.05E-05	1.71E-07		4.8E-04	8.2E-11	1.5E-11	1.1E-07	1.1E-07	6.4E-03	1.7E-05
Nickel	5.75E-08	2.92E-06		3.7E-03	1.1E-08	2.0E-09	6.0E-10	2.6E-09	6.5E+01	4.0E-11
Pentachloronitrobenzene (PCNB)	1.95E-06	1.74E-08		6.8E-04	1.2E-11	2.2E-12	2.0E-08	2.0E-08	6.9E+01	3.0E-10
Pentachlorophenol	4.55E-06	1.74E-06		1.9E-03	3.2E-09	6.0E-10	4.8E-08	4.8E-08	4.0E+00	1.2E-08
Selenium	4.36E-09	1.12E-06		1.4E-03	1.6E-09	2.9E-10	4.6E-11	3.4E-10	5.0E-01	6.8E-10
Silver	1.30E-04	2.58E-06		1.8E-03	4.8E-09	8.9E-10	1.4E-06	1.4E-06	1.8E+02	7.6E-09
TEQB	1.63E-08	2.97E-11		(l)	4.6E-15	8.7E-16	1.7E-10	1.7E-10	1.0E-05	1.7E-05
Thallium (l)	1.82E-03	2.83E-06		2.5E-02	7.0E-08	1.3E-08	1.9E-05	1.9E-05	3.5E-01	5.5E-05
Vanadium	6.50E-04	8.53E-07	1.1E-03	6.8E-04	5.8E-10	1.1E-10	6.8E-06	6.8E-06	1.1E+01	6.0E-07
Zinc	8.37E-07	4.46E-05		5.5E-05	2.5E-09	4.6E-10	8.8E-09	9.2E-09	1.3E+02	7.1E-11
									Cumulative HI (m) :	**1E-04**

(a) Only those compounds with TRVs are listed in this table.
(b) Soil concentrations (Csoil) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.
(c) Plant concentrations (Cplant) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program. Wet weight plant concentrations were calculated from the IRAP outputs dry weight concentrations using a moisture content of 88% as specified in USEPA's 1999 Screening Ecological Risk Assessment Protocol.
(d) For organic compounds not included in USEPA, 1999, the BaA was calculated using Travis & Arms equation: logBaA = -7.6 + logKow
For inorganic compounds not included in USEPA, 1999, the BaA was taken from Baes 1984.
(e) Bioconcentration Factors (BCFs) in prey items are based on the white footed mouse and were obtained from Appendix D of USEPA's 1999 Screening Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. If a BCF was not available then it was calculated using the following equation:
BCFplant-herbivore = BaA X Food IR, Food Ingestion Rate for mouse = 0.614 (kg WW/kg BW-d)
(f) Prey tissue concentration = plant tissue concentration X BCFplant-herbivore; except for Dioxin - TEQB which is calculated on a congener-specific basis and is shown elsewhere in this appendix.
(g) DDdiet = Cprey x Food IR; assumes that 100% of ingested prey is potentially contaminated
(h) DDsoil = Csoil x Soil IR; assumes that 100% of ingested soil is potentially contaminated
(i) Total Daily Dose = DDdiet + DDsoil
(j) Toxicity Reference Values (TRVs) are discussed in the text.

Table 3
Calculation of Hazard Quotients for Great Horned Owl - Creosote Bush Scrub Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg) (c)	Biotrasfer Factor (BaA) (d)	BCF plant-herbivore (e)	Mammal Prey Tissue Concentration (mg/kg) (f)	Daily Dose from Prey (mg/kg-BW-d) (g)	Daily Dose from Soil (mg/kg-BW-d) (h)	Total Daily Dose (mg/kg-BW-d) (i)	TRV (mg/kg-BW-d) (j)	Hazard Quotient (k)

(k) Hazard Quotients (HQ) are calculated by dividing the daily dose by the TRV.
(l) BCFs were calculated for individual congeners using bioaccumulation equivalency factors (BEFs) from Appendix D of USEPA (1999).
See elsewhere in this appendix for more information.
(m) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQB is the Toxic Equivalents (TEQ) for birds calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results.
This calculation is presented elsewhere in this appendix.
Food IR - Food ingestion rate as shown in Table 5.2-2
Soil IR - Soil ingestion rate as shown in Table 5.2-2

mg - milligrams
kg - kilograms
BW - body weight
WW- wet weight
d - day
DD - daily dose
Kow - octanol-water partition coefficient

Table 4
Hazard Quotients for Plants (Creosote Bush) in the Creosote Bush Area

CAS No	Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Toxicity Reference Value (TRV) (mg/kg) (c)	Hazard Quotient (d)
108-60-1	2,2'-oxybis (1-Chloropropane)	1.15E-09	2.0E+01	5.8E-11
591-78-6	2-Hexanone	7.76E-10	1.3E+01	6.2E-11
91-57-6	2-Methylnaphthalene	3.03E-08	3.2E+00	9.4E-09
534-52-1	4,6-Dinitro-2-methylphenol	4.12E-06	1.4E-01	2.9E-05
208-96-8	Acenaphthylene	3.65E-08	6.8E+02	5.3E-11
7429-90-5	Aluminum	6.52E-03	5.0E+00	1.3E-03
7440-36-0	Antimony	1.36E-09	5.0E-01	2.7E-09
11097-69-1	Aroclor 1254	3.61E-07	1.0E+01	3.6E-08
7440-38-2	Arsenic	1.06E-08	1.0E+00	1.1E-08
7440-39-3	Barium	1.44E-03	5.0E+00	2.9E-04
56-55-3	Benzo(a)Anthracene	5.51E-09	1.2E+00	4.6E-09
50-32-8	Benzo(a)pyrene	5.17E-09	1.2E+00	4.3E-09
205-99-2	Benzo(b)fluoranthene	5.60E-08	1.2E+00	4.7E-08
191-24-2	Benzo(g,h,i)perylene	2.24E-07	1.2E+02	1.9E-09
207-08-9	Benzo(k)fluoranthene	3.04E-08	1.2E+00	2.5E-08
7440-41-7	Beryllium	1.48E-05	1.0E-01	1.5E-04
111-91-1	Bis(2-chloroethoxy) methane	2.34E-07	3.0E-01	7.8E-07
7440-43-9	Cadmium	1.69E-06	2.0E-01	8.4E-06
18540-29-9	Chromium, hexavalent	5.76E-04	1.8E-02	3.2E-02
218-01-9	Chrysene	3.31E-08	1.2E+00	2.8E-08
7440-48-4	Cobalt	9.81E-05	2.0E+01	4.9E-06
7440-50-8	Copper	4.61E-06	1.0E+00	4.6E-06
319-86-8	delta-BHC	6.13E-07	9.9E+00	6.2E-08
53-70-3	Dibenz(a,h)anthracene	1.50E-08	1.2E+00	1.2E-08
122-39-4	Diphenylamine	2.17E-05	1.0E+00	2.2E-05
33213-65-9	Endosulfan II	3.58E-09	1.2E-01	3.0E-08
7421-93-4	Endrin aldehyde	1.33E-06	1.1E-02	1.3E-04
58-89-9	gamma-BHC (Lindane)	1.62E-09	5.0E-03	3.2E-07
76-44-8	Heptachlor	7.17E-10	1.0E+00	7.2E-10
77-47-4	Hexachlorocyclopentadiene	2.80E-07	1.0E-01	2.8E-06
193-39-5	Indeno(1,2,3-cd) pyrene	1.32E-07	1.2E+00	1.1E-07
74-88-4	Iodomethane	1.69E-10	1.2E+00	1.4E-10
7439-92-1	Lead	2.51E-05	4.6E+00	5.5E-06
7439-96-5	Manganese	2.75E-07	5.0E+02	5.5E-10
7487-94-7	Mercuric chloride	5.18E-04	3.5E-01	1.5E-03
80-62-6	Methyl methacrylate	6.98E-13	9.8E+02	7.1E-16
7440-02-0	Nickel	5.75E-08	2.5E+01	2.3E-09
62-75-9	N-nitrosodimethylamine	1.19E-08	1.2E+01	1.0E-09
87-86-5	Pentachlorophenol	4.55E-06	1.7E+00	2.6E-06
7782-49-2	Selenium	4.36E-09	5.0E-02	8.7E-08
7440-22-4	Silver	1.30E-04	2.0E-02	6.5E-03
7440-28-0	Thallium (I)	1.82E-03	1.0E-02	1.8E-01
7440-62-2	Vanadium	6.50E-04	2.0E+00	3.3E-04
7440-66-6	Zinc	8.37E-07	9.0E-01	9.3E-07
			Cumulative HI (e) =	**2E-01**

(a) Only those compounds with TRVs are listed in this table.
(b) Soil concentrations were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
(c) Toxicity Reference Values (TRVs) are discussed in the text.
(d) Maximum Hazard Quotient (HQ) is calculated by dividing the maximum annual soil concentration by the TRV.
(e) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

mg/kg - milligrams per kilogram

Table 5
Calculation of Hazard Quotients for Gambel's Quail - Agricultural Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg WW) (c)	Daily Dose from Diet (mg/kg BW-d) (d)	Daily Dose from Soil (mg/kg BW-d) (e)	Total Daily Dose (mg/kg BW-d) (f)	TRV (Bird) (mg/kg BW-d) (g)	Hazard Quotient (h)
Acetone	1.14E-08	8.59E-09	4.1E-09	2.0E-11	4.1E-09	5.2E+01	7.9E-11
Aluminum	1.36E-05	9.01E-07	4.3E-07	2.4E-08	4.5E-07	1.0E+02	4.5E-09
Aroclor 1254	6.38E-09	4.70E-12	2.2E-12	1.1E-11	1.3E-11	7.2E-02	1.8E-10
Arsenic	2.76E-09	9.80E-07	4.7E-07	4.8E-12	4.7E-07	2.5E+00	1.9E-07
Barium	3.37E-06	7.85E-08	3.8E-08	5.8E-09	4.3E-08	2.1E+01	2.1E-09
Benzo(a)Anthracene	6.09E-11	2.07E-12	9.9E-13	1.1E-13	1.1E-12	7.9E-04	1.4E-09
Benzo(a)pyrene	4.29E-11	6.10E-12	2.9E-12	7.4E-14	3.0E-12	1.0E-03	3.0E-09
Benzo(b)fluoranthene	9.68E-10	3.23E-12	1.5E-12	1.7E-12	3.2E-12	1.4E-04	2.3E-08
Benzo(k)fluoranthene	2.42E-10	1.31E-11	6.2E-12	4.2E-13	6.7E-12	1.4E-04	4.8E-08
Cadmium	4.38E-07	2.42E-06	1.2E-06	7.6E-10	1.2E-06	1.5E+00	8.0E-07
Chlordane	4.36E-09	1.17E-11	5.6E-12	7.5E-12	1.3E-11	2.1E+00	6.1E-12
Chromium, hexavalent	1.25E-06	4.55E-08	2.2E-08	2.2E-09	2.4E-08	1.0E+00	2.4E-08
Chrysene	4.81E-10	3.19E-12	1.5E-12	8.3E-13	2.4E-12	1.0E-03	2.4E-09
Copper	1.19E-06	9.60E-07	4.6E-07	2.1E-09	4.6E-07	4.7E+01	9.8E-09
DDE, 4,4'-	1.07E-08	2.14E-11	1.0E-11	1.9E-11	2.9E-11	8.5E-01	3.4E-11
Dibenz(a,h)anthracene	4.05E-11	2.85E-11	1.4E-11	7.0E-14	1.4E-11	3.9E-04	3.5E-08
Dinitrobenzene, 1,3-	8.08E-09	3.86E-09	1.8E-09	1.4E-11	1.9E-09	4.2E-04	4.4E-06
Ethylhexyl phthalate, bis-2-	5.92E-09	2.18E-08	1.0E-08	1.0E-11	1.0E-08	1.1E+02	9.4E-11
gamma-BHC (Lindane)	1.69E-10	5.90E-12	2.8E-12	2.9E-13	3.1E-12	2.0E+00	1.6E-12
Heptachlor	1.28E-11	1.46E-13	7.0E-14	2.2E-14	9.2E-14	6.5E-02	1.4E-12
Hexachloro-1,3-butadiene (Perchlorobutadiene)	1.08E-08	6.32E-11	3.0E-11	1.9E-11	4.9E-11	3.2E+00	1.5E-11
Hexachlorobenzene	2.90E-08	8.79E-11	4.2E-11	5.0E-11	9.2E-11	2.3E-01	4.1E-10
Indeno(1,2,3-cd) pyrene	3.48E-10	4.02E-11	1.9E-11	6.0E-13	2.0E-11	1.0E-03	2.0E-08
Lead	6.53E-06	2.43E-06	1.2E-06	1.1E-08	1.2E-06	2.5E-02	4.7E-05
Manganese	7.13E-08	3.61E-07	1.7E-07	1.2E-10	1.7E-07	9.8E+02	1.8E-10
Mercuric chloride	8.22E-06	9.67E-08	4.6E-08	1.4E-08	6.0E-08	3.3E+00	1.9E-08
Methyl mercury	1.67E-07	2.51E-08	1.2E-08	2.9E-10	1.2E-08	6.4E-03	1.9E-06
Nickel	1.50E-08	7.69E-08	3.7E-08	2.6E-11	3.7E-08	6.5E+01	5.7E-10
Pentachloronitrobenzene (PCNB)	3.95E-08	2.86E-10	1.4E-10	6.8E-11	2.1E-10	6.9E+01	3.0E-12
Pentachlorophenol	7.31E-08	3.04E-07	1.5E-07	1.3E-10	1.5E-07	4.0E+00	3.6E-08
Selenium	1.13E-09	2.94E-08	1.4E-08	1.9E-12	1.4E-08	5.0E-01	2.8E-08
Silver	2.71E-07	2.45E-08	1.2E-08	4.7E-10	1.2E-08	1.8E+02	6.8E-11
Dioxin - TEQB	1.65E-10	1.65E-12	7.9E-13	2.9E-13	1.1E-12	1.0E-05	1.1E-07
Thallium (I)	4.45E-06	7.20E-08	3.4E-08	7.7E-09	4.2E-08	3.5E-01	1.2E-07
Vanadium	1.70E-06	1.94E-08	9.3E-09	2.9E-09	1.2E-08	1.1E+01	1.1E-09
Zinc	2.17E-07	1.17E-06	5.6E-07	3.8E-10	5.6E-07	1.3E+02	4.3E-09
						Cumulative HI (i):	**5E-05**

(a) Only those compounds with TRVs are listed in this table.
(b) Soil concentrations (Csoil) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.
(c) Plant concentrations (Cplant) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program. Wet weight plant concentrations were calculated from the IRAP outputs dry weight concentrations using a moisture content of 88% as specified in USEPA's 1999 Screening Ecological Risk Assessment Protocol.
(d) DDdiet = Cplant x Food IR; assumes that 100% of ingested plant material is potentially contaminated
(e) DDsoil = Csoil x Soil IR; assumes that 100% of ingested soil is potentially contaminated
(f) Total Daily Dose = DDdiet + DDsoil

Table 5
Calculation of Hazard Quotients for Gambel's Quail - Agricultural Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg WW) (c)	Daily Dose from Diet (mg/kg BW-d) (d)	Daily Dose from Soil (mg/kg BW-d) (e)	Total Daily Dose (mg/kg BW-d) (f)	TRV (Bird) (mg/kg BW-d) (g)	Hazard Quotient (h)

(g) Toxicity Reference Values (TRVs) are discussed in the text.
(h) Hazard Quotients (HQ) are calculated by dividing the daily dose by the TRV.
(i) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQB is the Toxic Equivalents (TEQ) for birds calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.
Food IR - Food ingestion rate as shown in Table 5.2-2
Soil IR - Soil ingestion rate as shown in Table 5.2-2

mg - milligrams
kg - kilograms
BW - body weight
d - day
DD - daily dose

Table 6
Calculation of Hazard Quotients for Burrowing Owl - Agricultural Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg) (c)	Kow	Biotransfer Factor (BaA) (d)	BCF plant-herbivore (e)	Mammal Prey Tissue Concentration (mg/kg) (f)	Daily Dose from Prey (mg/kg-BW-d) (g)	Daily Dose from Soil (mg/kg-BW-d) (h)	Total Daily Dose (mg/kg-BW-d) (i)	TRV (mg/kg-BW-d) (j)	Hazard Quotient (k)
Acetone	1.14E-08	8.59E-09			9.3E-09	8.0E-17	2.8E-17	7.2E-10	7.2E-10	5.2E+01	1.4E-11
Aluminum	1.36E-05	9.01E-07		8.0E-04	4.9E-04	4.4E-10	1.6E-10	8.7E-07	8.7E-07	1.0E+02	8.7E-09
Aroclor 1254	6.38E-09	4.70E-12			2.5E-02	1.2E-13	4.1E-14	4.1E-10	4.1E-10	7.2E-02	5.6E-09
Arsenic	2.76E-09	9.80E-07			1.2E-03	1.2E-09	4.2E-10	1.8E-10	6.0E-10	2.5E+00	2.4E-10
Barium	3.37E-06	7.85E-08			9.2E-05	7.2E-12	2.5E-12	2.1E-07	2.1E-07	2.1E+01	1.0E-08
Benzo(a)Anthracene	6.09E-11	2.07E-12			7.4E-03	1.5E-14	5.4E-15	3.9E-12	3.9E-12	7.9E-04	4.9E-09
Benzo(a)pyrene	4.29E-11	6.10E-12			2.1E-02	1.3E-13	4.5E-14	2.7E-12	2.8E-12	1.0E-03	2.8E-09
Benzo(b)fluoranthene	9.68E-10	3.23E-12			2.5E-02	7.9E-14	2.8E-14	6.2E-11	6.2E-11	1.4E-04	4.4E-07
Benzo(k)fluoranthene	2.42E-10	1.31E-11			2.4E-02	3.2E-13	1.1E-13	1.5E-11	1.6E-11	1.4E-04	1.1E-07
Cadmium	4.38E-07	2.42E-06			7.4E-05	1.8E-10	6.3E-11	2.8E-08	2.8E-08	1.5E+00	1.9E-08
Chlordane	4.36E-09	1.17E-11	3.2E+05	7.9E-03	4.9E-03	5.7E-14	2.0E-14	2.8E-10	2.8E-10	2.1E+00	1.3E-10
Chromium, hexavalent	1.25E-06	4.55E-08			3.4E-03	1.5E-10	5.4E-11	8.0E-08	8.0E-08	1.0E+00	8.0E-08
Chrysene	4.81E-10	3.19E-12			8.5E-03	2.7E-14	9.5E-15	3.1E-11	3.1E-11	1.0E-03	3.1E-08
Copper	1.19E-06	9.60E-07		8.0E-02	4.9E-02	4.7E-08	1.7E-08	7.6E-08	9.3E-08	4.7E+01	2.0E-09
DDE, 4,4'-	1.07E-08	2.14E-11			2.8E-02	6.0E-13	2.1E-13	6.8E-10	6.8E-10	8.5E-01	8.1E-10
Dibenz(a,h)anthracene	4.05E-11	2.85E-11			5.4E-02	1.5E-12	5.5E-13	2.6E-12	3.1E-12	3.9E-04	8.0E-09
Dinitrobenzene, 1,3-	8.08E-09	3.86E-09			4.8E-07	1.8E-15	6.5E-16	5.1E-10	5.1E-10	4.2E-04	1.2E-06
Ethylhexyl phthalate, bis-2-	5.92E-09	2.18E-08			2.5E-03	5.4E-11	1.9E-11	3.8E-10	4.0E-10	1.1E+02	3.6E-12
gamma-BHC (Lindane)	1.69E-10	5.90E-12	4.0E+03	1.0E-04	6.1E-05	3.6E-16	1.3E-16	1.1E-11	1.1E-11	2.0E+00	5.4E-12
Heptachlor	1.28E-11	1.46E-13			1.6E-03	2.3E-16	8.2E-17	8.1E-13	8.1E-13	6.5E-02	1.3E-11
Hexachloro-1,3-butadiene (Perchlorobutadiene)	1.08E-08	6.32E-11			8.3E-04	5.2E-14	1.8E-14	6.9E-10	6.9E-10	3.2E+00	2.2E-10
Hexachlorobenzene	2.90E-08	8.79E-11			4.9E-03	4.3E-13	1.5E-13	1.8E-09	1.8E-09	2.3E-01	8.2E-09
Indeno(1,2,3-cd) pyrene	3.48E-10	4.02E-11			1.3E-01	5.1E-12	1.8E-12	2.2E-11	2.4E-11	1.0E-03	2.4E-08
Lead	6.53E-06	2.43E-06			1.8E-04	4.5E-10	1.6E-10	4.2E-07	4.2E-07	2.5E-02	1.7E-05
Manganese	7.13E-08	3.61E-07		5.0E-02	3.1E-02	1.1E-08	3.9E-09	4.5E-09	8.4E-09	9.8E+02	8.6E-12
Mercuric chloride	8.22E-06	9.67E-08			3.2E-03	3.1E-10	1.1E-10	5.2E-07	5.2E-07	3.3E+00	1.6E-07
Methyl mercury	1.67E-07	2.51E-08			4.8E-04	1.2E-11	4.2E-12	1.1E-08	1.1E-08	6.4E-03	1.7E-06
Nickel	1.50E-08	7.69E-08			3.7E-03	2.8E-10	1.0E-10	9.5E-10	1.1E-09	6.5E+01	1.6E-11
Pentachloronitrobenzene (PCNB)	3.95E-08	2.86E-10			6.8E-04	1.9E-13	6.8E-14	2.5E-09	2.5E-09	6.9E+01	3.7E-11
Pentachlorophenol	7.31E-08	3.04E-07			1.9E-03	5.6E-10	2.0E-10	4.7E-09	4.9E-09	4.0E+00	1.2E-09
Selenium	1.13E-09	2.94E-08			1.4E-03	4.1E-11	1.4E-11	7.2E-11	8.6E-11	5.0E-01	1.7E-10
Silver	2.71E-07	2.45E-08			1.8E-03	4.5E-11	1.6E-11	1.7E-08	1.7E-08	1.8E+02	9.7E-11
Dioxin - TEQB	1.65E-10	1.65E-12			(l)	2.5E-16	8.9E-17	1.0E-11	1.0E-11	1.0E-05	1.0E-06
Thallium (l)	4.45E-06	7.20E-08			2.5E-02	1.8E-09	6.2E-10	2.8E-07	2.8E-07	3.5E-01	8.1E-07
Vanadium	1.70E-06	1.94E-08		1.1E-03	6.8E-04	1.3E-11	4.6E-12	1.1E-07	1.1E-07	1.1E+01	9.5E-09
Zinc	2.17E-07	1.17E-06			5.5E-05	6.5E-11	2.3E-11	1.4E-08	1.4E-08	1.3E+02	1.1E-10
										Cumulative HI (m) :	**2E-05**

(a) Only those compounds with TRVs are listed in this table.
(b) Soil concentrations (Csoil) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.
(c) Plant concentrations (Cplant) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program. Wet weight plant concentrations were calculated from the IRAP outputs dry weight concentrations using a moisture content of 88% as specified in USEPA's 1999 Screening Ecological Risk Assessment Protocol.
(d) For organic compounds not included in USEPA, 1999, the BaA was calculated using Travis & Arms equation: logBaA = -7.6 + logKow
For inorganic compounds not included in USEPA, 1999, the BaA was taken from Baes 1984.
(e) Bioconcentration Factors (BCFs) in prey items are based on the white footed mouse and were obtained from Appendix D of USEPA's 1999 Screening Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. If a BCF was not available then it was calculated using the following equation:
BCFplant-herbivore = BaA X Food IR, Food Ingestion Rate for mouse = 0.614 (kg WW/kg BW-d)
(f) Prey tissue concentration = plant tissue concentration X BCFplant-herbivore; except for Dioxin TEQB which is calculated on a congener-specific basis and is shown elsewhere in this appendix.
(g) DDdiet = Cprey x Food IR; assumes that 100% of ingested prey is potentially contaminated
(h) DDsoil = Csoil x Soil IR; assumes that 100% of ingested soil is potentially contaminated
(i) Total Daily Dose = DDdiet + DDsoil

Table 6
Calculation of Hazard Quotients for Burrowing Owl - Agricultural Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg) (c)	Kow	Biotransfer Factor (BaA) (d)	BCF plant-herbivore (e)	Mammal Prey Tissue Concentration (mg/kg) (f)	Daily Dose from Prey (mg/kg-BW-d) (g)	Daily Dose from Soil (mg/kg-BW-d) (h)	Total Daily Dose (mg/kg-BW-d) (i)	TRV (mg/kg-BW-d) (j)	Hazard Quotient (k)

(j) Toxicity Reference Values (TRVs) are discussed in the text.
(k) Hazard Quotients (HQ) are calculated by dividing the daily dose by the TRV.
(l) BCFs were calculated for individual congeners using bioaccumulation equivalency factors (BEFs) from Appendix D of USEPA (1999).
See elsewhere in this appendix for more information.
(m) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQB is the Toxic Equivalents (TEQ) for birds calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.
Food IR - Food ingestion rate as shown in Table 5.2-2
Soil IR - Soil ingestion rate as shown in Table 5.2-2

mg - milligrams
kg - kilograms
BW - body weight
WW- wet weight
d - day
DD - daily dose
Kow - octanol-water partition coefficient

Table 7
Hazard Quotients for Plants (Alfalfa) in the Agricultural Area

CAS No	Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Toxicity Reference Value (TRV) (mg/kg) (c)	Hazard Quotient (d)
108-60-1	2,2'-oxybis (1-Chloropropane)	1.40E-09	2.0E+01	7.0E-11
591-78-6	2-Hexanone	1.05E-09	1.3E+01	8.3E-11
91-57-6	2-Methylnaphthalene	1.88E-08	3.2E+00	5.8E-09
534-52-1	4,6-Dinitro-2-methylphenol	8.05E-08	1.4E-01	5.6E-07
208-96-8	Acenaphthylene	3.23E-09	6.8E+02	4.7E-12
7429-90-5	Aluminum	1.36E-05	5.0E+00	2.7E-06
7440-36-0	Antimony	2.36E-09	5.0E-01	4.7E-09
11097-69-1	Aroclor 1254	6.38E-09	1.0E+01	6.4E-10
7440-38-2	Arsenic	2.76E-09	1.0E+00	2.8E-09
7440-39-3	Barium	3.37E-06	5.0E+00	6.7E-07
56-55-3	Benzo(a)Anthracene	6.09E-11	1.2E+00	5.1E-11
50-32-8	Benzo(a)pyrene	4.29E-11	1.2E+00	3.6E-11
205-99-2	Benzo(b)fluoranthene	9.68E-10	1.2E+00	8.1E-10
191-24-2	Benzo(g,h,i)perylene	1.06E-09	1.2E+02	8.9E-12
207-08-9	Benzo(k)fluoranthene	2.42E-10	1.2E+00	2.0E-10
7440-41-7	Beryllium	3.85E-06	1.0E-01	3.8E-05
111-91-1	Bis(2-chloroethoxy) methane	4.23E-09	3.0E-01	1.4E-08
7440-43-9	Cadmium	4.38E-07	2.0E-01	2.2E-06
18540-29-9	Chromium, hexavalent	1.25E-06	1.8E-02	7.0E-05
218-01-9	Chrysene	4.81E-10	1.2E+00	4.0E-10
7440-48-4	Cobalt	2.30E-07	2.0E+01	1.1E-08
7440-50-8	Copper	1.19E-06	1.0E+00	1.2E-06
319-86-8	delta-BHC	1.10E-08	9.9E+00	1.1E-09
53-70-3	Dibenz(a,h)anthracene	4.05E-11	1.2E+00	3.4E-11
122-39-4	Diphenylamine	4.01E-07	1.0E+00	4.0E-07
33213-65-9	Endosulfan II	7.18E-10	1.2E-01	6.0E-09
7421-93-4	Endrin aldehyde	2.17E-08	1.1E-02	2.1E-06
58-89-9	gamma-BHC (Lindane)	1.69E-10	5.0E-03	3.4E-08
76-44-8	Heptachlor	1.28E-11	1.0E+00	1.3E-11
77-47-4	Hexachlorocyclopentadiene	1.14E-08	1.0E-01	1.1E-07
193-39-5	Indeno(1,2,3-cd) pyrene	3.48E-10	1.2E+00	2.9E-10
74-88-4	Iodomethane	2.91E-10	1.2E+00	2.4E-10
7439-92-1	Lead	6.53E-06	4.6E+00	1.4E-06
7439-96-5	Manganese	7.13E-08	5.0E+02	1.4E-10
7487-94-7	Mercuric chloride	8.22E-06	3.5E-01	2.4E-05
80-62-6	Methyl methacrylate	1.11E-12	9.8E+02	1.1E-15
7440-02-0	Nickel	1.50E-08	2.5E+01	6.0E-10
62-75-9	N-nitrosodimethylamine	1.49E-09	1.2E+01	1.3E-10
87-86-5	Pentachlorophenol	7.31E-08	1.7E+00	4.2E-08
7782-49-2	Selenium	1.13E-09	5.0E-02	2.3E-08
7440-22-4	Silver	2.71E-07	2.0E-02	1.4E-05
7440-28-0	Thallium (I)	4.45E-06	1.0E-02	4.5E-04
7440-62-2	Vanadium	1.70E-06	2.0E+00	8.5E-07
7440-66-6	Zinc	2.17E-07	9.0E-01	2.4E-07
			Cumulative HI (e) =	**6E-04**

(a) Only those compounds with TRVs are listed in this table.
(b) Soil concentrations were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
(c) Toxicity Reference Values (TRVs) are discussed in the text.
(d) Hazard Quotient (HQ) is calculated by dividing the maximum annual soil concentration by the TRV.
(e) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

mg/kg - milligrams per kilogram

Table 8
Calculation of Hazard Quotients for Southwest Willow Flycatcher - Riparian Corridor Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Kow	BCF soil-soil invert (c)	Invertebrate Prey Tissue Concentration (mg/kg) (d)	Daily Dose from Prey (mg/kg-BW-d) (e)	Total Daily Dose (mg/kg-BW-d) (f)	TRV (mg/kg-BW-d) (g)	Hazard Quotient (h)
Acetone	2.90E-09		5.0E-02	8.7E-10	1.5E-09	1.5E-09	5.2E+01	2.8E-11
Aluminum	2.37E-04		2.2E-01	3.1E-04	5.2E-04	5.2E-04	1.0E+02	5.2E-06
Aroclor 1254	6.39E-08		1.1E+00	4.3E-07	7.3E-07	7.3E-07	7.2E-02	1.0E-05
Arsenic	3.87E-10		1.1E-01	2.5E-10	4.3E-10	4.3E-10	2.5E+00	1.7E-10
Barium	5.26E-05		2.2E-01	6.9E-05	1.2E-04	1.2E-04	2.1E+01	5.6E-06
Benzo(a)Anthracene	7.18E-10		3.0E-02	1.3E-10	2.2E-10	2.2E-10	7.9E-04	2.7E-07
Benzo(a)pyrene	5.72E-10		7.0E-02	2.4E-10	4.0E-10	4.0E-10	1.0E-03	4.0E-07
Benzo(b)fluoranthene	9.80E-09		7.0E-02	4.1E-09	6.9E-09	6.9E-09	1.4E-04	4.9E-05
Benzo(k)fluoranthene	3.29E-09		8.0E-02	1.6E-09	2.6E-09	2.6E-09	1.4E-04	1.9E-05
Cadmium	6.15E-08		9.6E-01	3.5E-07	5.9E-07	5.9E-07	1.5E+00	4.1E-07
Chromium, hexavalent	2.10E-05		2.2E-01	2.8E-05	4.7E-05	4.7E-05	1.0E+00	4.7E-05
Chrysene	5.14E-09		4.0E-02	1.2E-09	2.1E-09	2.1E-09	1.0E-03	2.1E-06
Copper	1.68E-07		4.0E-02	4.0E-08	6.7E-08	6.7E-08	4.7E+01	1.4E-09
DDE, 4,4'-	1.08E-07		1.3E+00	8.2E-07	1.4E-06	1.4E-06	8.5E-01	1.6E-06
Dibenz(a,h)anthracene	5.56E-10		7.0E-02	2.3E-10	3.9E-10	3.9E-10	3.9E-04	1.0E-06
Dinitrobenzene, 1,3-	8.56E-08		1.2E+00	6.1E-07	1.0E-06	1.0E-06	4.2E-04	2.4E-03
Ethylhexyl phthalate, bis-2-	9.50E-08		1.3E+03	7.4E-04	1.3E-03	1.3E-03	1.1E+02	1.1E-05
gamma-BHC (Lindane)	2.88E-10	4.0E+03	6.3E+01	1.1E-07	1.8E-07	1.8E-07	2.0E+00	9.2E-08
Heptachlor	1.28E-10		1.4E+00	1.1E-09	1.8E-09	1.8E-09	6.5E-02	2.8E-08
Hexachloro-1,3-butadiene (Perchlorobutadiene)	3.44E-08		5.4E+02	1.1E-04	1.9E-04	1.9E-04	3.2E+00	5.8E-05
Hexachlorobenzene	4.14E-09		2.3E+03	5.7E-05	9.6E-05	9.6E-05	2.3E-01	4.3E-04
Indeno(1,2,3-cd) pyrene	4.80E-09		8.0E-02	2.3E-09	3.9E-09	3.9E-09	1.0E-03	3.9E-06
Lead	9.16E-07		3.0E-02	1.6E-07	2.8E-07	2.8E-07	2.5E-02	1.1E-05
Manganese	1.00E-08		2.2E-01	1.3E-08	2.2E-08	2.2E-08	9.8E+02	2.3E-11
Mercuric chloride	8.55E-05		4.0E-02	2.0E-05	3.4E-05	3.4E-05	3.3E+00	1.1E-05
Methyl mercury	1.73E-06		8.5E+00	8.8E-05	1.5E-04	1.5E-04	6.4E-03	2.3E-02
Nickel	2.10E-09		2.0E-02	2.5E-10	4.2E-10	4.2E-10	6.5E+01	6.5E-12
Pentachloronitrobenzene (PCNB)	3.47E-07		4.5E+02	9.4E-04	1.6E-03	1.6E-03	6.9E+01	2.3E-05
Pentachlorophenol	8.08E-07		1.0E+03	5.0E-03	8.4E-03	8.4E-03	4.0E+00	2.1E-03
Selenium	1.59E-10		2.2E-01	2.1E-10	3.5E-10	3.5E-10	5.0E-01	7.0E-10
Silver	4.73E-06		2.2E-01	6.2E-06	1.0E-05	1.0E-05	1.8E+02	5.9E-08
Dioxin - TEQB	1.99E-09		(i)	3.2E-09	5.4E-09	5.4E-09	1.0E-05	5.4E-04
Thallium (l)	6.65E-05		2.2E-01	8.8E-05	1.5E-04	1.5E-04	3.5E-01	4.2E-04
Vanadium	2.36E-05		2.2E-01	3.1E-05	5.2E-05	5.2E-05	1.1E+01	4.6E-06
Zinc	3.05E-08		5.6E-01	1.0E-07	1.7E-07	1.7E-07	1.3E+02	1.3E-09
							Cumulative HI (j) :	**3E-02**

(a) Only those compounds with TRVs are listed in this table.

(b) Soil concentrations (Csoil) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.

(c) For organic compounds not included in USEPA, 1999, a BCF value was calculated using the following equation:
logBCF=0.819 x logKow 1.146. For inorganic compounds not included in USEPA, 1999, a BCF value of 0.22 was used.

(d) Prey Tissue Concentration = Csoil x BCF/$CF_{WWinvert}$; except for Dioxin - TEQB which is calculated on a congener-specific basis and is shown elsewhere in this appendix.
Assumes 100% of prey tissue is potentially contaminated

Table 8
Calculation of Hazard Quotients for Southwest Willow Flycatcher - Riparian Corridor Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Kow	BCF soil-soil invert (c)	Invertebrate Prey Tissue Concentration (mg/kg) (d)	Daily Dose from Prey (mg/kg-BW-d) (e)	Total Daily Dose (mg/kg-BW-d) (f)	TRV (mg/kg-BW-d) (g)	Hazard Quotient (h)

(e) DDprey = Prey Tissue Concentration x Food IR; assumes 100% of prey tissue is potentially contaminated
(f) Total daily dose is the daily dose from prey with the assumption the flycatcher does not ingest soil.
(g) Toxicity Reference Values (TRVs) are discussed in the text.
(h) Hazard Quotients (HQ) are calculated by dividing the daily dose by the TRV.
(i) BCFs were calculated for individual congeners using bioaccumulation equivalency factors (BEFs) from Appendix D of USEPA (1999).
See elsewhere in this appendix for more information.
(j) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQB is the Toxic Equivalents (TEQ) for birds calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.
Food IR - Food ingestion rate as shown in Table 5.2-2
Soil IR - Soil ingestion rate as shown in Table 5.2-2
$CF_{WW\text{-}invert}$ - Conversion factor from wet weight to dry weight (0.167)

mg - milligrams
kg - kilograms
BW - body weight
d - day
WW - wet weight
Kow - octanol-water partition coefficient

Table 9
Calculation of Hazard Quotients for Gambel's Quail - Riparian Corridor Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg WW) (c)	Daily Dose from Diet (mg/kg BW-d) (d)	Daily Dose from Soil (mg/kg BW-d) (e)	Total Daily Dose (mg/kg BW-d) (f)	TRV (Bird) (mg/kg BW-d) (g)	Hazard Quotient (h)
Acetone	2.90E-09	2.91E-09	1.4E-09	5.0E-12	1.4E-09	5.2E+01	2.7E-11
Aluminum	2.37E-04	1.27E-06	6.1E-07	4.1E-07	1.0E-06	1.0E+02	1.0E-08
Aroclor 1254	6.39E-08	3.14E-11	1.5E-11	1.1E-10	1.3E-10	7.2E-02	1.7E-09
Arsenic	3.87E-10	1.36E-06	6.5E-07	6.7E-13	6.5E-07	2.5E+00	2.6E-07
Barium	5.26E-05	2.18E-07	1.0E-07	9.1E-08	2.0E-07	2.1E+01	9.4E-09
Benzo(a)Anthracene	7.18E-10	4.78E-12	2.3E-12	1.2E-12	3.5E-12	7.9E-04	4.5E-09
Benzo(a)pyrene	5.72E-10	9.07E-12	4.3E-12	9.9E-13	5.3E-12	1.0E-03	5.3E-09
Benzo(b)fluoranthene	9.80E-09	1.52E-11	7.3E-12	1.7E-11	2.4E-11	1.4E-04	1.7E-07
Benzo(k)fluoranthene	3.29E-09	1.96E-11	9.4E-12	5.7E-12	1.5E-11	1.4E-04	1.1E-07
Cadmium	6.15E-08	3.35E-06	1.6E-06	1.1E-10	1.6E-06	1.5E+00	1.1E-06
Chromium, hexavalent	2.10E-05	7.07E-08	3.4E-08	3.6E-08	7.0E-08	1.0E+00	7.0E-08
Chrysene	5.14E-09	1.54E-11	7.3E-12	8.9E-12	1.6E-11	1.0E-03	1.6E-08
Copper	1.68E-07	1.29E-06	6.2E-07	2.9E-10	6.2E-07	4.7E+01	1.3E-08
DDE, 4,4'-	1.08E-07	1.58E-10	7.6E-11	1.9E-10	2.6E-10	8.5E-01	3.1E-10
Dibenz(a,h)anthracene	5.56E-10	3.00E-11	1.4E-11	9.6E-13	1.5E-11	3.9E-04	3.9E-08
Dinitrobenzene, 1,3-	8.56E-08	5.30E-08	2.5E-08	1.5E-10	2.5E-08	4.2E-04	6.0E-05
Ethylhexyl phthalate, bis-2-	9.50E-08	3.50E-08	1.7E-08	1.6E-10	1.7E-08	1.1E+02	1.5E-10
gamma-BHC (Lindane)	2.88E-10	1.20E-11	5.8E-12	5.0E-13	6.3E-12	2.0E+00	3.1E-12
Heptachlor	1.28E-10	1.94E-12	9.3E-13	2.2E-13	1.1E-12	6.5E-02	1.8E-11
Hexachloro-1,3-butadiene (Perchlorobutadiene)	3.44E-08	2.67E-10	1.3E-10	6.0E-11	1.9E-10	3.2E+00	5.9E-11
Hexachlorobenzene	4.14E-09	1.72E-11	8.2E-12	7.2E-12	1.5E-11	2.3E-01	6.8E-11
Indeno(1,2,3-cd) pyrene	4.80E-09	5.83E-11	2.8E-11	8.3E-12	3.6E-11	1.0E-03	3.6E-08
Lead	9.16E-07	3.36E-06	1.6E-06	1.6E-09	1.6E-06	2.5E-02	6.4E-05
Manganese	1.00E-08	4.99E-07	2.4E-07	1.7E-11	2.4E-07	9.8E+02	2.4E-10
Mercuric chloride	8.55E-05	1.64E-07	7.8E-08	1.5E-07	2.3E-07	3.3E+00	7.0E-08
Methyl mercury	1.73E-06	2.83E-08	1.4E-08	3.0E-09	1.7E-08	6.4E-03	2.6E-06
Nickel	2.10E-09	1.06E-07	5.1E-08	3.6E-12	5.1E-08	6.5E+01	7.8E-10
Pentachloronitrobenzene (PCNB)	3.47E-07	3.09E-09	1.5E-09	6.0E-10	2.1E-09	6.9E+01	3.0E-11
Pentachlorophenol	8.08E-07	3.06E-07	1.5E-07	1.4E-09	1.5E-07	4.0E+00	3.7E-08
Selenium	1.59E-10	4.07E-08	1.9E-08	2.7E-13	1.9E-08	5.0E-01	3.9E-08
Silver	4.73E-06	9.41E-08	4.5E-08	8.2E-09	5.3E-08	1.8E+02	3.0E-10
Dioxin - TEQB	1.99E-09	3.33E-12	1.6E-12	3.5E-12	5.0E-12	1.0E-05	5.0E-07
Thallium (I)	6.65E-05	1.03E-07	4.9E-08	1.2E-07	1.6E-07	3.5E-01	4.7E-07
Vanadium	2.36E-05	3.10E-08	1.5E-08	4.1E-08	5.6E-08	1.1E+01	4.9E-09
Zinc	3.05E-08	1.62E-06	7.8E-07	5.3E-11	7.8E-07	1.3E+02	5.9E-09
						Cumulative HI (i):	**1E-04**

(a) Only those compounds with TRVs are listed in this table.
(b) Soil concentrations (Csoil) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.
(c) Plant concentrations (Cplant) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program. Wet weight plant concentrations were calculated from the IRAP outputs dry weight concentrations using a moisture content of 88% as specified in USEPA's 1999 Screening Ecological Risk Assessment Protocol.
(d) DDdiet = Cplant x Food IR; assumes that 100% of ingested plant material is potentially contaminated
(e) DDsoil = Csoil x Soil IR; assumes that 100% of ingested soil is potentially contaminated
(f) Total Daily Dose = DDdiet + DDsoil
(g) Toxicity Reference Values (TRVs) are discussed in the text.

Table 9
Calculation of Hazard Quotients for Gambel's Quail - Riparian Corridor Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg WW) (c)	Daily Dose from Diet (mg/kg BW-d) (d)	Daily Dose from Soil (mg/kg BW-d) (e)	Total Daily Dose (mg/kg BW-d) (f)	TRV (Bird) (mg/kg BW-d) (g)	Hazard Quotient (h)

(h) Hazard Quotients (HQ) are calculated by dividing the daily dose by the TRV.

(i) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQB is the Toxic Equivalents (TEQ) for birds calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.

Food IR - Food ingestion rate as shown in Table 5.2-2

Soil IR - Soil ingestion rate as shown in Table 5.2-2

mg - milligrams

kg - kilograms

BW - body weight

d - day

DD - daily dose

Table 10
Hazard Quotients for Plants (Screwbean mesquite) in the Riparian Corridor Area

CAS No	Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Toxicity Reference Value (TRV) (mg/kg) (c)	Hazard Quotient (d)
108-60-1	2,2'-oxybis (1-Chloropropane)	2.04E-10	2.0E+01	1.0E-11
591-78-6	2-Hexanone	1.38E-10	1.3E+01	1.1E-11
91-57-6	2-Methylnaphthalene	5.39E-09	3.2E+00	1.7E-09
534-52-1	4,6-Dinitro-2-methylphenol	7.33E-07	1.4E-01	5.1E-06
208-96-8	Acenaphthylene	6.48E-09	6.8E+02	9.5E-12
7429-90-5	Aluminum	2.37E-04	5.0E+00	4.7E-05
7440-36-0	Antimony	2.42E-10	5.0E-01	4.8E-10
11097-69-1	Aroclor 1254	6.39E-08	1.0E+01	6.4E-09
7440-38-2	Arsenic	3.87E-10	1.0E+00	3.9E-10
7440-39-3	Barium	5.26E-05	5.0E+00	1.1E-05
56-55-3	Benzo(a)Anthracene	7.18E-10	1.2E+00	6.0E-10
50-32-8	Benzo(a)pyrene	5.72E-10	1.2E+00	4.8E-10
205-99-2	Benzo(b)fluoranthene	9.80E-09	1.2E+00	8.2E-09
191-24-2	Benzo(g,h,i)perylene	1.91E-08	1.2E+02	1.6E-10
207-08-9	Benzo(k)fluoranthene	3.29E-09	1.2E+00	2.7E-09
7440-41-7	Beryllium	5.40E-07	1.0E-01	5.4E-06
111-91-1	Bis(2-chloroethoxy) methane	4.17E-08	3.0E-01	1.4E-07
7440-43-9	Cadmium	6.15E-08	2.0E-01	3.1E-07
18540-29-9	Chromium, hexavalent	2.10E-05	1.8E-02	1.2E-03
218-01-9	Chrysene	5.14E-09	1.2E+00	4.3E-09
7440-48-4	Cobalt	3.57E-06	2.0E+01	1.8E-07
7440-50-8	Copper	1.68E-07	1.0E+00	1.7E-07
319-86-8	delta-BHC	1.09E-07	9.9E+00	1.1E-08
53-70-3	Dibenz(a,h)anthracene	5.56E-10	1.2E+00	4.6E-10
122-39-4	Diphenylamine	3.86E-06	1.0E+00	3.8E-06
33213-65-9	Endosulfan II	6.35E-10	1.2E-01	5.3E-09
7421-93-4	Endrin aldehyde	2.23E-07	1.1E-02	2.1E-05
58-89-9	gamma-BHC (Lindane)	2.88E-10	5.0E-03	5.8E-08
76-44-8	Heptachlor	1.28E-10	1.0E+00	1.3E-10
77-47-4	Hexachlorocyclopentadiene	4.99E-08	1.0E-01	5.0E-07
193-39-5	Indeno(1,2,3-cd) pyrene	4.80E-09	1.2E+00	4.0E-09
74-88-4	Iodomethane	3.01E-11	1.2E+00	2.4E-11
7439-92-1	Lead	9.16E-07	4.6E+00	2.0E-07
7439-96-5	Manganese	1.00E-08	5.0E+02	2.0E-11
7487-94-7	Mercuric chloride	8.55E-05	3.5E-01	2.4E-04
80-62-6	Methyl methacrylate	1.24E-13	9.8E+02	1.3E-16
7440-02-0	Nickel	2.10E-09	2.5E+01	8.4E-11
62-75-9	N-nitrosodimethylamine	2.11E-09	1.2E+01	1.8E-10
87-86-5	Pentachlorophenol	8.08E-07	1.7E+00	4.7E-07
7782-49-2	Selenium	1.59E-10	5.0E-02	3.2E-09
7440-22-4	Silver	4.73E-06	2.0E-02	2.4E-04
7440-28-0	Thallium (I)	6.65E-05	1.0E-02	6.7E-03
7440-62-2	Vanadium	2.36E-05	2.0E+00	1.2E-05
7440-66-6	Zinc	3.05E-08	9.0E-01	3.4E-08
			Cumulative HI (e):	**8E-03**

(a) Only those compounds with TRVs are listed in this table.
(b) Soil concentrations were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
(c) Toxicity Reference Values (TRVs) are discussed in the text.
(d) Hazard Quotient (HQ) is calculated by dividing the maximum annual soil concentration by the TRV.
(e) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted.
A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

mg/kg - milligrams per kilogram

Table 11
Calculation of Hazard Quotients for Double-crested Cormorant - Colorado River Area

Compound (a)	Maximum Annual Sediment Concentration (mg/kg) (b)	Maximum Annual Total Surface Water Concentration (mg/L) (c)	Maximum Annual Fish Concentration (mg COPC/kg WW tissue) (d)	Daily Dose from Sediment (mg/kg BW-d) (e)	Daily Dose from Surface Water (mg/kg BW-d) (f)	Daily Dose from Diet (mg/kg BW-d) (g)	Total Daily Dose (mg/kg BW-d) (h)	TRV (Bird) (mg/kg BW-d) (i)	Hazard Quotient (j)
Acetone	6.70E-12	3.35E-10	1.06E-09	3.7E-14	1.9E-11	2.9E-10	3.1E-10	5.2E+01	5.9E-12
Aluminum	5.48E-06	5.54E-07	2.77E-04	3.0E-08	3.1E-08	7.6E-05	7.6E-05	1.0E+02	7.6E-07
Aroclor 1254	4.48E-08	6.75E-13	1.57E-07	2.4E-10	3.7E-14	4.3E-08	4.3E-08	7.2E-02	6.0E-07
Arsenic	1.31E-08	4.52E-10	5.15E-08	7.2E-11	2.5E-11	1.4E-08	1.4E-08	2.5E+00	5.8E-09
Barium	1.24E-06	3.02E-08	1.91E-05	6.8E-09	1.7E-09	5.2E-06	5.2E-06	2.1E+01	2.5E-07
Benzo(a)Anthracene	2.09E-10	1.56E-14	7.27E-10	1.1E-12	8.7E-16	2.0E-10	2.0E-10	7.9E-04	2.5E-07
Benzo(a)pyrene	4.94E-10	1.52E-14	1.70E-09	2.7E-12	8.4E-16	4.6E-10	4.7E-10	1.0E-03	4.7E-07
Benzo(b)fluoranthene	6.89E-09	1.98E-13	3.39E-08	3.8E-11	1.1E-14	9.2E-09	9.3E-09	1.4E-04	6.6E-05
Benzo(k)fluoranthene	1.95E-09	5.88E-14	8.70E-09	1.1E-11	3.3E-15	2.4E-09	2.4E-09	1.4E-04	1.7E-05
Cadmium	8.57E-08	1.14E-09	1.04E-06	4.7E-10	6.3E-11	2.8E-07	2.8E-07	1.5E+00	2.0E-07
Chromium, hexavalent	4.52E-07	2.38E-08	4.52E-07	2.5E-09	1.3E-09	1.2E-07	1.3E-07	1.0E+00	1.3E-07
Chrysene	1.20E-09	8.08E-14	3.74E-09	6.6E-12	4.5E-15	1.0E-09	1.0E-09	1.0E-03	1.0E-06
Copper	1.90E-07	4.41E-10	8.82E-08	1.0E-09	2.5E-11	2.4E-08	2.5E-08	4.7E+01	5.3E-10
DDE, 4,4'-	3.92E-09	1.15E-12	5.65E-08	2.1E-11	6.4E-14	1.5E-08	1.5E-08	8.5E-01	1.8E-08
Dibenz(a,h)anthracene	1.35E-09	2.55E-14	9.38E-09	7.4E-12	1.4E-15	2.6E-09	2.6E-09	3.9E-04	6.6E-06
Dinitrobenzene, 1,3-	2.19E-10	1.84E-10	5.24E-10	1.2E-12	1.0E-11	1.4E-10	1.5E-10	4.2E-04	3.7E-07
Ethylhexyl phthalate, bis-2-	1.07E-07	2.46E-11	4.67E-09	5.8E-10	1.4E-12	1.3E-09	1.9E-09	1.1E+02	1.7E-11
gamma-BHC (Lindane)	6.66E-11	1.23E-12	1.45E-10	3.6E-13	6.8E-14	4.0E-11	4.0E-11	2.0E+00	2.0E-11
Heptachlor	3.00E-11	7.88E-14	4.79E-11	1.6E-13	4.4E-15	1.3E-11	1.3E-11	6.5E-02	2.0E-10
Hexachloro-1,3-butadiene (Perchlorobutadiene)	7.62E-10	2.52E-12	6.11E-09	4.2E-12	1.4E-13	1.7E-09	1.7E-09	3.2E+00	5.2E-10
Hexachlorobenzene	8.14E-09	2.58E-12	2.94E-08	4.4E-11	1.4E-13	8.0E-09	8.1E-09	2.3E-01	3.6E-08
Indeno(1,2,3-cd) pyrene	1.86E-08	2.42E-13	9.36E-08	1.0E-10	1.3E-14	2.6E-08	2.6E-08	1.0E-03	2.6E-05
Lead	1.04E-06	1.16E-09	1.04E-10	5.7E-09	6.4E-11	2.8E-11	5.8E-09	2.5E-02	2.3E-07
Manganese	1.11E-08	1.71E-10	6.82E-08	6.0E-11	9.5E-12	1.9E-08	1.9E-08	9.8E+02	1.9E-11
Mercuric chloride	1.54E-05	3.89E-10	0.00E+00	8.4E-08	2.2E-11	0.0E+00	8.4E-08	3.3E+00	2.6E-08
Methyl mercury	7.43E-08	4.63E-11	3.15E-04	4.1E-10	2.6E-12	8.6E-05	8.6E-05	6.4E-03	1.3E-02
Nickel	2.37E-09	3.65E-11	2.84E-09	1.3E-11	2.0E-12	7.8E-10	7.9E-10	6.5E+01	1.2E-11
Pentachloronitrobenzene (PCNB)	1.79E-08	1.24E-11	2.00E-08	9.8E-11	6.9E-13	5.4E-09	5.5E-09	6.9E+01	8.1E-11
Pentachlorophenol	1.38E-07	5.82E-09	1.42E-05	7.5E-10	3.2E-10	3.9E-06	3.9E-06	4.0E+00	9.6E-07
Selenium	7.24E-11	1.45E-11	5.93E-09	4.0E-13	8.0E-13	1.6E-09	1.6E-09	5.0E-01	3.2E-09
Silver	1.09E-07	1.31E-08	1.15E-06	5.9E-10	7.3E-10	3.1E-07	3.1E-07	1.8E+02	1.8E-09
Dioxin - TEQB	1.75E-09	3.23E-14	2.43E-10	9.6E-12	1.8E-15	6.6E-11	7.6E-11	1.0E-05	7.6E-06
Thallium (I)	1.59E-06	2.23E-08	2.23E-04	8.6E-09	1.2E-09	6.1E-05	6.1E-05	3.5E-01	1.7E-04
Vanadium	7.40E-07	7.42E-10	0.00E+00	4.0E-09	4.1E-11	0.0E+00	4.1E-09	1.1E+01	3.6E-10
Zinc	3.45E-08	5.56E-10	1.14E-06	1.9E-10	3.1E-11	3.1E-07	3.1E-07	1.3E+02	2.4E-09
								Cumulative HI (k):	**1E-02**

(a) Only those compounds with TRVs are listed in this table.
(b) Sediment concentrations (Csed) were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
(c) Surface water concentrations (Csw) were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
HHRAP calculates dissolved, but not total, water column concentrations for methyl mercury, and thus the dissolved concentration was used in this table for methyl mercury.
(d) Cfish were derived using IRAP software; assumes trophic level 4.
(e) DDsed = Csed x Sediment IR; assumes 100% of fish is potentially contaminated
(f) DDsw = Csw x Water IR; assumes 100% of surface water is potentially contaminated
(g) DDdiet = Cfish x Food IR; assumes 100% of fish is potentially contaminated
(h) Total Daily Dose = DDdiet + DDsed + DDsw

Table 11
Calculation of Hazard Quotients for Double-crested Cormorant - Colorado River Area

Compound (a)	Maximum Annual Sediment Concentration (mg/kg) (b)	Maximum Annual Total Surface Water Concentration (mg/L) (c)	Maximum Annual Fish Concentration (mg COPC/kg WW tissue) (d)	Daily Dose from Sediment (mg/kg BW-d) (e)	Daily Dose from Surface Water (mg/kg BW-d) (f)	Daily Dose from Diet (mg/kg BW-d) (g)	Total Daily Dose (mg/kg BW-d) (h)	TRV (Bird) (mg/kg BW-d) (i)	Hazard Quotient (j)

(i) Toxicity Reference Values (TRVs) are discussed in the text.
(j) Hazard Quotient is calculated by dividing the Daily Dose by the TRV.
(k) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQB is the Toxic Equivalents (TEQ) for birds calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.
Sediment IR - Sediment ingestion rate as shown in Table 5.2-2
Food IR - Food ingestion rate as shown in Table 5.2-2
Water IR - Surface water ingestion rate as shown in Table 5.2-2

mg - milligrams
kg - kilograms
L - liters
BW - body weight
d - day
WW - wet weight

Table 12
Calculation of Hazard Quotients for Surface Water - Colorado River Area*

CAS No	Compound (a)	Maximum Annual Dissolved Surface Water Concentration (mg/L) (b)	TRV (mg/L) (c)	Hazard Quotient (d)
95-63-6	1,2,4-Trimethylbenzene	1.26E-12	7.7E-02	1.6E-11
142-28-9	1,3-Dichloropropane	9.36E-13	1.3E+00	7.1E-13
110-54-3	1-Hexane (n-hexane)	1.51E-15	2.5E-02	6.1E-14
594-20-7	2,2-Dichloropropane	5.23E-13	3.9E-01	1.3E-12
625-86-5	2,5-Dimethylfuran	1.60E-12	7.1E-01	2.3E-12
95-49-8	2-Chlorotoluene	1.19E-12	1.4E-01	8.5E-12
591-78-6	2-Hexanone	9.45E-12	4.3E+00	2.2E-12
91-57-6	2-Methylnaphthalene	2.26E-13	1.5E-02	1.5E-11
534-52-1	4,6-Dinitro-2-methylphenol	2.58E-09	2.4E-02	1.1E-07
106-43-4	4-Chlorotoluene	9.00E-13	3.4E+00	2.6E-13
67-64-1	Acetone	3.35E-10	1.5E+00	2.2E-10
79-10-7	Acrylic Acid	1.10E-16	3.8E+00	2.9E-17
107-13-1	Acrylonitrile	3.85E-11	2.5E-01	1.5E-10
7429-90-5	Aluminum	5.54E-07	8.7E-02	6.4E-06
7440-36-0	Antimony	7.22E-12	3.0E-02	2.4E-10
11097-69-1	Aroclor 1254	4.56E-13	2.0E-05	2.3E-08
7440-38-2	Arsenic	4.52E-10	1.9E-01	2.4E-09
7440-39-3	Barium	3.02E-08	4.0E-03	7.6E-06
92-87-5	Benzidine	1.93E-08	8.9E-02	2.2E-07
56-55-3	Benzo(a)Anthracene	1.46E-14	2.7E-05	5.4E-10
50-32-8	Benzo(a)pyrene	1.28E-14	1.4E-05	9.1E-10
205-99-2	Benzo(b)fluoranthene	1.64E-13	2.7E-05	6.1E-09
207-08-9	Benzo(k)fluoranthene	4.93E-14	2.7E-05	1.8E-09
7440-41-7	Beryllium	4.76E-10	5.3E-03	9.0E-08
111-91-1	Bis(2-chloroethoxy) methane	5.33E-10	1.8E+00	2.9E-10
108-86-1	Bromobenzene	1.08E-12	5.6E-02	1.9E-11
98-06-6	Butylbenzene, tert	1.13E-12	6.5E-01	1.7E-12
7440-43-9	Cadmium	1.14E-09	5.3E-03	2.2E-07
86-74-8	Carbazole	1.12E-10	1.5E-02	7.5E-09
67-66-3	Chloroform (Trichloromethane)	1.62E-11	2.8E-02	5.8E-10
18540-29-9	Chromium, hexavalent	2.38E-08	1.1E-02	2.2E-06
218-01-9	Chrysene	7.50E-14	2.7E-05	2.8E-09
7440-50-8	Copper	4.41E-10	2.5E-02	1.8E-08
72-55-9	DDE, 4,4'-	1.13E-12	2.0E-05	5.7E-08
319-86-8	delta-BHC	2.53E-11	1.3E-01	1.9E-10
53-70-3	Dibenz(a,h)anthracene	1.89E-14	2.7E-05	7.0E-10
132-64-9	Dibenzofuran	5.95E-11	2.0E-02	3.0E-09
99-65-0	Dinitrobenzene, 1,3-	1.84E-10	2.6E-02	7.1E-09
121-14-2	Dinitrotoluene, 2,4-	4.24E-10	2.3E-02	1.8E-08
606-20-2	Dinitrotoluene, 2,6-	5.59E-10	6.0E-02	9.3E-09
117-84-0	Di-n-octylphthalate	3.94E-13	3.2E-01	1.2E-12
123-91-1	Dioxane, 1,4-	4.72E-16	6.2E+01	7.6E-18
122-39-4	Diphenylamine	1.45E-10	3.8E-02	3.8E-09
33213-65-9	Endosulfan II	1.43E-12	5.6E-05	2.5E-08
1031-07-8	Endosulfan sulfate	8.30E-12	6.0E-05	1.4E-07
7421-93-4	Endrin aldehyde	2.62E-12	8.0E-05	3.3E-08
107-21-1	Ethylene Glycol	5.40E-11	1.0E+03	5.4E-14
117-81-7	Ethylhexyl phthalate, bis-2-	2.41E-11	3.0E-03	8.0E-09
58-89-9	gamma-BHC (Lindane)	1.23E-12	2.8E-04	4.4E-09
76-44-8	Heptachlor	7.87E-14	4.0E-06	2.0E-08
87-68-3	Hexachloro-1,3-butadiene (Perchlorobutadiene)	2.52E-12	8.2E-03	3.1E-10
118-74-1	Hexachlorobenzene	2.54E-12	3.7E-03	6.9E-10
77-47-4	Hexachlorocyclopentadiene	1.65E-11	3.0E-04	5.5E-08
193-39-5	Indeno(1,2,3-cd) pyrene	1.51E-13	2.7E-05	5.6E-09
99-87-6	Isopropyl toluene, p-	1.01E-12	4.6E-02	2.2E-11
7439-92-1	Lead	1.16E-09	8.7E-03	1.3E-07
7439-96-5	Manganese	1.71E-10	8.0E-02	2.1E-09
7487-94-7	Mercuric chloride	2.62E-10	7.7E-04	3.4E-07
22967-92-6	Methyl mercury	4.63E-11	2.8E-06	1.7E-05
80-62-6	Methyl methacrylate	1.77E-14	3.4E+00	5.2E-15
1634-04-4	methyl tert-butyl ether	2.31E-13	1.0E+02	2.3E-15
7440-02-0	Nickel	3.65E-11	1.4E-01	2.6E-10
98-95-3	Nitrobenzene	1.20E-11	8.5E-01	1.4E-11

Table 12
Calculation of Hazard Quotients for Surface Water - Colorado River Area*

CAS No	Compound (a)	Maximum Annual Dissolved Surface Water Concentration (mg/L) (b)	TRV (mg/L) (c)	Hazard Quotient (d)
608-93-5	Pentachlorobenzene	2.76E-12	4.7E-04	5.9E-09
82-68-8	Pentachloronitrobenzene (PCNB)	1.23E-11	1.0E-02	1.2E-09
87-86-5	Pentachlorophenol	5.82E-09	1.6E-02	3.7E-07
103-65-1	Propylbenzene, n-	8.06E-13	1.6E-02	5.2E-11
7782-49-2	Selenium (e)	1.45E-11	2.0E-03	7.2E-09
7440-22-4	Silver	1.31E-08	1.2E-04	1.1E-04
TEQF	Dioxin - TEQF	8.86E-15	5.0E-06	1.8E-09
7440-28-0	Thallium (l)	2.23E-08	1.5E-01	1.5E-07
7440-62-2	Vanadium	7.40E-10	1.9E-02	3.9E-08
75-01-4	Vinyl Chloride	1.19E-12	3.9E+00	3.1E-13
7440-66-6	Zinc	5.56E-10	3.2E-01	1.8E-09
			Cumulative HI (f):	**1E-04**

(a) Only those compounds with TRVs are listed in this table.
(b) Surface water concentrations were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
(c) Toxicity Reference Values (TRVs) are discussed in the text.
(d) Maximum Hazard Quotient (HQ) is calculated by dividing the maximum annual surface water concentration by the TRV.
(e) The water concentration and the TRV for selenium is for total selenium.
(f) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQF is the Toxic Equivalents (TEQ) for fish calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.
* Surface water concentrations for the Colorado River Area are used as a surrogate for the Riparian Backwater Area. Therefore, hazard quotients for Colorado River Area apply to the Riparian Backwater Area as well.

mg/L - milligrams per liter

Table 13
Calculation of Hazard Quotients for Sediment - Colorado River Area*

CAS No	Compound (a)	Maximum Annual Sediment Concentration (mg/kg) (b)	Toxicity Reference Value (TRV) (mg/kg) (c)	Hazard Quotient (d)
67-64-1	Acetone	6.70E-12	5.7E-02	1.2E-10
107-13-1	Acrylonitrile	2.70E-12	2.3E-02	1.2E-10
7429-90-5	Aluminum	5.48E-06	1.4E+04	3.9E-10
7440-36-0	Antimony	3.25E-10	6.4E+01	5.1E-12
11097-69-1	Aroclor 1254	4.48E-08	5.0E-02	9.0E-07
7440-38-2	Arsenic	1.31E-08	6.0E+00	2.2E-09
7440-39-3	Barium	1.24E-06	2.0E+01	6.2E-08
56-55-3	Benzo(a)Anthracene	2.09E-10	1.9E-02	1.1E-08
50-32-8	Benzo(a)pyrene	4.94E-10	8.4E-02	5.9E-09
205-99-2	Benzo(b)fluoranthene	6.89E-09	3.7E-02	1.9E-07
207-08-9	Benzo(k)fluoranthene	1.95E-09	3.7E-02	5.3E-08
7440-43-9	Cadmium	8.57E-08	6.0E-01	1.4E-07
67-66-3	Chloroform (Trichloromethane)	3.41E-11	5.9E-02	5.7E-10
7440-47-3	Chromium	4.52E-07	2.6E+01	1.7E-08
218-01-9	Chrysene	1.20E-09	3.0E-02	4.0E-08
7440-50-8	Copper	1.90E-07	1.6E+01	1.2E-08
72-55-9	DDE, 4,4'-	3.92E-09	5.0E-03	7.8E-07
53-70-3	Dibenz(a,h)anthracene	1.35E-09	1.0E-02	1.4E-07
99-65-0	Dinitrobenzene, 1,3-	2.19E-10	2.1E-02	1.0E-08
121-14-2	Dinitrotoluene, 2,4-	1.50E-09	4.7E-02	3.2E-08
606-20-2	Dinitrotoluene, 2,6-	1.10E-09	1.0E-01	1.1E-08
117-84-0	Di-n-octylphthalate	1.45E-06	1.2E+07	1.2E-13
123-91-1	Dioxane, 1,4-	9.44E-18	2.2E+00	4.3E-18
117-81-7	Ethylhexyl phthalate, bis-2-	1.07E-07	1.3E+01	8.0E-09
58-89-9	gamma-BHC (Lindane)	6.66E-11	3.2E-04	2.1E-07
76-44-8	Heptachlor	3.00E-11	3.0E-04	1.0E-07
87-68-3	Hexachloro-1,3-butadiene (Perchlorobutadiene)	7.62E-10	2.6E-01	3.0E-09
118-74-1	Hexachlorobenzene	8.14E-09	2.0E-02	4.1E-07
77-47-4	Hexachlorocyclopentadiene	7.75E-09	2.0E-01	3.9E-08
193-39-5	Indeno(1,2,3-cd) pyrene	1.86E-08	3.0E-02	6.2E-07
7439-92-1	Lead	1.04E-06	3.1E+01	3.4E-08
7487-94-7	Mercuric chloride	1.54E-05	2.0E-01	7.7E-05
22967-92-6	Methyl mercury	7.43E-08	2.0E-01	3.7E-07
7440-02-0	Nickel	2.37E-09	1.6E+01	1.5E-10
98-95-3	Nitrobenzene	5.70E-11	1.3E+00	4.4E-11
608-93-5	Pentachlorobenzene	1.34E-08	6.0E-01	2.2E-08
87-86-5	Pentachlorophenol	1.38E-07	7.0E+00	2.0E-08
7782-49-2	Selenium	7.24E-11	1.0E-01	7.2E-10
7440-22-4	Silver	1.09E-07	4.5E+00	2.4E-08
TEQF	Dioxin - TEQF	1.22E-09	4.1E-04	3.0E-06
75-01-4	Vinyl Chloride	7.37E-13	1.7E+00	4.3E-13
7440-66-6	Zinc	3.45E-08	1.1E+02	3.1E-10
			Cumulative HI (e):	**8E-05**

(a) Only those compounds with TRVs are listed in this table.
(b) Sediment concentrations were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
(c) Toxicity Reference Values (TRVs) are discussed in the text.
(d) Maximum Hazard Quotient (HQ) is calculated by dividing the maximum annual sediment concentration by the TRV.
(e) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.
Dioxin-TEQF is the Toxic Equivalents (TEQ) for fish calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.
* Sediment concentrations for the Colorado River Area are used as a surrogate for the Riparian Backwater Area. Therefore, hazard quotients for Colorado River Area apply to the Riparian Backwater Area as well.

mg/kg - milligrams per kilogram

Table 14
Calculation of Hazard Quotients for Yuma Clapper Rail - Riparian Backwater Area

Compound (a)	Maximum Annual Sediment Concentration (mg/kg) (b)	Maximum Annual Total Surface Water Concentration (mg/L) (c)	Kow	BCF sediment-benthic invert (d)	Prey Tissue Concentration (mg/kg) (e)	Daily Dose from Sediment (mg/kg BW-d) (f)	Daily Dose from Surface Water (mg/kg BW-d) (g)	Daily Dose from Diet (mg/kg BW-d) (h)	Total Daily Dose (mg/kg BW-d) (i)	TRV (Bird) (mg/kg BW-d) (j)	Hazard Quotient (k)
Acetone	6.70E-12	3.35E-10		5.0E-02	2.8E-12	1.4E-13	3.6E-11	1.8E-12	3.8E-11	5.2E+01	7.3E-13
Aluminum	5.48E-06	5.54E-07		9.0E-01	4.1E-05	1.1E-07	6.0E-08	2.7E-05	2.7E-05	1.0E+02	2.7E-07
Aroclor 1254	4.48E-08	6.75E-13		5.3E-01	2.0E-07	9.3E-10	7.3E-14	1.3E-07	1.3E-07	7.2E-02	1.8E-06
Arsenic	1.31E-08	4.52E-10		9.0E-01	9.8E-08	2.7E-10	4.9E-11	6.5E-08	6.5E-08	2.5E+00	2.7E-08
Barium	1.24E-06	3.02E-08		9.0E-01	9.3E-06	2.6E-08	3.3E-09	6.1E-06	6.2E-06	2.1E+01	3.0E-07
Benzo(a)Anthracene	2.09E-10	1.56E-14		1.5E+00	2.5E-09	4.3E-12	1.7E-15	1.7E-09	1.7E-09	7.9E-04	2.1E-06
Benzo(a)pyrene	4.94E-10	1.52E-14		1.6E+00	6.6E-09	1.0E-11	1.6E-15	4.3E-09	4.3E-09	1.0E-03	4.3E-06
Benzo(b)fluoranthene	6.89E-09	1.98E-13		1.6E+00	9.2E-08	1.4E-10	2.1E-14	6.1E-08	6.1E-08	1.4E-04	4.4E-04
Benzo(k)fluoranthene	1.95E-09	5.88E-14		1.6E+00	2.6E-08	4.0E-11	6.3E-15	1.7E-08	1.7E-08	1.4E-04	1.2E-04
Cadmium	8.57E-08	1.14E-09		3.4E+00	2.4E-06	1.8E-09	1.2E-10	1.6E-06	1.6E-06	1.5E+00	1.1E-06
Chromium, hexavalent	4.52E-07	2.38E-08	1.0E+00	7.1E-02	2.7E-07	9.3E-09	2.6E-09	1.8E-07	1.9E-07	1.0E+00	1.9E-07
Chrysene	1.20E-09	8.08E-14		1.4E+00	1.4E-08	2.5E-11	8.7E-15	9.1E-09	9.2E-09	1.0E-03	9.2E-06
Copper	1.90E-07	4.41E-10		3.0E-01	4.7E-07	3.9E-09	4.8E-11	3.1E-07	3.2E-07	4.7E+01	6.7E-09
DDE, 4,4'-	3.92E-09	1.15E-12		9.5E-01	3.1E-08	8.1E-11	1.2E-13	2.0E-08	2.1E-08	8.5E-01	2.4E-08
Dibenz(a,h)anthracene	1.35E-09	2.55E-14		1.6E+00	1.8E-08	2.8E-11	2.8E-15	1.2E-08	1.2E-08	3.9E-04	3.1E-05
Dinitrobenzene, 1,3-	2.19E-10	1.84E-10		1.2E+00	2.2E-09	4.5E-12	2.0E-11	1.4E-09	1.5E-09	4.2E-04	3.4E-06
Ethylhexyl phthalate, bis-2-	1.07E-07	2.46E-11		1.3E+03	1.2E-03	2.2E-09	2.7E-12	7.7E-04	7.7E-04	1.1E+02	6.9E-06
gamma-BHC (Lindane)	6.66E-11	1.23E-12	4.0E+03	6.3E+01	3.5E-08	1.4E-12	1.3E-13	2.3E-08	2.3E-08	2.0E+00	1.2E-08
Heptachlor	3.00E-11	7.88E-14		1.7E+00	4.2E-10	6.2E-13	8.5E-15	2.8E-10	2.8E-10	6.5E-02	4.2E-09
Hexachloro-1,3-butadiene (Perchlorobutadiene)	7.62E-10	2.52E-12		4.4E-01	2.8E-09	1.6E-11	2.7E-13	1.8E-09	1.9E-09	3.2E+00	5.8E-10
Hexachlorobenzene	8.14E-09	2.58E-12		2.3E+03	1.6E-04	1.7E-10	2.8E-13	1.0E-04	1.0E-04	2.3E-01	4.6E-04
Indeno(1,2,3-cd) pyrene	1.86E-08	2.42E-13		1.6E+00	2.5E-07	3.9E-10	2.6E-14	1.6E-07	1.7E-07	1.0E-03	1.7E-04
Lead	1.04E-06	1.16E-09		6.3E-01	5.5E-06	2.1E-08	1.3E-10	3.6E-06	3.6E-06	2.5E-02	1.5E-04
Manganese	1.11E-08	1.71E-10		9.0E-01	8.3E-08	2.3E-10	1.8E-11	5.5E-08	5.5E-08	9.8E+02	5.6E-11
Mercuric chloride	1.54E-05	3.89E-10		6.8E-02	8.7E-06	3.2E-07	4.2E-11	5.8E-06	6.1E-06	3.3E+00	1.9E-06
Methyl mercury	7.43E-08	4.63E-11		4.8E-01	3.0E-07	1.5E-09	5.0E-12	2.0E-07	2.0E-07	6.4E-03	3.1E-05
Nickel	2.37E-09	3.65E-11		9.0E-01	1.8E-08	4.9E-11	3.9E-12	1.2E-08	1.2E-08	6.5E+01	1.8E-10
Pentachloronitrobenzene (PCNB)	1.79E-08	1.24E-11		4.5E+02	6.7E-05	3.7E-10	1.3E-12	4.4E-05	4.4E-05	6.9E+01	6.5E-07
Pentachlorophenol	1.38E-07	5.82E-09		1.0E+03	1.2E-03	2.8E-09	6.3E-10	7.8E-04	7.8E-04	4.0E+00	1.9E-04
Selenium	7.24E-11	1.45E-11		9.0E-01	5.4E-10	1.5E-12	1.6E-12	3.6E-10	3.6E-10	5.0E-01	7.2E-10
Silver	1.09E-07	1.31E-08		9.0E-01	8.2E-07	2.2E-09	1.4E-09	5.4E-07	5.4E-07	1.8E+02	3.0E-09
Dioxin - TEQB	1.75E-09	3.23E-14		(l)	8.4E-10	3.6E-11	3.5E-15	5.6E-10	5.9E-10	1.0E-05	5.9E-05
Thallium (l)	1.59E-06	2.23E-08		9.0E-01	1.2E-05	3.3E-08	2.4E-09	7.8E-06	7.9E-06	3.5E-01	2.3E-05
Vanadium	7.40E-07	7.42E-10		9.0E-01	5.6E-06	1.5E-08	8.0E-11	3.7E-06	3.7E-06	1.1E+01	3.2E-07
Zinc	3.45E-08	5.56E-10		5.7E-01	1.6E-07	7.1E-10	6.0E-11	1.1E-07	1.1E-07	1.3E+02	8.3E-10
										Cumulative HI (m) :	**2E-03**

(a) Only those compounds with TRVs are listed in this table.
(b) Sediment concentrations (Csed) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.
Riparian backwater area sediment concentrations were assumed to be the same as those calculated for the Colorado River.
(c) Surface water concentrations (Csw) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program.
Riparian backwater area surface water concentrations were assumed to be the same as those calculated for the Colorado River.
(d) For organic compounds not included in USEPA, 1999, a BCF value was calculated using the following equation:
logBCF=0.819 x logKow 1.146. For inorganic compounds not included in USEPA, 1999, a BCF value of 0.9 was used.
(e) Prey Tissue Concentration (benthic invertebrates) = Csoil x BCF/$CF_{WWinvert}$; except for Dioxin - TEQB which is calculated on a congener-specific basis and is shown elsewhere in this appendix.
(f) $DD_{sed} = C_{sed}$ x Sediment IR; assumes 100% of sediment ingested is potentially contaminated
(g) $DD_{sw} = C_{sw}$ x Water IR; assumes 100% of surface water ingested is potentially contaminated
(h) $DD_{diet} = C_{prey}$ x Food IR; assumes 100% of prey tissue is potentially contaminated

Table 14
Calculation of Hazard Quotients for Yuma Clapper Rail - Riparian Backwater Area

Compound (a)	Maximum Annual Sediment Concentration (mg/kg) (b)	Maximum Annual Total Surface Water Concentration (mg/L) (c)	Kow	BCF sediment-benthic invert (d)	Prey Tissue Concentration (mg/kg) (e)	Daily Dose from Sediment (mg/kg BW-d) (f)	Daily Dose from Surface Water (mg/kg BW-d) (g)	Daily Dose from Diet (mg/kg BW-d) (h)	Total Daily Dose (mg/kg BW-d) (i)	TRV (Bird) (mg/kg BW-d) (j)	Hazard Quotient (k)

(i) Total Daily Dose = $DD_{diet} + DD_{soil} + DD_{sw}$
(j) Toxicity Reference Values (TRVs) are discussed in the text.
(k) Hazard Quotients (HQ) are calculated by dividing the daily dose by the TRV.
(l) BCFs were calculated for individual congeners following the methodology of USEPA (1999) but based on crayfish specific values. See elsewhere in this appendix for more information.
(m) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQB is the Toxic Equivalents (TEQ) for birds calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.
Food IR - Food ingestion rate as shown in Table 5.2-2
Sediment IR - Sediment ingestion rate as shown in Table 5.2-2
Water IR - Water ingestion rate as shown in Table 5.2-2
$CF_{WW\text{-}invert}$ - Conversion factor from wet weight to dry weight (0.12)

mg - milligrams
kg - kilograms
BW - body weight
d - day
WW - wet weight
L - liters

Table 15
Calculation of Hazard Quotients for Double-crested Cormorant - Main Drain Area

Compound (a)	Maximum Annual Sediment Concentration (mg/kg) (b)	Maximum Annual Total Surface Water Concentration (mg/L) (c)	Maximum Annual Fish Concentration (mg COPC/kg WW tissue) (d)	Daily Dose from Sediment (mg/kg BW-d) (e)	Daily Dose from Surface Water (mg/kg BW-d) (f)	Daily Dose from Diet (mg/kg BW-d) (g)	Total Daily Dose (mg/kg BW-d) (h)	TRV (Bird) (mg/kg BW-d) (i)	Hazard Quotient (j)
Acetone	2.83E-11	1.41E-09	4.47E-09	1.5E-13	7.9E-11	1.2E-09	1.3E-09	5.2E+01	2.5E-11
Aluminum	7.05E-07	7.12E-08	3.56E-05	3.8E-09	4.0E-09	9.7E-06	9.7E-06	1.0E+02	9.7E-08
Aroclor 1254	1.44E-07	2.17E-12	5.04E-07	7.9E-10	1.2E-13	1.4E-07	1.4E-07	7.2E-02	1.9E-06
Arsenic	3.36E-09	1.16E-10	1.32E-08	1.8E-11	6.4E-12	3.6E-09	3.6E-09	2.5E+00	1.5E-09
Barium	2.31E-07	5.63E-09	3.56E-06	1.3E-09	3.1E-10	9.7E-07	9.7E-07	2.1E+01	4.7E-08
Benzo(a)Anthracene	7.70E-10	5.75E-14	2.68E-09	4.2E-12	3.2E-15	7.3E-10	7.4E-10	7.9E-04	9.3E-07
Benzo(a)pyrene	8.74E-10	2.68E-14	3.00E-09	4.8E-12	1.5E-15	8.2E-10	8.2E-10	1.0E-03	8.2E-07
Benzo(b)fluoranthene	1.98E-08	5.68E-13	9.74E-08	1.1E-10	3.2E-14	2.7E-08	2.7E-08	1.4E-04	1.9E-04
Benzo(k)fluoranthene	4.69E-09	1.41E-13	2.09E-08	2.6E-11	7.8E-15	5.7E-09	5.7E-09	1.4E-04	4.1E-05
Cadmium	2.40E-08	3.19E-10	2.90E-07	1.3E-10	1.8E-11	7.9E-08	7.9E-08	1.5E+00	5.5E-08
Chlordane	2.96E-08	1.46E-11	3.50E-07	1.6E-10	8.1E-13	9.6E-08	9.6E-08	2.1E+00	4.5E-08
Chromium, hexavalent	6.16E-08	3.24E-09	6.16E-08	3.4E-10	1.8E-10	1.7E-08	1.7E-08	1.0E+00	1.7E-08
Chrysene	5.75E-09	3.86E-13	1.79E-08	3.1E-11	2.1E-14	4.9E-09	4.9E-09	1.0E-03	4.9E-06
Copper	5.40E-08	1.26E-10	2.51E-08	2.9E-10	7.0E-12	6.9E-09	7.2E-09	4.7E+01	1.5E-10
DDE, 4,4'-	4.28E-08	1.26E-11	6.18E-07	2.3E-10	7.0E-13	1.7E-07	1.7E-07	8.5E-01	2.0E-07
Dibenz(a,h)anthracene	9.18E-10	1.73E-14	6.37E-09	5.0E-12	9.6E-16	1.7E-09	1.7E-09	3.9E-04	4.5E-06
Dinitrobenzene, 1,3-	7.12E-10	5.98E-10	1.70E-09	3.9E-12	3.3E-11	4.7E-10	5.0E-10	4.2E-04	1.2E-06
Ethylhexyl phthalate, bis-2-	8.28E-08	1.91E-11	3.63E-09	4.5E-10	1.1E-12	9.9E-10	1.4E-09	1.1E+02	1.3E-11
gamma-BHC (Lindane)	2.85E-10	5.28E-12	6.23E-10	1.6E-12	2.9E-13	1.7E-10	1.7E-10	2.0E+00	8.6E-11
Heptachlor	2.62E-11	6.88E-14	4.18E-11	1.4E-13	3.8E-15	1.1E-11	1.2E-11	6.5E-02	1.8E-10
Hexachloro-1,3-butadiene (Perchlorobutadiene)	1.42E-09	4.70E-12	1.14E-08	7.8E-12	2.6E-13	3.1E-09	3.1E-09	3.2E+00	9.8E-10
Hexachlorobenzene	1.32E-08	4.20E-12	4.78E-08	7.2E-11	2.3E-13	1.3E-08	1.3E-08	2.3E-01	5.8E-08
Indeno(1,2,3-cd) pyrene	8.71E-09	1.13E-13	4.37E-08	4.8E-11	6.3E-15	1.2E-08	1.2E-08	1.0E-03	1.2E-05
Lead	3.01E-07	3.36E-10	3.01E-11	1.6E-09	1.9E-11	8.2E-12	1.7E-09	2.5E-02	6.7E-08
Manganese	3.14E-09	4.83E-11	1.93E-08	1.7E-11	2.7E-12	5.3E-09	5.3E-09	9.8E+02	5.4E-12
Mercuric chloride	5.83E-05	1.47E-09	0.00E+00	3.2E-07	8.2E-11	0.0E+00	3.2E-07	3.3E+00	9.8E-08
Methyl mercury	5.58E-07	1.75E-10	1.19E-03	3.0E-09	9.7E-12	3.2E-04	3.2E-04	6.4E-03	5.1E-02
Nickel	6.76E-10	1.04E-11	8.11E-10	3.7E-12	5.8E-13	2.2E-10	2.3E-10	6.5E+01	3.5E-12
Pentachloronitrobenzene (PCNB)	1.24E-07	8.60E-11	1.39E-07	6.8E-10	4.8E-12	3.8E-08	3.9E-08	6.9E+01	5.6E-10
Pentachlorophenol	2.42E-07	1.02E-08	2.50E-05	1.3E-09	5.7E-10	6.8E-06	6.8E-06	4.0E+00	1.7E-06
Selenium	2.34E-11	4.68E-12	1.91E-09	1.3E-13	2.6E-13	5.2E-10	5.2E-10	5.0E-01	1.0E-09
Silver	1.40E-08	1.68E-09	1.48E-07	7.6E-11	9.4E-11	4.0E-08	4.0E-08	1.8E+02	2.3E-10
Dioxin - TEQB	3.37E-09	8.70E-14	5.16E-10	1.8E-11	4.8E-15	1.4E-10	1.6E-10	1.0E-05	1.6E-05
Thallium (I)	4.15E-07	5.85E-09	5.85E-05	2.3E-09	3.2E-10	1.6E-05	1.6E-05	3.5E-01	4.6E-05
Vanadium	9.65E-07	9.68E-10	0.00E+00	5.3E-09	5.4E-11	0.0E+00	5.3E-09	1.1E+01	4.7E-10
Zinc	9.82E-09	1.58E-10	3.26E-07	5.4E-11	8.8E-12	8.9E-08	8.9E-08	1.3E+02	6.8E-10
								Cumulative HI (k):	**5E-02**

(a) Only those compounds with TRVs are listed in this table.
(b) Sediment concentrations (Csed) were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
(c) Surface water concentrations (Csw) were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
HHRAP calculates dissolved, but not total, water column concentrations for methyl mercury, and thus the dissolved concentration was used in this table for methyl mercury.
(d) Cfish were derived using IRAP software; assumes trophic level 4.

Table 15
Calculation of Hazard Quotients for Double-crested Cormorant - Main Drain Area

Compound (a)	Maximum Annual Sediment Concentration (mg/kg) (b)	Maximum Annual Total Surface Water Concentration (mg/L) (c)	Maximum Annual Fish Concentration (mg COPC/kg WW tissue) (d)	Daily Dose from Sediment (mg/kg BW-d) (e)	Daily Dose from Surface Water (mg/kg BW-d) (f)	Daily Dose from Diet (mg/kg BW-d) (g)	Total Daily Dose (mg/kg BW-d) (h)	TRV (Bird) (mg/kg BW-d) (i)	Hazard Quotient (j)

(e) DDsed = Csed x Sediment IR; assumes 100% of fish is potentially contaminated
(f) DDsw = Csw x Water IR; assumes 100% of surface water is potentially contaminated
(g) DDdiet = Cfish x Food IR; assumes 100% of fish is potentially contaminated
(h) Total Daily Dose = DDdiet + DDsed + DDsw
(i) Toxicity Reference Values (TRVs) are discussed in the text.
(j) Hazard Quotient is calculated by dividing the Daily Dose by the TRV.
(k) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQB is the Toxic Equivalents (TEQ) for birds calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.
Sediment IR - Sediment ingestion rate as shown in Table 5.2-2
Food IR - Food ingestion rate as shown in Table 5.2-2
Water IR - Surface water ingestion rate as shown in Table 5.2-2

mg - milligrams
kg - kilograms
L - liters
BW - body weight
d - day
WW - wet weight

Table 16
Calculation of Hazard Quotients for Mule Deer - Main Drain Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg WW) (c)	Maximum Annual Total Surface Water Concentration (mg/L) (d)	Daily Dose from Soil (mg/kg BW-d) (e)	Daily Dose from Diet (mg/kg BW-d) (f)	Daily Dose from Surface Water (mg/kg BW-d) (g)	Total Daily Dose (mg/kg BW-d) (h)	TRV (Mammal) (mg/kg BW-d) (i)	Hazard Quotient (j)
Acetone	1.14E-08	8.59E-09	1.41E-09	8.0E-12	2.5E-09	9.6E-11	2.6E-09	1.0E+01	2.6E-10
Acrylonitrile	4.26E-10	3.21E-10	5.80E-11	3.0E-13	9.4E-11	3.9E-12	9.8E-11	4.6E-01	2.1E-10
Aluminum	1.36E-05	9.01E-07	7.12E-08	9.5E-09	2.6E-07	4.8E-09	2.8E-07	1.9E+00	1.4E-07
Antimony	2.36E-09	6.78E-12	5.88E-12	1.7E-12	2.0E-12	4.0E-13	4.0E-12	6.6E-02	6.1E-11
Aroclor 1254	6.38E-09	4.70E-12	2.17E-12	4.5E-12	1.4E-12	1.5E-13	6.0E-12	2.1E-04	2.9E-08
Arsenic	2.76E-09	9.80E-07	1.16E-10	1.9E-12	2.9E-07	7.9E-12	2.9E-07	1.3E+00	2.3E-07
Barium	3.37E-06	7.85E-08	5.63E-09	2.4E-09	2.3E-08	3.8E-10	2.6E-08	5.1E-01	5.0E-08
Benzo(a)Anthracene	6.09E-11	2.07E-12	5.75E-14	4.3E-14	6.0E-13	3.9E-15	6.5E-13	1.7E-01	3.9E-12
Benzo(a)pyrene	4.29E-11	6.10E-12	2.68E-14	3.0E-14	1.8E-12	1.8E-15	1.8E-12	1.0E-01	1.8E-11
Beryllium	3.85E-06	9.78E-07	1.50E-10	2.7E-09	2.9E-07	1.0E-11	2.9E-07	6.6E-01	4.4E-07
Cadmium	4.38E-07	2.42E-06	3.19E-10	3.1E-10	7.1E-07	2.2E-11	7.1E-07	2.5E-02	2.8E-05
Chlordane	4.36E-09	1.17E-11	1.46E-11	3.1E-12	3.4E-12	9.9E-13	7.5E-12	4.6E+00	1.6E-12
Chloroform (Trichloromethane)	4.45E-11	1.09E-11	1.37E-11	3.1E-14	3.2E-12	9.3E-13	4.1E-12	6.0E+01	6.9E-14
Chromium, hexavalent	1.25E-06	4.55E-08	3.24E-09	8.8E-10	1.3E-08	2.2E-10	1.4E-08	3.5E+00	4.1E-09
Copper	1.19E-06	9.60E-07	1.26E-10	8.4E-10	2.8E-07	8.5E-12	2.8E-07	1.2E+01	2.3E-08
DDE, 4,4'-	1.07E-08	2.14E-11	1.26E-11	7.5E-12	6.3E-12	8.5E-13	1.5E-11	1.0E+00	1.5E-11
Dibenz(a,h)anthracene	4.05E-11	2.85E-11	1.73E-14	2.8E-14	8.3E-12	1.2E-15	8.4E-12	2.0E-03	4.2E-09
Dinitrobenzene, 1,3-	8.08E-09	3.86E-09	5.98E-10	5.7E-12	1.1E-09	4.1E-11	1.2E-09	1.1E+00	1.1E-09
Dinitrotoluene, 2,4-	5.35E-09	1.66E-09	8.48E-10	3.8E-12	4.8E-10	5.8E-11	5.5E-10	7.0E-01	7.8E-10
Dinitrotoluene, 2,6-	3.15E-09	1.13E-09	7.32E-10	2.2E-12	3.3E-10	5.0E-11	3.8E-10	4.0E-01	9.6E-10
Di-n-octylphthalate	1.92E-09	1.35E-08	7.51E-13	1.3E-12	3.9E-09	5.1E-14	3.9E-09	7.5E+03	5.3E-13
Dioxane, 1,4-	1.67E-14	1.26E-14	1.83E-15	1.2E-17	3.7E-15	1.2E-16	3.8E-15	1.1E+02	3.6E-17
Ethylhexyl phthalate, bis-2-	5.92E-09	2.18E-08	1.91E-11	4.2E-12	6.4E-09	1.3E-12	6.4E-09	6.0E+01	1.1E-10
gamma-BHC (Lindane)	1.69E-10	5.90E-12	5.28E-12	1.2E-13	1.7E-12	3.6E-13	2.2E-12	8.0E+00	2.8E-13
Heptachlor	1.28E-11	1.46E-13	6.88E-14	9.0E-15	4.3E-14	4.7E-15	5.6E-14	2.5E-03	2.3E-11
Hexachlorobenzene	2.90E-08	8.79E-11	4.20E-12	2.0E-11	2.6E-11	2.9E-13	4.6E-11	1.6E+00	2.9E-11
Hexachlorocyclopentadiene	1.14E-08	4.87E-11	3.53E-11	8.0E-12	1.4E-11	2.4E-12	2.5E-11	3.8E+00	6.5E-12
Lead	6.53E-06	2.43E-06	3.36E-10	4.6E-09	7.1E-07	2.3E-11	7.2E-07	3.8E-02	1.9E-05
Manganese	7.13E-08	3.61E-07	4.83E-11	5.0E-11	1.1E-07	3.3E-12	1.1E-07	8.8E+01	1.2E-09
Mercuric chloride	8.22E-06	9.67E-08	1.47E-09	5.8E-09	2.8E-08	1.0E-10	3.4E-08	1.0E+00	3.4E-08
Methyl mercury	1.67E-07	2.51E-08	1.75E-10	1.2E-10	7.3E-09	1.2E-11	7.5E-09	3.2E-02	2.3E-07
Nickel	1.50E-08	7.69E-08	1.04E-11	1.0E-11	2.2E-08	7.1E-13	2.2E-08	5.0E+01	4.5E-10
Pentachlorobenzene	1.64E-08	5.94E-11	7.80E-12	1.1E-11	1.7E-11	5.3E-13	2.9E-11	7.3E+00	4.1E-12
Pentachloronitrobenzene (PCNB)	3.95E-08	2.86E-10	8.60E-11	2.8E-11	8.4E-11	5.8E-12	1.2E-10	4.6E+02	2.6E-13
Pentachlorophenol	7.31E-08	3.04E-07	1.02E-08	5.1E-11	8.9E-08	6.9E-10	9.0E-08	3.0E-01	3.0E-07
Selenium	1.13E-09	2.94E-08	4.68E-12	7.9E-13	8.6E-09	3.2E-13	8.6E-09	7.6E-02	1.1E-07
Silver	2.71E-07	2.45E-08	1.68E-09	1.9E-10	7.2E-09	1.1E-10	7.5E-09	3.8E-01	2.0E-08
Dioxin - TEQM	5.79E-11	7.83E-13	2.27E-14	4.1E-14	2.3E-13	1.5E-15	2.7E-13	1.0E-06	2.7E-07
Thallium (I)	4.45E-06	7.20E-08	5.85E-09	3.1E-09	2.1E-08	4.0E-10	2.5E-08	1.3E-02	1.9E-06
Vanadium	1.70E-06	1.94E-08	9.68E-10	1.2E-09	5.7E-09	6.6E-11	6.9E-09	2.1E-01	3.3E-08
Vinyl Chloride	2.28E-13	1.23E-13	9.18E-13	1.6E-16	3.6E-14	6.2E-14	9.8E-14	1.7E-01	5.8E-13
Xylene, m-	2.32E-11	1.18E-12	1.04E-12	1.6E-14	3.5E-13	7.1E-14	4.3E-13	2.1E+00	2.1E-13

Table 16
Calculation of Hazard Quotients for Mule Deer - Main Drain Area

Compound (a)	Maximum Annual Soil Concentration (mg/kg) (b)	Plant Tissue Concentration (mg/kg WW) (c)	Maximum Annual Total Surface Water Concentration (mg/L) (d)	Daily Dose from Soil (mg/kg BW-d) (e)	Daily Dose from Diet (mg/kg BW-d) (f)	Daily Dose from Surface Water (mg/kg BW-d) (g)	Total Daily Dose (mg/kg BW-d) (h)	TRV (Mammal) (mg/kg BW-d) (i)	Hazard Quotient (j)
Xylene, o-	1.51E-11	8.72E-13	6.48E-13	1.1E-14	2.5E-13	4.4E-14	3.1E-13	2.1E+00	1.5E-13
Xylene, p-	1.94E-11	1.12E-12	1.00E-12	1.4E-14	3.3E-13	6.8E-14	4.1E-13	2.1E+00	1.9E-13
Zinc	2.17E-07	1.17E-06	1.58E-10	1.5E-10	3.4E-07	1.1E-11	3.4E-07	1.0E+01	3.3E-08
								Cumulative HI (k) :	**5E-05**

(a) Only those compounds with TRVs are listed in this table.
(b) Soil concentrations (Csoil) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program. Soil concentrations in the main drain area were based on those calculated for the agricultural area.
(c) Plant concentrations (Cplant) were calculated using USEPA's HHRAP fate and transport equations, using the IRAP software program. Wet weight plant concentrations were calculated from the IRAP outputs dry weight concentrations using a moisture content of 88% as specified in USEPA's 1999 Screening Ecological Risk Assessment Protocol. Plant concentrations in the main drain area were based on those calculated for the agricultural area.
(d) Surface water concentrations (Csw) were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
(e) DDsoil = Csoil x Soil IR; assumes 100% of soil is potentially contaminated
(f) DDdiet = Cplant x Food IR; assumes 100% of plant material is potentially contaminated
(g) DDsw = Csw x Water IR; assumes 100% of surface water is potentially contaminated
(h) Total Daily Dose = DDdiet + DDsoil + DDsw
(i) Toxicity Reference Values (TRVs) are discussed in the text.
(j) Hazard Quotients (HQ) are calculated by dividing the daily dose by the TRV.
(k) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQM is the Toxic Equivalents (TEQ) for mammals calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.
Food IR - Food ingestion rate as shown in Table 5.2-2
Soil IR - Soil ingestion rate as shown in Table 5.2-2
Water IR - Water ingestion rate as shown in Table 5.2-2

mg - milligrams
kg - kilograms
BW - body weight
d - day
WW - wet weight
L - liters

Table 17
Calculation of Hazard Quotients for Surface Water - Main Drain Area

CAS No	Compound (a)	Maximum Annual Dissolved Surface Water Concentration (mg/L) (b)	TRV (mg/L) (c)	Hazard Quotient (d)
95-63-6	1,2,4-Trimethylbenzene	1.22E-12	7.7E-02	1.6E-11
142-28-9	1,3-Dichloropropane	1.40E-12	1.3E+00	1.1E-12
110-54-3	1-Hexane (n-hexane)	1.19E-15	2.5E-02	4.8E-14
594-20-7	2,2-Dichloropropane	4.37E-13	3.9E-01	1.1E-12
625-86-5	2,5-Dimethylfuran	1.39E-12	7.1E-01	2.0E-12
95-49-8	2-Chlorotoluene	1.67E-12	1.4E-01	1.2E-11
591-78-6	2-Hexanone	3.78E-11	4.3E+00	8.8E-12
91-57-6	2-Methylnaphthalene	9.57E-13	1.5E-02	6.6E-11
534-52-1	4,6-Dinitro-2-methylphenol	3.07E-09	2.4E-02	1.3E-07
106-43-4	4-Chlorotoluene	9.16E-13	3.4E+00	2.7E-13
67-64-1	Acetone	1.41E-09	1.5E+00	9.4E-10
79-10-7	Acrylic Acid	5.19E-16	3.8E+00	1.4E-16
107-13-1	Acrylonitrile	5.80E-11	2.5E-01	2.3E-10
7429-90-5	Aluminum	7.12E-08	8.7E-02	8.2E-07
7440-36-0	Antimony	5.88E-12	3.0E-02	2.0E-10
11097-69-1	Aroclor 1254	1.47E-12	2.0E-05	7.3E-08
7440-38-2	Arsenic	1.16E-10	1.9E-01	6.1E-10
7440-39-3	Barium	5.63E-09	4.0E-03	1.4E-06
92-87-5	Benzidine	9.09E-09	8.9E-02	1.0E-07
56-55-3	Benzo(a)Anthracene	5.37E-14	2.7E-05	2.0E-09
50-32-8	Benzo(a)pyrene	2.25E-14	1.4E-05	1.6E-09
205-99-2	Benzo(b)fluoranthene	4.72E-13	2.7E-05	1.7E-08
207-08-9	Benzo(k)fluoranthene	1.18E-13	2.7E-05	4.4E-09
7440-41-7	Beryllium	1.49E-10	5.3E-03	2.8E-08
111-91-1	Bis(2-chloroethoxy) methane	5.89E-10	1.8E+00	3.2E-10
108-86-1	Bromobenzene	1.31E-12	5.6E-02	2.3E-11
98-06-6	Butylbenzene, tert	9.92E-13	6.5E-01	1.5E-12
7440-43-9	Cadmium	3.19E-10	5.3E-03	6.0E-08
86-74-8	Carbazole	8.20E-10	1.5E-02	5.5E-08
67-66-3	Chloroform (Trichloromethane)	1.37E-11	2.8E-02	4.9E-10
18540-29-9	Chromium, hexavalent	3.24E-09	1.1E-02	2.9E-07
218-01-9	Chrysene	3.58E-13	2.7E-05	1.3E-08
7440-48-4	Cobalt	3.66E-10	3.0E-03	1.2E-07
7440-50-8	Copper	1.26E-10	2.5E-02	5.0E-09
72-55-9	DDE, 4,4'-	1.24E-11	2.0E-05	6.2E-07
319-86-8	delta-BHC	3.67E-11	1.3E-01	2.8E-10
53-70-3	Dibenz(a,h)anthracene	1.28E-14	2.7E-05	4.8E-10
132-64-9	Dibenzofuran	6.25E-10	2.0E-02	3.1E-08
99-65-0	Dinitrobenzene, 1,3-	5.98E-10	2.6E-02	2.3E-08
121-14-2	Dinitrotoluene, 2,4-	8.48E-10	2.3E-02	3.7E-08
606-20-2	Dinitrotoluene, 2,6-	7.32E-10	6.0E-02	1.2E-08
117-84-0	Di-n-octylphthalate	3.98E-14	3.2E-01	1.2E-13
123-91-1	Dioxane, 1,4-	1.83E-15	6.2E+01	2.9E-17
122-39-4	Diphenylamine	8.72E-10	3.8E-02	2.3E-08
33213-65-9	Endosulfan II	8.39E-12	5.6E-05	1.5E-07
1031-07-8	Endosulfan sulfate	1.09E-11	6.0E-05	1.8E-07
7421-93-4	Endrin aldehyde	3.05E-11	8.0E-05	3.8E-07
107-21-1	Ethylene Glycol	8.42E-11	1.0E+03	8.4E-14
117-81-7	Ethylhexyl phthalate, bis-2-	1.87E-11	3.0E-03	6.2E-09
58-89-9	gamma-BHC (Lindane)	5.28E-12	2.8E-04	1.9E-08
76-44-8	Heptachlor	6.87E-14	4.0E-06	1.7E-08
87-68-3	Hexachloro-1,3-butadiene (Perchlorobutadiene)	4.69E-12	8.2E-03	5.7E-10
118-74-1	Hexachlorobenzene	4.14E-12	3.7E-03	1.1E-09
77-47-4	Hexachlorocyclopentadiene	3.53E-11	3.0E-04	1.2E-07
193-39-5	Indeno(1,2,3-cd) pyrene	7.08E-14	2.7E-05	2.6E-09
99-87-6	Isopropyl toluene, p-	9.15E-13	4.6E-02	2.0E-11
7439-92-1	Lead	3.35E-10	8.7E-03	3.8E-08
7439-96-5	Manganese	4.83E-11	8.0E-02	6.0E-10
7487-94-7	Mercuric chloride	9.90E-10	7.7E-04	1.3E-06
22967-92-6	Methyl mercury	1.75E-10	2.8E-06	6.2E-05
80-62-6	Methyl methacrylate	3.72E-14	3.4E+00	1.1E-14
1634-04-4	methyl tert-butyl ether	4.32E-13	1.0E+02	4.3E-15

Table 17
Calculation of Hazard Quotients for Surface Water - Main Drain Area

CAS No	Compound (a)	Maximum Annual Dissolved Surface Water Concentration (mg/L) (b)	TRV (mg/L) (c)	Hazard Quotient (d)
7440-02-0	Nickel	1.04E-11	1.4E-01	7.5E-11
98-95-3	Nitrobenzene	8.65E-11	8.5E-01	1.0E-10
608-93-5	Pentachlorobenzene	7.62E-12	4.7E-04	1.6E-08
82-68-8	Pentachloronitrobenzene (PCNB)	8.54E-11	1.0E-02	8.5E-09
87-86-5	Pentachlorophenol	1.02E-08	1.6E-02	6.6E-07
103-65-1	Propylbenzene, n-	6.36E-13	1.6E-02	4.1E-11
7782-49-2	Selenium (e)	4.68E-12	2.0E-03	2.3E-09
7440-22-4	Silver	1.68E-09	1.2E-04	1.4E-05
TEQF	Dioxin - TEQF	1.35E-14	5.0E-06	2.7E-09
7440-28-0	Thallium	5.85E-09	1.5E-01	3.9E-08
7440-62-2	Vanadium	9.65E-10	1.9E-02	5.1E-08
75-01-4	Vinyl Chloride	9.18E-13	3.9E+00	2.4E-13
7440-66-6	Zinc	1.58E-10	3.2E-01	5.0E-10
			Cumulative HI (f):	**8E-05**

(a) Only those compounds with TRVs are listed in this table.
(b) Surface water concentrations were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
(c) Toxicity Reference Values (TRVs) are discussed in the text.
(d) Maximum Hazard Quotient (HQ) is calculated by dividing the maximum annual surface water concentration by the TRV.
(e) The water concentration and the TRV for selenium is for total selenium.
(f) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted. A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQF is the Toxic Equivalents (TEQ) for fish calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.

mg/L - milligrams per liter

Table 18
Calculation of Hazard Quotients for Sediment - Main Drain Area

CAS No	Compound (a)	Maximum Annual Sediment Concentration (mg/kg) (b)	Toxicity Reference Value (TRV) (mg/kg) (c)	Hazard Quotient (d)
67-64-1	Acetone	2.83E-11	5.7E-02	5.0E-10
107-13-1	Acrylonitrile	4.06E-12	2.3E-02	1.8E-10
7429-90-5	Aluminum	7.05E-07	1.4E+04	5.0E-11
7440-36-0	Antimony	2.64E-10	6.4E+01	4.1E-12
11097-69-1	Aroclor 1254	1.44E-07	5.0E-02	2.9E-06
7440-38-2	Arsenic	3.36E-09	6.0E+00	5.6E-10
7440-39-3	Barium	2.31E-07	2.0E+01	1.2E-08
56-55-3	Benzo(a)Anthracene	7.70E-10	1.9E-02	4.1E-08
50-32-8	Benzo(a)pyrene	8.74E-10	8.4E-02	1.0E-08
205-99-2	Benzo(b)fluoranthene	1.98E-08	3.7E-02	5.3E-07
207-08-9	Benzo(k)fluoranthene	4.69E-09	3.7E-02	1.3E-07
7440-43-9	Cadmium	2.40E-08	6.0E-01	4.0E-08
67-66-3	Chloroform (Trichloromethane)	2.88E-11	5.9E-02	4.8E-10
7440-47-3	Chromium	6.16E-08	2.6E+01	2.4E-09
218-01-9	Chrysene	5.75E-09	3.0E-02	1.9E-07
7440-50-8	Copper	5.40E-08	1.6E+01	3.4E-09
72-55-9	DDE, 4,4'-	4.28E-08	5.0E-03	8.6E-06
53-70-3	Dibenz(a,h)anthracene	9.18E-10	1.0E-02	9.2E-08
99-65-0	Dinitrobenzene, 1,3-	7.12E-10	2.1E-02	3.3E-08
121-14-2	Dinitrotoluene, 2,4-	3.00E-09	4.7E-02	6.4E-08
606-20-2	Dinitrotoluene, 2,6-	1.44E-09	1.0E-01	1.4E-08
117-84-0	Di-n-octylphthalate	1.46E-07	1.2E+07	1.3E-14
123-91-1	Dioxane, 1,4-	3.65E-17	2.2E+00	1.7E-17
117-81-7	Ethylhexyl phthalate, bis-2-	8.28E-08	1.3E+01	6.2E-09
58-89-9	gamma-BHC (Lindane)	2.85E-10	3.2E-04	8.9E-07
76-44-8	Heptachlor	2.62E-11	3.0E-04	8.7E-08
87-68-3	Hexachloro-1,3-butadiene (Perchlorobutadiene)	1.42E-09	2.6E-01	5.5E-09
118-74-1	Hexachlorobenzene	1.32E-08	2.0E-02	6.6E-07
77-47-4	Hexachlorocyclopentadiene	1.66E-08	2.0E-01	8.4E-08
193-39-5	Indeno(1,2,3-cd) pyrene	8.71E-09	3.0E-02	2.9E-07
7439-92-1	Lead	3.01E-07	3.1E+01	9.7E-09
7487-94-7	Mercuric chloride	5.83E-05	2.0E-01	2.9E-04
22967-92-6	Methyl mercury	5.58E-07	2.0E-01	2.8E-06
7440-02-0	Nickel	6.76E-10	1.6E+01	4.2E-11
98-95-3	Nitrobenzene	4.12E-10	1.3E+00	3.2E-10
608-93-5	Pentachlorobenzene	3.69E-08	6.0E-01	6.1E-08
87-86-5	Pentachlorophenol	2.42E-07	7.0E+00	3.5E-08
7782-49-2	Selenium	2.34E-11	1.0E-01	2.3E-10
7440-22-4	Silver	1.40E-08	4.5E+00	3.1E-09
TEQF	Dioxin - TEQF	1.29E-09	4.1E-04	3.1E-06
75-01-4	Vinyl Chloride	5.69E-13	1.7E+00	3.3E-13
7440-66-6	Zinc	9.82E-09	1.1E+02	8.9E-11
			Cumulative HI (e) =	**3E-04**

(a) Only those compounds with TRVs are listed in this table.
(b) Sediment concentrations were calculated using USEPA's 2005 HHRAP fate and transport equations, using the IRAP software program.
(c) Toxicity Reference Values (TRVs) are discussed in the text.
(d) Maximum Hazard Quotient (HQ) is calculated by dividing the maximum annual sediment concentration by the TRV.
(e) The Cumulative Hazard Index (HI) is calculated by summing the chemical-specific HQs. The HI conservatively reflects exposure to all evaluated compounds, regardless of the type or mechanism of effects. For this project, the target hazard index value was 0.25, based on USEPA Region IX input. If an HI, based on the sum of hazard quotients for all compounds, is above the target level, then the HI values are recalculated for groups of compounds having the same type of health effect and/or a more detailed evaluation may be conducted.
A common regulatory target hazard index value used by most states and many other USEPA programs, for compounds grouped according to specific types of health effects, is 1.

Dioxin-TEQF is the Toxic Equivalents (TEQ) for fish calculated by multiplying each congener concentration by its corresponding TEF then summing all of the results. This calculation is presented elsewhere in this appendix.

mg/kg - milligrams per kilogram

RESPONSE TO U.S. ENVIRONMENTAL PROTECTION AGENCY REGION IX COMMENTS ON THE SIEMENS WATER TECHNOLOGIES CORP. CARBON REGENERATION FACILITY RISK ASSESSMENT PARKER, ARIZONA

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March 13, 2008

RESPONSE TO U.S. ENVIRONMENTAL PROTECTION AGENCY REGION IX COMMENTS ON THE SIEMENS WATER TECHNOLOGIES CORP. CARBON REGENERATION FACILITY RISK ASSESSMENT, PARKER, ARIZONA

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ATTACHMENTS

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LIST OF ABBREVIATIONS

AZDEQ	Arizona Department of Environmental Quality
BOD	Biological oxygen demand
COD	Chemical oxygen demand
COPC	Chemical of potential concern
CPT	Comprehensive Performance Test
CRIT	Colorado River Indian Tribes
CRSSJV	Colorado River Sewage System Joint Venture
CrVI	Hexavalent Chromium
CWT	Centralized Waste Treatment
DRE	Destruction and removal efficiency
E	Exponent in the presentation of numerical results (e.g., 3E-4 = $3x10^{-4}$)
HCl	Hydrogen chloride
HHRAP	Human Health Risk Assessment Protocol published in 2005 by USEPA
HI	Hazard index
HQ	Hazard quotient
IEUBK	Integrated Exposure Uptake Biokinetic Model
IH	Industrial hygiene
IRAP	Industrial Risk Assessment Program
ISCST3	Industrial Source Complex Short-Term 3 air model
NIOSH	National Institute on Occupational Safety and Health
NOx	Nitrogen oxides
OSHA	Occupational Safety and Health Administration
PCBs	Polychlorinated biphenyls
PDT	Performance Demonstration Test
PCDDs/PCDFs	Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzo-furans
POTW	Publicly Owned Treatment Works
ppm	parts per million
RA	Risk assessment
RCRA	Resource Conservation and Recovery Act
SWT	Siemens Water Technologies Corp.
TWA	Time-weighted-average
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey

RESPONSE TO U.S. ENVIRONMENTAL PROTECTION AGENCY REGION IX COMMENTS ON THE SIEMENS WATER TECHNOLOGIES CORP. CARBON REGENERATION FACILITY RISK ASSESSMENT, PARKER, ARIZONA

I. INTRODUCTION

This document provides responses to comments received from the U.S. Environmental Protection Agency (USEPA) Region IX on the *Draft Risk Assessment for the Siemens Water Technologies Corp. Carbon Reactivation Facility in Parker, Arizona*. The Risk Assessment (RA) was prepared on behalf of Siemens Water Technologies Corp. (SWT) by CPF Associates, Inc. and was submitted to USEPA on July 30, 2007. USEPA provided comments on the document to Siemens on December 7, 2007 (USEPA 2007a) and November 26, 2007 (USEPA 2007b).

The SWT facility is a carbon reactivation plant located within the 269,000 acre Colorado River Indian Tribes ("CRIT") Reservation just outside of the Town of Parker in La Paz County, Arizona. The facility is located in an industrial park established by CRIT on Tribal land and is operated pursuant to a lease between the company and CRIT. The facility reactivates spent carbon which has been previously used to remove pollutants from water and air. The spent carbon is reactivated by heating it to very high temperatures under controlled conditions in a carbon reactivation furnace. The newly reactivated carbon is then reused as an activated carbon product.

The RA, consisting of a human health and ecological risk assessment of the facility, was conducted as part of the facility's permitting activities under the Resource Conservation and Recovery Act (RCRA). A risk assessment is a scientific study that is used to help evaluate risks associated with exposure to chemicals in the environment. The risk assessment represents one of the final steps in an evaluation process that has extended over a seven year period. The study was performed in accordance with a USEPA-approved Risk Assessment Workplan and was conducted by a team of scientists and engineers from independent consulting firms with expertise in risk assessment, toxicology, environmental engineering and air dispersion modeling.

The RA demonstrated that the potential risks associated with air emissions from the SWT carbon reactivation furnace and from spent carbon unloading are below regulatory and other target risk levels for both human health and ecological receptors. Additionally, the study showed that the incremental contribution of the facility effluent on the wastewater treatment plant discharge and the Main Drain does not pose unacceptable risks to either aquatic life or human health. Finally, fugitive emissions in ambient air during spent carbon unloading activities were demonstrated not to exceed occupational exposure limits that are established to protect facility employees.

USEPA's review of the ecological risk assessment portion of the RA (USEPA 2007a) concluded that "*the methods and strategies used to quantify the likelihood and magnitude of environmental impacts from Siemens' releases are consistent with the recommended procedures and strategies articulated in EPA's guidance reference. The methods which were used are largely consistent with the 2003 Agency-approved risk assessment workplan. The*

results of the evaluation of putative ecological risk from facility operations to ecological receptors were below ecotoxicologically based levels and below a conservative target level of Hazard Quotient = 0.25." USEPA's comments on the ecological risk assessment were generally favorable and do not require additional discussion or analysis.

USEPA's review of the human health risk assessment (USEPA 2007b) concluded that "*the methods and strategies used to quantify the likelihood and magnitude of environmental impacts from SWT releases are consistent with the recommended procedures and strategies articulated in EPA's guidance reference. In addition, the methods employed are largely consistent with the 2003 Agency-approved risk assessment workplan. All estimates of chronic human health impact fall well below the health-based regulatory thresholds with adequate margins of uncertainty*." USEPA also provided both general comments and page-specific comments on the human health risk assessment.

The remainder of this document provides responses to the USEPA comments on the human health risk assessment. Responses are provided in the same order as presented by USEPA (2007b), with General Comments addressed first and Specific Comments addressed second. In the following sections, USEPA's comments are presented in italics.

Responding to the wide range of comments provided by USEPA has resulted in a lengthy and complex response to comment document. It is recommended, therefore, that the entire risk assessment for this project be comprised of three documents: the original July 2007 draft risk assessment report, this response to comment document, and one inclusive executive summary that reflects and incorporates conclusions from both documents. The executive summary is provided as a stand-alone companion to this document.

II. RESPONSE TO GENERAL COMMENTS

Comment 1: Quality of Data Used to Support Analysis of Human and Ecological Impacts.

Comment:
This comment notes that the Comprehensive Performance Test (CPT) "was conducted and results tabulated in accordance with an Agency-approved CPT test plan." It also states that "All data subject to qualification review [from the CPT] was deemed sufficiently reliable to support quantitative estimations of the magnitude and likelihood of human or ecological impact."

Response: No response necessary.

Comment 2: Fugitive Impact Analysis and Occupational Dosimetry.

Comment:
"A predicted ambient air concentration was modeled from a high-end fugitive release scenario in support of the short-term or acute risk analysis. The location of maximum impact from fugitive releases was identified via the air dispersion and deposition model. This location was identified as about 10 meters north of hopper H-1.
The risk assessment has compared model-predicted airborne contaminant concentrations with constituent-specific occupational standards and recommendations from various government and non-governmental organizations. It would be useful to complement this level of analysis of on-site worker impact by conducting a retrospective comparison of model-predicted, on-site fugitive release air estimates with historical facility air monitoring results or occupational dosimetry data. Results from this level of comparison would provide additional data and further inform the overarching weight of evidence regarding the likelihood and magnitude of facility impacts on proximate, on-site receptors."

Response:

Introduction

Siemens conducts industrial hygiene (IH) surveys annually in which occupational dosimetry data are collected by measuring breathing zone air concentrations for organic compounds and dust. In response to this comment, historical IH survey data were compared to the risk assessment's model-predicted on-site air concentrations associated with fugitive releases. It is important to recognize, however, that these two data sets (measured IH breathing zone concentrations versus modeled outdoor ambient air concentrations) differ substantially in a number of important aspects and thus they should not be directly compared. Rather, as suggested in USEPA's comment, the two data sets together can help provide additional complementary information regarding the potential for impacts on proximate, on-site receptors.

Modeled chemical air concentrations on site were calculated in the risk assessment by combining chemical emission rates with air dispersion modeling results. Emission rates resulting from fugitive releases during spent carbon unloading at the outdoor hopper (H-1) were calculated using mathematical emission models developed for USEPA; these models

are described in detail in Section 4.3 of the risk assessment (USEPA 1997, 2004, 2006). Concentrations of compounds in spent carbon, a key input to the emission models, were determined based on detailed spent carbon composition data measured over a four-year period from 2003 through 2006. The chemical emission rates were then combined with output from the USEPA-approved Industrial Source Complex Short-Term 3 (ISCST3) air dispersion model to calculate outdoor ambient air concentrations on site. The highest on-site concentrations identified for this emission source were determined to occur 10 meters (roughly 30 feet) from the outdoor hopper.

Occupational dosimetry data collected during IH surveys are very different from ambient air concentrations calculated in the risk assessment. The IH surveys measure concentrations in the breathing zone of workers by placing samplers on the workers themselves (e.g., on a lapel close to the worker's breathing zone). Collection of dosimetry data from the breathing zone is preferred over modeled concentrations for monitoring potential worker exposures (Chrostowski 1994, NAS 1991) and is an important element in the Siemens' facility worker health and safety program. IH surveys often intentionally focus on workers whose potential exposures may be high based on the activities they perform during the workday. Consistent with this approach, many of the workers sampled at the carbon regeneration facility are engaged in activities in the immediate vicinity of spent carbon (e.g., handling, unloading and/or sampling spent carbon containers received at the facility). This means that the locations at which breathing zone concentrations are measured during IH surveys differ from the on-site location modeled in the risk assessment. Moreover, the workers are likely to be much closer to potential emission sources than the modeled location addressed in the risk assessment. Further, air quality models like ISCST are based on the concept of Gaussian dispersion which assumes that time-averaged concentration profiles at any distance in the crosswind direction are well represented by a normal distribution. This may not be the case for very short distances between sources and receptors (Turner 1994)[1] which introduces an element of uncertainty not associated with dosimetry or personnel monitoring. Because of these types of differences, the measured and modeled concentrations are not directly comparable.

Keeping in mind these fundamental differences, the measured and modeled concentrations were compared as recommended by USEPA Region IX in its comment. The following discussion presents the measured IH data and describes how on-site air concentrations were modeled in response to this comment. Finally, this section examines these two datasets in comparison with occupational exposure limits.

Industrial Hygiene Data

This response to comment focused on historical IH data measured over the same four-year time period that was evaluated in the risk assessment (i.e., 2003-2006) and addressed those compounds that were both reported in the IH surveys and also modeled as fugitives in the risk assessment. The IH data were compiled from survey reports provided to CPF Associates by Siemens[2], and include worker measurements collected over time periods

[1] Note also that the Pasquill-Gifford dispersion parameters have not been reliably measured for distances less than 0.1 km and the prediction of concentrations at receptors less than 0.1 km from a source is thus uncertain.
[2] Zurich Services Corporation. Industrial Hygiene Report – Parker, Arizona. Submitted to D. Eisner, US Filter Westates. February 26, 2004; Liberty Mutual Insurance Group. Industrial Hygiene Report. Submitted to D. Eisner, US Filter. January 5, 2005; Liberty Mutual Insurance Group. Industrial Hygiene Report. Submitted

ranging from roughly 140 minutes (2.3 hours) to 480 minutes (8 hours). Table 1 presents the reported IH results for the subset of compounds reported in the surveys and also modeled in the risk assessment. As can be seen, most of the organic compounds in Table 1 were not present at detectable concentrations. Those that were present at detectable concentrations were well below the associated Occupational Health and Safety Administration (OSHA) and National Institute of Occupational Safety and Health (NIOSH) occupational exposure limits.[3]

Modeled On-Site Chemical Air Concentrations

Modeled on-site chemical air concentrations associated with fugitive releases during spent carbon unloading were calculated by multiplying chemical emission rates with unitized ISCST3 air dispersion modeling results (i.e., air concentrations calculated for a unit 1 g/sec emission rate). This approach for calculating chemical air concentrations directly follows standard USEPA procedures and more specifically USEPA's Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (HHRAP) guidance. Section 3.8.1 of HHRAP explains how air concentrations are calculated, stating "you can derive COPC-specific[4] air concentrations by multiplying as follows:"

$$\text{COPC-Specific air concentration } (\mu g/m^3) = \frac{\text{Modeled output air concentration } (\mu g/m^3) * \text{COPC-specific emission rate (g/sec)}}{\text{Unit emission rate (1 g/sec)}} \quad \text{(Equ 1)}$$

As illustrated by this equation, the two key inputs for calculating chemical air concentrations are the chemical-specific emission rates and the air dispersion modeling outputs. Section 4.3 of the risk assessment describes the mathematical models that were used to calculate these two key inputs. The following discussion provides additional details about the chemical emission rates and the air dispersion modeling in response to this comment.

Chemical Emission Rates

Two sets of chemical emission rates were considered in this response, in order to reflect different assumptions about chemical concentrations in spent carbon.

- One set of modeled emission rates was obtained directly from the risk assessment; these emission rates were derived using average concentrations in spent carbon received at the facility from 2003 through 2006.

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to D. Eisner, US Filter. January 2006; Liberty Mutual Insurance Group. Industrial Hygiene Report. Submitted to D. Eisner, US Filter. December 28, 2006.

[3] The IH surveys analyzed breathing zone samples for more than 30 organic compounds. Most compounds were below the limits of quantitation. Those compounds that were detected were present at levels well below occupational exposure limits.

[4] COPC = chemical of potential concern.

Table 1

Results from Carbon Regeneration Facility Industrial Hygiene (IH) Surveys Conducted from 2003 Through 2006

Year	Breathing Zone Air Concentrations (a) (concentrations for organic compounds in parts per million (ppm); concentrations for dust in mg/m3)											
	1,4-Dichloro-benzene	Benzene	Chloroform	Cyclohexane	Ethylbenzene	n-Hexane	Styrene	Tetrachloro-ethylene	Toluene	Trichloro-ethylene	Total dust	Respirable dust
2003	< 0.07	< 0.06	< 0.2	< 0.05	< 0.05	< 0.05	< 0.06	< 0.08	< 0.05	< 0.1	0.12	1.2
	< 0.07	< 0.06	< 0.2	< 0.06	< 0.06	< 0.05	< 0.06	< 0.09	< 0.05	< 0.1	0.42	0.24
	< 0.07	< 0.06	< 0.2	< 0.06	< 0.06	< 0.05	< 0.06	< 0.09	< 0.05	< 0.1	0.41	
	< 0.07	< 0.06	< 0.2	< 0.06	< 0.06	< 0.05	< 0.06	< 0.09	< 0.05	< 0.1	1.4	
	< 0.09	< 0.08	< 0.3	< 0.07	< 0.07	< 0.07	< 0.08	< 0.1	< 0.07	< 0.1		
2004	< 0.0009	< 0.002	< 0.0083		< 0.00066	< 0.0094	< 0.002	< 0.003	< 0.001	< 0.0024		
	< 0.0013	< 0.0029	< 0.012		< 0.00096	< 0.014	< 0.003	< 0.0044	< 0.0015	< 0.0035		
	< 0.00084	< 0.0018	< 0.0077		< 0.00061	< 0.0089	< 0.0019	< 0.0028	< 0.00094	< 0.0022		
	< 0.0017	< 0.0038	< 0.016		< 0.0013	< 0.018	< 0.004	< 0.0058	< 0.002	< 0.0046		
	< 0.00063	< 0.0014	< 0.0058		< 0.00046	< 0.0066	< 0.0014	< 0.0021	< 0.0007	< 0.0017		
	< 0.00086	< 0.0019	< 0.0079		< 0.00063	< 0.0091	< 0.002	< 0.0029	< 0.00097	< 0.0023		
	< 0.0013	< 0.0028	< 0.012		< 0.00094	< 0.014	< 0.0029	< 0.0043	< 0.0014	< 0.0034		
	< 0.00086	< 0.0019	< 0.008		< 0.00063	< 0.0091	< 0.002	< 0.0029	< 0.00097	< 0.0023	0.35	
	< 0.0014	< 0.003	< 0.013		< 0.001	< 0.014	< 0.0031	< 0.0046	< 0.0015	< 0.0036	0.26	
	< 0.00097	< 0.021	< 0.0089		< 0.00071	< 0.01	< 0.0022	< 0.0032	< 0.0011	< 0.0026	2.57	
	< 0.0013	< 0.0028	< 0.012		< 0.00092	< 0.013	< 0.0028	< 0.0042	< 0.0014	< 0.0033	1.49	
2005	< 0.012	< 0.022	< 0.046		< 0.012	< 0.046	< 0.014	< 0.027	< 0.015	< 0.045	0.2	
	< 0.011	< 0.021	< 0.045		< 0.012	< 0.045	< 0.014	< 0.026	< 0.014	< 0.044	0.39	
	< 0.011	< 0.021	< 0.045		< 0.012	< 0.045	< 0.014	< 0.026	< 0.014	< 0.044	0.93	
	< 0.013	< 0.025	< 0.052		< 0.014	< 0.052	< 0.016	< 0.03	0.025	< 0.051	< 0.15	
	< 0.011	< 0.021	< 0.045		< 0.012	< 0.044	< 0.014	< 0.026	< 0.014	< 0.044	0.079	
2006		< 0.0062	< 0.091		< 0.012	0.15	0.028	< 0.05	0.03	< 0.034	5.23	
		< 0.0097	< 0.14		< 0.018	< 0.016	< 0.016	0.78	0.034	< 0.054	2.9	
		< 0.016	< 0.24		< 0.031	0.029	< 0.027	2.7	< 0.027	< 0.09	0.25	
		< 0.0063	< 0.092		< 0.012	0.11	0.027	0.07	0.015	< 0.035	0.65	
		< 0.007	< 0.1		< 0.013	< 0.012	0.039	< 0.056	0.012	< 0.038		
Summary of IH Survey Data												
# samples	21	26	26	5	26	26	26	26	26	26	17	2
# non-detects	21	26	26	5	26	23	23	23	21	26	1	0
% detected	0%	0%	0%	0%	0%	12%	12%	12%	19%	0%	94%	100%
Occupational Exposure Limits (8-hour TWA)												
OSHA PEL	75	1	NA	305	100	511	101	100	199	100	15	5
NIOSH REL	10	0.1	10	305	100	51	50	25	100	25	10	3

Source: IH survey reports provided by Siemens.

< = Compound was not detected at the listed detection limit.

OSHA PEL = Occupational Safety and Health Administration 8-hour time-weighted average Permissible Exposure Limit

NIOSH REL = National Institute for Occupational Safety and Health 8-hour time-weighted average Reference Exposure Limit

(a) The listed compounds include those that were selected for detailed evaluation in the spent carbon fugitive emissions analysis in the risk assessment and also were analyzed for during industrial hygiene monitoring programs conducted at the facility. Compounds that were evaluated in the fugitive emissions risk assessment but were not analyzed for in the IH surveys consisted of inorganics, 1,3-butadiene, acrylonitrile, naphthalene and vinyl chloride.

- The second set of modeled emission rates was evaluated to respond to another USEPA comment (Region IX Specific Comment 10, see below) which recommended that maximum rather than average spent carbon concentrations be used to model fugitive releases for the acute risk analysis. Accordingly, the second set of modeled emission rates was derived using the maximum concentration reported in any spent carbon load that was unloaded at the outdoor hopper over the four-year 2003-2006 period, rather than the average concentration. Table 2 presents the maximum concentrations in spent carbon unloaded at the outdoor hopper, the number of deliveries with this maximum concentration relative to the total number of deliveries, and the mathematically modeled fugitive chemical emission rates.

Air Dispersion Modeling

Equation 1, presented above, shows the HHRAP method for calculating chemical-specific air concentrations. In this method, unitized ISCST3 dispersion model output air concentrations are multiplied by chemical-specific emission rates. The unitized ISCST3 air concentration used in the risk assessment and in this response was the maximum modeled 8-hour average air concentration based on a unit 1 g/sec emission rate (i.e., $\mu g/m^3$ per 1 g/sec). The chemical-specific emission rates were calculated as described above.

The ISCST3 model, using 5 years of input meteorological data, calculated more than 5,400 unitized 8-hour average concentrations at each of the more than 60 on-site receptor locations that were modeled.[5] The maximum impact receptor point was located about 10 meters from the outdoor hopper. At this location, the highest unitized ISCST3 8-hour average concentration, from among the more than 5,400 modeled output concentrations, was 16,426 $\mu g/m^3$ per 1 g/sec (see Section 4.4.4.1 and Appendix D in the risk assessment for more detail on the ISCST3 modeling). All the other 8-hour average air concentrations modeled 10 m from the outdoor hopper, and at all the other modeled on-site receptor locations, were lower than this highest value.

Presentation of Measured Industrial Hygiene Data and Modeled On-Site Air Concentrations

Figure 1 presents the IH survey data and the modeled on-site air concentrations along with available occupational exposure limits. This comparison indicates that both the modeled ambient air concentrations and the measured worker breathing zone concentrations for the four-year period from 2003 through 2006 did not exceed the OSHA permissible exposure limits and the NIOSH reference exposure limits.

The highest modeled air concentration relative to an occupational exposure limit in Figure 1 was the maximum modeled on-site concentration of benzene. The maximum modeled

[5] Three 8-hour averages are calculated by ISCST3 for each modeled day (i.e., midnight – 8 AM, 8 AM-4 PM, and 4 PM-midnight). With 5 years of input meteorological data, including one leap year, this produces more than 5,400 8-hour average ambient air concentrations at each modeled receptor location (e.g., 5 years * 365 days/year * 3 8-hour averages/day).

Table 2
Maximum Modeled Fugitive Compound Emission Rates During Spent Carbon Unloading at the Outdoor Hopper (a)

Compound	CAS #	Loads Unloaded at Outdoor Hopper H-1 (Based on 2003-2006 Spent Carbon Data)			Emission Rate Based on Maximum Concentration (loads unloaded at H-1) (g/sec) (b)
		Maximum Concentration (ppm)	Number of Deliveries with Maximum	Total Number of Deliveries over 4-Year Period	
1,2-Dibromoethane	106-93-4	0.025	1	11	6.38E-10
1,3-Butadiene	106-99-0	NA	0	1	NA
1,4-Dichlorobenzene	106-46-7	34,500	9	59	4.27E-04
Acrylonitrile	107-13-1	11,500	9	9	2.08E-03
Arsenic	7440-38-2	73.4	3	145 (c)	4.31E-09
Benzene	71-43-2	70,000	15	3,443	2.02E-02
Beryllium	7440-41-7	9.8	1	52	5.73E-10
Cadmium	7440-43-9	79.3	2	63	4.65E-09
Chloroform	67-66-3	5,579	2	634	1.25E-03
Chromium	7440-47-3	294	2	310	1.73E-08
Chromium VI	18540-29-9	170	--	--	9.98E-09
Cobalt	7440-48-4	798	2	171	4.68E-08
Copper	7440-50-8	91	1	256	5.37E-09
Cyclohexane	110-82-7	46,000	3	16	5.87E-02
Ethylbenzene	100-41-4	25,932	13	888	3.19E-03
Naphthalene	91-20-3	3,600	5	57	4.62E-06
n-Hexane	110-54-3	2,220	1	1	8.46E-03
Nickel	7440-02-0	279	2	226	1.64E-08
Styrene	100-42-5	84,784	8	107	7.98E-04
Tetrachloroethylene	127-18-4	91,000	3	1,562	1.96E-02
Toluene	108-88-3	35,837	35	1,145	5.37E-03
Trichloroethylene	79-01-6	16,667	1	2,114	5.61E-03
Vinyl Chloride	75-01-4	6,100	1	375	3.29E-02

-- = no data. Chromium VI concentrations were calculated from total chromium data (see text).

NA = not applicable. Only one spent carbon load containing this compound was received and it was unloaded at H-2.

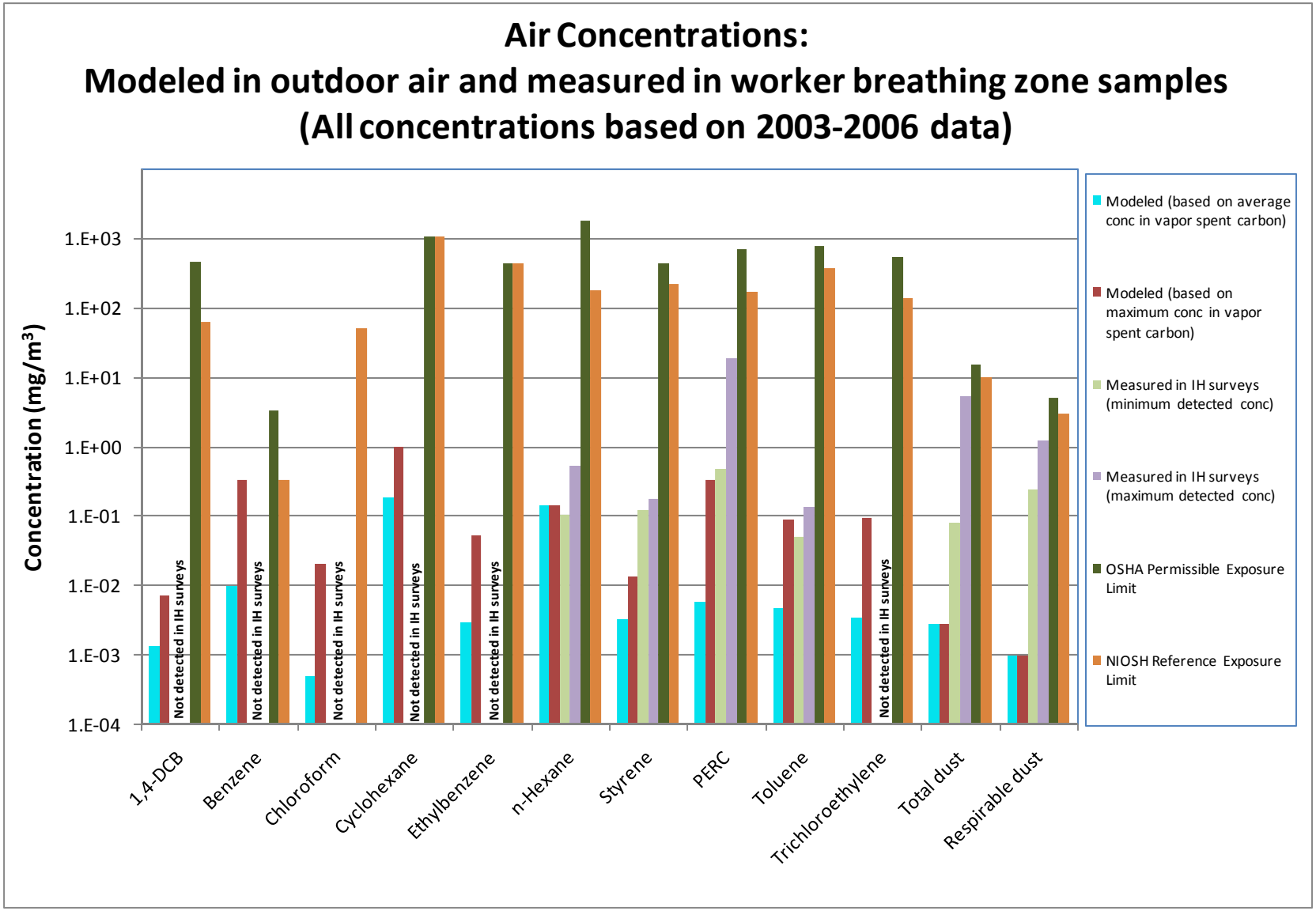
(a) Emission rates were modeled using maximum spent carbon concentrations for loads unloaded at H-1.

(b) Methods for calculating emission rates:

- Emission rates for inorganic compounds (g/sec) = PM10 dust emission rate (g/sec) * concentration in spent carbon (g/g), where the PM10 dust emission rate is 5.87E-5 g/sec (see Section 4.3.3.2 in the risk assessment for a description of the PM10 emission rate calculation).
- See Section 4.3.3.1 in the risk assessment for information on the methods used to calculate emission rates for organic compounds. As described in Section 4.3.3.1 of the risk assessment, emission rates for organic compounds were calculated for two different types of spent carbon received at the facility, aqua spent carbon and vapor spent carbon. Emission rates for unloading vapor spent carbon are shown here and used to evaluate potential risks since these emission rates are higher than those for unloading aqua spent carbon.

(c) Table 4.3-1 of the risk assessment indicated there were 10 deliveries over the 4-year period. The correct number of deliveries is shown here.

Figure 1


Air Concentrations:
Modeled in outdoor air and measured in worker breathing zone samples
(All concentrations based on 2003-2006 data)
Concentration (mg/m³)
1.E+03
1.E+02
1.E+01
1.E+00
1.E-01
1.E-02
1.E-03
1.E-04
Not detected in IH surveys
1,4-DCB
Benzene
Chloroform
Cyclohexane
Ethylbenzene
n-Hexane
Styrene
PERC
Toluene
Trichloroethylene
Total dust
Respirable dust
Modeled (based on average conc in vapor spent carbon)
Modeled (based on maximum conc in vapor spent carbon)
Measured in IH surveys (minimum detected conc)
Measured in IH surveys (maximum detected conc)
OSHA Permissible Exposure Limit
NIOSH Reference Exposure Limit

8-hour average benzene air concentration, calculated using the maximum spent carbon benzene concentration and the maximum ISCST3 dispersion result, was equal to the NIOSH reference exposure limit and about 10 times lower than the OSHA permissible exposure limit. This scenario has a very low probability of occurrence, however, since it assumed that the maximum benzene concentration would be unloaded during a workday also characterized by meteorological conditions that produced the maximum 8-hour average air concentration. The likelihood of this situation occurring is less than 4 in 100,000,000 per year.[6]

As described in more detail in response to Specific Comment #10 below, the facility has a protective worker health and safety program which has been developed to meet the requirements of OSHA. In addition to the IH surveys, the program includes training, medical monitoring, provision and use of personal protective equipment, and hazard communication. Specifically with respect to this response to comment, it is important to recognize that all workers involved in spent carbon unloading operations wear respirators in addition to protective clothing. When handling any spent carbon (whether it is classified as non-hazardous or hazardous), a half-face respirator with organic and dust control cartridges is worn by workers. Workers also wear company-supplied shorts, pants, steel-toed boots, hard hat and safety glasses.

Thus, the results of the dosimetry corroborate the conclusions of the risk assessment model that unacceptable risks to workers associated with chemical exposures from spent carbon are not likely to occur.

Comment 3: Clean Air Act MACT.

Comment:
In this comment, USEPA discusses the Maximum Achievable Control Technology (MACT) standards under the U.S. Clean Air Act and concludes that "While the MACT standards are not risk-based per se, this level of analysis is consistent with the overall weight of evidence suggesting a de minimus level of human and ecological impact from stack emissions on proximate receptors."

Response: No response necessary.

Comment 4: Upset Conditions (Stack Emissions)

Comment:
"Non-cancer or systemically toxic chemicals evaluated in this analysis were assessed by the Agency's threshold strategy which produces a constituent-specific, yet cumulative hazard index. The potential for acute health impacts associated with facility stack release upsets

[6] The probability of the maximum benzene concentration occurring in spent carbon is 15 in 3,443 (i.e., 15 deliveries with the maximum concentration were received over the 4-year period out of a total of 3,443 spent carbon deliveries containing benzene). The probability of meteorological conditions producing the maximum 8-hour air concentration is less than 1 in 5,400 over 5 years (i.e., 1 maximum 8-hour concentration out of more than 5,400 calculated 8-hour average concentrations at the receptor location). The overall probability of the maximum modeled benzene concentration occurring is, thus, [(15/3443) / 4 years] * [(<1/5400) / 5 years] = <4E-8 or less than 4 in 100,000,000 per year.

were subject to this level of scrutiny. Discrete locations subject to the maximum levels of contaminant deposition were identified by the computerized air dispersion and deposition model. These discrete locations, irrespective of their relationship to known human receptors, were then used to determine media-specific exposure point concentrations - and the concomitant estimate of hazard incurred by a hypothetical receptor.

The acute or short-term hazard estimates associated with upset stack releases should be clearly detailed on pg 42. The cumulative acute hazard index associated with grid locations (A_1) and (A_2) should be clearly provided either in a table or a revised narrative. Further, the acute or short-term upset stack release concentration should be consistent with the 1-hr maximum upset emission rate rather than the 1-hr average upset emission rate.

Moreover, the relationship between the 10x increased emission rate associated with a hypothetical facility upset condition and the acute hazard index is not clear based upon the data provided. That is, the contention that acute hazard quotients are uniformly and linearly increased by a factor of 10 is not supported by any data, as the air dispersion and deposition model is based on a gaussian distribution, plume-depleted, mass balance algorithm."

Response:

Introduction

In response to this comment, a more detailed explanation and presentation of acute, short-term hazard estimates associated with upset stack releases is provided. This section first explains how the acute inhalation risk assessment for upset conditions was performed in response to this comment. Then the results of this assessment are presented. In the course of this discussion, USEPA's comments noted above are addressed.

An acute inhalation risk assessment for upset stack emissions is performed using three key pieces of information: 1) chemical stack emission rates under upset conditions, 2) unitized air dispersion model output concentrations calculated using a unit 1 g/sec emission rate, and 3) short-term acute inhalation reference exposure concentrations. The short-term reference exposure concentrations were identified and compiled according to USEPA's HHRAP guidance and are addressed in Section 4.1.2 of the risk assessment. In this section, an expanded discussion of the remaining two items, upset emission rates and air model outputs, is provided.

Upset Stack Emission Rates

Upset stack emission rates were calculated in two steps. First, maximum measured emission rates from the performance demonstration test (PDT) were compiled[7] and then, second, these maximum values were increased by USEPA's default upset multiplication factor.

The approach used in this response to comment is even more conservative than that provided for in the risk assessment, in that maximum measured emission rates from the PDT were used in this response whereas the risk assessment, in accordance with the project Workplan, used

[7] Stack measurements for nitrogen oxides and sulfur dioxide were obtained from miniburn data since these compounds were not measured in the PDT.

average emission rates derived across the three PDT test runs. This change was made to respond to USEPA's comment to use the "maximum upset emission rate." These maximum measured emission rates are presented in Table 3 along with the stack emission rates that were used in the risk assessment. As described in Section 4.5.2 of the risk assessment, and as shown in Table 3, the differences between the average and maximum measured stack emission rates for those compounds with emission rates based on stack test data were not substantial, and ranged from a factor of 1.0 (i.e., no change) to a factor of 3.0.

Upset emission rates were calculated from the maximum measured values according to the USEPA guidance presented in Section 2.2.5 of HHRAP which, as a default and in the absence of site-specific data, assumes that "emissions during process upsets are 10 times greater than emissions measured during the trial burn." USEPA indicates in HHRAP that the multiplicative default factor of 10 is based on a method presented in 1990 by the California Air Resources Board for non-hazardous municipal waste combustors; HHRAP has extrapolated this to hazardous waste incinerators. An activated carbon regeneration facility is not a hazardous waste incinerator and is intrinsically easier to control than an incinerator due to homogeneity in the feedstock (consisting of only spent carbon), thereby ensuring that the default assumption is likely to be overly conservative when applied to carbon regeneration facilities. In addition, peer review comments received by USEPA on the hazardous waste incinerator methodology pointed out that "available technical information indicates that upset emissions are not close to 10 times normal emissions" (USEPA 2005). Nonetheless, in keeping with USEPA's HHRAP default approach, and because site-specific emissions data during upsets were not available, the upset stack emission rates were calculated by multiplying the maximum measured stack emission rates by a factor of 10. These upset emission rates are also listed in Table 3.

Upset conditions occur at the facility very infrequently. Facility data describing the frequency and duration of upset conditions from 2000 and 2001, which were presented in the risk assessment, indicate that upset conditions occur for about 0.24% of the time the facility is operating. The facility operated under upset conditions for 16.1 hours out of a total of 6,745 operating hours in 2000 and for 18.4 hours out of a total of 7,844 operating hours in 2001 (see Table 4.2-2 in the risk assessment for more details).

<u>Proportionality of Chemical Emission Rates to Air Concentrations and Hazard Quotients</u>

USEPA's comment questions whether the relationship between acute hazard quotients (HQs) and emission rates is linear and the contention that a factor of 10 increase in emission rates will increase HQs by a factor of 10. This section responds to USEPA's comment, drawing directly from USEPA guidance.

Short-term chemical-specific air concentrations for the upset acute risk assessment, and in fact chemical-specific air concentrations throughout the risk assessment, were calculated in accordance with standard USEPA procedures and HHRAP guidance. USEPA's guidance in Section 3.8 of HHRAP (Using Model Output) states: "ISCST3 output (air concentrations and deposition rates) are usually provided on a unit emission rate (1.0 g/sec) basis from the combustor or emission source, and aren't COPC-specific. This is to preclude having to run the

Table 3

Maximum Measured Stack Emission Rates, Emission Rates Used in the Risk Assessment, and Upset Condition Stack Emission Rates

Compound	CAS Number	Stack Emission Rates Used in Risk Assessment (Non-Upset Conditions)		Maximum Measured Stack Emission Rate from PDT (g/sec)	Ratio: Maximum Measured Emission Rate / Average Measured Emission Rate Used in Risk Assessment	Upset Condition Stack Emission Rates Used in Response to Comments (maximum measured emission rate * 10) (g/sec) (d)
		Emission Rate (g/sec) (a)	Basis for Emission Rate			
Inorganic Compounds						
Aluminum	7429-90-5	1.15E-04	PDT	1.43E-04	1.2	1.43E-03
Antimony	7440-36-0	3.89E-06	PDT	4.96E-06	1.3	4.96E-05
Arsenic	7440-38-2	1.26E-04	permit limit	6.22E-06	not applicable (b)	6.22E-05
Barium	7440-39-3	9.01E-06	PDT	1.10E-05	1.2	1.10E-04
Beryllium	7440-41-7	1.26E-04	permit limit	3.13E-07	not applicable (b)	3.13E-06
Cadmium	7440-43-9	3.12E-04	permit limit	1.31E-05	not applicable (b)	1.31E-04
Chromium	7440-47-3	1.26E-04	permit limit	6.04E-05 (c)	not applicable (b)	6.04E-04
Chromium, hexavalent	7440-47-3	5.80E-06	PDT	6.28E-06	1.1	6.28E-05
Cobalt	7440-48-4	5.82E-07	PDT	9.38E-07	1.6	9.38E-06
Copper	7440-50-8	1.19E-04	PDT	1.80E-04	1.5	1.80E-03
Lead	7439-92-1	3.12E-04	permit limit	5.60E-04 (c)	not applicable (b)	5.60E-03
Manganese	7439-96-5	4.61E-05	PDT	7.10E-05	1.5	7.10E-04
Mercuric chloride	7487-94-7	2.30E-05	permit limit	1.62E-06	not applicable (b)	1.62E-05
Mercury, elemental	7439-97-6	1.34E-06	permit limit	9.48E-08	not applicable (b)	9.48E-07
Nickel	7440-02-0	9.91E-06	PDT	1.29E-05	1.3	1.29E-04
Selenium	7782-49-2	3.76E-06	PDT	4.85E-06	1.3	4.85E-05
Silver	7440-22-4	2.73E-06	PDT	4.62E-06	1.7	4.62E-05
Thallium	7440-28-0	9.24E-06	PDT	1.13E-05	1.2	1.13E-04
Vanadium	7440-62-2	2.43E-06	PDT	3.23E-06	1.3	3.23E-05
Zinc	7440-66-6	1.51E-04	PDT	2.36E-04	1.6	2.36E-03
Organic Compounds						
1,1,1-Trichloroethane	71-55-6	2.78E-07	PDT	3.17E-07	1.1	3.17E-06
1,1,2,2-Tetrachloroethane	79-34-5	1.32E-06	PDT	1.51E-06	1.1	1.51E-05
1,1,2-Trichloroethane	79-00-5	8.02E-07	PDT	9.14E-07	1.1	9.14E-06
1,1-Dichloroethane	75-34-3	3.09E-07	PDT	3.53E-07	1.1	3.53E-06

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		Emission Rate (g/sec) (a)	Basis for Emission Rate			
1,1-Dichloroethene	75-35-4	3.52E-07	PDT	4.01E-07	1.1	4.01E-06
1,1-Dichloropropene	563-58-6	2.15E-07	PDT	2.45E-07	1.1	2.45E-06
1,2,3-Trichlorobenzene	87-61-6	1.73E-06	PDT	1.97E-06	1.1	1.97E-05
1,2,3-Trichloropropane	96-18-4	1.25E-06	PDT	1.42E-06	1.1	1.42E-05
1,2,4-Trichlorobenzene	120-82-1	9.30E-07	PDT	1.06E-06	1.1	1.06E-05
1,2,4-Trimethylbenzene	95-63-6	6.26E-07	PDT	7.14E-07	1.1	7.14E-06
1,2-Dibromo-3-chloropropane	96-12-8	2.60E-06	PDT	2.97E-06	1.1	2.97E-05
Ethylene dibromide	106-93-4	1.32E-06	PDT	1.50E-06	1.1	1.50E-05
1,2-Dichlorobenzene	95-50-1	8.43E-07	PDT	9.73E-07	1.2	9.73E-06
1,2-Dichloroethane	107-06-2	5.05E-07	PDT	6.15E-07	1.2	6.15E-06
1,2-Dichloroethene (cis)	156-59-2	4.17E-07	PDT	5.17E-07	1.2	5.17E-06
1,2-Dichloroethene (trans)	156-60-5	2.89E-07	PDT	3.29E-07	1.1	3.29E-06
1,2-Dichloropropane	78-87-5	3.98E-07	PDT	4.49E-07	1.1	4.49E-06
1,2-Diphenylhydrazine	122-66-7	7.00E-07	PDT	8.02E-07	1.1	8.02E-06
1,3,5-Trimethylbenzene	108-67-8	4.05E-07	PDT	4.62E-07	1.1	4.62E-06
1,3-Dichlorobenzene	541-73-1	8.86E-07	PDT	1.01E-06	1.1	1.01E-05
1,3-Dichloropropane	142-28-9	3.77E-07	PDT	4.29E-07	1.1	4.29E-06
1,3-Dichloropropene	542-75-6	7.58E-07	PDT	8.46E-07	1.1	8.46E-06
1,3-Dinitrobenzene	99-65-0	1.08E-06	PDT	1.26E-06	1.2	1.26E-05
1,4-Dichlorobenzene	106-46-7	1.00E-06	PDT	1.16E-06	1.2	1.16E-05
1-Hexane (n-hexane)	110-54-3	7.98E-10	FR&DRE	--	not applicable (b)	8.0E-09
2,2'-oxybis (1-Chloropropane)	108-60-1	9.72E-07	PDT	1.11E-06	1.1	1.11E-05
2,2-Dichloropropane	594-20-7	2.79E-07	PDT	3.18E-07	1.1	3.18E-06
2,4,5-Trichlorophenol	95-95-4	1.61E-06	PDT	1.85E-06	1.1	1.85E-05
2,4,6-Trichlorophenol	88-06-2	1.27E-06	PDT	1.47E-06	1.2	1.47E-05
2,4-Dichlorophenol	120-83-2	1.30E-06	PDT	1.68E-06	1.3	1.68E-05

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		Emission Rate (g/sec) (a)	Basis for Emission Rate			
2,4-Dimethylphenol	105-67-9	3.09E-06	PDT	3.50E-06	1.1	3.50E-05
2,4-Dinitrophenol	51-28-5	9.15E-06	PDT	1.04E-05	1.1	1.04E-04
2,4-Dinitrotoluene	121-14-2	1.32E-06	PDT	1.52E-06	1.1	1.52E-05
2,5-Dimethylfuran	625-86-5	8.43E-07	PDT	2.53E-06	3.0	2.53E-05
2,5-Dimethylheptane	2216-30-0	1.68E-05	PDT	2.77E-05	1.6	2.77E-04
2,5-Dione, 3-hexene	17559-81-8	9.53E-07	PDT	2.86E-06	3.0	2.86E-05
2,6-Dinitrotoluene	606-20-2	1.06E-06	PDT	1.22E-06	1.2	1.22E-05
Methyl ethyl ketone	78-93-3	4.51E-06	PDT	5.14E-06	1.1	5.14E-05
2-Chloronaphthalene	91-58-7	6.53E-07	PDT	7.59E-07	1.2	7.59E-06
2-Chlorophenol	95-57-8	8.60E-07	PDT	9.83E-07	1.1	9.83E-06
2-Chlorotoluene	95-49-8	5.10E-07	PDT	5.77E-07	1.1	5.77E-06
2-Hexanone	591-78-6	1.88E-06	PDT	2.14E-06	1.1	2.14E-05
2-Methyl octane	3221-61-2	3.98E-06	PDT	8.58E-06	2.2	8.58E-05
2-Methylnaphthalene	91-57-6	5.79E-08	PDT	8.13E-08	1.4	8.13E-07
Cresol, o-	95-48-7	2.09E-06	PDT	2.38E-06	1.1	2.38E-05
2-Nitroaniline	88-74-4	1.04E-06	PDT	1.21E-06	1.2	1.21E-05
2-Nitrophenol	88-75-5	1.77E-06	PDT	2.01E-06	1.1	2.01E-05
3,3'-Dichlorobenzidine	91-94-1	4.96E-06	PDT	5.68E-06	1.1	5.68E-05
Cresol, m-	108-39-4	9.15E-07	PDT	1.04E-06	1.1	1.04E-05
Cresol, p-	106-44-5	9.15E-07	PDT	1.04E-06	1.1	1.04E-05
3-Ethyl benzaldehyde	34246-54-3	2.38E-06	PDT	3.89E-06	1.6	3.89E-05
3-Hexen-2-one	763-93-9	1.14E-04	PDT	3.41E-04	3.0	3.41E-03
3-Nitroaniline	99-09-2	2.91E-06	PDT	3.33E-06	1.1	3.33E-05
Ethylidene acetone (3-penten-2-one)	625-33-2	4.83E-06	PDT	1.45E-05	3.0	1.45E-04
3-Penten-2-one, 4-methyl	141-79-7	9.30E-05	PDT	2.14E-04	2.3	2.14E-03

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		Emission Rate (g/sec) (a)	Basis for Emission Rate			
4,4'-DDD	72-54-8	1.31E-07	PDT	2.01E-07	1.5	2.01E-06
4,4'-DDE	72-55-9	4.47E-08	PDT	5.64E-08	1.3	5.64E-07
4,4'-DDT	50-29-3	3.34E-08	PDT	6.63E-08	2.0	6.63E-07
4,6-Dinitro-2-methylphenol	534-52-1	4.37E-06	PDT	4.95E-06	1.1	4.95E-05
4-Bromophenyl-phenyl ether	101-55-3	6.71E-07	PDT	7.69E-07	1.1	7.69E-06
4-Chloro-3-methylphenol	59-50-7	2.17E-06	PDT	2.51E-06	1.2	2.51E-05
4-Chloroaniline	106-47-8	4.17E-06	PDT	4.78E-06	1.1	4.78E-05
4-Chlorophenyl-phenyl ether	7005-72-3	1.11E-06	PDT	1.29E-06	1.2	1.29E-05
4-Chlorotoluene	106-43-4	4.42E-07	PDT	5.03E-07	1.1	5.03E-06
4-Ethyl benzaldehyde	4748-78-1	1.30E-06	PDT	3.89E-06	3.0	3.89E-05
4-Nitroaniline	100-01-6	2.34E-06	PDT	2.57E-06	1.1	2.57E-05
4-Nitrophenol	100-02-7	2.92E-06	PDT	3.33E-06	1.1	3.33E-05
9-Octadecenamide	301-02-0	2.52E-06	PDT	7.57E-06	3.0	7.57E-05
Acenaphthene	83-32-9	4.48E-09	PDT	5.51E-09	1.2	5.51E-08
Acenaphthylene	208-96-8	8.11E-09	PDT	1.52E-08	1.9	1.52E-07
Acetone	67-64-1	6.14E-05	PDT	6.21E-05	1.0	6.21E-04
Acetophenone	98-86-2	3.41E-06	PDT	3.62E-06	1.1	3.62E-05
Acrylic Acid	79-10-7	1.80E-11	FR&DRE	--	not applicable (b)	1.8E-10
Acrylonitrile	107-13-1	1.10E-05	PDT	1.25E-05	1.1	1.25E-04
Aldrin	309-00-2	2.45E-08	PDT	2.77E-08	1.1	2.77E-07
Aniline	62-53-3	7.19E-06	PDT	8.33E-06	1.2	8.33E-05
Anthracene	120-12-7	1.28E-08	PDT	2.61E-08	2.0	2.61E-07
Benzaldehyde	100-52-7	4.90E-06	PDT	6.60E-06	1.3	6.60E-05
Benzene	71-43-2	2.59E-06	PDT	3.02E-06	1.2	3.02E-05
Benzidine	92-87-5	4.68E-05	PDT	5.35E-05	1.1	5.35E-04
Benzo(a)Anthracene	56-55-3	2.84E-09	PDT	4.82E-09	1.7	4.82E-08

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		Emission Rate (g/sec) (a)	Basis for Emission Rate			
Benzo(a)pyrene	50-32-8	3.58E-09	PDT	5.45E-09	1.5	5.45E-08
Benzo(b)fluoranthene	205-99-2	2.94E-08	PDT	3.28E-08	1.1	3.28E-07
Benzo(e)pyrene	192-97-2	5.35E-09	PDT	9.18E-09	1.7	9.18E-08
Benzo(g,h,i)perylene	191-24-2	1.13E-08	PDT	1.61E-08	1.4	1.61E-07
Benzo(k)fluoranthene	207-08-9	5.43E-09	PDT	8.46E-09	1.6	8.46E-08
Benzoic Acid	65-85-0	2.81E-05	PDT	3.19E-05	1.1	3.19E-04
Benzoic acid, methyl ester	93-58-3	8.07E-07	PDT	2.42E-06	3.0	2.42E-05
Benzonitrile	100-47-0	1.87E-06	PDT	2.14E-06	1.1	2.14E-05
Benzyl alcohol	100-51-6	2.09E-05	PDT	2.37E-05	1.1	2.37E-04
Bis(2-chloroethoxy) methane	111-91-1	8.34E-07	PDT	9.54E-07	1.1	9.54E-06
Bis-(2-chloroethyl) ether	111-44-4	8.14E-07	PDT	9.31E-07	1.1	9.31E-06
Bis(2-ethylhexyl) phthalate	117-81-7	1.69E-05	PDT	1.96E-05	1.2	1.96E-04
Bromobenzene	108-86-1	5.00E-07	PDT	5.70E-07	1.1	5.70E-06
Bromochloromethane	74-97-5	1.52E-06	PDT	1.74E-06	1.1	1.74E-05
Bromodichloromethane	75-27-4	5.44E-06	PDT	8.53E-06	1.6	8.53E-05
Bromoform (tribromomethane)	75-25-2	1.38E-05	PDT	1.60E-05	1.2	1.60E-04
Bromomethane (methyl bromide)	74-83-9	4.72E-06	PDT	6.40E-06	1.4	6.40E-05
Butylbenzene, n-	104-51-8	6.09E-07	PDT	6.90E-07	1.1	6.90E-06
Butylbenzene, sec-	135-98-8	4.89E-07	PDT	5.58E-07	1.1	5.58E-06
Butylbenzene, tert-	98-06-6	5.80E-07	PDT	6.61E-07	1.1	6.61E-06
Butylbenzylphthalate	85-68-7	1.08E-06	PDT	1.26E-06	1.2	1.26E-05
Carbazole	86-74-8	9.83E-07	PDT	1.12E-06	1.1	1.12E-05
Carbon Disulfide	75-15-0	1.24E-06	PDT	1.62E-06	1.3	1.62E-05
Carbon Tetrachloride	56-23-5	6.77E-07	PDT	8.61E-07	1.3	8.61E-06
Chlorine	7782-50-5	3.60E-02	permit limit	2.25E-03 (c)	not applicable (b)	2.25E-02
Chlorobenzene	108-90-7	2.58E-04	PDT	3.77E-04 (c)	1.5	3.77E-03

Table 3
Maximum Measured Stack Emission Rates, Emission Rates Used in the Risk Assessment, and Upset Condition Stack Emission Rates

Compound	CAS Number	Stack Emission Rates Used in Risk Assessment (Non-Upset Conditions)		Maximum Measured Stack Emission Rate from PDT (g/sec)	Ratio: Maximum Measured Emission Rate / Average Measured Emission Rate Used in Risk Assessment	Upset Condition Stack Emission Rates Used in Response to Comments (maximum measured emission rate * 10) (g/sec) (d)
		Emission Rate (g/sec) (a)	Basis for Emission Rate			
Chlorobenzilate	510-15-6	1.17E-07	PDT	1.54E-07	1.3	1.54E-06
Chlorodibromomethane	124-48-1	1.08E-05	PDT	1.19E-05	1.1	1.19E-04
Chloroethane	75-00-3	1.32E-06	PDT	1.50E-06	1.1	1.50E-05
Chloroform	67-66-3	8.24E-06	PDT	1.91E-05	2.3	1.91E-04
Chloromethane (methyl chloride)	74-87-3	2.41E-05	PDT	4.91E-05	2.0	4.91E-04
Chrysene	218-01-9	1.10E-08	PDT	1.72E-08	1.6	1.72E-07
Cumene (Isopropylbenzene)	98-82-8	3.64E-07	PDT	4.01E-07	1.1	4.01E-06
Diallate	2303-16-4	6.27E-06	PDT	7.09E-06	1.1	7.09E-05
Dibenzo(a,h)anthracene	53-70-3	4.67E-10	PDT	4.82E-10	1.0	4.82E-09
Dibenzofuran	132-64-9	1.06E-06	PDT	1.23E-06	1.2	1.23E-05
Dibromomethane	74-95-3	1.28E-06	PDT	1.46E-06	1.1	1.46E-05
Dichlorodifluoromethane	75-71-8	3.83E-06	PDT	8.82E-06	2.3	8.82E-05
Dieldrin	60-57-1	1.17E-08	PDT	1.32E-08	1.1	1.32E-07
Diethyl phthalate	84-66-2	1.01E-06	PDT	1.16E-06	1.2	1.16E-05
Dimethylphthalate	131-11-3	6.71E-07	PDT	7.69E-07	1.1	7.69E-06
Di-n-butylphthalate	84-74-2	3.71E-06	PDT	4.23E-06	1.1	4.23E-05
Di-n-octyl phthalate	117-84-0	1.42E-06	PDT	1.64E-06	1.2	1.64E-05
Dioxane (1,4)	123-91-1	8.91E-11	FR&DRE	--	not applicable (b)	8.9E-10
Diphenylamine	122-39-4	1.05E-06	PDT	1.22E-06	1.2	1.22E-05
Endosulfan I	959-98-8	1.31E-08	PDT	1.48E-08	1.1	1.48E-07
Endosulfan II	33213-65-9	2.67E-08	PDT	5.02E-08	1.9	5.02E-07
Endosulfan sulfate	1031-07-8	1.52E-08	PDT	1.72E-08	1.1	1.72E-07
Endrin	72-20-8	4.79E-08	PDT	5.41E-08	1.1	5.41E-07
Endrin aldehyde	7421-93-4	5.83E-08	PDT	1.15E-07	2.0	1.15E-06
Endrin ketone	53494-70-5	1.72E-08	PDT	1.95E-08	1.1	1.95E-07

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		Emission Rate (g/sec) (a)	Basis for Emission Rate			
Ethylbenzene	100-41-4	3.13E-07	PDT	4.51E-07	1.4	4.51E-06
Ethylene Glycol	107-21-1	1.25E-07	FR&DRE	--	not applicable (b)	1.3E-06
Fluoranthene	206-44-0	4.90E-08	PDT	1.00E-07	2.0	1.00E-06
Fluorene	86-73-7	1.26E-08	PDT	1.92E-08	1.5	1.92E-07
Freon 113	76-13-1	3.33E-07	PDT	3.79E-07	1.1	3.79E-06
Heptachlor	76-44-8	4.31E-08	PDT	6.85E-08	1.6	6.85E-07
Heptachlor epoxide	1024-57-3	2.46E-08	PDT	3.66E-08	1.5	3.66E-07
Hexachlorobenzene	118-74-1	1.00E-06	PDT	1.14E-06	1.1	1.14E-05
Hexachlorobutadiene	87-68-3	1.12E-06	PDT	1.30E-06	1.2	1.30E-05
Hexachlorocyclo-pentadiene	77-47-4	7.53E-06	PDT	8.58E-06	1.1	8.58E-05
Hexachloroethane	67-72-1	1.39E-06	PDT	1.60E-06	1.1	1.60E-05
Hydrogen chloride	7647-01-0	1.60E-01	permit limit	1.36E-02 (c)	not applicable (b)	1.36E-01
Indeno(1,2,3-cd)pyrene	193-39-5	5.08E-09	PDT	7.74E-09	1.5	7.74E-08
Iodomethane	74-88-4	1.97E-06	PDT	2.01E-06	1.0	2.01E-05
Isophorone	78-59-1	7.96E-07	PDT	9.11E-07	1.1	9.11E-06
Isopropyl toluene, p-	99-87-6	5.10E-07	PDT	5.82E-07	1.1	5.82E-06
Methoxychlor	72-43-5	5.38E-08	PDT	6.10E-08	1.1	6.10E-07
Methyl Isobutyl ketone (4-methyl-2-pentanone)	108-10-1	2.25E-06	PDT	3.22E-06	1.4	3.22E-05
Methyl methacrylate	80-62-6	5.50E-09	FR&DRE	--	not applicable (b)	5.5E-08
methyl tert-butyl ether	1634-04-4	8.16E-08	FR&DRE	--	not applicable (b)	8.2E-07
Methylene chloride	75-09-2	1.74E-05	PDT	3.12E-05 (c)	1.8	3.12E-04
Naphthalene	91-20-3	3.58E-06	PDT	9.11E-06 (c)	2.5	9.11E-05
Nitrobenzene	98-95-3	7.87E-07	PDT	9.01E-07	1.1	9.01E-06
N-nitrosodimethylamine	62-75-9	9.21E-07	PDT	1.06E-06	1.2	1.06E-05
N-Nitroso-di-n-propylamine	621-64-7	9.63E-07	PDT	1.10E-06	1.1	1.10E-05

Table 3

Maximum Measured Stack Emission Rates, Emission Rates Used in the Risk Assessment, and Upset Condition Stack Emission Rates

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		Emission Rate (g/sec) (a)	Basis for Emission Rate			
N-Nitrosodiphenylamine	86-30-6	7.90E-07	PDT	9.14E-07	1.2	9.14E-06
Pentachlorobenzene	608-93-5	8.83E-07	PDT	1.03E-06	1.2	1.03E-05
Pentachloronitrobenzene	82-68-8	1.04E-06	PDT	1.21E-06	1.2	1.21E-05
Pentachlorophenol	87-86-5	1.55E-05	PDT	1.76E-05	1.1	1.76E-04
Perylene	198-55-0	1.34E-08	PDT	3.59E-08	2.7	3.59E-07
Phenanthrene	85-01-8	1.51E-07	PDT	3.14E-07	2.1	3.14E-06
Phenol	108-95-2	1.14E-06	PDT	1.32E-06	1.2	1.32E-05
Phosphine imide, P,P,P-triphenyl	2240-47-3	1.06E-06	PDT	3.17E-06	3.0	3.17E-05
PCBs as Aroclor 1254 (d)	11097-69-1	2.34E-08	PDT	4.18E-08	1.8	4.18E-07
Propylbenzene, n-	103-65-1	4.15E-07	PDT	4.74E-07	1.1	4.74E-06
Propylene oxide	75-56-9	1.00E-09	FR&DRE	--	not applicable (b)	1.0E-08
Pyrene	129-00-0	4.93E-08	PDT	1.02E-07	2.1	1.02E-06
Pyridine	110-86-1	1.85E-06	PDT	2.15E-06	1.2	2.15E-05
Styrene	100-42-5	2.89E-07	PDT	3.29E-07	1.1	3.29E-06
Tetrachlorobenzene, 1,2,4,5-	95-94-3	9.55E-07	PDT	1.11E-06	1.2	1.11E-05
Tetrachloroethane, 1,1,1,2-	630-20-6	2.68E-07	PDT	3.62E-07	1.4	3.62E-06
Tetrachloroethylene	127-18-4	1.12E-04	PDT	2.18E-04 (c)	1.9	2.18E-03
Tetrahydrofuran	109-99-9	4.59E-06	PDT	5.23E-06	1.1	5.23E-05
Toluene	108-88-3	1.18E-05	PDT	2.98E-05 (c)	2.5	2.98E-04
Trichloroethylene	79-01-6	2.63E-06	PDT	4.87E-06	1.9	4.87E-05
Trichlorofluoromethane (Freon 11)	75-69-4	1.27E-06	PDT	2.62E-06	2.1	2.62E-05
Vinyl Acetate	108-05-4	1.52E-06	PDT	1.74E-06	1.1	1.74E-05
Vinyl Chloride	75-01-4	6.75E-07	PDT	8.81E-07	1.3	8.81E-06
Xylene, o-	95-47-6	3.70E-07	PDT	4.90E-07	1.3	4.90E-06
Xylene, m-	108-38-3	5.80E-07	PDT	1.44E-06	2.5	1.44E-05

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		Emission Rate (g/sec) (a)	Basis for Emission Rate			
Xylene, p-	106-42-3	5.80E-07	PDT	1.44E-06	2.5	1.44E-05
BHC, alpha-	319-84-6	2.14E-08	PDT	2.59E-08	1.2	2.59E-07
Chlordane	57-74-9	5.97E-08	PDT	1.23E-07	2.1	1.23E-06
BHC, beta-	319-85-7	5.53E-08	PDT	6.79E-08	1.2	6.79E-07
BHC, gamma- (lindane)	58-89-9	1.17E-08	PDT	1.32E-08	1.1	1.32E-07
BHC, delta-	319-86-8	4.97E-08	PDT	6.99E-08	1.4	6.99E-07
PCDDs/PCDFs (Dioxins and Furans)						
2,3,7,8-TCDD	1746-01-6	4.37E-11	permit limit	1.20E-11	not applicable (b)	1.20E-10
2,3,7,8-TCDF	51207-31-9	4.20E-10	permit limit	1.47E-11	not applicable (b)	1.47E-10
1,2,3,7,8-PeCDD	40321-76-4	1.16E-10	permit limit	1.05E-11	not applicable (b)	1.05E-10
1,2,3,7,8-PeCDF	57117-41-6	4.29E-10	permit limit	5.49E-12	not applicable (b)	5.49E-11
2,3,4,7,8-PeCDF	57117-31-4	4.45E-10	permit limit	6.11E-11	not applicable (b)	6.11E-10
1,2,3,6,7,8-HxCDD	57653-85-7	7.99E-11	permit limit	6.08E-13	not applicable (b)	6.08E-12
1,2,3,4,7,8-HxCDD	39227-28-6	7.91E-11	permit limit	6.97E-13	not applicable (b)	6.97E-12
1,2,3,7,8,9-HxCDD	19408-74-3	9.35E-11	permit limit	1.01E-12	not applicable (b)	1.01E-11
1,2,3,6,7,8-HxCDF	57117-44-9	2.76E-10	permit limit	6.57E-12	not applicable (b)	6.57E-11
1,2,3,4,7,8-HxCDF	70648-26-9	5.07E-10	permit limit	1.30E-11	not applicable (b)	1.30E-10
1,2,3,7,8,9-HxCDF	72918-21-9	7.33E-11	permit limit	4.48E-13	not applicable (b)	4.48E-12
2,3,4,6,7,8-HxCDF	60851-34-5	1.55E-10	permit limit	3.15E-12	not applicable (b)	3.15E-11
1,2,3,4,6,7,8-HpCDD	35822-46-9	8.20E-11	permit limit	1.94E-13	not applicable (b)	1.94E-12
1,2,3,4,6,7,8-HpCDF	67562-39-4	3.98E-10	permit limit	1.00E-12	not applicable (b)	1.00E-11
1,2,3,4,7,8,9-HpCDF	55673-89-7	9.52E-11	permit limit	1.12E-13	not applicable (b)	1.12E-12
Total OCDD	3268-87-9	1.05E-10	permit limit	3.10E-14	not applicable (b)	3.10E-13
Total OCDF	39001-02-0	5.81E-11	permit limit	1.45E-14	not applicable (b)	1.45E-13

Table 3

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		Emission Rate (g/sec) (a)	Basis for Emission Rate			
Combustion Gases						
Sulfur dioxide	7446-09-5	8.69E-02	miniburn data	1.79E-01	2.1	1.79E+00
Nitrogen dioxide	10102-44-0	3.28E-01	miniburn data	3.53E-01	1.1	3.53E+00

-- = This compound was not measured in the Performance Demonstration Test.

FR&DRE = Emission rate based on annual average feed rate and 99.99% destruction and removal efficiency (DRE), because emission rates for this compound were not measured during the PDT. See Section 4.2.1 of the Risk Assessment for additional discussion.

PDT = Performance Demonstration Test.

(a) For compounds measured in the PDT, without proposed permit limits, the emission rate was calculated as the average across the three PDT test runs.

(b) Not applicable is listed because the emission rate used in the risk assessment was either based on a proposed permit limit or was calculated based on feed rate and DRE.

(c) This compound was spiked into the feed materials used during the PDT.

(d) If a compound was not measured in the PDT, and its emission rate was based on feed rate and DRE, its upset emission rate was calculated by increasing the feed rate & DRE based emission rate by a factor of 10.

model for each individual COPC." USEPA further explains that chemical-specific emission rates are used to adjust the ISCST3 unitized output to calculate chemical-specific air concentrations and deposition rates, noting that "concentration and deposition are directly proportional to the unit emission rate used in the ISCST3 modeling."

USEPA also states in Section 3.8.1 of HHRAP, "We advocate using a unit emission rate in the air modeling because you can develop a common ratio relationship between the unit emission rate and the COPC-specific emission rate. The ratio is based on the fact that both individual relationships are linear in the air model. This ratio relationship is expressed by the following equation:"

$$\frac{\text{COPC-specific air concentration } (\mu g/m^3)}{\text{COPC-specific emission rate (g/sec)}} = \frac{\text{Modeled output air concentration } (\mu g/m^3)}{\text{Unit emission rate (1 g/sec)}} \quad \text{(Equ 2)}$$

In addition, the relationship between chemical air concentration and the acute hazard quotient is also linear. Section 7.4.3 of HHRAP presents the equation used to calculate the hazard quotient as follows:

$$\text{Acute hazard quotient} = \frac{\text{COPC-specific air concentration (acute 1-hour average) } (\mu g/m^3)}{\text{Acute inhalation reference exposure concentration } (\mu g/m^3)} \quad \text{(Equ 3)}$$

If Equation 2 is solved for COPC-specific air concentration, and this result is substituted into Equation 3, the resulting solution demonstrates that the acute hazard quotient is linearly proportional to emission rate:

$$\text{Acute hazard quotient} = \frac{\text{Modeled output air concentration } (\mu g/m^3) * \text{COPC-specific emission rate (g/sec)}}{\text{Unit emission rate (1 g/sec)} * \text{Acute inhalation exposure concentration } (\mu g/m^3)} \quad \text{(Equ 4)}$$

In essence, when following HHRAP guidance, air concentrations are linearly proportional to emission rates and hazard quotients are linearly proportional to air concentrations, therefore, hazard quotients are also proportional to emission rates at any given receptor location. As a result, a factor of 10 increase in chemical emission rates will produce a factor of 10 increase in HQs for a given modeled emission source and receptor location when HHRAP acute risk assessment guidance is followed.

ISCST3 Modeling of Air Concentrations for Acute Risk Assessment Under Upset Conditions

USEPA's comment mentions the terms "1-hour average" and "1-hour maximum" as they relate to the "upset stack release concentration." This section clarifies the basis and meaning of the term "1-hour average" air concentration and how it relates to the air concentrations used in the risk assessment.

The HHRAP guidance recommends evaluating risks due to acute exposure based on maximum 1-hour average air concentrations calculated using a dispersion model. The shortest time step that the ISCST3 dispersion model can predict is a 1-hour average period. The term "1-hour average" thus commonly refers to the averaging time associated with this ISCST3 output.

When the ISCST3 model is run to produce results for an acute inhalation risk assessment, it calculates a 1-hour average air concentration for every hour of input meteorological data at each modeled receptor location. The five years of hourly meteorological data input to ISCST3 for the risk assessment, therefore, produced more than 40,000 1-hour average air concentrations at each of the more than 5,200 individual modeled receptor locations beyond the property boundary. The highest of these more than 40,000 1-hour average concentrations at each location was then selected and used to evaluate potential acute inhalation risks in the risk assessment. This means that, for any given receptor location, the 1-hour average air concentrations for all other hours modeled by ISCST3 were lower than the one result used in the risk assessment. This very conservative approach is recommended in HHRAP and was used in the risk assessment and in this response to USEPA's comment.

As indicated in Equation 1 above, chemical air concentrations are calculated by combining unitized ISCST3 model output air concentrations with chemical emission rates. The modeled output air concentrations used to evaluate potential acute risks (both in the risk assessment and in this section) were, as described above, the maximum modeled 1-hour average air concentrations based on a unit 1 g/sec emission rate calculated at each assessed receptor location. The chemical emission rates used to evaluate upset conditions were based on maximum measured values multiplied by USEPA's default factor of 10.

Potential Acute Inhalation Risks Under Upset Conditions

The potential for acute inhalation risks under stack upset conditions, using the inputs described above, was evaluated by re-running the Industrial Risk Assessment Program (IRAP) software in the same manner as applied in the risk assessment, except that in this case the upset emission rates were based on maximum measured values rather than average measured values multiplied by USEPA's upset default factor of 10.

The resulting hazard quotients are presented in Table 4 for the same set of receptor locations already evaluated in the risk assessment. The detailed chemical-specific acute hazard quotient results for this upset stack emissions scenario are included in Attachment A. The cumulative acute hazard index (HI) values, based on exposure to all compounds evaluated regardless of the type of potential health effects, were 0.59 at grid location A_1 and 0.56 at grid location A_2. Summing all hazard quotients regardless of type of health effect is not recommended in HHRAP, but was performed here in response to USEPA Region IX's comment. HHRAP recommends instead that acute hazard quotients from individual compounds be summed if they have similar effects. Given that the cumulative HI across all compounds is less than 1, the sum for subsets with similar types of health effects will also be less than 1.

The likelihood of this upset acute inhalation risk scenario occurring at any given receptor location is expected to be less than 1 in 100,000,000 (one in one hundred million) per year, because it presumes that a stack upset occurs simultaneously with meteorological conditions that produce the maximum 1-hour average air concentration. As noted earlier, detailed facility data from 2000 and 2001 indicate that upset conditions have occurred very infrequently, for only about 0.24% of the time the facility is operating. Also, as described above, the maximum air concentration evaluated in the acute inhalation risk analysis for each location was based on the

Table 4
Acute Inhalation Results - Upset Stack Emissions (a)

Receptor Name	Description	Minimum Hazard Quotient (b)	Maximum Hazard Quotient (b)
Residential Receptors (developed area within and around Town of Parker)			
R_1 resident	Closest residential location to facility and residential area in town with highest hourly modeled impacts	<1E-10	0.2
R_2 resident	Residential area in town with highest annual modeled impacts	<1E-10	0.1
Farmer Receptors (residential area with access to irrigation water and within modeling domain)			
R_3 resident farmer	Residential area with access to irrigation water with highest annual modeled impacts	<1E-10	0.1
R_4 resident farmer	Residential area with access to irrigation water with highest hourly modeled impacts	<1E-10	0.2
Maximum Impact Point (undeveloped land area)			
A_1 max hourly	Maximum impact location for hourly concentrations. There is no residential or commercial land use in the vicinity of the maximum impact location (SW of facility).	<1E-10	0.4
Non-Residential Areas			
A_2 closest business (c)	Closest developed location beyond property boundary (non-residential) with highest hourly modeled impacts	<1E-10	0.4

(a) These results are conservatively based on both maximum upset emission rates and maximum modeled ISCST3 air concentrations. For each specific receptor location, the maximum modeled ISCST3 concentration was the highest 1-hour average result out of the more than 40,000 1-hour averages calculated at that location (i.e., based on input to ISCST3 of 5 years of hourly meteorological data from Parker, Arizona). This means that at each location the concentrations for all other hours were lower than those used to calculate these hazard quotients.

(b) The minimum and maximum results are the lowest and highest hazard quotients, respectively, calculated among all of the evaluated compounds. The typical target hazard quotient value used by regulatory agencies is 1.

(c) The County Agricultural Extension Office and CRIT Realty are located at receptor A_2. Maximum 1-hour average air concentrations at all other non-residential developed land use locations were lower than at receptor A_2.

highest ISCST3 model output calculated out of more than 40,000 hours modeled over a 5-year period. As a result, the probability per year of the maximum 1-hour average modeled concentration occurring during an upset condition is less than 1 in 100,000,000 per year.[8]

Conclusion

These results indicate that short-term acute health effects are not expected to occur in areas near the reactivation facility as a result of inhalation of stack emissions under hypothetical upset conditions.

Comment 4. Upset Conditions (continued)

Comment:
"Finally, the mitigating contention that the constituent-specific emission rates associated with the acute upset scenario are overestimations of the emission rates optimized in the performance demonstration test (PDT) is germane only to the extent that the facility subscribes to a series of permitable conditions which limits constituent-specific emission rates to those exclusively used in the PDT. Other results, and lines of reasoning in this risk assessment suggest that the differences between "evaluated versus measured emission rates" remain a basis for supporting the proposed de minimus level of public health and ecological impact from facility operations."

Response: No response required.

Comment 5. Fate & Transport Air Dispersion Modeling

Comment:
In this comment, USEPA Region IX discusses the "application of Agency-approved air dispersion and deposition computerized fate and transport models" in the risk assessment, explains that the "Data inputs and air dispersion and deposition results were reviewed by air modeling experts in U.S. EPA Region IX's Air Division" and concludes "that the air dispersion and deposition analysis was conducted consistent with the Agency's recommended procedures, and that the results from the modeling exercise are useful to support risk-based analysis."

Response: No response required.

[8] [(<1/40,000) / 5 years] * (0.24/100) = <1E-8

III. RESPONSE TO SPECIFIC COMMENTS

1. Executive Summary, pg. xii.

Comment:
"The final sentence of the first paragraph should be revised to: 'When excess lifetime cancer risks from both stack and fugitive emissions are considered together, the cancer risk estimate remains below the U.S. EPA target risk level.' "

Response: The executive summary has been revised to incorporate this comment and to reflect the other responses to USEPA's comments. As noted in the Introduction to this document, it is recommended that the entire risk assessment for this project be comprised of three documents: the original July 2007 draft risk assessment report, this response to comment document, and one inclusive executive summary that reflects and incorporates conclusions from both documents. The executive summary is included as a stand-alone companion to this document.

2. Upset Scaling Factors – Section 4.2.1.2, pg. 20 (Stack Emissions)
This comment includes two related items, each of which are addressed below.

2a. Start-up and Shut-down Procedures

Comment:
"The risk assessment concludes that contaminant releases do not occur from the facility's stack during start-up and shut-down procedures. This conclusion is supported by the fact that spent or contaminated carbon is not processed during this operation. Please detail or document all efforts made, or any monitoring data or modeled studies pursued, to characterize the emission profile during start-up or shut-down procedures. The de minimus impact contention from emissions resulting from natural gas initiated start-up, should be well characterized prior to concluding that unit start-up and shut-down procedures do not substantively contribute to either acute or chronic-level human or ecological impact."

Response:

With respect to start-up and shut-down procedures, the risk assessment states that "under these conditions, emissions associated with spent carbon [emphasis added] will not occur." The focus of the RCRA permitting activity for this facility, and accordingly the risk assessment, is on potential environmental releases associated with the management and treatment of spent carbon, not emissions from natural gas.

The carbon regeneration facility, like waste combustion facilities, requires fuel for combustion to create heat and ensure stable operating conditions when spent carbon is being heated in the furnace. Among the fuel options available, natural gas is the only fuel used for the furnace and is the preferred fuel choice from an emissions perspective because it emits lower quantities of greenhouse gases, nitrogen oxides, sulfur dioxide, particulates and mercury when compared to other options such as oil and coal. During typical start-up and shut-down procedures, spent carbon is not present in the furnace and, therefore, there are no emissions associated with spent

carbon. Start-up and shut-down conditions account for less than 3% of the total facility operating time.[9]

In response to this comment, potential emission rates associated with natural gas combustion when no spent carbon is in the furnace were calculated and compared to those when spent carbon is being heated in the furnace. Table 5 shows that the natural gas emission rates are consistently lower than those used in the risk assessment and measured during the stack test, generally by several orders of magnitude. Emission rates associated with combustion of natural gas were calculated from typical constituent concentrations reported by the Gas Research Institute (GRI 2000), the natural gas fuel use rate at the facility (approximately 250,000 cubic feet per day), and the reactivation facility system removal efficiencies determined from the PDT (Focus 2006). The calculated emission rates are shown in Table 5 for those compounds with reported natural gas concentrations in GRI (2000) that were also evaluated in the risk assessment. The facility's destruction and removal efficiency (DRE) for organic compounds present in natural gas was conservatively assumed to be 99.99%. The removal efficiencies demonstrated in the PDT for low-volatile and semi-volatile metals were 99.92% and 97.05% for chromium and lead, respectively (Focus 2006).[10] These REs were applied to the other metals in natural gas using USEPA (2001) metal volatility groupings. Emission rates of chlorine and hydrogen chloride (HCl) associated with chlorine present in natural gas were determined based on the PDT test results, which showed that for every pound of chlorine fed into the combustion system, 1.08×10^{-3} pounds of HCl and 1.93×10^{-4} pounds of chlorine would be emitted.[11]

The measured nitrogen oxides (NOx) emission rate that was used in the risk assessment is considered to be a reasonable reflection of potential NOx emissions during periods when the facility is burning natural gas and there is no spent carbon in the furnace. Nitrogen oxides (NOx) generated by combustion include thermal NOx and fuel NOx. Fuel NOx comes from direct oxidation of nitrogen in the fuel or nitrogen present in spent carbon that is being heated. Thermal NOx is generated through high temperature bonding of nitrogen and oxygen in the combustion air and predominantly occurs at the auxiliary fuel burner, which is where natural gas is fired. Considering that the spent carbon contains very little nitrogen, the primary source of NOx in emissions would be natural gas.

In conclusion, potential emissions from the combustion of natural gas at the facility during start-up and shut-down conditions have a negligible impact compared to emissions when spent carbon is being treated and would not substantively contribute to the acute or chronic-level risks calculated in the risk assessment.

[9] Each start-up and shut-down condition requires about 30 hours and typically there are three start-up and shut-down conditions each year. This amounts to roughly 180 hours per year under start-up and shut-down conditions or about 3% of the total facility operating time.

[10] Metal system removal efficiencies were calculated from data provided in Tables 3-5, 4-9, 4-10, 4-11, and 6-2 in the PDT report (Focus 2006).

[11] See Tables 3-5, 4-6, 4-7, and 4-8 in the PDT report (Focus 2006).

Table 5
Evaluation of Natural Gas Emissions During Start-Up and Shut-Down Procedures

Compound	Typical Concentrations in Natural Gas (a)	Facility Removal Efficiency (b)	Emission Rate for Natural Gas Only (g/sec) (d)	Stack Emission Rates (spent carbon plus natural gas) (g/sec) (e)	
				Emission Rates Used in Risk Assessment	Maximum Measured Stack Emission Rate from PDT
Arsenic (LV)	< 0.2 µg/m3	0.9992	< 1.31E-11	1.26E-04	6.22E-06
Barium (SV)	< 0.05 µg/m3	0.9705	< 1.21E-10	9.01E-06	1.10E-05
Cadmium (SV)	< 0.01 µg/m3	0.9705	< 2.42E-11	3.12E-04	1.31E-05
Chromium (LV)	< 0.01 µg/m3	0.9992	< 6.55E-13	1.26E-04	6.04E-05
Cobalt (LV)	< 0.1 µg/m3	0.9992	< 6.55E-12	5.82E-07	9.38E-07
Copper (LV)	< 0.3 µg/m3	0.9992	< 1.97E-11	1.19E-04	1.80E-04
Lead (SV)	< 0.05 µg/m3	0.9705	< 1.21E-10	3.12E-04	5.60E-04
Manganese (LV)	< 0.2 µg/m3	0.9992	< 1.31E-11	4.61E-05	7.10E-05
Mercury	< 0.01 µg/m3	0	< 8.19E-10	1.34E-06	9.48E-08
Nickel (LV)	< 0.5 µg/m3	0.9992	< 3.28E-11	9.91E-06	1.29E-05
Vanadium (LV)	< 0.2 µg/m3	0.9992	< 1.31E-11	2.43E-06	3.23E-06
Benzene	57,500 µg/m3	0.9999	4.71E-07	2.59E-06	3.02E-06
Chlorine	< 1.6 µg/m3 (c)	NA (c)	< 2.53E-11	3.60E-02	2.25E-03
Ethylbenzene	3,040 µg/m3	0.9999	2.49E-08	3.13E-07	4.51E-07
Hydrogen chloride	< 1.6 µg/m3 (c)	NA (c)	< 1.42E-10	1.60E-01	1.36E-02
PCBs as Aroclor 1254	< 0.13 µg/m3	0.9999	< 1.09E-12	2.34E-08	4.18E-08
Toluene	37,700 µg/m3	0.9999	3.09E-07	1.18E-05	2.98E-05
Xylene, o-	3,500 µg/m3	0.9999	2.87E-08	3.70E-07	4.90E-07
Xylene, m-	10,400 µg/m3	0.9999	8.52E-08	5.80E-07	1.44E-06
Xylene, p-	2,600 µg/m3	0.9999	2.13E-08	5.80E-07	1.44E-06

LV = low volatile metals (USEPA 2001).

SV = semi-volatile metals (USEPA 2001).

(a) Source: Gas Research Institute (GRI). 2000. Analysis of Trace Level Compounds in Natural Gas. GRI-99/0111. February 2000.

(b) Facility removal efficiencies were based on Performance Demonstration Test results (Focus 2006).

(c) The listed concentration is for total chlorine/chloride in natural gas (GRI 2000). Emission rates of chlorine and hydrogen chloride associated with chlorine present in natural gas were determined based on the PDT test results (Focus 2006), which showed that for every pound of chlorine fed into the combustion system, 1.08×10^{-3} pounds of hydrogen chloride (HCl) and 1.93×10^{-4} pounds of chlorine would be emitted.

(d) Emission rate (g/sec) = concentration ug/m3 * g/10^6 ug * flow rate m3/day * day/86,400 sec * (1 - removal efficiency). The typical natural gas flow rate at facility is 250,000 cubic feet/day (7,079 cubic meters/day).

(e) See Table 3 in Response to Comment Document for stack emission rates.

2b. Upset Scaling Factors

Comment:
"The narrative supporting the analysis of upset scaling factors is not clear. An upset scaling factor of 1.02 was developed from historical analysis of the frequency of facility upsets having the potential to increase stack emissions from study years 2001-2002. In essence then, approximately 2% of operational time during the period of interest was interrupted by some level of facility upset. These upsets potentially increase stack emissions by up to 10%. It is not clear from this review why the upset scaling factor has a negligible numerical impact on the chronic stack emission rates as determined by equation 4-1. The basis and data for this conclusion has not been made clear in the narrative. The narrative should be revised to reflect that the increased stack emissions would only occur approximately 220 days out of a total of 10,950 operational days. A similar illustration detailing the magnitude of emission rate differences would also be useful and offer consistency in support of this line of reasoning."

Response:

In response to this comment, the following discussion clarifies the method used to derive the upset scaling factor for the risk assessment, the frequency of time the facility operates under upset conditions, and the impacts of the upset scaling factor on the risk assessment results.

USEPA's Default Scaling Factors

Upset scaling factors were developed for the risk assessment by directly applying HHRAP guidance. Section 2.2.5 of HHRAP recommends "that the stack emission rates estimated from trial burn data be multiplied by an upset factor" and that "when available, site-specific emissions or process data can be useful to estimate the upset factor."

HHRAP provides a default upset scaling factor for metals "by assuming that emissions during process upsets are 10 times greater than emissions measured during the trial burn" and that the facility operates under upset conditions 5% of the year. This produces a default upset scaling factor for metals of 1.45, as follows:

$$\text{Scaling factor}_{(\text{metals})} * ER = (95/100)*ER + (5/100)*10*ER = 1.45_{(\text{metals})} * ER$$

where ER = emission rate under on non-upset stack conditions.

Similarly, HHRAP provides a default upset scaling factor for organics "by assuming that emissions during process upsets are 10 times greater than emissions measured during the trial burn" and that the facility operates under upset conditions 20% of the year. This produces a default upset scaling factor for organics of 2.8, as follows:

$$\text{Scaling factor}_{(\text{organics})} * ER = (80/100)*ER + (20/100)*10*ER = 2.8_{(\text{organics})} * ER$$

As discussed earlier in response to General Comment 4, USEPA indicates that these default assumptions are based on a method presented in 1990 by the California Air Resources Board for non-hazardous municipal waste combustors that HHRAP has extrapolated to hazardous waste incinerators. Due to heterogeneity of the feedstock, MSW combustors typically have a more variable range of emissions than hazardous waste incinerators, thus it is anticipated that MSW incinerators will experience upsets resulting in an increase of emissions at a greater frequency than hazardous waste incinerators. An activated carbon regeneration facility is not a hazardous waste incinerator and is intrinsically easier to control than an incinerator due to homogeneity in the feedstock (consisting of only spent carbon). As a result, a carbon regeneration facility should experience a much lower frequency of upsets resulting in an increase in emissions than at an incinerator, thereby ensuring that the default assumptions are likely to be overly conservative when applied to carbon regeneration facilities. In addition, peer review comments received by USEPA on the hazardous waste incinerator methodology pointed out that the default upset factors are "excessively conservative" for those facilities, noting not only that no facility would be allowed to operate under upset conditions for the durations assumed by USEPA but also that upset emissions are not close to 10 times non-upset emissions (USEPA 2005).

In the absence of site-specific information, USEPA's approach assumes that emissions increase by a factor of 10 during upset conditions. A factor of 10 increase in emission rates equates to a 900% increase in emissions, as follows: ((ER*10) – ER) / ER) * 100 = 900%.

Scaling Factors Used in the Risk Assessment: Chronic Risks

In HHRAP, USEPA recommends generating a site-specific upset factor where possible. For example, USEPA explains that site-specific information on the percentage of time, on an annual basis, that the facility operates under upset conditions can be used to estimate the upset scaling factor. In the carbon regeneration facility risk assessment, site-specific information on the percentage of time, on an annual basis, that the facility operates under upset conditions was presented in Table 4.2-2. This information, which was discussed earlier in response to General Comment 4, indicates that the facility operates under upset conditions very infrequently, representing about 0.24% of the total operating time. Based on the annual 2000 and 2001 data where were used in the risk assessment, the facility operated under upset conditions for 16.1 hours out of a total of 6,745 operating hours in 2000[12] and for 18.4 hours out of a total of 7,844 operating hours in 2001.

This site-specific information was used in place of USEPA's defaults in the scaling factor equations shown above to calculate a site-specific scaling factor for both metals and organics of 1.02, as follows:

$$\text{Scaling factor}_{(\text{site-specific})} * ER = (99.76/100)*ER + (0.24/100)*10*ER = 1.02_{(\text{site-specific})} * ER$$

[12] In 2000, the total operating hours were 6,745 hours, not 7,844 hours as noted in footnote (a) on Table 4.2-2. The hours listed in footnote (a) on Table 4.2-2 for 2000 was a typographical error. The scaling factor for 2000 was, however, calculated using the correct number of operating hours (i.e., 6,745 hours). The total operating hours for 2001 was 7,844 hours.

Note that this calculation incorporates USEPA's conservative default assumption that emission rates increase by a factor of 10 during an upset. This default was used because emissions data during actual facility upsets was not available.

As directed in HHRAP, emission rates for a chronic risk assessment are then calculated by multiplying the non-upset emission rates by the upset scaling factor, as follows:

$$ER_{RA} = ER * USF \qquad \text{(Equ 5)}$$

where ER_{RA} = emission rate for input to risk assessment (g/sec), ER = emission rate based on non-upset stack conditions (g/sec), and USF = upset scaling factor (unitless).

This equation was also shown in the risk assessment (see Equation 4-1 in Section 4.2.1.2).

The upset scaling factor had a negligible numerical impact on the chronic stack emission rates because its value was 1.02, that is, essentially equal to a value of 1. As a result, in the chronic facility risk assessment, the emission rates under non-upset conditions were used without adjustment for the scaling factor.

Scaling Factors Used in the Risk Assessment: Acute Risks

The approach used to identify emission rates for the acute risk assessment differed from that described above for the chronic risk assessment, and was consistent with HHRAP guidance. Potential acute inhalation risks associated with upset conditions were evaluated using upset stack emission rates, combined with maximum unitized air modeling results from ISCST3, as described earlier in response to General Comment 4. The upset stack emission rates were calculated, in according with HHRAP guidance, by assuming that stack emissions would increase by a factor of 10 during upsets. This approach also assumes that the duration of an upset condition would be at least one hour. As noted in response to General Comment 4 above, the likelihood of the acute inhalation scenario occurring is expected to be less than 1 in 100,000,000 (less than one in one hundred million), because it presumes that a stack upset occurs simultaneously with meteorological conditions that produce maximum 1-hour average air concentrations.

2c. Upset Scaling Factors - Dates of data

Comment:
"The narrative supporting this section is not clear and appears inconsistent with graphical representations of the data. Historical upset data is provided for calendar years 2000 & 2001 in table 4.2-2 rather than years 2001 & 2002 as claimed in section 4.2.1.2. Please reconcile this discrepancy."

Response:

The upset data used in the risk assessment were from 2000 and 2001, not 2001 and 2002. The revised narrative therefore reads as follows (edits shown in italics): "SWT identified upset

conditions that have the potential to affect stack emission rates, and compiled data on historical upsets at the facility that occurred for these conditions during *2000* and *2001*."

3. Calculation of environmental concentrations – Section 4.2.5, pg. 27

Comment:
"This section of the analysis details the environmental media for which exposure point concentrations will be developed. Please supplement this section by adding "air" to the list of media that will be subject to development of media-specific exposure point concentrations."

Response:

Air is one of the media for which exposure point concentrations were developed. The revised narrative reads as follows (edits shown in italics): "The next step in the exposure assessment was the calculation of chemical concentrations in each environmental medium of interest. These are referred to as exposure point concentrations. For example, concentrations were calculated in *air,* soil, homegrown produce, fish, animal products, and human breast milk."

4. Calculation of human exposures – Section 4.2.6, pg.28
This comment includes two items, each of which are addressed below.

4a. Calculation of human exposures – subsistence scenarios

Comment:
"EPA's guidance reference for conducting risk assessments of combustion facilities recommends impact analysis of several differing human receptor exposure scenarios. Subsistence fishers and subsistence farmers are considered potentially high-end receptors from a contaminant exposure and impact standpoint because, in addition to directly inhaling contaminants released to air, their sources of food and water may also be secondarily impacted by facility releases. To the extent these impacts result from indirect pathways of exposure (ingestion of an impacted food source), potential combined exposures impacting these human receptors is considered high-end, and unlikely to be exceeded by those receptors incurring exposure exclusively from the direct pathways of contaminant exposure."

Response:

Introduction

The following discussion expands on the subsistence exposure scenarios that were addressed in the risk assessment in order to more fully explore potential risks to hypothetical subsistence fisher and subsistence farmer receptors in the facility vicinity. Specifically, this discussion summarizes the hypothetical, high-end subsistence exposure scenarios that were evaluated in the risk assessment and presents additional evaluations in response to Region IX's comment.

Subsistence Exposure Scenarios Addressed in the Risk Assessment

In the risk assessment, fish ingestion risks were calculated for a subsistence scenario and were determined to be below USEPA's target risk levels. Potential risks for the adult and child fisher exposure scenarios incorporated USEPA's default subsistence assumption that 100% of fish ingested were obtained from either the Main Drain or the Colorado River. As shown in Table 4.4-1 of the risk assessment, these receptors were designated as "R_only_fish_drain" and "R_only_fish_river", respectively. The highest excess lifetime cancer risk for the subsistence fisher scenarios was 2E-08 (2 in 100 million), 500 times below USEPA's target cancer risk level of 1E-05 (1 in 100 thousand). The highest non-cancer hazard index for the subsistence fisher scenarios was 0.01, 25 times lower than USEPA's target level of 0.25.

Subsistence farmer exposure scenarios were also addressed in the Discussion of Uncertainties section of the risk assessment (Section 4.5.9) and were determined to be below USEPA's target risk levels. As noted in the risk assessment, site-specific information received from Ms. Linda Masters of the La Paz County Agricultural Extension Office (see response to Specific Comment 4b below) indicated that subsistence (i.e., 100%) reliance on locally-grown produce and locally raised animal products is not applicable to the facility area. The Discussion of Uncertainties Section of the risk assessment, however, nonetheless evaluated potential risks incorporating subsistence assumptions. The subsistence scenarios assumed that 100% of all produce, beef, poultry, eggs and pork ingested by a receptor was locally-grown or locally-raised, compared to the 20% assumption used in the risk assessment (see Table 4.4-1 in the risk assessment). The subsistence evaluation in the Discussion of Uncertainties (Section 4.5.9) addressed the resident and farmer receptors with the highest risks (i.e., receptors R_2 and R_3, respectively, as noted in Table 4.2-7) and focused on all compounds evaluated in the risk assessment, both detected and not detected, except for benzidine (these were referred to as "Group 2" compounds in the risk assessment). As presented in Section 4.5.9, the excess lifetime cancer risks for these subsistence scenarios were 3E-07 for receptor R_2 and 1E-07 for receptor R_3, more than 30 times below USEPA's target cancer risk level of 1E-05.

Additional Subsistence Exposure Scenarios

In response to Region IX's comment, the risk assessment results associated with hypothetical subsistence assumptions were further evaluated in this document. This additional evaluation addressed the three different groups of chemical compounds that were evaluated in the risk assessment:[13]

- *Group 1 - All detected compounds.* This group includes 95 compounds that were detected in the PDT in addition to several compounds that were not measured during the PDT but which were evaluated based on emission rates derived from feed rates.

[13] The list of chemicals selected for evaluation included compounds that were detected in stack emissions and also over 80 compounds that were not detected. Compounds that were not detectable in stack emissions were included in the risk assessment at the request of USEPA, according to the chemical-selection method in the USEPA-approved 2003 Workplan. This method ensures that risks are likely to be overestimated, and would not be underestimated.

- *Group 2 - All evaluated compounds, both detects and compounds that were not detected, except for benzidine.* This group includes 177 compounds, 82 of which were not detected in the PDT. This group does not include benzidine which was not detected in the PDT in stack gases and for which there is no evidence from waste profile reports and analytical spent carbon data that it has ever been accepted in spent carbon received at the facility. In addition, benzidine is a chemically unstable hetero-nitrogen compound that is not a product of incomplete combustion.[14] Benzidine was singled out because it was found to be a significant risk driver, accounting for most of the total cancer risk when included in the risk calculations.

- *Group 3 - All evaluated compounds.* This group includes 178 compounds, of which 83 were not detected in the PDT, including benzidine.

A summary of the hypothetical subsistence results, in comparison with those presented in Table 4.4-1 of the risk assessment (i.e., the results calculated in the risk assessment using site-specific assumptions), is shown below in Table 6. As can be seen from this table, the risks using subsistence assumptions, even when all selected compounds are evaluated (i.e., Group 3 compounds), remain below USEPA's target levels for both cancer risks (1E-05 target) and non-cancer health effects (0.25 target). When only detected compounds are included, the risks are reduced significantly below USEPA's target risk levels.

Table 7 expands on the subsistence results by presenting cumulative risks for the hypothetical subsistence scenarios. This table shows the combined risks for a subsistence town resident who is also assumed to be a subsistence fisher, and a subsistence farmer who is also assumed to be a subsistence fisher, as compared to the results from Table 4.4-1 in the risk assessment. The potential risks even when added across all subsistence exposure pathways remain below USEPA's target risk levels for both cancer and non-cancer health effects. These potential combined risks for subsistence receptors reflect high-end scenarios that are highly unlikely to be exceeded.

<u>4b. Calculation of human exposures – site-specific exposure information</u>

Comment:
"The current analysis makes use of site-specific exposure assumptions which essentially serve to diminish the concentration of impacted local food sources ingested in support of the subsistence farmer exposure scenario. These community or site-specific intake values were derived from a personal communication reference provided by the La Paz County Agricultural Extension Office (Masters 2007). Please provide reference to any and all data or surveys conducted by the extension office in support of this site-specific value."

Response:

The site-specific information from the La Paz County Agricultural Extension Office was

[14] Benzidine was used in the past mostly to produce dyes, however, it has not been produced for sale in the U.S. since the mid-1970's. Major U.S. dye companies no longer make benzidine-based dyes, and benzidine is no longer used in medical laboratories or in the rubber or plastics industries (ATSDR 2001).

Table 6
Evaluation of Hypothetical Subsistence Scenarios
for Receptors with the Highest Risk Results

Receptor and Group of Evaluated Compounds	Excess Lifetime Cancer Risk		Total Hazard Index	
	Risk assessment results in Table 4.4-1	Subsistence scenario (a)	Risk assessment results in Table 4.4-1	Subsistence scenario (a)
Town resident receptor (R_2 Adult): Receptor in town residential area with highest potential risks and highest annual modeled impacts				
Group 1 – all detected compounds (95 compounds)	6E-08	1E-07	5E-02	5E-02
Group 2 – all compounds except benzidine (177 compounds)	2E-07	3E-07	5E-02	5E-02
Group 3 – all compounds (178 compounds) (c)	2E-06	9E-06	5E-02	5E-02
Farmer receptor (R_3 Adult): Farmer in residential area with access to irrigation water with highest potential risks and highest annual modeled impacts				
Group 1 – all detected compounds (95 compounds)	3E-08	6E-08	1E-02	1E-02
Group 2 – all compounds except benzidine (177 compounds)	6E-08	1E-07	2E-02	2E-02
Group 3 – all compounds (178 compounds) (c)	5E-07	2E-06	2E-02	2E-02
Subsistence fish ingestion pathway receptor (R_only_fish_drain): Fish ingestion evaluation for the Main Drain (b)				
Group 1 – all detected compounds (95 compounds)	1E-08		1E-02	
Group 2 – all compounds except benzidine (177 compounds)	1E-08		1E-02	
Group 3 – all compounds (178 compounds) (c)	2E-08		1E-02	
USEPA Target Risk Levels				
Target risk levels for combustion source risk assessment	1E-05		0.25	

(a) The subsistence scenarios assume that 100% of all produce, beef, eggs, chicken, and pork ingested by a receptor would be locally-grown or locally-raised. The risk assessment results in Table 4.4-1 assumed, based on site-specific input, that 20% of all produce, beef, eggs, chicken and pork ingested by a receptor would be locally-grown or locally-raised.

(b) The risk assessment evaluated a subsistence fish ingestion scenario, assuming that 100% of all fish ingested would be caught locally. Thus, the results in Table 4.4-1 already reflect a subsistence scenario.

(c) The stack emissions risk results for Group 3 compounds (which includes 83 compounds that were not detected in stack emissions) were dominated by one compound, benzidine, which was not detected stack gases and for which there is no evidence that it has ever been accepted in spent carbon received at the facility.

Table 7
Combined Potential Risks for Hypothetical Subsistence Receptors

Receptor and Group of Evaluated Compounds	Excess Lifetime Cancer Risk		Total Hazard Index	
	Risk assessment results in Table 4.4-1	Subsistence scenario	Risk assessment results in Table 4.4-1	Subsistence scenario
Town Resident + Subsistence Fisher (a) ***Exposure pathways: inhalation + soil ingestion + produce ingestion + fish ingestion (c)***				
Group 1 – all detected compounds (95 compounds)	7E-08	1E-07	6E-02	
Group 2 – all compounds except benzidine (177 compounds)	2E-07	3E-07	6E-02	
Group 3 – all compounds (178 compounds) (d)	2E-06	9E-06	6E-02	
Farmer + Subsistence Fisher (b) ***Exposure pathways: inhalation + soil ingestion + produce ingestion + fish ingestion + beef ingestion + poultry ingestion + egg ingestion + pork ingestion (c)***				
Group 1 – all detected compounds (95 compounds)	4E-08	9E-08	2E-02	
Group 2 – all compounds except benzidine (177 compounds)	7E-08	1E-07	3E-02	
Group 3 – all compounds (178 compounds) (d)	5E-07	2E-06	3E-02	
USEPA Target Risk Levels				
Target risk levels for combustion source risk assessment	1E-05		0.25	

(a) Adult receptors "R_2" + "R_only_fish_drain".

(b) Adult receptors "R_3" + "R_only_fish_drain".

(c) The results in Table 4.4-1 of the risk assessment assumed that 20% of a person's diet from the following food items was locally grown or raised and ingested - produce, beef, poultry, eggs and pork. It was also assumed that 100% of a person's fish diet was provided by locally caught fish. The subsistence results assume 100% of a person's diet from all evaluated food items are locally grown or raised, and ingested.

(d) The stack emissions risk results for Group 3 compounds (which includes 83 compounds that were not detected in stack emissions) were dominated by one compound, benzidine, which was not detected stack gases and for which there is no evidence that it has ever been accepted in spent carbon received at the facility.

obtained via telephone interviews with Ms. Masters conducted by S. Foster of CPF Associates on June 26, 2007 and July 2, 2007. A summary of the information obtained during these interviews is provided below.

June 26, 2007 interview

Homegrown produce: Not many vegetables are raised in the northern part of the CRIT reservation; there are some backyard gardens in Parker but these won't get much produce; water bill may triple for a town residence with a home garden because of watering needs of crops grown in town; produce can only be grown seasonally, a few months in spring and fall; most produce (e.g., tomatoes, onions, melons) is grown in the southern part of the CRIT reservation near Poston, not near Parker; most crops grown on CRIT reservation are commercial and are shipped out and are not marketed locally. A reasonable estimate for someone living on the CRIT reservation is that 10% of the annual diet could be obtained from home grown produce, and 5% or less for someone living in town. Ms. Masters indicated she would follow up with colleagues on this topic and respond back.

Animal products: CRIT reservation residents buy their meat at the store; animals are raised through 4-H program, perhaps 70 pigs per year, and these animals have to be sold to someone else; people do not butcher their own animals for meat; 1 farmer has 50 head of cattle located beyond 10 km from the facility which are sold; there are no dairy cows and no locally-produced dairy milk on the CRIT reservation; there are no slaughter facilities in the vicinity that she is aware of; people may raise chicken and eggs, and might have pigs or beef cattle; not many chickens raised in the area, though kids might raise chickens sometimes; alfalfa feed for animals is available locally; grain is not grown locally; chickens probably don't have locally grown feed because grain is not grown locally; there is a feed store in the area where animal feed can be purchased.

July 2, 2007 interview

Ms. Masters indicated that she had spoken with many colleagues since the 6/26/07 phone interview and was providing additional information based on this broader input.

Homegrown produce: The types of produce grown in Parker and the irrigated valley are similar but it is very difficult due to climate and soil. Based on the input she received, she estimates that 10% of produce diet may be from home grown produce and cannot see this number being higher than 20%, especially considering there are not extended growing seasons.

Animal products: All feed used for pigs is not local; people may raise lamb and goat, feed for these animals is not obtained locally; no feed for chickens is locally-grown; hay for cattle is obtained locally, but grain not local; among people who might raise animals, they might butcher 1 animal/year and only 20% of their meat diet would be from locally-raised animals; a small number of people raise animals, expects no more than 10% to raise animals for home consumption.

5. Selection of Chemicals for Evaluation – Section 4.3.2, pg. 29 & Tables 4.3.1, 4.3.2 (Fugitive Emissions)

Comment:
"It is not clear from this review the basis for exclusion of chrome as a constituent in the assessment of potential fugitive releases and impacts. Chrome (valence-specific) is considered carcinogenic via the inhalation exposure pathway by several government regulatory agencies and international scientific bodies, and while an inorganic constituent, the metal does enjoy limited volatility under terrestrial conditions. Please reconsider the criteria used for selection of constituents subject to this level of analysis and modify the list of constituents with the stated criteria."

Response:

Introduction

In response to this comment, both total and hexavalent chromium were selected for evaluation in the assessment of potential fugitive emissions from spent carbon unloading. The remainder of this response describes the approaches used to evaluate the two chromium compounds and the risk assessment results. Chromium is generally not considered to be volatile in the environment. The vapor pressure of chromium at 298K calculated from Antoine coefficients is approximately 10E-50 mm Hg. Some specific chromium compounds such as chromium carbonyl and chromium oxychloride are somewhat volatile at ambient temperatures (Yaws 1999), however these compounds are unstable under environmental conditions. Due to these properties, this analysis focuses on the particulate phase rather than the vapor phase.

Chromium Emission Rates

Fugitive emission rates for the two chromium compounds were calculated using the methodology presented in Section 4.3.3.2 and Equation 4-8 in the risk assessment. In this method, inorganic compound emission rates were calculated by multiplying the emission rate of PM10 particles (particles < 10 microns in diameter) in g/sec by the inorganic compound concentration in spent carbon in g/g.

Based on 2003-2006 spent carbon data from the facility, the average concentration of total chromium in spent carbon was 12 parts per million (ppm) or 1.2×10^{-5} g/g (see Table 4.3.1 in the risk assessment). The PM10 emission rate was calculated to be 5.87×10^{-5} g/sec in Table 4.3-6 in the risk assessment. Using these inputs, a total chromium emission rate of 7.0×10^{-10} g/sec was calculated (i.e., PM10 emission rate * total chromium spent carbon concentration).[15]

From a thermodynamic standpoint, activated carbon will reduce chromium and maintain it in a stable chromium III form which will predominate over the unstable hexavalent form. The hexavalent chromium (CrVI) concentration in spent carbon was, however, calculated by

[15] For example, total chromium emission rate (g/sec) based on average spent carbon concentration = PM10 emission rate of 5.87×10^{-5} g/sec from Table 4.3-6 in the risk assessment * total chromium average concentration in spent carbon of 1.2×10^{-5} g/g = 7.0×10^{-10} g/sec.

assuming that 13% of the total chromium was present as CrVI[16] based on an evaluation of 137 concurrent CrVI and total chromium measurements in monthly composite spent carbon samples from 1994-2006 that were provided to CPF by Siemens. Although CrVI was not detected in 134 of the 137 samples, these data showed that, on average, 13% of the total chromium could potentially be CrVI if all non-detected CrVI results were conservatively assumed to be present at their reported detection limits. If the more commonly employed assumption of one-half the detection limit were used for samples in which CrVI was not detected, roughly 7% of the total chromium could be CrVI; this would produce lower spent carbon concentrations, lower air concentrations, and lower risks than calculated in response to this Region IX comment. Based on a conservatively assumed CrVI concentration in spent carbon of $1.6x10^{-6}$ g/g (13% of the total chromium), the CrVI emission rate was calculated to be $9.4x10^{-11}$ g/sec.[17]

Ambient Air Concentrations

Ambient air concentrations of total chromium and CrVI were calculated using the standard USEPA method described in HHRAP guidance and used in the risk assessment. In this method, as discussed previously in response to General Comment 2 and indicated in Equation 1 shown earlier in this document, air concentrations are calculated by multiplying unitized ISCST3 air dispersion modeling results (i.e., unitized concentrations in $\mu g/m^3$ based on a 1 g/sec emission rate) by the chemical emission rates in g/sec.

Potential ambient air concentrations associated with fugitive emissions in the risk assessment were modeled both on site, at the maximum on-site impact location, and off site, at a variety of receptor locations, using the same approaches applied in the risk assessment. The off-site locations are described in Table 4.3-8 in the risk assessment and include four residential receptor locations, two farmer receptor locations, two maximum off-site impact points on undeveloped land, and the closest maximally impacted non-residential business receptor location.

Risk Characterization

Potential risks associated with the chromium ambient air concentrations were evaluated using the same methods applied in the risk assessment. For off-site receptors, off-site ambient air concentrations and associated risks were calculated using the IRAP software program. For the on-site worker analysis, on-site ambient air concentrations and their comparison to occupational exposure limits were calculated using an excel spreadsheet.

Inclusion of the chromium compounds in the off-site fugitives risk assessment did not change the risk assessment conclusions. The numerical risk results for the fugitive evaluation were presented in the risk assessment in Table 4.4-4 (chronic inhalation risks) and Table 4.4-5 (acute inhalation risks); these results are all well below USEPA target risk levels and are unchanged by the addition of chromium. The detailed chemical-specific results from the revised off-site fugitives risk assessment, now including total chromium and CrVI, are presented in Attachment B. This attachment provides the same data that were included in the risk assessment in Appendix J (chronic inhalation risks) and Appendix K (acute inhalation risks), with the addition

[16] CrVI concentration (g/g) = $1.2x10^{-5}$ g/g total Cr * 0.13 = $1.6x10^{-6}$ g/g CrVI.
[17] CrVI emission rate (g/sec) = PM10 emission rate of $5.87x10^{-5}$ g/sec * CrVI concentration in spent carbon of $1.6x10^{-6}$ g/g = $9.4x10^{-11}$ g/sec.

of the two chromium compounds. The total chromium and CrVI results in Attachment B are many orders of magnitude below the chronic and acute USEPA target risk levels.

The conclusions of the on-site workplace evaluation also did not change after total chromium and CrVI were added to the fugitives risk assessment in that the on-site concentrations were well below occupational exposure limits. The calculated on-site maximum 8-hour average chromium air concentrations and associated occupational exposure limits are presented in Table 8. As can be seen, the on-site air concentrations were significantly lower than the 8-hour average OSHA and NIOSH exposure limits.

6. Fugitive Organic Vapor Emissions & Hazard – Section 4.3.3.1, pg.30

Comment:
"The human health and ecological impacts assessed from fugitive releases were determined from facility activities (spent carbon unloading) or sources with the potential for maximum or high-end contaminant releases. Non-cancer or systemically toxic compounds are assessed in this analysis by a cumulative approach which considers the total concentration of those compounds in an exposure scenario germane to the impacted receptor. It is not clear from this review why the non-cancer or systemically-toxic hazard potentially incurred from fugitive releases was not considerate of the combined exposures from both the outdoor spent-carbon unloading hopper (H-1) operations, in addition to the source and activity generating fugitive emissions from other facility operations (hopper H-2)? This estimate of cumulative hazard would more closely capture the entire range of potential exposures incurred by human receptors."

Response:

A detailed review of facility operations was conducted during the Workplan stage of this risk assessment process, in 2003, in order to select a potential fugitive emissions source most likely to impact ambient air. This review, which is presented in Section 4.3 of the 2003 Workplan and reprinted here as Attachment C, provided an overview of potential sources of fugitive emissions related to spent carbon at the facility in addition to a discussion of regulatory requirements, and engineering and institutional controls that are in place to minimize potential fugitive emissions. Based on this review, the Workplan (which was approved by USEPA prior to performing the risk assessment) indicated that the potential fugitive emission source related to spent carbon considered most likely to impact ambient air is the unloading of spent carbon at the outdoor hopper (H-1) and that this emission source would be addressed in the risk assessment.

In addition to the reasons outlined in Attachment C for selecting the outdoor hopper (H-1) for detailed evaluation in the risk assessment, potential fugitive emissions from H-1 were considered more likely to impact outdoor ambient air for a number of reasons. First, most of the spent carbon received at the facility is unloaded at H-1. For example, between 82%-86% of the spent carbon received at the facility annually during 2005 and 2006 was unloaded into the outdoor hopper from a variety of different bulk container types (e.g., roll-off containers, slurry trucks). The remainder of spent carbon received at the facility was unloaded indoors inside the spent carbon storage and warehouse building into hopper H-2 (e.g., drums, supersacks). Second, while

Table 8
On-Site Air Concentrations Associated with Fugitive Chromium Emissions and Comparison to Occupational Exposure Limits

Compound	Maximum On-Site 8-Hour Average Air Concentration (mg/m^3) (a)	Occupational Exposure Limits (mg/m^3) (b)		Comparison of Maximum Modeled 8-Hour Average Concentrations to Occupational Exposure Limits	
		NIOSH Reference Exposure Limit (8-hr TWA REL)	OSHA Permissible Exposure Limit (8-hr TWA PEL)	Ratio - Air Concentration/ NIOSH REL	Ratio - Air Concentration/ OSHA PEL
Total Chromium (c)	1.2E-08	0.5	0.5	2E-08	2E-08
Chromium VI (d)	1.5E-09	0.001	0.005	2E-06	3E-07

TWA = time-weighted average.

(a) Air concentration (mg/m3) = emission rate (g/sec) * maximum 8-hour average unit air concentration (16,426 ug/m3 per 1 g/sec) * mg/1,000 ug.

(b) Sources: OSHA PELS - www.osha.gov/pls/oshaweb. NIOSH RELs - www.cdc.gov/niosh/npg.

(c) The listed OSHA PEL for chromium is based on CrIII and CrII. The value for chromium metals and insoluble salts is slightly higher, at 1 mg/m3.

(d) The listed NIOSH REL for CrVI is a 10-hr TWA.

both hoppers are equipped with an air exhaust system, which directs collected air to a fabric filter baghouse and carbon adsorber, potential fugitive emissions to outdoor air are considered more likely to occur from H-1 due to its outdoor location and its configuration. The outdoor hopper is an enclosed three-walled free standing building with a fixed roof and heavy long plastic sheeting on the fourth side where spent carbon is unloaded. At the face of hopper H-1 where unloading occurs, fugitive emissions have the potential to occur during unloading operations.

Additionally, the method used to calculate fugitive emissions from hopper H-1 in the risk assessment did not take into account the beneficial effect of the air exhaust system. The calculated emission rates assumed, instead, that all fugitive emissions during unloading were directly released to outdoor ambient air. This approach assumed that no fugitive emissions were captured by the exhaust system and thus none were directed through the particulate and organic vapor pollution control systems. This unrealistic, albeit conservative, assumption is expected to overestimate potential ambient air concentrations, and thus potential risks, associated with fugitive emissions.

Finally, as discussed above in response to General Comment 2, it is important to recognize that all workers involved in spent carbon unloading operations wear respirators in addition to protective clothing. When handling any spent carbon (whether it is classified as non-hazardous or hazardous), a half-face respirator with organic and dust control cartridges is worn by workers. Workers also wear company-supplied shorts, pants, steel-toed boots, hard hat and safety glasses. The facility's worker health and safety program additionally includes training, medical monitoring, and hazard communication.

7. Risk Characterization – Section 4.4.1.1, pg.39 (Stack Emissions)

Comment:
"It would be useful to provide a table supporting this narrative which detailed those constituents which significantly influenced the receptor-specific risk estimates, but whose rate of emission was not consistent with the emission rate optimized in the performance demonstration test (PDT). Cadmium and benzidine are illustrative of this phenomenon."

Response:

Table 9 was prepared to detail those constituents which significantly influenced the receptor-specific excess lifetime cancer risk estimates. This table focuses on the receptors with the highest risk results, indicating the dominant compounds affecting the results and providing background on the basis of each compound's emission rate used in the risk assessment. The risks are presented for the three groups of compounds addressed in the risk assessment, as described earlier in response to Specific Comment 4. The results, which are discussed in Section 4.4.1.1 of the risk assessment, are all below USEPA's target cancer risk level of 1E-5 (one in 100,000) over a 70-year lifetime.

A similar table was not prepared for the non-cancer risk results because the non-cancer hazard index values, and the dominant compounds, were essentially the same across the three groups of

Table 9
Dominant Compounds Contributing to Excess Lifetime Cancer Risks Associated with Stack Emissions

Receptor and Group of Evaluated Compounds	Excess Lifetime Cancer Risks (a)	Dominant Compounds (% Contribution to Risk Result)
Town Resident receptor (R_2 Adult): ***Receptor in town residential area with highest potential risks and highest annual modeled impacts***		
Group 1 – all detected compounds (95 compounds)	6E-08	- Cadmium (94%) (b)
Group 2 – all compounds except benzidine (177 compounds)	2E-07	- Cadmium (36%) (b) - Arsenic (38%) (c) - Beryllium (17%) (d)
Group 3 – all compounds (178 compounds)	2E-06	- Benzidine (92%) (e)
Farmer receptor (R_3 Adult): ***Farmer in residential area with access to irrigation water with highest potential risks and highest annual modeled impacts***		
Group 1 – all detected compounds (95 compounds)	3E-08	- Cadmium (75%) (b) - PCDDs/PCDFs (23%) (f)
Group 2 – all compounds except benzidine (177 compounds)	6E-08	- Cadmium (33%) (b) - PCDDs/PCDFs (10%) (f) - Arsenic (36%) (c) - Beryllium (16%) (d)
Group 3 – all compounds (178 compounds)	5E-07	- Benzidine (87%) (e)
Subsistence fish ingestion pathway receptor (R_only_fish_drain): ***Fish ingestion evaluation for the Main Drain***		
Group 1 – all detected compounds (95 compounds)	1E-08	- PCDDs/PCDFs (88%) (f)
Group 2 – all compounds except benzidine (177 compounds)	1E-08	- PCDDs/PCDFs (71%) (f)
Group 3 – all compounds (178 compounds)	2E-08	- PCDDs/PCDFs (53%) (f) - Benzidine (36%) (e)

PDT = Performance Demonstration Test.

PCDDs/PCDFs = polychlorinated dibenzo-p-dioxins and polychlorinated dibenzo furans.

(a) The cancer risks were obtained from Table 4.4-1 in the risk assessment. They reflect the additional excess lifetime cancer risks from exposure to all potential carcinogens evaluated. These risk results are all lower than the regulatory target cancer risk level used by USEPA for combustion sources of 1E-05 (1 in 100,000).

(b) Cadmium was evalauted using an emission rate based on a proposed permit limit that was >30 times higher than measured during the PDT.

(c) Arsenic was not detected in the PDT but was evaluated in the risk assessment using an emission rate based on a proposed permit limit.

(d) Beryllium was not detected in the PDT but was evaluated in the risk assessment using an emission rate based on a proposed permit limit.

(e) Benzidine was not detected in the PDT and there is no evidence from waste profile reports and analytical spent carbon data that it has ever been accepted in spent carbon received at the facility. It was evaluated using an emission rate based on its PDT-reported detection limit.

(f) PCDDs/PCDFs were evaluted using an emission rate based on a proposed permit limit that was about 4 times higher than measured during the PDT. The feed used during the PDT was spiked to maximize production of combustion by-products such as PCDDs/PCDFs.

compounds evaluated (i.e., Groups 1, 2 and 3). The hazard index values for stack emissions were lower than the conservative non-cancer target level of 0.25 used by USEPA for evaluating combustion sources. As described in Section 4.4.1.1 of the risk assessment, the dominant compounds affecting the hazard index results were chlorine, for the resident and farmer receptors, and methyl mercury for the fish ingestion pathway. Chlorine was evaluated in the risk assessment using an emission rate based on a proposed permit limit that was much higher than measured in the PDT, even though many chlorine-containing compounds were spiked into the feed during the PDT. Similarly, mercury was evaluated using a permit limit-based emission rate that was higher than measured in the PDT. These results indicate that chronic non-cancer adverse health effects would not occur due to stack emissions from the carbon reactivation facility.

8. Acute Short-term Risks – Section 4.4.1.4, pg.41 (Stack Emissions)
This comment includes two items, each of which are addressed below.

8a. Acute Short-term Risks – Calculation of Maximum Concentrations

Comment:
"The current assessment evaluated the impact from acute or short-term inhalation exposures from stack emissions by comparing the 1-hr average air concentrations (model derived) with acute reference thresholds. Results from this comparison demonstrated that the non-cancer or systemically toxic hazard thresholds were not exceeded. Determination of acute inhalation impacts should be derived from comparison of the 1-hr maximum stack concentrations with acute thresholds rather than 1-hr average maximum stack concentrations. Results from this level of analysis would better inform and therefore reduce the level of uncertainty inherent in the acute level impact characterization."

Response:

The acute risk assessment evaluation for stack emissions was modified, in response to this comment, by using maximum measured stack emission rates. This approach differs from the risk assessment which, as described in the Workplan, used average emission rates derived across the three PDT test runs. As noted earlier in response to General Comment 4, and as described in Section 4.5.2 of the risk assessment, the differences between the average and maximum measured stack emission rates for those compounds with emission rates based on stack test data were not substantial, and ranged from a factor of 1.0 (i.e., no change) to a factor of 3.0. The maximum measured emission rates are listed in Table 2 in response to General Comment 4.

In this analysis, the maximum measured emission rates were used for those compounds with emission rates based on stack test data. For the remaining compounds (i.e., those with emission rates based on proposed permit limits or calculated based on feed rate and destruction and removal efficiency), the emission rates for this acute analysis were the same as those used in the chronic risk assessment (see Table 2).

The potential acute inhalation risks were evaluated by re-running the IRAP software program in the same manner as applied in the risk assessment. The resulting hazard quotients are presented

in Table 10 for the same set of receptor locations evaluated in the risk assessment. The detailed chemical-specific acute hazard quotients for this stack emissions scenario are included in Attachment D.

All of the hazard quotients (HQs) at all receptor locations were well below the target level of 1.0, indicating that adverse acute health effects would not occur due to stack emissions at locations beyond the property boundary. The highest HQ values were calculated at grid location A_1 (0.08) and A_2 (0.04). These results were unchanged from the original risk assessment (see Table 4.4-3 in the risk assessment report).

The cumulative acute hazard index (HI) values, based on the sum of all hazard quotients and assuming exposure to all compounds evaluated regardless of the type of potential health effects, were 0.2 at grid location A_1 and 0.1 at grid location A_2, still well below a target of 1.0. The corresponding cumulative hazard index results from the risk assessment using average measured stack emission rates (see Appendix H of the risk assessment) were 0.1 at A_1 and 0.09 at A_2, only slightly lower than calculated here using maximum measured emission rates. These results confirm that the acute risk assessment results are negligibly different whether using average or maximum stack emission rates.

It should be noted that summing all hazard quotients together regardless of type of health effect is not recommended in HHRAP, but was performed here in response to General Comment 4. HHRAP recommends that acute hazard quotients from individual compounds be summed if they have similar effects. Given that the cumulative HI values across all compounds were less than 1, the sum for any subsets with similar types of health effects will also be less than 1.

8b. Acute Short-term Risks – Acute Hazard Quotients

Comment:
"An acute hazard quotient above one may indicate and increased chance of developing health endpoints more profound than the mild transient adverse health effects described in the report. The specific health endpoint is constituent-specific and has been detailed in the reference documents used to support acute reference levels."

Response: No response necessary.

9. Evaluation of Lead – Section 4.4.1.5, pg. 43

Comment:
"EPA's Integrated Exposure Uptake Biokinetic Model (IEUBK) for lead in children is designed to predict a child's blood-lead concentration from multimedia exposure pathways. While EPA's combustion guidance reference for risk analysis recommends application of the model in the context of combustion-unit risk assessments when the lead in soil concentrations exceed health-based levels (400 mg/kg), it is not clear from this review the manner in which potential lead exposure and the resultant blood-lead level impact from the direct pathway of human exposure (inhalation) can be assessed without model application. The IEUBK model should be considered to reduce uncertainties associated with potential lead impacts on proximate receptors."

Table 10

Acute Inhalation Results - Maximum Measured Stack Emissions (a)

Receptor Name	Description	Minimum Hazard Quotient (b)	Maximum Hazard Quotient (b)
Residential Receptors (developed area within and around Town of Parker)			
R_1 resident	Closest residential location to facility and residential area in town with highest hourly modeled impacts	<1E-10	0.02
R_2 resident	Residential area in town with highest annual modeled impacts	<1E-10	0.01
Farmer Receptors (residential area with access to irrigation water and within modeling domain)			
R_3 resident farmer	Residential area with access to irrigation water with highest annual modeled impacts	<1E-10	0.01
R_4 resident farmer	Residential area with access to irrigation water with highest hourly modeled impacts	<1E-10	0.02
Maximum Impact Point (undeveloped land area)			
A_1 max hourly	Maximum impact location for hourly concentrations. There is no residential or commercial land use in the vicinity of the maximum impact location (SW of facility).	<1E-10	0.08
Non-Residential Areas			
A_2 closest business (c)	Closest developed location beyond property boundary (non-residential) with highest hourly modeled impacts	<1E-10	0.04

(a) These results are conservatively based on both maximum measured stack emission rates and also maximum modeled unitized ISCST3 air concentrations. For each specific receptor location, the maximum modeled ISCST3 unitized concentration was the highest 1-hour average result out of the more than 40,000 1-hour averages calculated at that location (i.e., based on input to ISCST3 of 5 years of hourly meteorological data from Parker, Arizona). At each location the concentrations for all other hours were lower than those used to calculate these hazard quotients.

(b) The minimum and maximum results are the lowest and highest hazard quotients, respectively, calculated among all of the evaluated compounds. The typical target hazard quotient value used by regulatory agencies is 1.

(c) The County Agricultural Extension Office and CRIT Realty are located at receptor A_2. Maximum 1-hour average air concentrations at all other non-residential developed land use locations were lower than at receptor A_2.

Response:

In response to this comment, potential lead exposures were evaluated using the IEUBK model (USEPA 2002, Version 1.0.264). Inputs to the IEUBK model include background exposures to lead in addition to lead exposures associated with facility stack emissions.

Background lead exposures were based on the USEPA defaults incorporated in the IEUBK model with the exception of background air and soil lead concentrations, for which data specific to Arizona were compiled. Background levels in air were based on ambient air measurements from Maricopa, Pima and Yavapai Counties reported in AZDEQ (1999) (no data were available for La Paz, Mohave or Yuma Counties). Note that lead is no longer routinely measured in ambient air by AZDEQ because concentrations have declined to very low levels in response to regulatory controls (AZDEQ 2007). Background soil levels were based on surface soil measurements from Yuma and Mohave Counties reported in USGS (1981) (data were not available for La Paz County in the USGS report).

Potential lead exposures associated with facility stack emissions were compiled for the resident child and farmer child receptors that were calculated to have the highest lead intakes in the risk assessment (referred to as receptors R_2 and R_3). The facility-specific IEUBK inputs for these receptors included air and soil lead concentrations at each receptor location, in addition to dietary lead intakes. These inputs were compiled from the risk assessment results calculated using the IRAP software program which, as described in the risk assessment, calculates lead exposures and risks using USEPA's HHRAP methods and inputs. Table 11 presents the lead concentrations and dietary intakes associated with stack emissions that were calculated using IRAP and used in the IEUBK model.

The IEUBK inputs and outputs are summarized in Table 12. The model outputs were compared to the USEPA target blood lead level of 10 µg/dL (USEPA 2002). As shown in Table 12, the model predicted no blood lead elevation compared to that predicted by exposure to background. The predicted blood lead levels were all lower than those measured among children in Yuma County, Arizona as part of the Arizona/Sonora blood lead study (mean blood lead level = 3.1 µg/dL; 95% confidence interval = 2.9-3.3 µg/dL) (Cowan et al. 2006). The blood lead levels associated with background, and background plus potential facility impacts, were all below USEPA's target level. The probability of the target level being exceeded, which is an output of the IEUBK model, was 0.01% for all model runs. These results indicate that adverse health effects due to lead exposure would not occur as a result of facility stack emissions.

10. Acute Short-term Risks – Section 4.4.2.2, pg. 44 (Fugitive Emissions)
This comment includes a number of items, each of which is addressed below.

<u>10a. Acute Short-term Risks – Maximum Modeled Fugitive Emission Rates</u>

Comment:
"An acute or short-term analysis of fugitive releases from the facility's spent-carbon hopper loading activities was conducted to assess the magnitude of acute impacts. Rather than applying the 1-hr average air concentration from modeled releases in support of this analysis, the 1-hr

Table 11
Potential Lead Concentrations and Dietary Intakes Associated with Stack Emissions

Risk Assessment Results (a)	Resident child receptor (R_2) (b)	Farmer child receptor (R_3) (b)	Units
Air Concentration	6.9E-05	2.0E-05	ug/m3
Soil Concentration	2.7E-04	2.8E-05	ug/g
Dietary intake (1-7 year old child)			
Produce	1.95E-03	3.00E-04	ug Pb/day
Beef	NA	6.30E-06	ug Pb/day
Fish (Main Drain)	3.90E-10	3.90E-10	ug Pb/day
Fish (Colorado River)	1.38E-09	1.38E-09	ug Pb/day
Total	2.0E-03	3.1E-04	ug Pb/day

NA = not applicable for this receptor.

(a) The reported results were calculated in the risk assessment using the IRAP software program (see Section 4.2 in the risk assessment report).

(b) Results are presented for the resident child and farmer child receptors with the highest intakes calculated in the risk assessment : R_2 resident and R_3 farmer.

Table 12
Lead Exposure Evaluation Using USEPA's IEUBK Model

Information	AZ background (a,b) + USEPA diet defaults	Potential facility contribution + background (c)	
		Resident child receptor (R_2)	Farmer child receptor (R_3)
Model Inputs			
Air concentration (µg/m3)	0.01	0.010069	0.01002
Soil concentration (µg/g)	27	27.00027	27.000028
Dietary intake (µg/day)			
.5-1 years	5.53	5.532	5.5303
1-2 years	5.78	5.782	5.7803
2-3 years	6.49	6.492	6.4903
3-4 years	6.24	6.242	6.2403
4-5 years	6.01	6.012	6.0103
5-6 years	6.34	6.342	6.3403
6-7 years	7.00	7.002	7.0003
Model Outputs			
Blood Pb Concentration (ug/dL)			
.5-1 years	2.0	2.0	2.0
1-2 years	2.0	2.0	2.0
2-3 years	1.9	1.9	1.9
3-4 years	1.8	1.8	1.8
4-5 years	1.6	1.6	1.6
5-6 years	1.5	1.5	1.5
6-7 years	1.4	1.4	1.4
Probability of Pb blood concentration greater than USEPA's 10 µg/dL target			
Probability	0.01%	0.01%	0.01%

(a) Background levels in air were based on data in AZDEQ (1999).
(b) Background soil levels were based on Arizona surface soil measurements reported in USGS (1981).

(c) The facility contribution was evaluated for the resident child and farmer child receptors with the highest intakes calculated in the risk assessment : R_2 resident and R_3 farmer.
Facility contribution for R_2 included air, soil and diet (produce + fish).
Facility contribution for R_3 included air, soil and diet (produce + beef + fish).

maximum concentration should be applied to determine the magnitude of acute impacts associated with fugitive releases. Further, the cumulative hazard index for all compounds should be clearly detailed in the supporting narrative, and only when this value exceeds the target threshold, should a target-organ segregation approach be applied in the context of risk characterization."

Response:

In response to this comment, emission rates for the acute fugitives risk evaluation were re-calculated using maximum rather than average spent carbon concentrations. These revised maximum emission rates were then input into the IRAP software program to recalculate potential acute risks associated with fugitive releases during unloading activities.

Maximum Modeled Fugitive Emission Rates

Table 2, shown earlier in this document, presents the mathematically modeled maximum fugitive chemical emission rates, as well as the maximum concentrations in spent carbon unloaded at the outdoor hopper, and the number of deliveries with this maximum concentration relative to the total number of deliveries.

ISCST3 Modeling of Short-Term Unitized Air Concentrations

Equation 1, presented earlier in this document, shows the HHRAP method for calculating chemical-specific air concentrations. In this method, unitized ISCST3 model output air concentrations are multiplied by chemical-specific emission rates. The unitized ISCST3 air concentration at each receptor location was the maximum modeled 1-hour average air concentration based on a unit 1 g/sec emission rate. The chemical-specific emission rates were calculated as described above.

HHRAP recommends evaluating risks due to acute exposure based on maximum 1-hour average air concentrations calculated using a dispersion model. The shortest time step that the ISCST3 dispersion model can predict is a 1-hour average period. The term "1-hour average" thus commonly refers to the averaging time associated with this ISCST3 output.

The ISCST3 model calculates a 1-hour average unitized air concentration (i.e., $\mu g/m^3$ per 1 g/sec) for every hour of input meteorological data at each modeled receptor location. The five years of hourly meteorological data input to ISCST3 for the risk assessment, therefore, produced more than 40,000 1-hour average air concentrations at each of the more than 5,200 individual modeled receptor locations beyond the property boundary. The highest of these more than 40,000 1-hour average concentrations at each location was then selected for use in evaluating potential acute inhalation risks in the risk assessment. This very conservative approach is recommended in HHRAP and was used in the risk assessment and in response to this Region IX comment.

The maximum 1-hour average unitized concentration modeled by ISCST3 at each location reflects a specific set of meteorological conditions that produce less dispersion and higher air concentrations than for any of the other more than 40,000 modeled hours. This means that the maximum short-term air concentrations, and thus the acute risks derived from them, have a very low probability of occurrence. It also means that the short-term air concentrations for every other hour modeled at each receptor location were lower than the maximum used in the risk assessment.

Potential Acute Inhalation Risks

The potential acute inhalation risks associated with the maximum modeled fugitive emission rates and the maximum unitized ISCST3 modeled short-term air concentrations were evaluated by re-running the IRAP software program in the same manner as applied in the risk assessment.

The resulting hazard quotients are presented in Table 13 for the same set of receptor locations evaluated in the risk assessment (see Table 4.4-5 in the risk assessment). The detailed chemical-specific acute hazard quotients for this fugitive emissions scenario are included in Attachment E.

All of the hazard quotients (HQs) at all receptor locations were below the target level of 1.0, indicating that adverse acute health effects are not expected to occur due to fugitive hopper emissions, even when spent carbon containing maximum concentrations are unloaded at the outdoor hopper. The highest HQ values were calculated at grid location A_3 (0.4) and A_2 (0.02). Note that grid location A_3 is on the facility property boundary; beyond this location there is undeveloped land that is not used for residential or commercial purposes. The cumulative acute hazard index (HI) values, based on the sum of all hazard quotients and assuming exposure to all compounds evaluated regardless of the type of potential health effects, were 0.6 at grid location A_3 and 0.03 at grid location A_2, still below the target of 1.0.

These results corroborate the conclusions of the risk assessment. They indicate that short-term health effects are not expected to occur in areas near the facility as a result of inhalation exposure to fugitive emissions during spent carbon unloading at the outdoor hopper, individually or in combination with risks from stack emissions.

10b. Acute Short-term Risks – On-Site Evaluation of Short-term Exposure Limits

Comment:
"The fugitive release acute analysis suggests that on-site receptors incur maximal impacts from fugitive releases (hopper activities). While the narrative in this section identifies the location of maximal off-site impacts and the resultant hazard estimates, the magnitude of on-site impact associated with this exposure scenario should also be identified (10 m north of hopper) and discussed. A fugitive release, on-site acute analysis comparing short-term occupational standards (STELs) to maximum predicted air concentrations should also be considered."

Table 13
Acute Inhalation Results - Maximum Fugitive Emissions During Spent Carbon Unloading at the Outdoor Hopper (a)

Receptor Name	Description	Minimum Hazard Quotient (b)	Maximum Hazard Quotient (b)
Residential Receptors (developed area within and around Town of Parker)			
R_1 resident	Closest residential location to facility, residential area in town with highest hourly modeled impacts for stack emissions	<1E-9	0.001
R_2 resident	Residential area in town with highest annual modeled impacts for stack emissions	<1E-9	0.0009
R_5 resident	Residential area in town with highest hourly modeled impacts for fugitive hopper emissions	<1E-9	0.001
R_6 resident	Residential area in town with highest annual modeled impacts for fugitive hopper emissions	<1E-9	0.0005
Farmer Receptors (residential area with access to irrigation water and within modeling domain)			
R_3 resident farmer	Residential area with access to irrigation water with highest annual modeled impacts (stack and fugitive hopper emissions)	<1E-9	0.0007
R_4 resident farmer	Residential area with access to irrigation water with highest hourly modeled impacts (stack and fugitive hopper emissions)	<1E-9	0.0009
Maximum Impact Point (undeveloped land area)			
A_1 max hourly (stack)	Maximum stack emissions impact location for hourly concentrations. There is no residential or commercial land use in the vicinity of the maximum impact location (SW of facility).	<1E-8	0.007
A_3 max hourly (fugitives)	Maximum fugitive hopper emissions impact location for hourly concentrations. Occurs on northern facility property boundary. There is no residential or commercial land use in the vicinity of the maximum impact location.	<1E-7	0.4
Non-Residential Areas			
A_2 closest business (c)	Closest developed location beyond property boundary (non-residential) with highest hourly modeled impacts	<1E-9	0.02

(a) These results are based on both maximum fugitive chemical-specific emission rates and maximum modeled ISCST3 unitized 1-hour average air concentrations calculated for each specified receptor location. The ISCST3 air concentrations for all other hours were lower than those used to calculate these hazard quotients.

(b) The minimum and maximum results are the lowest and highest hazard quotients, respectively, calculated among all of the evaluated compounds. The typical target hazard quotient value used by regulatory agencies is 1.

(c) The County Agricultural Extension Office and CRIT Realty are located at receptor A_2. Maximum 1-hour average air concentrations at all other non-residential developed land use locations were lower than at receptor A_2.

Response:

Section 4.4.2.2 of the risk assessment addresses potential off-site impacts to public health. On-site impacts are addressed in Section 4.4.4 of the risk assessment and also in response to General Comment 2.

In response to this comment, an on-site acute analysis was conducted to compare short-term occupational exposure limits to maximum modeled on-site air concentrations. Short-term exposure limits (STELs) have been developed by NIOSH and OSHA for varying short-term durations. For example, STELs are defined as 15-minute time-weighted average concentrations that should not be exceeded at any time during a workday. Ceiling limits are maximum peak values not to be exceeded at any time.

Table 14 presents the available short-term exposure limits provided by OSHA and NIOSH, the approximate duration associated with each short-term limit, and the 8-hour time weighted average permissible exposure limits (PELs).

Table 14 also presents modeled maximum on-site air concentrations associated with maximum fugitive emissions. The maximum 8-hour average and 1-hour average air concentrations were calculated by combining ISCST3 unitized modeling results with maximum modeled chemical-specific emission rates. The air concentrations for averaging times less than 1 hour were calculated by scaling from the modeled maximum on-site 1-hour average concentrations using USEPA screening-level scaling factors that convert concentrations to different averaging times (USEPA 1992). The estimated short-term air concentrations were calculated for durations that corresponded to the short-term exposure limit durations indicated in Table 14. The screening-level scaling factors can only provide very rough approximations of air concentrations because of their inherent uncertainties (e.g., application at close distances from a source).

Table 14 shows that the modeled short-term on-site air concentrations are lower than the corresponding short-term exposure limits, in most cases by several orders of magnitude. This conclusion provides additional support that unacceptable risks to workers associated with chemical exposures from spent carbon unloading activities are not likely to occur.

10c. Acute Short-term Risks – Risk Management Procedures

Comment:
"To the extent that on-site risk management procedures remain in place to mitigate these potential exposures and concomitant risks, and to the extent that these potential exposures are regulated by facility compliance with the Occupational Safety & Health Administration (OSHA) worker protection standards, the risk implications associated with this scenario can be deemed de minimus. This level of analysis should be clearly articulated in this section, and section 4.4.4 of the risk assessment report."

Response:

The facility has in place a protective worker health and safety program which has been developed to meet the requirements of OSHA and a set of comprehensive on-site risk

Table 14
Evaluation of Short-Term Occupational Exposure Limits And Modeled Maximum Ambient Air Concentrations On Site Associated with Fugitive Emissions During Spent Carbon Unloading

Compound	CAS #	Maximum Modeled On-Site Air Concentrations (mg/m3) (a)		Calculated Maximum On-Site Air Concentrations for Short-Term Averaging Times (mg/m3) (scaled from maximum modeled 1-hour average concentration) (f)				8-Hour Average Occupational Exposure Limits (mg/m3) (b)		Short-Term Occupational Exposure Limits (mg/m3) (b)			
										OSHA Exposure Limits		NIOSH Exposure Limits	
		Maximum Modeled 8-Hour Average	Maximum Modeled 1-Hour Average	30-minute (1-hr)*1.1	15-minute (1-hr)*1.3	10-minute (1-hr)*1.4	5-minute (1-hr)*1.6	NIOSH Reference Exposure Limit (8-hr TWA REL)	OSHA Permissible Exposure Limit (8-hr TWA PEL)	Exposure Limit	Duration	Exposure Limit	Duration
1,2-Dibromoethane	106-93-4	1.0E-08	2.4E-08		3E-08		4E-08	0.35	150	230	5-minute	1.0	15-minute
1,3-Butadiene	106-99-0	--	--					4.4 (c)	2.2	10	15-minute		
1,4-Dichlorobenzene	106-46-7	7.0E-03	1.6E-02					60 (c)	450				
Acrylonitrile	107-13-1	3.4E-02	8.0E-02		1E-01			2.2	4.3	20	15-minute	20	15-minute
Arsenic	7440-38-2	7.1E-08	1.7E-07		2E-07			--	0.01			0.002	15-minute
Benzene	71-43-2	3.3E-01	7.7E-01		1E+00			0.32	3.2	20	15-minute	3	15-minute
Beryllium	7440-41-7	9.4E-09	2.2E-08	2E-08			4E-08	--	0.002	0.005	30-minute	0.0005	ceiling
Cadmium	7440-43-9	7.6E-08	1.8E-07		2E-07		3E-07	--	0.005	0.6	ceiling		
Chloroform	67-66-3	2.0E-02	4.8E-02		6E-02		8E-02	49 (c)	--	240	ceiling	9.78	60-minute
Chromium (e)	7440-47-3	2.8E-07	6.6E-07					0.5	0.5				
Chromium VI	18540-29-9	1.6E-07	3.8E-07					0.001 (e)	0.005				
Cobalt	7440-48-4	7.7E-07	1.8E-06					0.05	0.1				
Copper	7440-50-8	8.8E-08	2.1E-07					1	1				
Cyclohexane	110-82-7	9.6E-01	2.2E+00					1050	1050				
Ethylbenzene	100-41-4	5.2E-02	1.2E-01		2E-01			435	435			545	15-minute
Naphthalene	91-20-3	7.6E-05	1.8E-04		2E-04			50	50			75	15-minute
n-Hexane	110-54-3	1.4E-01	3.2E-01					180	1800				
Nickel	7440-02-0	2.7E-07	6.3E-07					0.015	1				
Styrene	100-42-5	1.3E-02	3.1E-02		4E-02		5E-02	215	430	850	5-minute	425	15-minute
Tetrachloroethylene	127-18-4	3.2E-01	7.5E-01				1E+00	170 (c)	680	1360	5-minute		
Toluene	108-88-3	8.8E-02	2.1E-01		3E-01	3E-01		375	750	1130	10-minute	560	15-minute
Trichloroethylene	79-01-6	9.2E-02	2.1E-01				3E-01	134 (d)	540	1070	5-minute		
Vinyl Chloride	75-01-4	5.4E-01	1.3E+00		2E+00			2.6 (c)	2.6	13	15-minute		

TWA = time weighted average.
-- = not available or not calculated.

(a) The maximum modeled on-site 8-hour and 1-hour average air concentrations were based on: 1) the maximum modeled receptor location on site (about 10 meter from H-1); 2) the highest ISCST3-modeled unitized 8-hour average and 1-hour average concentration among all modeled concentrations at the maximum receptor location; and 3) maximum fugitive chemical-specific emission rates calculated based on the maximum spent carbon concentrations unloaded at H-1 for vapor spent carbon. The highest ISCST3-modeled unitized 8-hour and 1-hour average concentrations at the maximum modeled receptor location were 16,426 ug/m3 per 1 g/sec, and 38,302 ug/m3 per 1 g/sec, respectively.
(b) Sources: OSHA PELS - www.osha.gov/pls/oshaweb. NIOSH RELs - www.cdc.gov/niosh/npg. ACGIH TLVs - www.osha.gov/dts/chemicalsampling/toc/toc_chemsamp.html.
(c) The ACGIH TWA-threshold limit value (TLV) was used, if available, if a NIOSH REL was not available.
(d) 10-hour TWA concentration.
(e) NIOSH REL for CrVI is a 10-hr TWA. The listed OSHA PEL for chromium is based on CrIII and CrII. The value for chromium metals and insoluble salts is slightly higher, at 1 mg/m3.
(f) Short-term concentrations were calculated using screening-level scaling factors for durations that corresponded to available short-term occupational exposure limits. Source for screening-level scaling factors: USEPA. 1992. Workbook of Screening Techniques for Assessing Impacts of Toxic Air Pollutants (Revised). EPA-454/R-92-024.

management procedures. A detailed description of on-site risk management procedures and OSHA compliance programs is provided in the RCRA Part B permit application submitted to USEPA in February 2007 (Focus 2007). In addition, the risk assessment Workplan prepared in 2003 presented a summary of workplace practices implemented under OSHA.

In response to this comment, a summary of information related to these topics is provided below, with reference to pertinent sections of the RCRA Part B permit.

The facility's worker health and safety program includes training, medical monitoring, industrial hygiene sampling, hazard communication and use of personal protective equipment, as outlined in Table 15. This program includes an extensive training program to ensure worker safety in areas ranging from use of personal protective equipment to minimize potential chemical exposures, to fall and back protection to minimize the chance of accidental injury or muscle strain. All employees must undergo 40 hours of training related to hazardous waste operations when initially hired, plus an 8-hour refresher course each year. All employees are required to attend regularly scheduled safety meetings and are also required to pass an additional safety test each month. Section H and Appendix XIV of the RCRA Part B permit application provide more details on the facility's personnel training program, including an overall description of the personnel training program and requirements established for handling of hazardous wastes at the facility.

The facility's worker health and safety program includes provision and use of personal protective equipment. All workers involved in spent carbon unloading operations wear respirators in addition to protective clothing. Workers wear company-supplied shirts, pants and steel-toe boots, hard hat, and safety glasses. When handling any spent carbon (whether it is classified as non-hazardous or hazardous), a half-face respirator with organic and dust control cartridges is worn by workers. This practice has been followed since 1992. All employees also receive physicals prior to the start of work and annually thereafter, including the performance of blood testing, EKGs, hearing tests, and pulmonary function tests.

Industrial hygiene (IH) monitoring is conducted each year for a wide variety of organic compounds and dust in air to ensure that adequate personal protective equipment is being used at the facility. The IH monitoring also evaluates noise conditions at the plant. The annual IH surveys monitor workplace breathing zone concentrations of organic compounds and particulate matter among workers employed in a variety of tasks at the facility, for example workers unloading and sampling spent carbon containers, lab technicians and facility assistant managers. As described previously in response to General Comment 2, the IH monitoring includes workers whose potential exposures may be high based on the activities they perform during the workday.

The facility has a variety of safety, emergency and security devices and procedures in place to minimize the possibility of an explosion, fire, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water which could threaten human health or the environment. These devices and procedures are described in Section F of the RCRA Part B permit application. Section F also describes the security measures and devices that are used to prevent unauthorized site entry and minimize

Table 15
Siemens Water Technologies Corp. Facility Worker Protection Program

1. Corporate EH&S Manual

2. Local Training Programs

40-Hour Hazwoper Training (new employees)
Hazard Communication (Computer)
Confined Space (Computer)
Lock Out/Tag Out (Computer)
Bloodborne Pathogens (Computer)
Fire Extinguisher
Contingency Plan
Personal Protection Equipment (Computer)
Back Safety (Computer)
Respiratory Protection (Computer)
Forklift Training (Computer)
Hot Work
First Aid (Every Other Year)
HM-181 (Computer)
Hearing Protection (Computer)
Electrical Safety (Computer)
Laboratory Safety (Computer)
Fall Protection
8-Hour Hazwoper Refresher
Hazardous Debris Management
Burn Prevention
Acid and Caustic Handling

3. Annual Employee Physicals

General Physical
Blood Workup
EKG
Hearing Test
Pulmonary Function Test

4. Annual Employee IH Monitoring (organics, dust, noise)

5. Annual Respirator Fit Test

6. Monthly Employee Safety Meetings

7. Monthly Safety Committee Meetings

8. Company Furnished Items: Split Lockeroom, Showers, Soap, Towels, Work clothes, Steel-Toed Safety Shoes, Safety Glasses, Gloves, etc.

the possibility of livestock or persons contacting hazardous waste or hazardous waste management units. Additionally, the facility has a comprehensive inspection schedule and inspection procedures to ensure that all facility equipment is in proper operating condition and is being operated properly, as described in Appendix XII in the permit application.

The facility also has a Contingency Plan, presented in Section G and Appendix XIII of the permit application, which is designed to minimize hazards to human health or the environment in the event of a fire, explosion or any unplanned sudden or nonsudden release of hazardous waste or hazardous waste constituents to air, soil or surface water.

11. Evaluation of Reactivation Facility Incremental Impact to CRSSJV Discharge – Section 4.4.3.3, pg. 47

Comment:
"The subsection regarding the "Compil(ation) of chemical concentrations in effluent and select compounds for evaluation" should be expanded to include additional levels of detail. Similar to the manner in which the waste stream was well characterized in preparation of the facility-specific PDT, this section should include general descriptions of the type and magnitude of waste treated while facility effluent data was being compiled. These waste characterization efforts should coincide with the window of time (2005-2006) which serves as the basis for effluent analysis. The subsection should also be expanded to include details regarding effluent monitoring or sampling frequency throughout the period used for analysis."

Response:

The facility performs routine effluent monitoring for a variety of constituents. The facility is required to monitor twice per month for total suspended solids, once per month for chemical oxygen demand (COD) and once per year for a comprehensive priority pollutant test in accordance with its discharge permit issued by the Colorado River Sewage System Joint Venture (CRSSJV) publicly owned treatment works (POTW). The annual comprehensive priority pollutant test samples effluent for more than 20 inorganic compounds, and more than 70 organic compounds, including volatile organics, semi-volatile organics, organochlorine pesticides, and polychlorinated biphenyls (PCBs). The facility's effluent that is discharged to the POTW is also continuously monitored for pH, total dissolved solids, flow, and temperature. The facility also conducts biannual sampling in compliance with USEPA's Centralized Waste Treatment (CWT) categorical pretreatment standards and its analytical results are submitted to both USEPA and CRIT every 6 months. The CWT analysis includes several organic compounds, metals, and oil and grease, in accordance with 40 CFR 437.46(b).

Effluent discharge data from 2005-2006 are provided in Table 4.4-6 in the risk assessment. These data encompass roughly 30 separate sampling events, and include results from several days of sampling conducted during the PDT, biannual sampling conducted in compliance with the CWT categorical pretreatment standards, one sampling event conducted for the facility's annual priority pollutants testing report, and monthly composite metals sampling

that was conducted for a limited time for internal Siemens reference. The submitted regulatory monitoring reports for these tests are provided in Attachment F.

In general, since the facility accepts spent carbon that has been used for a variety of different purposes (e.g., treating industrial and municipal wastewater, groundwater, surface water, process materials, or for removing pollutants from vent gases) and at a variety of different locations, the type and magnitude of the spent carbon treated at the facility varies. A detailed description of spent carbon treated during the PDT, and the spiked materials that were added to the feed during the test, is provided in the comprehensive PDT report (Focus 2006). The composition of the spent carbon was considered in establishing the feed for the PDT in order to develop test conditions that were illustrative of the variability of the carbon received by the facility, although to be conservative the feed during the PDT was more heavily loaded with compounds than is typical due to the addition of several spiked materials, and the feed rate was higher than is typical. Sections 3.2 and 3.3 of the PDT report contain information on the spent carbon and spiked material characteristics and constituent feed rates during the PDT. The spent carbon feed rate to the furnace during the PDT averaged 3,049 lbs/hour. During the 2005 priority pollutant testing, the average spent carbon feed rate to the furnace was 2,716 lbs/hour. The average spent carbon feed rate during the biannual CWT tests in 2005 and 2006 ranged from 2,473 lbs/hour to 2,707 lbs/hour. The amount of spent carbon fed to the furnace in 2005 and 2006 averaged 2,680 lbs/hour and 2,686 lbs/hour, respectively. In 2005 and 2006, the annual average total concentration in spent carbon received, calculated based on the sum of all organic and inorganic compound concentrations reported in spent carbon profiles, was approximately 2,100 ppm and 2,800 ppm, respectively. Overall, the 2005-2006 sampling data in Table 4.4-6 (other than the PDT data) are likely to represent a good cross-section of the wide range of spent carbon that is routinely received at the facility.

12. Calculation of incremental facility concentrations resulting from water treatment

Comment:
"The subsection regarding the "Calculat(ion of) incremental facility concentrations resulting from water treatment" should provide additional detail on the relationship between the CRSSJV's removal efficiencies for BOD and suspended solids in treated waters with the removal efficiencies estimated for the range of constituents identified in the SWT effluent."

Response:

In response to USEPA's comment, the following discussion provides additional detail on the relationship between the CRSSJV's removal efficiencies for biological oxygen demand (BOD) and suspended solids in treated waters with the removal efficiencies estimated for the constituents identified in the SWT effluent.

Section 4.4.3.3 in the risk assessment describes the mathematical modeling used to calculate facility-related incremental concentrations in the CRSSJV discharge due to effluent from the carbon reactivation facility that enters the CRSSJV. This methodology took into account the effectiveness of water treatment at the CRSSJV in removing particulates and organics from water prior to discharge. The CRSSJV treatment plant's discharge records for 2005

documented 98% removal of suspended solids and 98% removal of BOD. For purposes of this analysis, suspended solids removal is assumed to correlate directly with particulate removal, and BOD removal is assumed to correlate directly with organics removal. Accordingly, the removal efficiencies for effluent from the facility treated at the CRSSJV were assumed to be 98% for particulates, based on the reported suspended solids removal efficiency, and 98% for organics, based on the facility's reported BOD removal efficiency.

Analysis for chemical material in water and wastewater is classified into two general types of measurements: those that quantify an aggregate amount of chemical matter comprising constituents with a common characteristic and those that quantify individual compounds (APHA/AWWA/WEF 1998). Two aggregate parameters, BOD and total suspended solids (TSS) have traditionally been used to assess the performance and efficacy of waste water treatment plants (Metcalf & Eddy 1991). The common characteristic measured by BOD is the ability of aggressive microorganisms to degrade organic constituents. The common characteristic measured by TSS is the amount of insoluble inorganic constituents.

Operationally, BOD measures the amount of oxygen consumed by heterotrophic microorganisms during the biochemical oxidation of organic matter over a period of 5 days under controlled conditions. Since most organic chemicals (including the priority pollutants) are biodegradable to some extent, BOD can be used as a surrogate for the overall destruction and removal efficiency of individual organics. As an example, we can look at the common priority pollutant toluene. Toluene is 98.6% biotransformed during secondary wastewater treatment (Verschueren 2001). The BOD reduction (as a percentage of the amount that can be rigorously chemically oxidized) corresponding to this treatment is about 86%. Thus the use of BOD is a plausible (albeit conservative) estimate for the destruction and removal of toluene.

Inorganics, particularly metals, in water are partitioned into two broad categories – dissolved and sorbed or chemical incorporated into particulate. Taken together, these categories constitute the aggregate parameter of total solids. Dissolved solids is determined by the residue remaining following evaporation while undissolved particulate is determined by the fraction of materials that is retained on a filter (APHA/AWWA/WEF 1998). The filters normally used to effect this separation have pore sizes between 1.0 and 1.2 µm, thus, only extremely small particulate or colloidal matter can pass (Metcalf & Eddy 1991). The removal of TSS in a wastewater treatment plant is thus a surrogate for the removal of undissolved particulate which is primarily composed of insoluble inorganic matter.

13. Potential fish ingestion risks for the Main Drain – Section 4.4.3.5, pg. 50
This comment includes two items, each of which is addressed below.

13a. Potential fish ingestion risks for the Main Drain – Subsistence Scenario

Comment:
"The risk characterization of this subsistence receptor scenario (fisher), and all subsistence receptor scenarios evaluated, should include the likelihood and magnitude of the entire range of direct and indirect exposures that these receptors incur. EPA's HHRAP guidance is clear, the subsistence fisher exposure scenario assumes that the receptor is exposed to

contaminants emitted from the facility via direct inhalation of vapors and particles, via incidental ingestion of soil, via ingestion of drinking water from surface water sources, via ingestion of homegrown produce, via ingestion of fish, and via ingestion of breast milk. Therefore, please revise and supplement the subsistence receptor risk and hazard estimates with a comprehensive estimate of impact inclusive of the recommended pathways of contaminant exposure."

Response:

In response to this comment, the potential risks due to stack emissions for hypothetical subsistence receptors were expanded to explicitly add in the potential subsistence fish ingestion risks associated with the incremental impact of facility effluent discharged from the CRSSJV.

Table 16 presents the potential fish ingestion risks associated with the incremental impact of facility-effluent on the CRSSJV discharge. These results, which conservatively assume that an adult receptor obtains 100% of the fish they ingest from only the Main Drain over a 30-year period, are well below USEPA's target risk level. The evaluation of the potential incremental impact of facility effluent on the CRSSJV discharge is presented in the risk assessment in Section 4.4.3.5 and Table 4.4-12.

Table 16 also shows the potential risks associated with stack emissions for the receptor with the highest results calculated in the risk assessment (i.e., adult town resident "receptor R_2" who is also assumed to be a subsistence fisher) (see Table 7 in response to Specific Comment 4).

The resulting combined risks shown in Table 16, inclusive of all pathways and reflecting potential impacts from both stack emissions and incremental effluent-related discharge from the CRSSJV, are below USEPA's target risk levels for both cancer and non-cancer health effects. As shown in Table 9, the stack emissions risk assessment results are dominated by one compound, benzidine, which was not detected in the PDT stack gases and which has never been accepted in spent carbon at the facility. When this one compound is removed from the calculations, the risks drop substantially below USEPA's target risk levels. When only detected compounds are included, the risks are reduced even further below target levels.

The likelihood of the subsistence scenario actually occurring is considered to be extremely small, because it incorporates a number of high-end assumptions that each are expected to have a low likelihood of occurrence (e.g., (i) assuming that 100% of a town resident's produce diet for a 30-year period is obtained from homegrown produce, even though the climate limits growing seasons to only selected months of the year, and (ii) assuming that 100% of a person's fish diet over a 30-year period is obtained solely from fish caught in the Main Drain). The potential combined risks for subsistence receptors are considered to reflect high-end scenarios that are highly unlikely to be exceeded.

HHRAP guidance (Chapter 4, Chapter 7 and Appendix C) recommends that infant exposure via breast-milk ingestion be evaluated separately from other exposure scenarios. The

Table 16

Combined Potential Risks for Hypothetical Subsistence Receptors: Stack Emissions and Effluent-Related Discharge from the Joint Venture

Receptor and Group of Evaluated Compounds	Excess Lifetime Cancer Risk		Total Hazard Index	
	Risk assessment results	Subsistence scenario	Risk assessment results	Subsistence scenario
Incremental Effluent-Related Discharge from POTW: Adult Subsistence Fisher (Main Drain) (a)				
All detected compounds in facility effluent	3E-07		1E-02	
Stack Emissions: Adult Town Resident + Subsistence Fisher (Main Drain) (a, b)				
Group 1 – all detected compounds in stack emissions (95 compounds)	7E-08	1E-07	6E-02	
Group 2 – all compounds in stack emissions except benzidine (177 compounds)	2E-07	3E-07	6E-02	
Group 3 – all compounds in stack emissions (178 compounds) (c)	2E-06	9E-06	6E-02	
Incremental Effluent-Related Discharge from POTW + Stack Emissions: Adult Town Resident + Subsistence Fisher (Main Drain) (a)				
Group 1 – all detected compounds in stack emissions (95 compounds)	4E-07	4E-07	7E-02	
Group 2 – all compounds in stack emissions except benzidine (177 compounds)	5E-07	3E-07	7E-02	
Group 3 – all compounds in stack emissions (178 compounds) (c)	2E-06	9E-06	7E-02	
USEPA Target Risk Levels				
Target risk levels for combustion source risk assessment	1E-05		0.25	

(a) The subsistence fish ingestion pathway assumes 100% of a person's fish diet is provided by fish caught from the Main Drain.

(b) Results are shown for the receptor with the highest calculated potential risks associated with stack emissions (the adult town resident receptor "R_2", who is also assumed to be a subsistence fisher receptor "R_only_fish_drain"). Potential risks for all other evaluated receptors were lower than these values. The town resident receptor is assumed to be exposed via inhalation, soil ingestion, produce ingestion and fish ingestion. The risk assessment assumes that 20% of a person's produce diet is home grown. The subsistence scenario assumes 100% of a persons' produce diet is home grown.

(c) The stack emissions risk results for Group 3 compounds (which includes 83 compounds that were not detected in stack emissions) were dominated by one compound, benzidine, which was not detected stack gases and for which there is no evidence that it has ever been accepted in spent carbon received at the facility.

guidance does not recommend adding infant risks from ingestion of breast-milk to risks calculated for other receptors (adult or child) via other exposure pathways. Rather the guidance recommends calculating cumulative risks for each given receptor. Accordingly, potential risks from breast-milk ingestion by an infant receptor were not added into the combined risks shown in Table 16, which were based on an adult receptor. Rather, as described in Section 4.4.1.3 in the risk assessment, potential risks for a breast-fed infant were calculated using the recommended HHRAP method in which average daily doses of PCDDs/PCDFs from breast-milk ingestion are compared to a background level for a nursing infant. The risk assessment results demonstrated that potential exposure to PCDDs/PCDFs by a nursing infant would be far below background levels.

Potential exposures via drinking water were not evaluated in the risk assessment because drinking water is obtained from groundwater wells for both the CRIT area and for the Town of Parker. Drinking water for CRIT is provided by the CRIT Regional Water System. Drinking water for the Town of Parker is provided by the town water department.

13b. Potential fish ingestion risks for the Main Drain – Exposure Duration

Comment:
"In addition, the details regarding the number of years of contaminant exposure incurred by each subsistence receptor is not clear as presented in table 4.4-12. Please revise the table and narrative in this section by replacing the term "many years", with the precise number of years assumed for determination of both subsistence and chronic-level health impact."

Response:

Footnote (f) in Table 4.4-12 in the risk assessment indicates that the exposure durations used in the fish ingestion exposure calculation were 30 years for an adult and 6 years for a child. These are the recommended default values from HHRAP. The revised narrative in the risk assessment reads as follows (edits in italics): "In the absence of site-specific data, it was conservatively assumed that 100% of the fish eaten by a person every year, *for 30 years by an adult receptor and 6 years by a child receptor,* would be caught only from the Main Drain."

14. Evaluation of subsistence exposure pathways – Section 4.5.9, pg. 61

Comment:
"This assessment of facility-associated health and ecological impact has attempted to comprehensively characterize the range and magnitude of constituents released, and the settings or conditions under which potential exposure may occur. To the extent practicable, site-specific exposure conditions and assumptions were applied to the analysis in an attempt to reduce assessment uncertainty. Many tribal subgroups enjoy unique and culturally significant practices which may effectively serve to increase their exposure to toxic constituents released to the terrestrial environment. The use of sweat lodges and the use of plants and other agricultural products for cultural and/or traditional healing practices illustrate this concept.

This risk assessment report should be expanded to detail all efforts made to evaluate and assess potential impacts resulting from idiosyncratic and culturally-specific tribal practices with the potential to increase contaminant exposure. To the extent these efforts have been made, and the lack of exposure information from culturally-specific tribal practices results in significant datagaps, the influence of those exposure-related datagaps on the overall risk and hazard estimates should be described and characterized as an element of uncertainty."

Response:

The risk assessment aimed to incorporate as much site-specific information as available, including information from CRIT. In 2002, CRIT developed a protocol for obtaining all site-specific information relating to CRIT and tribal members for use in performing the risk assessment. This protocol is presented in Appendix A of the November 2003 Working Draft Risk Assessment Workplan and reprinted here in Attachment G. The protocol was approved as part of the Risk Assessment Workplan and was followed for the risk assessment project, as discussed recently in a phone call with USEPA.[18] Adherence to this protocol is essential for both the integrity of the risk assessment process and for recognition of the unique status and role of CRIT in the permitting process.

The protocol ensures that the RCRA permitting process will provide appropriate respect and deference to Native religious and cultural practices. This has precluded the inclusion of a detailed assessment of these practices in the risk assessment. As with many variables in risk assessment methodology, this adds some uncertainty to the assessment. The potential exposures that were characterized, particularly for subsistence receptors, may provide insight into potential risks from other exposure pathways.

15. Table 4.4-6, 2005-2006 Effluent Discharge Data from Facility

Comment:
"The subject table details the constituents discharged from the facility via the main drain. The primary compounds released via this pathway remain inorganic and metallic constituents. Please develop a supporting narrative for the table which better explains, from a facility-specific constituent fate and transport perspective, why so few organic constituents are subject to release in this aqueous discharge."

Response:

Every organic compound that was detected, even once, in the sampling programs noted in Table 4.4-6 in the risk assessment was evaluated in the risk assessment.[19] As noted above, the facility monitors its effluent for a variety of organic parameters in accordance with its discharge permit and USEPA regulations. The annual comprehensive priority pollutant sampling analyzes the facility effluent for more than 70 organic compounds, including

[18] Telephone conference call with Patrick Wilson, USEPA Region IX, Monte McCue, Siemens Water Technologies Corp. Plant Manager, and Sarah Foster, CPF Associates, Inc. January 14, 2008.
[19] Organic compounds that were detected only in the PDT effluent testing and were also spiked into the feed materials during the PDT were not selected for evaluation (see Table 4.1-1 in the risk assessment for spiking information).

volatile organics, semi-volatile organics, organochlorine pesticides, and polychlorinated biphenyls (PCBs), in addition to more than 20 inorganic compounds. The biannual CWT sampling analyzes effluent for nine organic compounds, in addition to metals and oil and grease, in accordance with 40 CFR 437.46(b). Sampling conducted as part of the PDT analyzed effluent for over 100 volatile and semi-volatile organic compounds.

The small number of detected organic compounds in facility effluent is a reflection of the facility's carbon regeneration process. Effluent from the facility is discharged from Tank 11 which contains scrubber water blow down, cooling water blow down, boiler blow down, and excess recycle water. Two of these effluent water sources come into contact with compounds associated with spent carbon, the scrubber water that is used to scrub exhaust gases in the facility's air pollution control system, and the recycle water that is used to facilitate transport of spent carbon from the hoppers to the furnace. The presence of organic compounds in scrubber water blow down is limited because these compounds are largely destroyed in the combustion process. The destruction rate of the afterburner is designed to achieve a stringent destruction and removal efficiency (DRE) of 99.99%. The DREs actually achieved in the PDT, which was conducted under challenged operating conditions, were even higher, ranging on average from 99.9941% to 99.997% (see Table 4-1 in the PDT report) (Focus 2006). The transfer of organic compounds that are not destroyed in the afterburner to scrubber water may also be limited by their chemical-physical characteristics (e.g., highly volatile or poorly water soluble compounds will not tend to partition into the aqueous phase). Recycle water accounts for only about 0.1% of the water in Tank 11 and thus the recycle water has a negligible effect on organics in the effluent. The effectiveness of these procedures in limiting organic compounds in the facility effluent is evident in the results compiled for the risk assessment. Out of the more than 100 organic compounds tested for across the multiple sampling programs considered, less than 10 were detected and these were evaluated in the risk assessment.

16. Table 1, Compilation of Chronic Human Health Toxicity Criteria for Compounds not Included in USEPA's 2005 HHRAP

Comment:
"The source of toxicity information (rfd) for the element cobalt appears to be U.S. EPA's Provisional Peer-Reviewed Toxicity Value (PPRTV) database rather than from ATSDR datasource. Please review and confirm the source of all toxicity values to ensure the accuracy of table #1."

Response:

The sources of all toxicity values in Table 1 of Appendix B have been reviewed and confirmed. A check of USEPA's PPRTV database provided by the National Center for Environmental Assessment (NCEA), specifically the "PPRTV Status Table for Registered Users" for the 4th Quarter FY07, showed that cobalt is not on the list of compounds addressed. In the absence of values from USEPA's Integrated Risk Information System (IRIS) or the PPRTV database, toxicity values for cobalt were obtained from one of the other preferred sources recommended in HHRAP. The toxicity values for cobalt were based

on minimum risk levels (MRLs) developed by the Agency for Toxic Substances and Disease Registry (ATSDR).

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ATTACHMENTS

ATTACHMENT A

STACK EMISSIONS RISK ASSESSMENT:

ACUTE INHALATION RISK RESULTS

UNDER HYPOTHETICAL UPSET CONDITIONS

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
UPSET CONDITIONS (MAXIMUM MEASURED EMISSION RATE *10)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
A_1 max hourly impact point (stack)	
Nitrogen dioxide	3.9E-01
Sulfur dioxide	1.4E-01
Arsenic	4.1E-02
Chlorine	5.6E-03
Lead	4.6E-03
Hydrogen chloride	3.4E-03
Nickel	2.7E-03
Copper	2.2E-03
Cadmium	5.4E-04
Hexachlorobenzene	9.9E-05
Chlorophenyl-phenylether, 4-	8.9E-05
Beryllium	7.8E-05
Chloroform (Trichloromethane)	6.6E-05
Benzidine	6.0E-05
Dibromo-3-chloropropane, 1,2-	5.1E-05
Thallium (I)	4.7E-05
Manganese	3.0E-05
Mercury	2.7E-05
Vanadium	2.7E-05
Hexachlorocyclopentadiene	2.2E-05
Silver	1.9E-05
4,6-Dinitro-2-methylphenol	1.3E-05
Zinc	9.8E-06
Barium	9.1E-06
Mercuric chloride	6.8E-06
Pentachlorophenol	6.1E-06
Aluminum	5.9E-06
Tetrachloroethylene (Perchloroethylene)	5.7E-06
Chromium	5.2E-06
Chromium, hexavalent	5.2E-06
Selenium	4.1E-06
Fluoranthene	3.5E-06
Nitrosodipropylamine, n-	2.9E-06
Antimony	1.7E-06
Bromoform (tribromomethane)	1.7E-06
Chlorobenzene	1.6E-06
Benzoic Acid	1.3E-06
Dinitrotoluene, 2,4-	1.3E-06
Benzene	1.2E-06
Methylene chloride	1.2E-06
3-Penten-2-one, 4-methyl	1.1E-06
Bromodichloromethane	1.1E-06
Ethylhexyl phthalate, bis-2-	1.1E-06
Dinitrotoluene, 2,6-	1.1E-06
Dibromochloromethane	1.0E-06
Methyl bromide (Bromomethane)	8.5E-07
Dinitrophenol, 2,4-	7.2E-07
Nitrophenol, 4-	6.9E-07
Nitroaniline, 3-	6.9E-07
Chloronaphthalene,2-	6.6E-07
Dichlorobenzidine, 3,3'-	5.1E-07
Methylene bromide	5.1E-07
PentaCDF, 2,3,4,7,8-	4.5E-07
Pentachloronitrobenzene (PCNB)	4.2E-07
Toluene	4.2E-07
Cobalt	3.9E-07
Chlorobenzilate	3.2E-07
Dimethylphenol, 2,4-	3.0E-07
Acrylonitrile	3.0E-07
Nitrophenol, 2-	2.6E-07
Heptachlor	2.4E-07
Carbon Tetrachloride	2.4E-07
Carbazole	2.3E-07
Benzaldehyde	2.3E-07
Dinitrobenzene, 1,3-	2.2E-07
Methyl ethyl ketone (2-Butanone)	2.1E-07
Benzyl alcohol	2.1E-07
Phenanthrene	1.6E-07

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
UPSET CONDITIONS (MAXIMUM MEASURED EMISSION RATE *10)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Nitroaniline, 4-	1.5E-07
Benzonitrile	1.5E-07
Di-n-butyl phthalate	1.5E-07
Aniline	1.4E-07
Carbon Disulfide	1.4E-07
Methyl chloride (Chloromethane)	1.3E-07
Heptachlor epoxide	1.3E-07
Phenol	1.2E-07
Endrin	9.5E-08
Chlorophenol, 2-	8.5E-08
Chloroaniline, p-	8.3E-08
Trichlorobenzene, 1,2,3-	6.8E-08
Acetone	6.8E-08
Bromophenyl-phenylether, 4-	6.7E-08
Chloro-3-methylphenol, 4-	6.5E-08
Hexachloro-1,3-butadiene (Perchlorobutadiene)	6.3E-08
Naphthalene	6.3E-08
Acetophenone	6.3E-08
Cresol, o-	6.2E-08
N-nitrosodimethylamine	5.5E-08
Butylbenzylphthalate	4.4E-08
Chlordane	4.3E-08
Dichlorobenzene, 1,3-	4.2E-08
2,5-Dimethylheptane	4.1E-08
Diethyl phthalate	4.0E-08
Acenaphthylene	4.0E-08
Tetrachloroethane, 1,1,2,2-	3.9E-08
Vinyl Acetate	3.8E-08
Dichloropropene, 1,3- (cis)	3.5E-08
Xylene, p-	3.4E-08
Xylene, m-	3.4E-08
Bis(2-chloroethoxy) methane	3.3E-08
Trichlorophenol, 2,4,5-	3.2E-08
Nitroaniline, 2-	3.1E-08
Nitrobenzene	3.1E-08
Dichlorophenol, 2,4-	2.9E-08
Benzo(b)fluoranthene	2.9E-08
2-Hexanone	2.8E-08
Hexachloroethane (Perchloroethane)	2.8E-08
Cresol, p-	2.7E-08
Cresol, m-	2.7E-08
Dimethyl phthalate	2.7E-08
Endosulfan I	2.6E-08
Trichlorophenol, 2,4,6-	2.5E-08
BHC, beta-	2.4E-08
Pyridine	2.2E-08
Dibenzofuran	2.1E-08
Diphenylamine	2.1E-08
Bromobenzene	2.0E-08
Indeno(1,2,3-cd) pyrene	1.9E-08
Tetrachlorobenzene, 1,2,4,5-	1.9E-08
Aldrin	1.9E-08
Nitrosodiphenylamine, N-	1.9E-08
Isophorone	1.9E-08
Pentachlorobenzene	1.8E-08
Di-n-octylphthalate	1.7E-08
Trichlorobenzene, 1,2,4-	1.6E-08
Chrysene	1.5E-08
Aroclor 1254	1.4E-08
Diphenylhydrazine,1,2-	1.4E-08
3-Ethyl benzaldehyde	1.3E-08
4-Ethyl benzaldehyde	1.3E-08
Trichloropropane, 1,2,3-	1.2E-08
DDT, 4-4'-	1.2E-08
Butylbenzene, sec	1.2E-08
Xylene, o-	1.2E-08
1,1-Dichloropropene	1.0E-08
Trichloroethane, 1,1,2-	9.5E-09
Dieldrin	9.2E-09
BHC, alpha-	9.0E-09
Benzo(a)Anthracene	8.7E-09

ACUTE INHALATION RISK RESULTS

**REACTIVATION FACILITY STACK EMISSIONS -
UPSET CONDITIONS (MAXIMUM MEASURED EMISSION RATE *10)**

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Styrene	8.1E-09
Bis(2-chlorethyl)ether	8.1E-09
Benzo(k)fluoranthene	7.8E-09
2,2'-oxybis (1-Chloropropane)	7.7E-09
Iodomethane	7.2E-09
Methyl isobutyl ketone	5.6E-09
Benzo(a)pyrene	5.0E-09
gamma-BHC (Lindane)	4.6E-09
TetraCDD, 2,3,7,8-	4.3E-09
Ethylene dibromide	3.9E-09
TetraCDF, 2,3,7,8-	3.9E-09
Trichloroethylene	3.6E-09
Tetrahydrofuran	3.6E-09
Pyrene	3.5E-09
DDD, 4,4'-	3.5E-09
Tetrachloroethane, 1,1,1,2-	3.1E-09
1,3-Dichloropropane	3.0E-09
Butylbenzene, n-	2.9E-09
Dichloroethylene 1,1-	2.8E-09
2,2-Dichloropropane	2.8E-09
Butylbenzene, tert	2.7E-09
Vinyl Chloride	2.5E-09
Trichloroethane, 1,1,1-	2.4E-09
PentaCDD, 1,2,3,7,8-	2.3E-09
Anthracene	2.3E-09
Acenaphthene	2.2E-09
2-Methylnaphthalene	2.1E-09
Trimethylbenzene, 1,3,5-	1.9E-09
Dichlorobenzene, 1,2-	1.7E-09
Dichloroethane, 1,2- (Ethylene Dichloride)	1.6E-09
HexaCDF, 1,2,3,6,7,8-	1.5E-09
HexaCDF, 2,3,4,6,7,8-	1.2E-09
Methoxychlor	1.1E-09
Dichlorobenzene,1,4-	1.0E-09
DDE, 4,4'-	9.8E-10
HexaCDF, 1,2,3,4,7,8-	9.8E-10
Fluorene	8.6E-10
Cumene (Isopropylbenzene)	8.5E-10
2-Chlorotoluene	7.5E-10
4-Chlorotoluene	7.5E-10
Ethylene Glycol	6.5E-10
Propylbenzene, n-	6.2E-10
Trichlorofluoromethane (Freon 11)	5.4E-10
1,2,4-Trimethylbenzene	5.4E-10
Dichloroethylene, cis-1,2-	4.8E-10
Ethylbenzene	4.7E-10
Dichloropropane, 1,2-	4.7E-10
PentaCDF, 1,2,3,7,8-	4.0E-10
HexaCDD, 1,2,3,4,7,8-	3.1E-10
Chloroethane	3.1E-10
Dichlorodifluoromethane	3.1E-10
Bromochloromethane	3.0E-10
Benzo(g,h,i)perylene	3.0E-10
methyl tert-butyl ether	2.4E-10
Propylene oxide	1.7E-10
Dichloroethylene-1,2 (trans)	1.5E-10
Dichloroethane 1,1-	1.5E-10
Methyl methacrylate	4.1E-11
HexaCDD, 1,2,3,7,8,9-	3.8E-11
HexaCDD, 1,2,3,6,7,8-	2.3E-11
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	2.0E-11
Dibenz(a,h)anthracene	1.9E-11
Dioxane, 1,4-	1.5E-11
HeptaCDF, 1,2,3,4,6,7,8-	3.8E-12
HexaCDF, 1,2,3,7,8,9-	2.0E-12
Acrylic Acid	1.6E-12
OctaCDF, 1,2,3,4,6,7,8,9-	1.1E-12
1-Hexane (n-hexane)	2.8E-13
HeptaCDF, 1,2,3,4,7,8,9-	2.5E-13
OctaCDD, 1,2,3,4,6,7,8,9-	2.3E-13
HeptaCDD, 1,2,3,4,6,7,8-	1.8E-13

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
UPSET CONDITIONS (MAXIMUM MEASURED EMISSION RATE *10)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Endosulfan sulfate	NC
2,5-Dione, 3-hexene	NC
Benzo(e)pyrene	NC
Perylene	NC
Phosphine imide, P,P,P-triphenyl	NC
Diallate	NC
9-Octadecenamide (oleamide)	NC
delta-BHC	NC
2-Methyl octane	NC
Endosulfan II	NC
Endrin ketone	NC
3-Penten-2-one (ethylidene acetone)	NC
2,5-Dimethylfuran	NC
Endrin aldehyde	NC
3-Hexen-2-one	NC
Benzoic acid, methyl ester (methyl benzoate)	NC
Isopropyl toluene, p-	NC
Total (b)	5.9E-01
A_2 closest business	
Nitrogen dioxide	3.9E-01
Sulfur dioxide	1.4E-01
Arsenic	1.6E-02
Chlorine	5.6E-03
Hydrogen chloride	3.4E-03
Lead	1.9E-03
Nickel	1.1E-03
Copper	9.0E-04
Cadmium	2.2E-04
Hexachlorobenzene	9.9E-05
Chlorophenyl-phenylether, 4-	9.0E-05
Chloroform (Trichloromethane)	6.7E-05
Benzidine	5.8E-05
Dibromo-3-chloropropane, 1,2-	5.2E-05
Beryllium	3.1E-05
Mercury	2.8E-05
Hexachlorocyclopentadiene	2.2E-05
Thallium (I)	1.9E-05
4,6-Dinitro-2-methylphenol	1.3E-05
Manganese	1.2E-05
Vanadium	1.1E-05
Silver	7.7E-06
Mercuric chloride	6.8E-06
Pentachlorophenol	6.1E-06
Tetrachloroethylene (Perchloroethylene)	5.7E-06
Zinc	3.9E-06
Barium	3.7E-06
Fluoranthene	3.5E-06
Nitrosodipropylamine, n-	2.9E-06
Aluminum	2.4E-06
Chromium	2.1E-06
Chromium, hexavalent	2.1E-06
Antimony	1.7E-06
Bromoform (tribromomethane)	1.7E-06
Selenium	1.6E-06
Chlorobenzene	1.6E-06
Benzoic Acid	1.3E-06
Dinitrotoluene, 2,4-	1.3E-06
Benzene	1.2E-06
Methylene chloride	1.2E-06
3-Penten-2-one, 4-methyl	1.1E-06
Bromodichloromethane	1.1E-06
Ethylhexyl phthalate, bis-2-	1.1E-06
Dinitrotoluene, 2,6-	1.1E-06
Dibromochloromethane	1.0E-06
Methyl bromide (Bromomethane)	8.6E-07
Dinitrophenol, 2,4-	7.3E-07
Nitrophenol, 4-	7.0E-07
Nitroaniline, 3-	7.0E-07
Chloronaphthalene,2-	6.6E-07

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
UPSET CONDITIONS (MAXIMUM MEASURED EMISSION RATE *10)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Methylene bromide	5.1E-07
Dichlorobenzidine, 3,3'-	5.1E-07
PentaCDF, 2,3,4,7,8-	4.4E-07
Pentachloronitrobenzene (PCNB)	4.2E-07
Toluene	4.2E-07
Chlorobenzilate	3.2E-07
Dimethylphenol, 2,4-	3.1E-07
Acrylonitrile	3.0E-07
Nitrophenol, 2-	2.6E-07
Heptachlor	2.4E-07
Carbon Tetrachloride	2.4E-07
Carbazole	2.3E-07
Benzaldehyde	2.3E-07
Dinitrobenzene, 1,3-	2.2E-07
Methyl ethyl ketone (2-Butanone)	2.1E-07
Benzyl alcohol	2.1E-07
Phenanthrene	1.6E-07
Cobalt	1.6E-07
Nitroaniline, 4-	1.5E-07
Benzonitrile	1.5E-07
Di-n-butyl phthalate	1.5E-07
Aniline	1.4E-07
Carbon Disulfide	1.4E-07
Methyl chloride (Chloromethane)	1.3E-07
Heptachlor epoxide	1.3E-07
Phenol	1.2E-07
Endrin	9.5E-08
Chlorophenol, 2-	8.6E-08
Chloroaniline, p-	8.3E-08
Trichlorobenzene, 1,2,3-	6.9E-08
Acetone	6.8E-08
Bromophenyl-phenylether, 4-	6.7E-08
Chloro-3-methylphenol, 4-	6.6E-08
Hexachloro-1,3-butadiene (Perchlorobutadiene)	6.4E-08
Naphthalene	6.4E-08
Acetophenone	6.3E-08
Cresol, o-	6.2E-08
N-nitrosodimethylamine	5.5E-08
Butylbenzylphthalate	4.4E-08
Chlordane	4.3E-08
Dichlorobenzene, 1,3-	4.2E-08
2,5-Dimethylheptane	4.1E-08
Diethyl phthalate	4.0E-08
Acenaphthylene	4.0E-08
Tetrachloroethane, 1,1,2,2-	3.9E-08
Vinyl Acetate	3.9E-08
Dichloropropene, 1,3- (cis)	3.5E-08
Xylene, p-	3.4E-08
Xylene, m-	3.4E-08
Bis(2-chloroethoxy) methane	3.3E-08
Trichlorophenol, 2,4,5-	3.2E-08
Nitroaniline, 2-	3.2E-08
Nitrobenzene	3.1E-08
Dichlorophenol, 2,4-	2.9E-08
Benzo(b)fluoranthene	2.9E-08
2-Hexanone	2.8E-08
Hexachloroethane (Perchloroethane)	2.8E-08
Cresol, p-	2.7E-08
Cresol, m-	2.7E-08
Dimethyl phthalate	2.7E-08
Endosulfan I	2.6E-08
Trichlorophenol, 2,4,6-	2.6E-08
BHC, beta-	2.4E-08
Pyridine	2.2E-08
Dibenzofuran	2.1E-08
Diphenylamine	2.1E-08
Bromobenzene	2.0E-08
Tetrachlorobenzene, 1,2,4,5-	1.9E-08
Aldrin	1.9E-08
Nitrosodiphenylamine, N-	1.9E-08
Isophorone	1.9E-08

ACUTE INHALATION RISK RESULTS

**REACTIVATION FACILITY STACK EMISSIONS -
UPSET CONDITIONS (MAXIMUM MEASURED EMISSION RATE *10)**

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Pentachlorobenzene	1.8E-08
Di-n-octylphthalate	1.7E-08
Trichlorobenzene, 1,2,4-	1.6E-08
Chrysene	1.5E-08
Aroclor 1254	1.5E-08
Diphenylhydrazine,1,2-	1.4E-08
3-Ethyl benzaldehyde	1.4E-08
4-Ethyl benzaldehyde	1.4E-08
Trichloropropane, 1,2,3-	1.2E-08
DDT, 4-4'-	1.2E-08
Butylbenzene, sec	1.2E-08
Xylene, o-	1.2E-08
1,1-Dichloropropene	1.0E-08
Trichloroethane, 1,1,2-	9.6E-09
Dieldrin	9.2E-09
BHC, alpha-	9.0E-09
Benzo(a)Anthracene	8.6E-09
Styrene	8.2E-09
Bis(2-chlorethyl)ether	8.1E-09
2,2'-oxybis (1-Chloropropane)	7.7E-09
Indeno(1,2,3-cd) pyrene	7.7E-09
Benzo(k)fluoranthene	7.6E-09
Iodomethane	7.2E-09
Methyl isobutyl ketone	5.6E-09
Benzo(a)pyrene	4.9E-09
gamma-BHC (Lindane)	4.6E-09
TetraCDD, 2,3,7,8-	4.3E-09
Ethylene dibromide	3.9E-09
TetraCDF, 2,3,7,8-	3.9E-09
Trichloroethylene	3.6E-09
Tetrahydrofuran	3.6E-09
Pyrene	3.6E-09
DDD, 4,4'-	3.5E-09
Tetrachloroethane, 1,1,1,2-	3.2E-09
1,3-Dichloropropane	3.0E-09
Butylbenzene, n-	2.9E-09
Dichloroethylene 1,1-	2.8E-09
2,2-Dichloropropane	2.8E-09
Butylbenzene, tert	2.8E-09
Vinyl Chloride	2.6E-09
Trichloroethane, 1,1,1-	2.4E-09
PentaCDD, 1,2,3,7,8-	2.3E-09
Anthracene	2.3E-09
Acenaphthene	2.2E-09
2-Methylnaphthalene	2.1E-09
Trimethylbenzene, 1,3,5-	1.9E-09
Dichlorobenzene, 1,2-	1.7E-09
Dichloroethane, 1,2- (Ethylene Dichloride)	1.6E-09
HexaCDF, 1,2,3,6,7,8-	1.4E-09
HexaCDF, 2,3,4,6,7,8-	1.1E-09
Methoxychlor	1.1E-09
Dichlorobenzene,1,4-	1.0E-09
DDE, 4,4'-	9.8E-10
HexaCDF, 1,2,3,4,7,8-	9.5E-10
Fluorene	8.7E-10
Cumene (Isopropylbenzene)	8.5E-10
2-Chlorotoluene	7.5E-10
4-Chlorotoluene	7.5E-10
Ethylene Glycol	6.5E-10
Propylbenzene, n-	6.2E-10
Trichlorofluoromethane (Freon 11)	5.5E-10
1,2,4-Trimethylbenzene	5.4E-10
Dichloroethylene, cis-1,2-	4.9E-10
Ethylbenzene	4.7E-10
Dichloropropane, 1,2-	4.7E-10
PentaCDF, 1,2,3,7,8-	4.0E-10
Chloroethane	3.1E-10
Dichlorodifluoromethane	3.1E-10
HexaCDD, 1,2,3,4,7,8-	3.1E-10
Bromochloromethane	3.0E-10
Benzo(g,h,i)perylene	2.9E-10

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
UPSET CONDITIONS (MAXIMUM MEASURED EMISSION RATE *10)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
methyl tert-butyl ether	2.4E-10
Propylene oxide	1.7E-10
Dichloroethylene-1,2 (trans)	1.5E-10
Dichloroethane 1,1-	1.5E-10
Methyl methacrylate	4.1E-11
HexaCDD, 1,2,3,7,8,9-	3.7E-11
HexaCDD, 1,2,3,6,7,8-	2.2E-11
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	2.0E-11
Dioxane, 1,4-	1.6E-11
Dibenz(a,h)anthracene	8.0E-12
HeptaCDF, 1,2,3,4,6,7,8-	3.7E-12
HexaCDF, 1,2,3,7,8,9-	2.0E-12
Acrylic Acid	1.6E-12
OctaCDF, 1,2,3,4,6,7,8,9-	1.1E-12
1-Hexane (n-hexane)	2.8E-13
HeptaCDF, 1,2,3,4,7,8,9-	2.5E-13
OctaCDD, 1,2,3,4,6,7,8,9-	2.3E-13
HeptaCDD, 1,2,3,4,6,7,8-	1.8E-13
Endosulfan sulfate	NC
2,5-Dione, 3-hexene	NC
Benzo(e)pyrene	NC
Perylene	NC
Phosphine imide, P,P,P-triphenyl	NC
Diallate	NC
9-Octadecenamide (oleamide)	NC
delta-BHC	NC
2-Methyl octane	NC
Endosulfan II	NC
Endrin ketone	NC
3-Penten-2-one (ethylidene acetone)	NC
2,5-Dimethylfuran	NC
Endrin aldehyde	NC
3-Hexen-2-one	NC
Benzoic acid, methyl ester (methyl benzoate)	NC
Isopropyl toluene, p-	NC
Total (b)	5.6E-01
R_1 resident	
Nitrogen dioxide	1.6E-01
Sulfur dioxide	5.8E-02
Arsenic	5.8E-03
Chlorine	2.3E-03
Hydrogen chloride	1.4E-03
Lead	6.6E-04
Nickel	3.8E-04
Copper	3.2E-04
Cadmium	7.8E-05
Hexachlorobenzene	4.0E-05
Chlorophenyl-phenylether, 4-	3.7E-05
Chloroform (Trichloromethane)	2.7E-05
Benzidine	2.6E-05
Dibromo-3-chloropropane, 1,2-	2.1E-05
Mercury	1.1E-05
Beryllium	1.1E-05
Hexachlorocyclopentadiene	9.1E-06
Thallium (I)	6.7E-06
4,6-Dinitro-2-methylphenol	5.3E-06
Manganese	4.2E-06
Vanadium	3.8E-06
Mercuric chloride	2.8E-06
Silver	2.7E-06
Pentachlorophenol	2.5E-06
Tetrachloroethylene (Perchloroethylene)	2.3E-06
Fluoranthene	1.4E-06
Zinc	1.4E-06
Barium	1.3E-06
Nitrosodipropylamine, n-	1.2E-06
Aluminum	8.4E-07
Chromium	7.4E-07
Chromium, hexavalent	7.4E-07

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
UPSET CONDITIONS (MAXIMUM MEASURED EMISSION RATE *10)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Antimony	7.0E-07
Bromoform (tribromomethane)	6.8E-07
Chlorobenzene	6.4E-07
Selenium	5.8E-07
Benzoic Acid	5.4E-07
Dinitrotoluene, 2,4-	5.4E-07
Benzene	4.9E-07
Methylene chloride	4.7E-07
Ethylhexyl phthalate, bis-2-	4.7E-07
3-Penten-2-one, 4-methyl	4.6E-07
Bromodichloromethane	4.5E-07
Dinitrotoluene, 2,6-	4.3E-07
Dibromochloromethane	4.2E-07
Methyl bromide (Bromomethane)	3.5E-07
Dinitrophenol, 2,4-	3.0E-07
Nitrophenol, 4-	2.8E-07
Nitroaniline, 3-	2.8E-07
Chloronaphthalene,2-	2.7E-07
Dichlorobenzidine, 3,3'-	2.2E-07
Methylene bromide	2.1E-07
PentaCDF, 2,3,4,7,8-	1.9E-07
Pentachloronitrobenzene (PCNB)	1.7E-07
Toluene	1.7E-07
Chlorobenzilate	1.3E-07
Dimethylphenol, 2,4-	1.2E-07
Acrylonitrile	1.2E-07
Nitrophenol, 2-	1.1E-07
Heptachlor	9.7E-08
Carbon Tetrachloride	9.7E-08
Carbazole	9.5E-08
Benzaldehyde	9.4E-08
Dinitrobenzene, 1,3-	8.9E-08
Methyl ethyl ketone (2-Butanone)	8.4E-08
Benzyl alcohol	8.4E-08
Phenanthrene	6.7E-08
Nitroaniline, 4-	6.1E-08
Benzonitrile	6.1E-08
Di-n-butyl phthalate	6.0E-08
Aniline	5.8E-08
Carbon Disulfide	5.6E-08
Cobalt	5.5E-08
Methyl chloride (Chloromethane)	5.2E-08
Heptachlor epoxide	5.2E-08
Phenol	4.8E-08
Endrin	3.9E-08
Chlorophenol, 2-	3.5E-08
Chloroaniline, p-	3.4E-08
Trichlorobenzene, 1,2,3-	2.8E-08
Acetone	2.8E-08
Bromophenyl-phenylether, 4-	2.7E-08
Chloro-3-methylphenol, 4-	2.7E-08
Hexachloro-1,3-butadiene (Perchlorobutadiene)	2.6E-08
Naphthalene	2.6E-08
Acetophenone	2.6E-08
Cresol, o-	2.5E-08
N-nitrosodimethylamine	2.3E-08
Butylbenzylphthalate	1.8E-08
Chlordane	1.7E-08
Dichlorobenzene, 1,3-	1.7E-08
2,5-Dimethylheptane	1.7E-08
Diethyl phthalate	1.6E-08
Acenaphthylene	1.6E-08
Tetrachloroethane, 1,1,2,2-	1.6E-08
Vinyl Acetate	1.6E-08
Dichloropropene, 1,3- (cis)	1.4E-08
Xylene, p-	1.4E-08
Xylene, m-	1.4E-08
Bis(2-chloroethoxy) methane	1.4E-08
Trichlorophenol, 2,4,5-	1.3E-08
Nitroaniline, 2-	1.3E-08
Nitrobenzene	1.3E-08

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
UPSET CONDITIONS (MAXIMUM MEASURED EMISSION RATE *10)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Dichlorophenol, 2,4-	1.2E-08
Benzo(b)fluoranthene	1.2E-08
2-Hexanone	1.1E-08
Hexachloroethane (Perchloroethane`	1.1E-08
Cresol, p-	1.1E-08
Cresol, m-	1.1E-08
Dimethyl phthalate	1.1E-08
Endosulfan I	1.1E-08
Trichlorophenol, 2,4,6-	1.0E-08
BHC, beta-	9.6E-09
Pyridine	9.2E-09
Dibenzofuran	8.7E-09
Diphenylamine	8.7E-09
Bromobenzene	8.1E-09
Aldrin	7.9E-09
Tetrachlorobenzene, 1,2,4,5-	7.9E-09
Nitrosodiphenylamine, N-	7.8E-09
Isophorone	7.8E-09
Pentachlorobenzene	7.3E-09
Di-n-octylphthalate	7.1E-09
Trichlorobenzene, 1,2,4-	6.5E-09
Chrysene	6.3E-09
Aroclor 1254	5.9E-09
Diphenylhydrazine,1,2-	5.7E-09
3-Ethyl benzaldehyde	5.5E-09
4-Ethyl benzaldehyde	5.5E-09
Trichloropropane, 1,2,3-	5.0E-09
DDT, 4-4'-	4.9E-09
Butylbenzene, sec	4.8E-09
Xylene, o-	4.7E-09
1,1-Dichloropropene	4.2E-09
Trichloroethane, 1,1,2-	3.9E-09
Dieldrin	3.8E-09
BHC, alpha-	3.7E-09
Benzo(a)Anthracene	3.7E-09
Styrene	3.3E-09
Benzo(k)fluoranthene	3.3E-09
Bis(2-chlorethyl)ether	3.3E-09
2,2'-oxybis (1-Chloropropane)	3.2E-09
Iodomethane	3.0E-09
Indeno(1,2,3-cd) pyrene	2.7E-09
Methyl isobutyl ketone	2.3E-09
Benzo(a)pyrene	2.1E-09
gamma-BHC (Lindane)	1.9E-09
TetraCDD, 2,3,7,8-	1.8E-09
TetraCDF, 2,3,7,8-	1.6E-09
Ethylene dibromide	1.6E-09
Trichloroethylene	1.5E-09
Tetrahydrofuran	1.5E-09
Pyrene	1.5E-09
DDD, 4,4'-	1.4E-09
Tetrachloroethane, 1,1,1,2-	1.3E-09
1,3-Dichloropropane	1.2E-09
Butylbenzene, n-	1.2E-09
Dichloroethylene 1,1-	1.1E-09
2,2-Dichloropropane	1.1E-09
Butylbenzene, tert	1.1E-09
Vinyl Chloride	1.0E-09
PentaCDD, 1,2,3,7,8-	1.0E-09
Trichloroethane, 1,1,1-	9.9E-10
Anthracene	9.3E-10
Acenaphthene	9.0E-10
2-Methylnaphthalene	8.7E-10
Trimethylbenzene, 1,3,5-	7.9E-10
Dichlorobenzene, 1,2-	6.9E-10
Dichloroethane, 1,2- (Ethylene Dichloride)	6.5E-10
HexaCDF, 1,2,3,6,7,8-	6.4E-10
HexaCDF, 2,3,4,6,7,8-	5.1E-10
Methoxychlor	4.4E-10
HexaCDF, 1,2,3,4,7,8-	4.2E-10
Dichlorobenzene,1,4-	4.1E-10

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
UPSET CONDITIONS (MAXIMUM MEASURED EMISSION RATE *10)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
DDE, 4,4'-	4.0E-10
Fluorene	3.5E-10
Cumene (Isopropylbenzene)	3.5E-10
2-Chlorotoluene	3.1E-10
4-Chlorotoluene	3.1E-10
Ethylene Glycol	2.7E-10
Propylbenzene, n-	2.5E-10
Trichlorofluoromethane (Freon 11)	2.2E-10
1,2,4-Trimethylbenzene	2.2E-10
Dichloroethylene, cis-1,2-	2.0E-10
Ethylbenzene	1.9E-10
Dichloropropane, 1,2-	1.9E-10
PentaCDF, 1,2,3,7,8-	1.7E-10
HexaCDD, 1,2,3,4,7,8-	1.4E-10
Benzo(g,h,i)perylene	1.3E-10
Chloroethane	1.3E-10
Dichlorodifluoromethane	1.3E-10
Bromochloromethane	1.2E-10
methyl tert-butyl ether	9.7E-11
Propylene oxide	6.9E-11
Dichloroethylene-1,2 (trans)	6.3E-11
Dichloroethane 1,1-	6.0E-11
Methyl methacrylate	1.7E-11
HexaCDD, 1,2,3,7,8,9-	1.6E-11
HexaCDD, 1,2,3,6,7,8-	9.8E-12
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	8.1E-12
Dioxane, 1,4-	6.3E-12
Dibenz(a,h)anthracene	2.9E-12
HeptaCDF, 1,2,3,4,6,7,8-	1.6E-12
HexaCDF, 1,2,3,7,8,9-	8.6E-13
Acrylic Acid	6.4E-13
OctaCDF, 1,2,3,4,6,7,8,9-	4.7E-13
1-Hexane (n-hexane)	1.1E-13
HeptaCDF, 1,2,3,4,7,8,9-	1.1E-13
OctaCDD, 1,2,3,4,6,7,8,9-	1.0E-13
HeptaCDD, 1,2,3,4,6,7,8-	7.9E-14
Endosulfan sulfate	NC
2,5-Dione, 3-hexene	NC
Benzo(e)pyrene	NC
Perylene	NC
Phosphine imide, P,P,P-triphenyl	NC
Diallate	NC
9-Octadecenamide (oleamide)	NC
delta-BHC	NC
2-Methyl octane	NC
Endosulfan II	NC
Endrin ketone	NC
3-Penten-2-one (ethylidene acetone)	NC
2,5-Dimethylfuran	NC
Endrin aldehyde	NC
3-Hexen-2-one	NC
Benzoic acid, methyl ester (methyl benzoate)	NC
Isopropyl toluene, p-	NC
Total (b)	2.3E-01
R_2 resident	
Nitrogen dioxide	1.1E-01
Sulfur dioxide	3.9E-02
Arsenic	3.4E-03
Chlorine	1.5E-03
Hydrogen chloride	9.2E-04
Lead	3.9E-04
Nickel	2.3E-04
Copper	1.9E-04
Cadmium	4.6E-05
Hexachlorobenzene	2.7E-05
Chlorophenyl-phenylether, 4-	2.5E-05
Chloroform (Trichloromethane)	1.8E-05
Benzidine	1.7E-05
Dibromo-3-chloropropane, 1,2-	1.4E-05

ACUTE INHALATION RISK RESULTS

**REACTIVATION FACILITY STACK EMISSIONS -
UPSET CONDITIONS (MAXIMUM MEASURED EMISSION RATE *10)**

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Mercury	7.5E-06
Beryllium	6.6E-06
Hexachlorocyclopentadiene	6.1E-06
Thallium (I)	4.0E-06
4,6-Dinitro-2-methylphenol	3.5E-06
Manganese	2.5E-06
Vanadium	2.3E-06
Mercuric chloride	1.9E-06
Pentachlorophenol	1.7E-06
Silver	1.6E-06
Tetrachloroethylene (Perchloroethylene)	1.6E-06
Fluoranthene	9.5E-07
Zinc	8.3E-07
Nitrosodipropylamine, n-	7.8E-07
Barium	7.7E-07
Aluminum	5.0E-07
Antimony	4.7E-07
Bromoform (tribromomethane)	4.6E-07
Chromium	4.4E-07
Chromium, hexavalent	4.4E-07
Chlorobenzene	4.3E-07
Benzoic Acid	3.6E-07
Dinitrotoluene, 2,4-	3.6E-07
Selenium	3.5E-07
Benzene	3.3E-07
Ethylhexyl phthalate, bis-2-	3.2E-07
Methylene chloride	3.2E-07
3-Penten-2-one, 4-methyl	3.1E-07
Bromodichloromethane	3.0E-07
Dinitrotoluene, 2,6-	2.9E-07
Dibromochloromethane	2.8E-07
Methyl bromide (Bromomethane)	2.3E-07
Dinitrophenol, 2,4-	2.0E-07
Nitrophenol, 4-	1.9E-07
Nitroaniline, 3-	1.9E-07
Chloronaphthalene,2-	1.8E-07
Dichlorobenzidine, 3,3'-	1.5E-07
Methylene bromide	1.4E-07
PentaCDF, 2,3,4,7,8-	1.3E-07
Pentachloronitrobenzene (PCNB)	1.1E-07
Toluene	1.1E-07
Chlorobenzilate	9.0E-08
Dimethylphenol, 2,4-	8.3E-08
Acrylonitrile	8.1E-08
Nitrophenol, 2-	7.2E-08
Heptachlor	6.5E-08
Carbon Tetrachloride	6.5E-08
Carbazole	6.4E-08
Benzaldehyde	6.3E-08
Dinitrobenzene, 1,3-	6.0E-08
Methyl ethyl ketone (2-Butanone)	5.6E-08
Benzyl alcohol	5.6E-08
Phenanthrene	4.5E-08
Nitroaniline, 4-	4.1E-08
Benzonitrile	4.1E-08
Di-n-butyl phthalate	4.0E-08
Aniline	3.9E-08
Carbon Disulfide	3.7E-08
Methyl chloride (Chloromethane)	3.5E-08
Heptachlor epoxide	3.5E-08
Cobalt	3.3E-08
Phenol	3.2E-08
Endrin	2.6E-08
Chlorophenol, 2-	2.3E-08
Chloroaniline, p-	2.3E-08
Trichlorobenzene, 1,2,3-	1.9E-08
Acetone	1.9E-08
Bromophenyl-phenylether, 4-	1.8E-08
Chloro-3-methylphenol, 4-	1.8E-08
Hexachloro-1,3-butadiene (Perchlorobutadiene)	1.7E-08
Naphthalene	1.7E-08

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
UPSET CONDITIONS (MAXIMUM MEASURED EMISSION RATE *10)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Acetophenone	1.7E-08
Cresol, o-	1.7E-08
N-nitrosodimethylamine	1.5E-08
Butylbenzylphthalate	1.2E-08
Chlordane	1.2E-08
Dichlorobenzene, 1,3-	1.2E-08
2,5-Dimethylheptane	1.1E-08
Diethyl phthalate	1.1E-08
Acenaphthylene	1.1E-08
Tetrachloroethane, 1,1,2,2-	1.1E-08
Vinyl Acetate	1.1E-08
Dichloropropene, 1,3- (cis)	9.6E-09
Xylene, p-	9.3E-09
Xylene, m-	9.3E-09
Bis(2-chloroethoxy) methane	9.1E-09
Trichlorophenol, 2,4,5-	8.8E-09
Nitroaniline, 2-	8.6E-09
Nitrobenzene	8.6E-09
Dichlorophenol, 2,4-	8.0E-09
Benzo(b)fluoranthene	7.8E-09
2-Hexanone	7.6E-09
Hexachloroethane (Perchloroethane`	7.6E-09
Cresol, p-	7.4E-09
Cresol, m-	7.4E-09
Dimethyl phthalate	7.3E-09
Endosulfan I	7.0E-09
Trichlorophenol, 2,4,6-	7.0E-09
BHC, beta-	6.5E-09
Pyridine	6.1E-09
Dibenzofuran	5.8E-09
Diphenylamine	5.8E-09
Bromobenzene	5.4E-09
Aldrin	5.3E-09
Tetrachlorobenzene, 1,2,4,5-	5.3E-09
Nitrosodiphenylamine, N-	5.2E-09
Isophorone	5.2E-09
Pentachlorobenzene	4.9E-09
Di-n-octylphthalate	4.8E-09
Trichlorobenzene, 1,2,4-	4.3E-09
Chrysene	4.3E-09
Aroclor 1254	4.0E-09
Diphenylhydrazine,1,2-	3.8E-09
3-Ethyl benzaldehyde	3.7E-09
4-Ethyl benzaldehyde	3.7E-09
Trichloropropane, 1,2,3-	3.4E-09
DDT, 4-4'-	3.3E-09
Butylbenzene, sec	3.2E-09
Xylene, o-	3.2E-09
1,1-Dichloropropene	2.8E-09
Trichloroethane, 1,1,2-	2.6E-09
Dieldrin	2.5E-09
Benzo(a)Anthracene	2.5E-09
BHC, alpha-	2.5E-09
Benzo(k)fluoranthene	2.2E-09
Styrene	2.2E-09
Bis(2-chlorethyl)ether	2.2E-09
2,2'-oxybis (1-Chloropropane)	2.1E-09
Iodomethane	2.0E-09
Indeno(1,2,3-cd) pyrene	1.6E-09
Methyl isobutyl ketone	1.5E-09
Benzo(a)pyrene	1.4E-09
gamma-BHC (Lindane)	1.3E-09
TetraCDD, 2,3,7,8-	1.2E-09
TetraCDF, 2,3,7,8-	1.1E-09
Ethylene dibromide	1.1E-09
Trichloroethylene	9.9E-10
Tetrahydrofuran	9.9E-10
Pyrene	9.7E-10
DDD, 4,4'-	9.7E-10
Tetrachloroethane, 1,1,1,2-	8.6E-10
1,3-Dichloropropane	8.2E-10

ACUTE INHALATION RISK RESULTS

**REACTIVATION FACILITY STACK EMISSIONS -
UPSET CONDITIONS (MAXIMUM MEASURED EMISSION RATE *10)**

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Butylbenzene, n-	7.9E-10
Dichloroethylene 1,1-	7.6E-10
2,2-Dichloropropane	7.6E-10
Butylbenzene, tert	7.5E-10
Vinyl Chloride	7.0E-10
PentaCDD, 1,2,3,7,8-	6.8E-10
Trichloroethane, 1,1,1-	6.6E-10
Anthracene	6.2E-10
Acenaphthene	6.0E-10
2-Methylnaphthalene	5.8E-10
Trimethylbenzene, 1,3,5-	5.3E-10
Dichlorobenzene, 1,2-	4.6E-10
Dichloroethane, 1,2- (Ethylene Dichloride)	4.3E-10
HexaCDF, 1,2,3,6,7,8-	4.3E-10
HexaCDF, 2,3,4,6,7,8-	3.4E-10
Methoxychlor	3.0E-10
HexaCDF, 1,2,3,4,7,8-	2.8E-10
Dichlorobenzene,1,4-	2.8E-10
DDE, 4,4'-	2.7E-10
Fluorene	2.4E-10
Cumene (Isopropylbenzene)	2.3E-10
2-Chlorotoluene	2.1E-10
4-Chlorotoluene	2.0E-10
Ethylene Glycol	1.8E-10
Propylbenzene, n-	1.7E-10
Trichlorofluoromethane (Freon 11)	1.5E-10
1,2,4-Trimethylbenzene	1.5E-10
Dichloroethylene, cis-1,2-	1.3E-10
Ethylbenzene	1.3E-10
Dichloropropane, 1,2-	1.3E-10
PentaCDF, 1,2,3,7,8-	1.2E-10
HexaCDD, 1,2,3,4,7,8-	9.2E-11
Benzo(g,h,i)perylene	8.8E-11
Chloroethane	8.6E-11
Dichlorodifluoromethane	8.4E-11
Bromochloromethane	8.3E-11
methyl tert-butyl ether	6.5E-11
Propylene oxide	4.6E-11
Dichloroethylene-1,2 (trans)	4.2E-11
Dichloroethane 1,1-	4.0E-11
Methyl methacrylate	1.1E-11
HexaCDD, 1,2,3,7,8,9-	1.1E-11
HexaCDD, 1,2,3,6,7,8-	6.7E-12
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	5.4E-12
Dioxane, 1,4-	4.2E-12
Dibenz(a,h)anthracene	1.7E-12
HeptaCDF, 1,2,3,4,6,7,8-	1.1E-12
HexaCDF, 1,2,3,7,8,9-	5.8E-13
Acrylic Acid	4.3E-13
OctaCDF, 1,2,3,4,6,7,8,9-	3.2E-13
1-Hexane (n-hexane)	7.6E-14
HeptaCDF, 1,2,3,4,7,8,9-	7.3E-14
OctaCDD, 1,2,3,4,6,7,8,9-	6.8E-14
HeptaCDD, 1,2,3,4,6,7,8-	5.3E-14
Endosulfan sulfate	NC
2,5-Dione, 3-hexene	NC
Benzo(e)pyrene	NC
Perylene	NC
Phosphine imide, P,P,P-triphenyl	NC
Diallate	NC
9-Octadecenamide (oleamide)	NC
delta-BHC	NC
2-Methyl octane	NC
Endosulfan II	NC
Endrin ketone	NC
3-Penten-2-one (ethylidene acetone)	NC
2,5-Dimethylfuran	NC
Endrin aldehyde	NC
3-Hexen-2-one	NC
Benzoic acid, methyl ester (methyl benzoate)	NC
Isopropyl toluene, p-	NC

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
UPSET CONDITIONS (MAXIMUM MEASURED EMISSION RATE *10)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Total (b)	1.5E-01
R_3 resident farmer	
Nitrogen dioxide	1.0E-01
Sulfur dioxide	3.6E-02
Arsenic	3.3E-03
Chlorine	1.4E-03
Hydrogen chloride	8.7E-04
Lead	3.7E-04
Nickel	2.1E-04
Copper	1.8E-04
Cadmium	4.4E-05
Hexachlorobenzene	2.6E-05
Chlorophenyl-phenylether, 4-	2.3E-05
Chloroform (Trichloromethane)	1.7E-05
Benzidine	1.7E-05
Dibromo-3-chloropropane, 1,2-	1.3E-05
Mercury	7.1E-06
Beryllium	6.2E-06
Hexachlorocyclopentadiene	5.8E-06
Thallium (I)	3.8E-06
4,6-Dinitro-2-methylphenol	3.3E-06
Manganese	2.4E-06
Vanadium	2.1E-06
Mercuric chloride	1.8E-06
Pentachlorophenol	1.6E-06
Silver	1.5E-06
Tetrachloroethylene (Perchloroethylene)	1.5E-06
Fluoranthene	9.0E-07
Zinc	7.8E-07
Nitrosodipropylamine, n-	7.4E-07
Barium	7.3E-07
Aluminum	4.7E-07
Antimony	4.4E-07
Bromoform (tribromomethane)	4.3E-07
Chromium	4.2E-07
Chromium, hexavalent	4.2E-07
Chlorobenzene	4.0E-07
Benzoic Acid	3.4E-07
Dinitrotoluene, 2,4-	3.4E-07
Selenium	3.3E-07
Benzene	3.1E-07
Ethylhexyl phthalate, bis-2-	3.0E-07
Methylene chloride	3.0E-07
3-Penten-2-one, 4-methyl	2.9E-07
Bromodichloromethane	2.9E-07
Dinitrotoluene, 2,6-	2.7E-07
Dibromochloromethane	2.7E-07
Methyl bromide (Bromomethane)	2.2E-07
Dinitrophenol, 2,4-	1.9E-07
Nitrophenol, 4-	1.8E-07
Nitroaniline, 3-	1.8E-07
Chloronaphthalene,2-	1.7E-07
Dichlorobenzidine, 3,3'-	1.4E-07
Methylene bromide	1.3E-07
PentaCDF, 2,3,4,7,8-	1.2E-07
Pentachloronitrobenzene (PCNB)	1.1E-07
Toluene	1.1E-07
Chlorobenzilate	8.5E-08
Dimethylphenol, 2,4-	7.8E-08
Acrylonitrile	7.6E-08
Nitrophenol, 2-	6.7E-08
Heptachlor	6.1E-08
Carbon Tetrachloride	6.1E-08
Carbazole	6.0E-08
Benzaldehyde	5.9E-08
Dinitrobenzene, 1,3-	5.6E-08
Methyl ethyl ketone (2-Butanone)	5.3E-08
Benzyl alcohol	5.3E-08
Phenanthrene	4.2E-08

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
UPSET CONDITIONS (MAXIMUM MEASURED EMISSION RATE *10)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Nitroaniline, 4-	3.8E-08
Benzonitrile	3.8E-08
Di-n-butyl phthalate	3.8E-08
Aniline	3.7E-08
Carbon Disulfide	3.5E-08
Methyl chloride (Chloromethane)	3.3E-08
Heptachlor epoxide	3.3E-08
Cobalt	3.1E-08
Phenol	3.1E-08
Endrin	2.5E-08
Chlorophenol, 2-	2.2E-08
Chloroaniline, p-	2.1E-08
Trichlorobenzene, 1,2,3-	1.8E-08
Acetone	1.8E-08
Bromophenyl-phenylether, 4-	1.7E-08
Chloro-3-methylphenol, 4-	1.7E-08
Hexachloro-1,3-butadiene (Perchlorobutadiene)	1.6E-08
Naphthalene	1.6E-08
Acetophenone	1.6E-08
Cresol, o-	1.6E-08
N-nitrosodimethylamine	1.4E-08
Butylbenzylphthalate	1.1E-08
Chlordane	1.1E-08
Dichlorobenzene, 1,3-	1.1E-08
2,5-Dimethylheptane	1.1E-08
Diethyl phthalate	1.0E-08
Acenaphthylene	1.0E-08
Tetrachloroethane, 1,1,2,2-	1.0E-08
Vinyl Acetate	9.9E-09
Dichloropropene, 1,3- (cis)	9.1E-09
Xylene, p-	8.8E-09
Xylene, m-	8.8E-09
Bis(2-chloroethoxy) methane	8.5E-09
Trichlorophenol, 2,4,5-	8.3E-09
Nitroaniline, 2-	8.1E-09
Nitrobenzene	8.1E-09
Dichlorophenol, 2,4-	7.5E-09
Benzo(b)fluoranthene	7.4E-09
2-Hexanone	7.2E-09
Hexachloroethane (Perchloroethane)	7.2E-09
Cresol, p-	7.0E-09
Cresol, m-	7.0E-09
Dimethyl phthalate	6.9E-09
Endosulfan I	6.6E-09
Trichlorophenol, 2,4,6-	6.6E-09
BHC, beta-	6.1E-09
Pyridine	5.8E-09
Dibenzofuran	5.5E-09
Diphenylamine	5.5E-09
Bromobenzene	5.1E-09
Aldrin	5.0E-09
Tetrachlorobenzene, 1,2,4,5-	5.0E-09
Nitrosodiphenylamine, N-	4.9E-09
Isophorone	4.9E-09
Pentachlorobenzene	4.6E-09
Di-n-octylphthalate	4.5E-09
Trichlorobenzene, 1,2,4-	4.1E-09
Chrysene	4.0E-09
Aroclor 1254	3.7E-09
Diphenylhydrazine,1,2-	3.6E-09
3-Ethyl benzaldehyde	3.5E-09
4-Ethyl benzaldehyde	3.5E-09
Trichloropropane, 1,2,3-	3.2E-09
DDT, 4-4'-	3.1E-09
Butylbenzene, sec	3.0E-09
Xylene, o-	3.0E-09
1,1-Dichloropropene	2.6E-09
Trichloroethane, 1,1,2-	2.5E-09
Dieldrin	2.4E-09
Benzo(a)Anthracene	2.4E-09
BHC, alpha-	2.3E-09

ACUTE INHALATION RISK RESULTS

**REACTIVATION FACILITY STACK EMISSIONS -
UPSET CONDITIONS (MAXIMUM MEASURED EMISSION RATE *10)**

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Benzo(k)fluoranthene	2.1E-09
Styrene	2.1E-09
Bis(2-chlorethyl)ether	2.1E-09
2,2'-oxybis (1-Chloropropane)	2.0E-09
Iodomethane	1.9E-09
Indeno(1,2,3-cd) pyrene	1.5E-09
Methyl isobutyl ketone	1.4E-09
Benzo(a)pyrene	1.4E-09
gamma-BHC (Lindane)	1.2E-09
TetraCDD, 2,3,7,8-	1.1E-09
TetraCDF, 2,3,7,8-	1.0E-09
Ethylene dibromide	1.0E-09
Trichloroethylene	9.4E-10
Tetrahydrofuran	9.4E-10
Pyrene	9.1E-10
DDD, 4,4'-	9.1E-10
Tetrachloroethane, 1,1,1,2-	8.1E-10
1,3-Dichloropropane	7.7E-10
Butylbenzene, n-	7.4E-10
Dichloroethylene 1,1-	7.2E-10
2,2-Dichloropropane	7.1E-10
Butylbenzene, tert	7.1E-10
Vinyl Chloride	6.6E-10
PentaCDD, 1,2,3,7,8-	6.5E-10
Trichloroethane, 1,1,1-	6.3E-10
Anthracene	5.8E-10
Acenaphthene	5.7E-10
2-Methylnaphthalene	5.5E-10
Trimethylbenzene, 1,3,5-	5.0E-10
Dichlorobenzene, 1,2-	4.4E-10
HexaCDF, 1,2,3,6,7,8-	4.1E-10
Dichloroethane, 1,2- (Ethylene Dichloride)	4.1E-10
HexaCDF, 2,3,4,6,7,8-	3.3E-10
Methoxychlor	2.8E-10
HexaCDF, 1,2,3,4,7,8-	2.7E-10
Dichlorobenzene,1,4-	2.6E-10
DDE, 4,4'-	2.5E-10
Fluorene	2.2E-10
Cumene (Isopropylbenzene)	2.2E-10
2-Chlorotoluene	1.9E-10
4-Chlorotoluene	1.9E-10
Ethylene Glycol	1.7E-10
Propylbenzene, n-	1.6E-10
Trichlorofluoromethane (Freon 11)	1.4E-10
1,2,4-Trimethylbenzene	1.4E-10
Dichloroethylene, cis-1,2-	1.3E-10
Ethylbenzene	1.2E-10
Dichloropropane, 1,2-	1.2E-10
PentaCDF, 1,2,3,7,8-	1.1E-10
HexaCDD, 1,2,3,4,7,8-	8.8E-11
Benzo(g,h,i)perylene	8.4E-11
Chloroethane	8.1E-11
Dichlorodifluoromethane	7.9E-11
Bromochloromethane	7.8E-11
methyl tert-butyl ether	6.1E-11
Propylene oxide	4.3E-11
Dichloroethylene-1,2 (trans)	4.0E-11
Dichloroethane 1,1-	3.8E-11
HexaCDD, 1,2,3,7,8,9-	1.1E-11
Methyl methacrylate	1.1E-11
HexaCDD, 1,2,3,6,7,8-	6.4E-12
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	5.1E-12
Dioxane, 1,4-	4.0E-12
Dibenz(a,h)anthracene	1.6E-12
HeptaCDF, 1,2,3,4,6,7,8-	1.1E-12
HexaCDF, 1,2,3,7,8,9-	5.6E-13
Acrylic Acid	4.0E-13
OctaCDF, 1,2,3,4,6,7,8,9-	3.1E-13
1-Hexane (n-hexane)	7.1E-14
HeptaCDF, 1,2,3,4,7,8,9-	7.0E-14
OctaCDD, 1,2,3,4,6,7,8,9-	6.5E-14

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
UPSET CONDITIONS (MAXIMUM MEASURED EMISSION RATE *10)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
HeptaCDD, 1,2,3,4,6,7,8-	5.1E-14
Endosulfan sulfate	NC
2,5-Dione, 3-hexene	NC
Benzo(e)pyrene	NC
Perylene	NC
Phosphine imide, P,P,P-triphenyl	NC
Diallate	NC
9-Octadecenamide (oleamide)	NC
delta-BHC	NC
2-Methyl octane	NC
Endosulfan II	NC
Endrin ketone	NC
3-Penten-2-one (ethylidene acetone)	NC
2,5-Dimethylfuran	NC
Endrin aldehyde	NC
3-Hexen-2-one	NC
Benzoic acid, methyl ester (methyl benzoate)	NC
Isopropyl toluene, p-	NC
Total (b)	1.4E-01
R_4 resident farmer	
Nitrogen dioxide	1.6E-01
Sulfur dioxide	5.9E-02
Arsenic	5.5E-03
Chlorine	2.3E-03
Hydrogen chloride	1.4E-03
Lead	6.3E-04
Nickel	3.6E-04
Copper	3.0E-04
Cadmium	7.3E-05
Hexachlorobenzene	4.1E-05
Chlorophenyl-phenylether, 4-	3.7E-05
Benzidine	2.8E-05
Chloroform (Trichloromethane)	2.8E-05
Dibromo-3-chloropropane, 1,2-	2.2E-05
Mercury	1.1E-05
Beryllium	1.0E-05
Hexachlorocyclopentadiene	9.4E-06
Thallium (I)	6.3E-06
4,6-Dinitro-2-methylphenol	5.4E-06
Manganese	4.0E-06
Vanadium	3.6E-06
Mercuric chloride	2.9E-06
Silver	2.6E-06
Pentachlorophenol	2.6E-06
Tetrachloroethylene (Perchloroethylene)	2.4E-06
Fluoranthene	1.5E-06
Zinc	1.3E-06
Barium	1.2E-06
Nitrosodipropylamine, n-	1.2E-06
Aluminum	8.0E-07
Antimony	7.2E-07
Chromium	7.0E-07
Chromium, hexavalent	7.0E-07
Bromoform (tribromomethane)	7.0E-07
Chlorobenzene	6.6E-07
Benzoic Acid	5.6E-07
Dinitrotoluene, 2,4-	5.5E-07
Selenium	5.5E-07
Ethylhexyl phthalate, bis-2-	5.1E-07
Benzene	5.1E-07
Methylene chloride	4.9E-07
3-Penten-2-one, 4-methyl	4.7E-07
Bromodichloromethane	4.6E-07
Dinitrotoluene, 2,6-	4.4E-07
Dibromochloromethane	4.3E-07
Methyl bromide (Bromomethane)	3.6E-07
Dinitrophenol, 2,4-	3.0E-07
Nitrophenol, 4-	2.9E-07
Nitroaniline, 3-	2.9E-07

ACUTE INHALATION RISK RESULTS

**REACTIVATION FACILITY STACK EMISSIONS -
UPSET CONDITIONS (MAXIMUM MEASURED EMISSION RATE *10)**

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Chloronaphthalene,2-	2.8E-07
Dichlorobenzidine, 3,3'-	2.3E-07
Methylene bromide	2.1E-07
PentaCDF, 2,3,4,7,8-	2.1E-07
Pentachloronitrobenzene (PCNB)	1.8E-07
Toluene	1.8E-07
Chlorobenzilate	1.4E-07
Dimethylphenol, 2,4-	1.3E-07
Acrylonitrile	1.2E-07
Nitrophenol, 2-	1.1E-07
Heptachlor	1.0E-07
Carbon Tetrachloride	9.9E-08
Carbazole	9.8E-08
Benzaldehyde	9.6E-08
Dinitrobenzene, 1,3-	9.2E-08
Methyl ethyl ketone (2-Butanone)	8.6E-08
Benzyl alcohol	8.6E-08
Phenanthrene	6.8E-08
Nitroaniline, 4-	6.2E-08
Benzonitrile	6.2E-08
Di-n-butyl phthalate	6.2E-08
Aniline	6.0E-08
Carbon Disulfide	5.7E-08
Methyl chloride (Chloromethane)	5.4E-08
Heptachlor epoxide	5.3E-08
Cobalt	5.2E-08
Phenol	5.0E-08
Endrin	4.0E-08
Chlorophenol, 2-	3.6E-08
Chloroaniline, p-	3.5E-08
Trichlorobenzene, 1,2,3-	2.9E-08
Acetone	2.9E-08
Bromophenyl-phenylether, 4-	2.8E-08
Chloro-3-methylphenol, 4-	2.7E-08
Hexachloro-1,3-butadiene (Perchlorobutadiene)	2.6E-08
Naphthalene	2.6E-08
Acetophenone	2.6E-08
Cresol, o-	2.6E-08
N-nitrosodimethylamine	2.3E-08
Butylbenzylphthalate	1.9E-08
Chlordane	1.8E-08
Dichlorobenzene, 1,3-	1.8E-08
2,5-Dimethylheptane	1.7E-08
Diethyl phthalate	1.7E-08
Acenaphthylene	1.7E-08
Tetrachloroethane, 1,1,2,2-	1.6E-08
Vinyl Acetate	1.6E-08
Dichloropropene, 1,3- (cis)	1.5E-08
Xylene, p-	1.4E-08
Xylene, m-	1.4E-08
Bis(2-chloroethoxy) methane	1.4E-08
Trichlorophenol, 2,4,5-	1.3E-08
Nitroaniline, 2-	1.3E-08
Nitrobenzene	1.3E-08
Dichlorophenol, 2,4-	1.2E-08
Benzo(b)fluoranthene	1.2E-08
2-Hexanone	1.2E-08
Hexachloroethane (Perchloroethane)	1.2E-08
Cresol, p-	1.1E-08
Cresol, m-	1.1E-08
Dimethyl phthalate	1.1E-08
Endosulfan I	1.1E-08
Trichlorophenol, 2,4,6-	1.1E-08
BHC, beta-	9.9E-09
Pyridine	9.4E-09
Dibenzofuran	8.9E-09
Diphenylamine	8.9E-09
Bromobenzene	8.3E-09
Aldrin	8.1E-09
Tetrachlorobenzene, 1,2,4,5-	8.1E-09
Nitrosodiphenylamine, N-	8.0E-09

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
UPSET CONDITIONS (MAXIMUM MEASURED EMISSION RATE *10)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Isophorone	7.9E-09
Pentachlorobenzene	7.5E-09
Di-n-octylphthalate	7.4E-09
Chrysene	6.6E-09
Trichlorobenzene, 1,2,4-	6.6E-09
Aroclor 1254	6.1E-09
Diphenylhydrazine,1,2-	5.8E-09
3-Ethyl benzaldehyde	5.7E-09
4-Ethyl benzaldehyde	5.7E-09
Trichloropropane, 1,2,3-	5.2E-09
DDT, 4-4'-	5.1E-09
Butylbenzene, sec	4.9E-09
Xylene, o-	4.9E-09
1,1-Dichloropropene	4.3E-09
Trichloroethane, 1,1,2-	4.0E-09
Benzo(a)Anthracene	3.9E-09
Dieldrin	3.8E-09
BHC, alpha-	3.8E-09
Benzo(k)fluoranthene	3.6E-09
Styrene	3.4E-09
Bis(2-chlorethyl)ether	3.4E-09
2,2'-oxybis (1-Chloropropane)	3.2E-09
Iodomethane	3.0E-09
Indeno(1,2,3-cd) pyrene	2.6E-09
Methyl isobutyl ketone	2.3E-09
Benzo(a)pyrene	2.3E-09
gamma-BHC (Lindane)	1.9E-09
TetraCDD, 2,3,7,8-	1.9E-09
TetraCDF, 2,3,7,8-	1.7E-09
Ethylene dibromide	1.6E-09
Trichloroethylene	1.5E-09
Tetrahydrofuran	1.5E-09
DDD, 4,4'-	1.5E-09
Pyrene	1.5E-09
Tetrachloroethane, 1,1,1,2-	1.3E-09
1,3-Dichloropropane	1.2E-09
Butylbenzene, n-	1.2E-09
Dichloroethylene 1,1-	1.2E-09
2,2-Dichloropropane	1.2E-09
Butylbenzene, tert	1.2E-09
PentaCDD, 1,2,3,7,8-	1.1E-09
Vinyl Chloride	1.1E-09
Trichloroethane, 1,1,1-	1.0E-09
Anthracene	9.5E-10
Acenaphthene	9.2E-10
2-Methylnaphthalene	8.9E-10
Trimethylbenzene, 1,3,5-	8.1E-10
Dichlorobenzene, 1,2-	7.1E-10
HexaCDF, 1,2,3,6,7,8-	7.0E-10
Dichloroethane, 1,2- (Ethylene Dichloride)	6.6E-10
HexaCDF, 2,3,4,6,7,8-	5.6E-10
HexaCDF, 1,2,3,4,7,8-	4.6E-10
Methoxychlor	4.6E-10
Dichlorobenzene,1,4-	4.2E-10
DDE, 4,4'-	4.1E-10
Fluorene	3.6E-10
Cumene (Isopropylbenzene)	3.6E-10
2-Chlorotoluene	3.1E-10
4-Chlorotoluene	3.1E-10
Ethylene Glycol	2.7E-10
Propylbenzene, n-	2.6E-10
Trichlorofluoromethane (Freon 11)	2.3E-10
1,2,4-Trimethylbenzene	2.3E-10
Dichloroethylene, cis-1,2-	2.0E-10
Ethylbenzene	2.0E-10
Dichloropropane, 1,2-	2.0E-10
PentaCDF, 1,2,3,7,8-	1.9E-10
HexaCDD, 1,2,3,4,7,8-	1.5E-10
Benzo(g,h,i)perylene	1.4E-10
Chloroethane	1.3E-10
Dichlorodifluoromethane	1.3E-10

ACUTE INHALATION RISK RESULTS

**REACTIVATION FACILITY STACK EMISSIONS -
UPSET CONDITIONS (MAXIMUM MEASURED EMISSION RATE *10)**

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Bromochloromethane	1.3E-10
methyl tert-butyl ether	9.9E-11
Propylene oxide	7.0E-11
Dichloroethylene-1,2 (trans)	6.5E-11
Dichloroethane 1,1-	6.2E-11
HexaCDD, 1,2,3,7,8,9-	1.8E-11
Methyl methacrylate	1.7E-11
HexaCDD, 1,2,3,6,7,8-	1.1E-11
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	8.3E-12
Dioxane, 1,4-	6.5E-12
Dibenz(a,h)anthracene	2.7E-12
HeptaCDF, 1,2,3,4,6,7,8-	1.8E-12
HexaCDF, 1,2,3,7,8,9-	9.4E-13
Acrylic Acid	6.5E-13
OctaCDF, 1,2,3,4,6,7,8,9-	5.2E-13
HeptaCDF, 1,2,3,4,7,8,9-	1.2E-13
1-Hexane (n-hexane)	1.2E-13
OctaCDD, 1,2,3,4,6,7,8,9-	1.1E-13
HeptaCDD, 1,2,3,4,6,7,8-	8.7E-14
Endosulfan sulfate	NC
2,5-Dione, 3-hexene	NC
Benzo(e)pyrene	NC
Perylene	NC
Phosphine imide, P,P,P-triphenyl	NC
Diallate	NC
9-Octadecenamide (oleamide)	NC
delta-BHC	NC
2-Methyl octane	NC
Endosulfan II	NC
Endrin ketone	NC
3-Penten-2-one (ethylidene acetone)	NC
2,5-Dimethylfuran	NC
Endrin aldehyde	NC
3-Hexen-2-one	NC
Benzoic acid, methyl ester (methyl benzoate)	NC
Isopropyl toluene, p-	NC
Total (b)	2.3E-01

NC = Not calculated.

(a) Acute hazard quotients were calculated for all compounds with stack air emission rates and acute inhalation toxicity criteria.

(b) The total is based on the sum of all chemical-specific hazard quotients regardless of the type of health effects of the summed compounds. A total value summed across all compounds is used as a screening tool only, to determine if additional evaluation for specific types of health effects is warranted (i.e., if the total value is greater than 1).

ATTACHMENT B

FUGITIVE EMISSIONS RISK ASSESSMENT:

DETAILED CHRONIC AND ACUTE RISK RESULTS INCLUDING TOTAL CHROMIUM AND HEXAVALENT CHROMIUM

Fugitive Air Emissions Risk Assessment
Chronic Inhalation Risk Results by Compound
(IRAP Software Output Information)

Receptor	Scenario	Compound	Inhalation Excess Lifetime Cancer Risk	Inhalation Non-Cancer Hazard Quotient
R_1 resident	resident_adult	1,3-Butadiene	1.0E-08	3.9E-04
R_1 resident	resident_adult	1-Hexane (n-hexane)	0.0E+00	3.7E-07
R_1 resident	resident_adult	Acrylonitrile	1.8E-09	3.2E-05
R_1 resident	resident_adult	Arsenic	2.3E-14	4.2E-10
R_1 resident	resident_adult	Benzene	6.0E-11	6.0E-07
R_1 resident	resident_adult	Beryllium	1.1E-15	5.3E-11
R_1 resident	resident_adult	Cadmium	4.5E-15	2.9E-11
R_1 resident	resident_adult	Chloroform (Trichloromethane)	8.7E-12	2.9E-06
R_1 resident	resident_adult	Chromium	0.0E+00	4.0E-15
R_1 resident	resident_adult	Chromium, hexavalent	1.5E-14	3.6E-10
R_1 resident	resident_adult	Cobalt	0.0E+00	2.0E-10
R_1 resident	resident_adult	Copper	0.0E+00	6.1E-12
R_1 resident	resident_adult	Cyclohexane	0.0E+00	5.6E-08
R_1 resident	resident_adult	Dichlorobenzene,1,4-	1.2E-11	3.1E-09
R_1 resident	resident_adult	Ethylbenzene	0.0E+00	5.3E-09
R_1 resident	resident_adult	Ethylene Dibromide	3.0E-11	1.3E-08
R_1 resident	resident_adult	Ethylene Glycol	0.0E+00	9.6E-11
R_1 resident	resident_adult	Naphthalene	0.0E+00	8.6E-09
R_1 resident	resident_adult	Nickel	7.1E-15	3.5E-10
R_1 resident	resident_adult	Styrene	0.0E+00	5.8E-09
R_1 resident	resident_adult	Tetrachloroethylene (Perchloroethylene)	2.7E-11	2.6E-08
R_1 resident	resident_adult	Toluene	0.0E+00	2.1E-08
R_1 resident	resident_adult	Trichloroethylene	5.3E-12	1.0E-08
R_1 resident	resident_adult	Vinyl Chloride	3.7E-11	9.9E-08
		Total	1E-08	4E-04
R_1 resident	resident_child	1,3-Butadiene	2.0E-09	3.9E-04
R_1 resident	resident_child	1-Hexane (n-hexane)	0.0E+00	3.7E-07
R_1 resident	resident_child	Acrylonitrile	3.7E-10	3.2E-05
R_1 resident	resident_child	Arsenic	4.7E-15	4.2E-10
R_1 resident	resident_child	Benzene	1.2E-11	6.0E-07
R_1 resident	resident_child	Beryllium	2.2E-16	5.3E-11
R_1 resident	resident_child	Cadmium	9.1E-16	2.9E-11
R_1 resident	resident_child	Chloroform (Trichloromethane)	1.7E-12	2.9E-06
R_1 resident	resident_child	Chromium	0.0E+00	4.0E-15
R_1 resident	resident_child	Chromium, hexavalent	2.9E-15	3.6E-10
R_1 resident	resident_child	Cobalt	0.0E+00	2.0E-10
R_1 resident	resident_child	Copper	0.0E+00	6.1E-12
R_1 resident	resident_child	Cyclohexane	0.0E+00	5.6E-08
R_1 resident	resident_child	Dichlorobenzene,1,4-	2.3E-12	3.1E-09
R_1 resident	resident_child	Ethylbenzene	0.0E+00	5.3E-09
R_1 resident	resident_child	Ethylene Dibromide	6.1E-12	1.3E-08
R_1 resident	resident_child	Ethylene Glycol	0.0E+00	9.6E-11
R_1 resident	resident_child	Naphthalene	0.0E+00	8.6E-09
R_1 resident	resident_child	Nickel	1.4E-15	3.5E-10
R_1 resident	resident_child	Styrene	0.0E+00	5.8E-09
R_1 resident	resident_child	Tetrachloroethylene (Perchloroethylene)	5.3E-12	2.6E-08
R_1 resident	resident_child	Toluene	0.0E+00	2.1E-08
R_1 resident	resident_child	Trichloroethylene	1.1E-12	1.0E-08
R_1 resident	resident_child	Vinyl Chloride	7.5E-12	9.9E-08
		Total	2E-09	4E-04
R_2 resident	resident_adult	1,3-Butadiene	2.4E-08	9.2E-04
R_2 resident	resident_adult	1-Hexane (n-hexane)	0.0E+00	8.7E-07
R_2 resident	resident_adult	Acrylonitrile	4.4E-09	7.5E-05
R_2 resident	resident_adult	Arsenic	5.5E-14	1.0E-09
R_2 resident	resident_adult	Benzene	1.4E-10	1.4E-06
R_2 resident	resident_adult	Beryllium	2.6E-15	1.3E-10
R_2 resident	resident_adult	Cadmium	1.1E-14	7.0E-11
R_2 resident	resident_adult	Chloroform (Trichloromethane)	2.1E-11	6.9E-06
R_2 resident	resident_adult	Chromium	0.0E+00	9.5E-15
R_2 resident	resident_adult	Chromium, hexavalent	3.5E-14	8.4E-10
R_2 resident	resident_adult	Cobalt	0.0E+00	4.8E-10
R_2 resident	resident_adult	Copper	0.0E+00	1.4E-11

Fugitive Air Emissions Risk Assessment
Chronic Inhalation Risk Results by Compound
(IRAP Software Output Information)

Receptor	Scenario	Compound	Inhalation Excess Lifetime Cancer Risk	Inhalation Non-Cancer Hazard Quotient
R_2 resident	resident_adult	Cyclohexane	0.0E+00	1.3E-07
R_2 resident	resident_adult	Dichlorobenzene,1,4-	2.7E-11	7.3E-09
R_2 resident	resident_adult	Ethylbenzene	0.0E+00	1.2E-08
R_2 resident	resident_adult	Ethylene Dibromide	7.2E-11	3.1E-08
R_2 resident	resident_adult	Ethylene Glycol	0.0E+00	2.3E-10
R_2 resident	resident_adult	Naphthalene	0.0E+00	2.0E-08
R_2 resident	resident_adult	Nickel	1.7E-14	8.2E-10
R_2 resident	resident_adult	Styrene	0.0E+00	1.4E-08
R_2 resident	resident_adult	Tetrachloroethylene (Perchloroethylene)	6.3E-11	6.2E-08
R_2 resident	resident_adult	Toluene	0.0E+00	5.0E-08
R_2 resident	resident_adult	Trichloroethylene	1.3E-11	2.4E-08
R_2 resident	resident_adult	Vinyl Chloride	8.9E-11	2.3E-07
		Total	3E-08	1E-03
R_2 resident	resident_child	1,3-Butadiene	4.7E-09	9.2E-04
R_2 resident	resident_child	1-Hexane (n-hexane)	0.0E+00	8.7E-07
R_2 resident	resident_child	Acrylonitrile	8.7E-10	7.5E-05
R_2 resident	resident_child	Arsenic	1.1E-14	1.0E-09
R_2 resident	resident_child	Benzene	2.8E-11	1.4E-06
R_2 resident	resident_child	Beryllium	5.2E-16	1.3E-10
R_2 resident	resident_child	Cadmium	2.1E-15	7.0E-11
R_2 resident	resident_child	Chloroform (Trichloromethane)	4.1E-12	6.9E-06
R_2 resident	resident_child	Chromium	0.0E+00	9.5E-15
R_2 resident	resident_child	Chromium, hexavalent	6.9E-15	8.4E-10
R_2 resident	resident_child	Cobalt	0.0E+00	4.8E-10
R_2 resident	resident_child	Copper	0.0E+00	1.4E-11
R_2 resident	resident_child	Cyclohexane	0.0E+00	1.3E-07
R_2 resident	resident_child	Dichlorobenzene,1,4-	5.5E-12	7.3E-09
R_2 resident	resident_child	Ethylbenzene	0.0E+00	1.2E-08
R_2 resident	resident_child	Ethylene Dibromide	1.4E-11	3.1E-08
R_2 resident	resident_child	Ethylene Glycol	0.0E+00	2.3E-10
R_2 resident	resident_child	Naphthalene	0.0E+00	2.0E-08
R_2 resident	resident_child	Nickel	3.4E-15	8.2E-10
R_2 resident	resident_child	Styrene	0.0E+00	1.4E-08
R_2 resident	resident_child	Tetrachloroethylene (Perchloroethylene)	1.3E-11	6.2E-08
R_2 resident	resident_child	Toluene	0.0E+00	5.0E-08
R_2 resident	resident_child	Trichloroethylene	2.5E-12	2.4E-08
R_2 resident	resident_child	Vinyl Chloride	1.8E-11	2.3E-07
		Total	6E-09	1E-03
R_3 resident farmer	farmer_adult	1,3-Butadiene	3.9E-08	1.1E-03
R_3 resident farmer	farmer_adult	1-Hexane (n-hexane)	0.0E+00	1.1E-06
R_3 resident farmer	farmer_adult	Acrylonitrile	7.2E-09	9.3E-05
R_3 resident farmer	farmer_adult	Arsenic	9.2E-14	1.2E-09
R_3 resident farmer	farmer_adult	Benzene	2.4E-10	1.8E-06
R_3 resident farmer	farmer_adult	Beryllium	4.3E-15	1.6E-10
R_3 resident farmer	farmer_adult	Cadmium	1.8E-14	8.7E-11
R_3 resident farmer	farmer_adult	Chloroform (Trichloromethane)	3.4E-11	8.6E-06
R_3 resident farmer	farmer_adult	Chromium	0.0E+00	1.2E-14
R_3 resident farmer	farmer_adult	Chromium, hexavalent	5.8E-14	1.1E-09
R_3 resident farmer	farmer_adult	Cobalt	0.0E+00	6.0E-10
R_3 resident farmer	farmer_adult	Copper	0.0E+00	1.8E-11
R_3 resident farmer	farmer_adult	Cyclohexane	0.0E+00	1.6E-07
R_3 resident farmer	farmer_adult	Dichlorobenzene,1,4-	4.6E-11	9.1E-09
R_3 resident farmer	farmer_adult	Ethylbenzene	0.0E+00	1.5E-08
R_3 resident farmer	farmer_adult	Ethylene Dibromide	1.2E-10	3.9E-08
R_3 resident farmer	farmer_adult	Ethylene Glycol	0.0E+00	2.8E-10
R_3 resident farmer	farmer_adult	Naphthalene	0.0E+00	2.5E-08
R_3 resident farmer	farmer_adult	Nickel	2.8E-14	1.0E-09
R_3 resident farmer	farmer_adult	Styrene	0.0E+00	1.7E-08
R_3 resident farmer	farmer_adult	Tetrachloroethylene (Perchloroethylene)	1.0E-10	7.8E-08
R_3 resident farmer	farmer_adult	Toluene	0.0E+00	6.2E-08
R_3 resident farmer	farmer_adult	Trichloroethylene	2.1E-11	3.0E-08

Fugitive Air Emissions Risk Assessment
Chronic Inhalation Risk Results by Compound
(IRAP Software Output Information)

Receptor	Scenario	Compound	Inhalation Excess Lifetime Cancer Risk	Inhalation Non-Cancer Hazard Quotient
R_3 resident farmer	farmer_adult	Vinyl Chloride	1.5E-10	2.9E-07
		Total	5E-08	1E-03
R_3 resident farmer	farmer_child	1,3-Butadiene	5.9E-09	1.1E-03
R_3 resident farmer	farmer_child	1-Hexane (n-hexane)	0.0E+00	1.1E-06
R_3 resident farmer	farmer_child	Acrylonitrile	1.1E-09	9.3E-05
R_3 resident farmer	farmer_child	Arsenic	1.4E-14	1.2E-09
R_3 resident farmer	farmer_child	Benzene	3.5E-11	1.8E-06
R_3 resident farmer	farmer_child	Beryllium	6.4E-16	1.6E-10
R_3 resident farmer	farmer_child	Cadmium	2.7E-15	8.7E-11
R_3 resident farmer	farmer_child	Chloroform (Trichloromethane)	5.1E-12	8.6E-06
R_3 resident farmer	farmer_child	Chromium	0.0E+00	1.2E-14
R_3 resident farmer	farmer_child	Chromium, hexavalent	8.7E-15	1.1E-09
R_3 resident farmer	farmer_child	Cobalt	0.0E+00	6.0E-10
R_3 resident farmer	farmer_child	Copper	0.0E+00	1.8E-11
R_3 resident farmer	farmer_child	Cyclohexane	0.0E+00	1.6E-07
R_3 resident farmer	farmer_child	Dichlorobenzene,1,4-	6.8E-12	9.1E-09
R_3 resident farmer	farmer_child	Ethylbenzene	0.0E+00	1.5E-08
R_3 resident farmer	farmer_child	Ethylene Dibromide	1.8E-11	3.9E-08
R_3 resident farmer	farmer_child	Ethylene Glycol	0.0E+00	2.8E-10
R_3 resident farmer	farmer_child	Naphthalene	0.0E+00	2.5E-08
R_3 resident farmer	farmer_child	Nickel	4.2E-15	1.0E-09
R_3 resident farmer	farmer_child	Styrene	0.0E+00	1.7E-08
R_3 resident farmer	farmer_child	Tetrachloroethylene (Perchloroethylene)	1.6E-11	7.8E-08
R_3 resident farmer	farmer_child	Toluene	0.0E+00	6.2E-08
R_3 resident farmer	farmer_child	Trichloroethylene	3.1E-12	3.0E-08
R_3 resident farmer	farmer_child	Vinyl Chloride	2.2E-11	2.9E-07
		Total	7E-09	1E-03
R_4 resident farmer	farmer_adult	1,3-Butadiene	3.2E-08	9.4E-04
R_4 resident farmer	farmer_adult	1-Hexane (n-hexane)	0.0E+00	8.8E-07
R_4 resident farmer	farmer_adult	Acrylonitrile	5.9E-09	7.6E-05
R_4 resident farmer	farmer_adult	Arsenic	7.5E-14	1.0E-09
R_4 resident farmer	farmer_adult	Benzene	1.9E-10	1.4E-06
R_4 resident farmer	farmer_adult	Beryllium	3.5E-15	1.3E-10
R_4 resident farmer	farmer_adult	Cadmium	1.5E-14	7.1E-11
R_4 resident farmer	farmer_adult	Chloroform (Trichloromethane)	2.8E-11	7.0E-06
R_4 resident farmer	farmer_adult	Chromium	0.0E+00	9.7E-15
R_4 resident farmer	farmer_adult	Chromium, hexavalent	4.7E-14	8.6E-10
R_4 resident farmer	farmer_adult	Cobalt	0.0E+00	4.9E-10
R_4 resident farmer	farmer_adult	Copper	0.0E+00	1.5E-11
R_4 resident farmer	farmer_adult	Cyclohexane	0.0E+00	1.3E-07
R_4 resident farmer	farmer_adult	Dichlorobenzene,1,4-	3.7E-11	7.4E-09
R_4 resident farmer	farmer_adult	Ethylbenzene	0.0E+00	1.3E-08
R_4 resident farmer	farmer_adult	Ethylene Dibromide	9.7E-11	3.1E-08
R_4 resident farmer	farmer_adult	Ethylene Glycol	0.0E+00	2.3E-10
R_4 resident farmer	farmer_adult	Naphthalene	0.0E+00	2.1E-08
R_4 resident farmer	farmer_adult	Nickel	2.3E-14	8.3E-10
R_4 resident farmer	farmer_adult	Styrene	0.0E+00	1.4E-08
R_4 resident farmer	farmer_adult	Tetrachloroethylene (Perchloroethylene)	8.5E-11	6.3E-08
R_4 resident farmer	farmer_adult	Toluene	0.0E+00	5.1E-08
R_4 resident farmer	farmer_adult	Trichloroethylene	1.7E-11	2.5E-08
R_4 resident farmer	farmer_adult	Vinyl Chloride	1.2E-10	2.4E-07
		Total	4E-08	1E-03
R_4 resident farmer	farmer_child	1,3-Butadiene	4.8E-09	9.4E-04
R_4 resident farmer	farmer_child	1-Hexane (n-hexane)	0.0E+00	8.8E-07
R_4 resident farmer	farmer_child	Acrylonitrile	8.8E-10	7.6E-05
R_4 resident farmer	farmer_child	Arsenic	1.1E-14	1.0E-09
R_4 resident farmer	farmer_child	Benzene	2.9E-11	1.4E-06
R_4 resident farmer	farmer_child	Beryllium	5.2E-16	1.3E-10
R_4 resident farmer	farmer_child	Cadmium	2.2E-15	7.1E-11
R_4 resident farmer	farmer_child	Chloroform (Trichloromethane)	4.2E-12	7.0E-06
R_4 resident farmer	farmer_child	Chromium	0.0E+00	9.7E-15

Fugitive Air Emissions Risk Assessment
Chronic Inhalation Risk Results by Compound
(IRAP Software Output Information)

Receptor	Scenario	Compound	Inhalation Excess Lifetime Cancer Risk	Inhalation Non-Cancer Hazard Quotient
R_4 resident farmer	farmer_child	Chromium, hexavalent	7.0E-15	8.6E-10
R_4 resident farmer	farmer_child	Cobalt	0.0E+00	4.9E-10
R_4 resident farmer	farmer_child	Copper	0.0E+00	1.5E-11
R_4 resident farmer	farmer_child	Cyclohexane	0.0E+00	1.3E-07
R_4 resident farmer	farmer_child	Dichlorobenzene,1,4-	5.6E-12	7.4E-09
R_4 resident farmer	farmer_child	Ethylbenzene	0.0E+00	1.3E-08
R_4 resident farmer	farmer_child	Ethylene Dibromide	1.5E-11	3.1E-08
R_4 resident farmer	farmer_child	Ethylene Glycol	0.0E+00	2.3E-10
R_4 resident farmer	farmer_child	Naphthalene	0.0E+00	2.1E-08
R_4 resident farmer	farmer_child	Nickel	3.4E-15	8.3E-10
R_4 resident farmer	farmer_child	Styrene	0.0E+00	1.4E-08
R_4 resident farmer	farmer_child	Tetrachloroethylene (Perchloroethylene)	1.3E-11	6.3E-08
R_4 resident farmer	farmer_child	Toluene	0.0E+00	5.1E-08
R_4 resident farmer	farmer_child	Trichloroethylene	2.5E-12	2.5E-08
R_4 resident farmer	farmer_child	Vinyl Chloride	1.8E-11	2.4E-07
		Total	6E-09	1E-03
R_5 resident	resident_adult	1,3-Butadiene	2.1E-08	8.0E-04
R_5 resident	resident_adult	1-Hexane (n-hexane)	0.0E+00	7.5E-07
R_5 resident	resident_adult	Acrylonitrile	3.8E-09	6.5E-05
R_5 resident	resident_adult	Arsenic	4.8E-14	8.7E-10
R_5 resident	resident_adult	Benzene	1.2E-10	1.2E-06
R_5 resident	resident_adult	Beryllium	2.2E-15	1.1E-10
R_5 resident	resident_adult	Cadmium	9.3E-15	6.0E-11
R_5 resident	resident_adult	Chloroform (Trichloromethane)	1.8E-11	6.0E-06
R_5 resident	resident_adult	Chromium	0.0E+00	8.3E-15
R_5 resident	resident_adult	Chromium, hexavalent	3.0E-14	7.3E-10
R_5 resident	resident_adult	Cobalt	0.0E+00	4.2E-10
R_5 resident	resident_adult	Copper	0.0E+00	1.2E-11
R_5 resident	resident_adult	Cyclohexane	0.0E+00	1.1E-07
R_5 resident	resident_adult	Dichlorobenzene,1,4-	2.4E-11	6.3E-09
R_5 resident	resident_adult	Ethylbenzene	0.0E+00	1.1E-08
R_5 resident	resident_adult	Ethylene Dibromide	6.2E-11	2.7E-08
R_5 resident	resident_adult	Ethylene Glycol	0.0E+00	2.0E-10
R_5 resident	resident_adult	Naphthalene	0.0E+00	1.8E-08
R_5 resident	resident_adult	Nickel	1.5E-14	7.1E-10
R_5 resident	resident_adult	Styrene	0.0E+00	1.2E-08
R_5 resident	resident_adult	Tetrachloroethylene (Perchloroethylene)	5.5E-11	5.4E-08
R_5 resident	resident_adult	Toluene	0.0E+00	4.3E-08
R_5 resident	resident_adult	Trichloroethylene	1.1E-11	2.1E-08
R_5 resident	resident_adult	Vinyl Chloride	7.7E-11	2.0E-07
		Total	2E-08	9E-04
R_5 resident	resident_child	1,3-Butadiene	4.1E-09	8.0E-04
R_5 resident	resident_child	1-Hexane (n-hexane)	0.0E+00	7.5E-07
R_5 resident	resident_child	Acrylonitrile	7.5E-10	6.5E-05
R_5 resident	resident_child	Arsenic	9.6E-15	8.7E-10
R_5 resident	resident_child	Benzene	2.5E-11	1.2E-06
R_5 resident	resident_child	Beryllium	4.5E-16	1.1E-10
R_5 resident	resident_child	Cadmium	1.9E-15	6.0E-11
R_5 resident	resident_child	Chloroform (Trichloromethane)	3.6E-12	6.0E-06
R_5 resident	resident_child	Chromium	0.0E+00	8.3E-15
R_5 resident	resident_child	Chromium, hexavalent	6.0E-15	7.3E-10
R_5 resident	resident_child	Cobalt	0.0E+00	4.2E-10
R_5 resident	resident_child	Copper	0.0E+00	1.2E-11
R_5 resident	resident_child	Cyclohexane	0.0E+00	1.1E-07
R_5 resident	resident_child	Dichlorobenzene,1,4-	4.8E-12	6.3E-09
R_5 resident	resident_child	Ethylbenzene	0.0E+00	1.1E-08
R_5 resident	resident_child	Ethylene Dibromide	1.2E-11	2.7E-08
R_5 resident	resident_child	Ethylene Glycol	0.0E+00	2.0E-10
R_5 resident	resident_child	Naphthalene	0.0E+00	1.8E-08
R_5 resident	resident_child	Nickel	2.9E-15	7.1E-10
R_5 resident	resident_child	Styrene	0.0E+00	1.2E-08

Fugitive Air Emissions Risk Assessment
Chronic Inhalation Risk Results by Compound
(IRAP Software Output Information)

Receptor	Scenario	Compound	Inhalation Excess Lifetime Cancer Risk	Inhalation Non-Cancer Hazard Quotient
R_5 resident	resident_child	Tetrachloroethylene (Perchloroethylene)	1.1E-11	5.4E-08
R_5 resident	resident_child	Toluene	0.0E+00	4.3E-08
R_5 resident	resident_child	Trichloroethylene	2.2E-12	2.1E-08
R_5 resident	resident_child	Vinyl Chloride	1.5E-11	2.0E-07
		Total	5E-09	9E-04
R_6 resident	resident_adult	1,3-Butadiene	2.6E-08	1.0E-03
R_6 resident	resident_adult	1-Hexane (n-hexane)	0.0E+00	9.4E-07
R_6 resident	resident_adult	Acrylonitrile	4.7E-09	8.1E-05
R_6 resident	resident_adult	Arsenic	6.0E-14	1.1E-09
R_6 resident	resident_adult	Benzene	1.5E-10	1.5E-06
R_6 resident	resident_adult	Beryllium	2.8E-15	1.4E-10
R_6 resident	resident_adult	Cadmium	1.2E-14	7.5E-11
R_6 resident	resident_adult	Chloroform (Trichloromethane)	2.2E-11	7.5E-06
R_6 resident	resident_adult	Chromium	0.0E+00	1.0E-14
R_6 resident	resident_adult	Chromium, hexavalent	3.7E-14	9.1E-10
R_6 resident	resident_adult	Cobalt	0.0E+00	5.2E-10
R_6 resident	resident_adult	Copper	0.0E+00	1.5E-11
R_6 resident	resident_adult	Cyclohexane	0.0E+00	1.4E-07
R_6 resident	resident_adult	Dichlorobenzene,1,4-	3.0E-11	7.9E-09
R_6 resident	resident_adult	Ethylbenzene	0.0E+00	1.3E-08
R_6 resident	resident_adult	Ethylene Dibromide	7.7E-11	3.3E-08
R_6 resident	resident_adult	Ethylene Glycol	0.0E+00	2.4E-10
R_6 resident	resident_adult	Naphthalene	0.0E+00	2.2E-08
R_6 resident	resident_adult	Nickel	1.8E-14	8.8E-10
R_6 resident	resident_adult	Styrene	0.0E+00	1.5E-08
R_6 resident	resident_adult	Tetrachloroethylene (Perchloroethylene)	6.8E-11	6.7E-08
R_6 resident	resident_adult	Toluene	0.0E+00	5.4E-08
R_6 resident	resident_adult	Trichloroethylene	1.4E-11	2.6E-08
R_6 resident	resident_adult	Vinyl Chloride	9.6E-11	2.5E-07
		Total	3E-08	1E-03
R_6 resident	resident_child	1,3-Butadiene	5.1E-09	1.0E-03
R_6 resident	resident_child	1-Hexane (n-hexane)	0.0E+00	9.4E-07
R_6 resident	resident_child	Acrylonitrile	9.4E-10	8.1E-05
R_6 resident	resident_child	Arsenic	1.2E-14	1.1E-09
R_6 resident	resident_child	Benzene	3.1E-11	1.5E-06
R_6 resident	resident_child	Beryllium	5.6E-16	1.4E-10
R_6 resident	resident_child	Cadmium	2.3E-15	7.5E-11
R_6 resident	resident_child	Chloroform (Trichloromethane)	4.4E-12	7.5E-06
R_6 resident	resident_child	Chromium	0.0E+00	1.0E-14
R_6 resident	resident_child	Chromium, hexavalent	7.5E-15	9.1E-10
R_6 resident	resident_child	Cobalt	0.0E+00	5.2E-10
R_6 resident	resident_child	Copper	0.0E+00	1.5E-11
R_6 resident	resident_child	Cyclohexane	0.0E+00	1.4E-07
R_6 resident	resident_child	Dichlorobenzene,1,4-	5.9E-12	7.9E-09
R_6 resident	resident_child	Ethylbenzene	0.0E+00	1.3E-08
R_6 resident	resident_child	Ethylene Dibromide	1.5E-11	3.3E-08
R_6 resident	resident_child	Ethylene Glycol	0.0E+00	2.4E-10
R_6 resident	resident_child	Naphthalene	0.0E+00	2.2E-08
R_6 resident	resident_child	Nickel	3.6E-15	8.8E-10
R_6 resident	resident_child	Styrene	0.0E+00	1.5E-08
R_6 resident	resident_child	Tetrachloroethylene	1.4E-11	6.7E-08
R_6 resident	resident_child	Toluene	0.0E+00	5.4E-08
R_6 resident	resident_child	Trichloroethylene	2.7E-12	2.6E-08
R_6 resident	resident_child	Vinyl Chloride	1.9E-11	2.5E-07
		Total	6E-09	1E-03

IRAP-h View

ACUTE INHALATION RISK RESULTS
FUGITIVE AIR EMISSIONS DURING UNLOADING AT OUTDOOR HOPPER

Emission Rates Based On Average Concentration in All Delivered Spent Carbon Loads Over 4-Year Period (2003-2006 Data)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
A_1 maximum impact point (stack emissions)	
Benzene	2.1E-04
Chloroform (Trichloromethane)	8.8E-05
Acrylonitrile	4.3E-05
1,3-Butadiene	7.9E-06
Tetrachloroethylene (Perchloroethylene)	7.9E-06
Cyclohexane	5.0E-06
Styrene	4.1E-06
Toluene	3.4E-06
1-Hexane (n-hexane)	2.6E-06
Arsenic	1.0E-06
Vinyl Chloride	8.2E-07
Nickel	1.7E-07
Ethylbenzene	1.6E-07
Trichloroethylene	1.3E-07
Dichlorobenzene,1,4-	6.1E-08
Copper	3.2E-08
Ethylene Dibromide	8.8E-09
Naphthalene	5.1E-09
Beryllium	3.2E-09
Cadmium	2.9E-09
Chromium	2.1E-10
Cobalt	1.0E-10
Chromium, hexavalent (c)	0.0E+00
Total	3.7E-04
A_2 closest business	
Benzene	4.6E-04
Chloroform (Trichloromethane)	1.9E-04
Acrylonitrile	9.5E-05
1,3-Butadiene	1.7E-05
Tetrachloroethylene (Perchloroethylene)	1.7E-05
Cyclohexane	1.1E-05
Styrene	9.2E-06
Toluene	7.5E-06
1-Hexane (n-hexane)	5.7E-06
Arsenic	2.2E-06
Vinyl Chloride	1.8E-06
Nickel	3.8E-07
Ethylbenzene	3.5E-07
Trichloroethylene	2.9E-07
Dichlorobenzene,1,4-	1.4E-07
Copper	7.0E-08
Ethylene Dibromide	1.9E-08
Naphthalene	1.1E-08
Beryllium	7.0E-09
Cadmium	6.5E-09
Chromium	4.7E-10
Cobalt	2.3E-10
Chromium, hexavalent (c)	0.0E+00
Total	8.2E-04
A_3 maximum impact point (hopper fugitive emissions)	
Benzene	1.1E-02
Chloroform (Trichloromethane)	4.8E-03
Acrylonitrile	2.4E-03
1,3-Butadiene	4.3E-04
Tetrachloroethylene (Perchloroethylene)	4.3E-04
Cyclohexane	2.7E-04
Styrene	2.3E-04
Toluene	1.9E-04
1-Hexane (n-hexane)	1.4E-04
Arsenic	5.5E-05
Vinyl Chloride	4.5E-05
Nickel	9.5E-06

ACUTE INHALATION RISK RESULTS
FUGITIVE AIR EMISSIONS DURING UNLOADING AT OUTDOOR HOPPER

Emission Rates Based On Average Concentration in All Delivered Spent Carbon Loads Over 4-Year Period (2003-2006 Data)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Ethylbenzene	8.6E-06
Trichloroethylene	7.3E-06
Dichlorobenzene,1,4-	3.4E-06
Copper	1.7E-06
Ethylene Dibromide	4.8E-07
Naphthalene	2.8E-07
Beryllium	1.7E-07
Cadmium	1.6E-07
Chromium	1.2E-08
Cobalt	5.6E-09
Chromium, hexavalent (c)	0.0E+00
Total	2.0E-02
R_1 resident	
Benzene	2.8E-05
Chloroform (Trichloromethane)	1.2E-05
Acrylonitrile	5.8E-06
1,3-Butadiene	1.1E-06
Tetrachloroethylene (Perchloroethylene)	1.1E-06
Cyclohexane	6.8E-07
Styrene	5.7E-07
Toluene	4.6E-07
1-Hexane (n-hexane)	3.5E-07
Arsenic	1.4E-07
Vinyl Chloride	1.1E-07
Nickel	2.4E-08
Ethylbenzene	2.1E-08
Trichloroethylene	1.8E-08
Dichlorobenzene,1,4-	8.4E-09
Copper	4.3E-09
Ethylene Dibromide	1.2E-09
Naphthalene	7.0E-10
Beryllium	4.3E-10
Cadmium	4.0E-10
Chromium	2.9E-11
Cobalt	1.4E-11
Chromium, hexavalent (c)	0.0E+00
Total	5.1E-05
R_2 resident	
Benzene	2.6E-05
Chloroform (Trichloromethane)	1.1E-05
Acrylonitrile	5.4E-06
1,3-Butadiene	9.9E-07
Tetrachloroethylene (Perchloroethylene)	9.9E-07
Cyclohexane	6.3E-07
Styrene	5.2E-07
Toluene	4.3E-07
1-Hexane (n-hexane)	3.2E-07
Arsenic	1.3E-07
Vinyl Chloride	1.0E-07
Nickel	2.2E-08
Ethylbenzene	2.0E-08
Trichloroethylene	1.7E-08
Dichlorobenzene,1,4-	7.7E-09
Copper	4.0E-09
Ethylene Dibromide	1.1E-09
Naphthalene	6.5E-10
Beryllium	4.0E-10
Cadmium	3.7E-10
Chromium	2.7E-11
Cobalt	1.3E-11
Chromium, hexavalent (c)	0.0E+00
Total	4.7E-05
R_3 resident farmer	

ACUTE INHALATION RISK RESULTS
FUGITIVE AIR EMISSIONS DURING UNLOADING AT OUTDOOR HOPPER

Emission Rates Based On Average Concentration in All Delivered Spent Carbon Loads Over 4-Year Period (2003-2006 Data)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Benzene	2.1E-05
Chloroform (Trichloromethane)	8.9E-06
Acrylonitrile	4.4E-06
1,3-Butadiene	8.0E-07
Tetrachloroethylene (Perchloroethylene)	8.0E-07
Cyclohexane	5.1E-07
Styrene	4.2E-07
Toluene	3.5E-07
1-Hexane (n-hexane)	2.6E-07
Arsenic	1.0E-07
Vinyl Chloride	8.4E-08
Nickel	1.8E-08
Ethylbenzene	1.6E-08
Trichloroethylene	1.4E-08
Dichlorobenzene,1,4-	6.3E-09
Copper	3.2E-09
Ethylene Dibromide	9.0E-10
Naphthalene	5.2E-10
Beryllium	3.2E-10
Cadmium	3.0E-10
Chromium	2.2E-11
Cobalt	1.0E-11
Chromium, hexavalent (c)	0.0E+00
Total	3.8E-05
R_4 resident farmer	
Benzene	2.7E-05
Chloroform (Trichloromethane)	1.2E-05
Acrylonitrile	5.6E-06
1,3-Butadiene	1.0E-06
Tetrachloroethylene (Perchloroethylene)	1.0E-06
Cyclohexane	6.6E-07
Styrene	5.4E-07
Toluene	4.5E-07
1-Hexane (n-hexane)	3.4E-07
Arsenic	1.3E-07
Vinyl Chloride	1.1E-07
Nickel	2.3E-08
Ethylbenzene	2.1E-08
Trichloroethylene	1.7E-08
Dichlorobenzene,1,4-	8.1E-09
Copper	4.2E-09
Ethylene Dibromide	1.2E-09
Naphthalene	6.7E-10
Beryllium	4.2E-10
Cadmium	3.9E-10
Chromium	2.8E-11
Cobalt	1.3E-11
Chromium, hexavalent (c)	0.0E+00
Total	4.9E-05
R_5 resident	
Benzene	3.4E-05
Chloroform (Trichloromethane)	1.4E-05
Acrylonitrile	7.0E-06
1,3-Butadiene	1.3E-06
Tetrachloroethylene (Perchloroethylene)	1.3E-06
Cyclohexane	8.2E-07
Styrene	6.8E-07
Toluene	5.6E-07
1-Hexane (n-hexane)	4.2E-07
Arsenic	1.6E-07
Vinyl Chloride	1.4E-07
Nickel	2.8E-08
Ethylbenzene	2.6E-08
Trichloroethylene	2.2E-08

ACUTE INHALATION RISK RESULTS
FUGITIVE AIR EMISSIONS DURING UNLOADING AT OUTDOOR HOPPER

Emission Rates Based On Average Concentration in All Delivered Spent Carbon Loads Over 4-Year Period (2003-2006 Data)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
Dichlorobenzene,1,4-	1.0E-08
Copper	5.2E-09
Ethylene Dibromide	1.4E-09
Naphthalene	8.4E-10
Beryllium	5.2E-10
Cadmium	4.8E-10
Chromium	3.5E-11
Cobalt	1.7E-11
Chromium, hexavalent (c)	0.0E+00
Total	6.1E-05
R_6 resident	
Benzene	1.5E-05
Chloroform (Trichloromethane)	6.5E-06
Acrylonitrile	3.2E-06
1,3-Butadiene	5.8E-07
Tetrachloroethylene (Perchloroethylene)	5.8E-07
Cyclohexane	3.7E-07
Styrene	3.1E-07
Toluene	2.5E-07
1-Hexane (n-hexane)	1.9E-07
Arsenic	7.4E-08
Vinyl Chloride	6.1E-08
Nickel	1.3E-08
Ethylbenzene	1.2E-08
Trichloroethylene	9.8E-09
Dichlorobenzene,1,4-	4.5E-09
Copper	2.3E-09
Ethylene Dibromide	6.5E-10
Naphthalene	3.8E-10
Beryllium	2.3E-10
Cadmium	2.2E-10
Chromium	1.6E-11
Cobalt	7.5E-12
Chromium, hexavalent (c)	0.0E+00
Total	2.7E-05

(a) Acute hazard quotients were calculated for all compounds with fugitive air emission rates and acute inhalation toxicity criteria.

(b) The total is based on the sum of all chemical-specific hazard quotients regardless of the type of health effects of the summed compounds. A total value summed across all compounds is used as a screening tool only, to determine if additional evaluation for specific types of health effects is warranted (i.e., if the total value is greater than 1).

(c) USEPA does not provide an acute inhalation reference concentration for hexavalent chromium.

ATTACHMENT C

EXCERPT FROM 2003 WORKING DRAFT RISK ASSESSMENT WORKPLAN FOR THE SIEMENS WATER TECHNOLOGIES CORP. CARBON REACTIVATION FACILITY:

4.3 FUGITIVE EMISSIONS EXPOSURE ASSESSMENT

ATTACHMENT C

EXCERPT FROM 2003 WORKING DRAFT RISK ASSESSMENT WORKPLAN FOR THE SIEMENS WATER TECHNOLOGIES CORP. CARBON REACTIVATION FACILITY

INTRODUCTION

The following text is an excerpt from the November 2003 Risk Assessment Workplan prepared for the Siemens Water Technologies Corp. (SWT) carbon reactivation facility. This excerpt is provided in response to USEPA Region IX comments on the July 2007 risk assessment that was performed for the facility. The information provided in this excerpt was based on facility data available in 2003.

The Workplan described the approaches proposed for the SWT facility risk assessment. The Workplan, updated by agreement with the USEPA to include elements of more recent 2005 Agency guidance for risk assessments of waste combustion facilities, was approved by USEPA prior to the initiation of the risk assessment.

EXCERPT FROM 2003 WORKPLAN

4.3 Fugitive Emissions Exposure Assessment

USEPA (2001a) requested that Westates' risk analysis address fugitive emissions potentially associated with the carbon reactivation facility including waste unloading, handling and processing. This section provides an overview of potential sources of fugitive emissions related to spent carbon at the facility in addition to a discussion of regulatory requirements, and engineering and institutional controls that are in place to minimize potential fugitive emissions. This discussion is used to identify the potential fugitive emission source related to spent carbon considered most likely to impact ambient air and thus proposed for detailed evaluation. This section also describes the exposure assessment approach that will be used to quantitatively evaluate the selected fugitive emissions source.

4.3.1 Potential for Fugitive Emissions from the Westates Facility

Processes involving spent carbon at the Westates facility that have the potential for fugitive particulate and volatile organic compound (VOC) emissions include:

- Handling of spent carbon containers received at the facility,
- Spent carbon unloading operations,
- Storage of spent carbon at the facility,
- Reactivation of spent carbon, and
- Production and bagging of reactivated carbon.

Potential fugitive emissions from each of these activities are reduced through standard work practices, facility design, and air pollution control (APC) devices. In addition, the intrinsic

highly adsorptive nature of spent carbon results in very low partitioning of contaminants from the carbon to the atmosphere.

Potential fugitive emission sources at the facility are addressed by the USEPA under:

- the National Emission Standard for Benzene Waste Operations, Subpart FF of 40 CFR Part 61 (part of USEPA's program addressing National Emission Standards for Hazardous Air Pollutants or NESHAPs),
- the Resource Conservation and Recovery Act (RCRA) Subpart CC, [1] and
- the Potential to Emit Transition Policy for Part 71 Implementation (part of USEPA's Clean Air Act program).

4.3.1.1 Spent Carbon Containers

All containers received at the facility that contain spent carbon classified as hazardous waste under RCRA and all containers of spent carbon received from a facility that is regulated under the benzene NESHAP rule must be managed in accordance with strict USEPA requirements. These requirements include assuring that the spent carbon containers are completely sealed; this is initially accomplished by the spent carbon generators through both visual inspections of containers and VOC monitoring around the seals of containers. Then upon arrival at the Westates facility, containers are again visually inspected for proper seals.

The Westates facility currently stores sealed containers of spent carbon for up to one year, although most such containers are typically unloaded into the unloading hopper H-2 within about one month. These containers are also visually inspected during routine quarterly plant inspections. Rolloff containers and slurry trucks unload spent carbon at the time of delivery into hopper H-1. Supersacks and other smaller containers unloaded at H-1 may be stored for up to one year but are usually unloaded within about one to three months. Although not required, similar practices are typically followed for non-RCRA classified spent carbon as well.

4.3.1.2 Spent Carbon Unloading

Engineering and work practices during unloading operations at the facility's two hoppers are designed to limit the potential for fugitive dust emissions. Moreover, at no time other than when spent carbon is being unloaded into one of the hoppers is spent carbon exposed directly to the ambient environment. The two spent carbon hoppers are considered in the Part 71 Implementation program, but are not specifically regulated under the benzene Subpart FF standard or RCRA Subpart CC.

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[1] USEPA's air emission control standards under RCRA for certain hazardous waste management units (tanks and containers) are generally known as the Subpart CC standards, found at 40 CFR Parts 264 and 265. USEPA has also developed national emissions standards for hazardous air pollutants (NESHAPS) under the Clean Air Act specifically for benzene, known as the National Emission Standard for Benzene Waste Operations, Subpart FF of 40 CFR Part 61. RCRA waste management units that are operated in compliance with the Subpart FF standards are generally exempt from the RCRA Subpart CC standards (because the practices used to control potential benzene emissions will also control other volatile organic compound emissions, meeting the Subpart CC requirements as well. See 40 CFR 264.1080(b)(7) and 40 CFR 265.1080(b)(7)). (See 40 CFR 264.1080 and 40 CFR 265.1080 for Subpart CC standards and 40 CFR 61.340 for Subpart FF standards.)

Roughly 52% of the spent carbon unloaded at hopper H-1 and 47% of the spent carbon unloaded at hopper H-2 is wet (saturated at roughly 50% moisture content by weight) and, therefore, do not generate fugitive dusts. Moreover, only a very small percentage of the dry spent carbon may be fine particulates. Powdered activated carbon is not accepted at the facility.

A hand-held water spray hose is used at H-1 as the material exits the containers to minimize potential dust emissions during unloading of dry spent carbon as well as to facilitate transfer of the spent carbon from the hopper through the piping system to the storage tanks. A hand-held water spray is also occasionally used to minimize dust emissions while unloading at hopper H-2 inside the spent carbon storage building.

An exhaust ventilation system is used for both hoppers, drawing roughly 2,500 cubic feet per minute of air from several ducts inside the hoppers through a fabric filter baghouse (BH-2) and then a carbon adsorber (WS-2). Particulate matter collected in the baghouse is periodically emptied into a container and placed in the RCRA-regulated debris bin maintained on site. Waste in the debris bin is sent to the RCRA-regulated Aptus, Utah incinerator facility every 60-90 days.

4.3.1.3 Spent Carbon Storage and Furnace Feed Hopper

All spent carbon storage tanks and the furnace feed hopper used at the facility are regulated under the benzene NESHAP Subpart FF air emission regulation which effectively minimizes potential VOC emissions. Although this regulation focuses on controlling benzene emissions, it ultimately achieves control of all VOC emissions. The tanks used to store spent carbon, as well as the furnace feed hopper and the water recycle tanks, have been constructed and are managed to comply with these regulations. The spent carbon storage tanks (tanks T-1, T-2, T-5, T-6), the furnace feed hopper (T-18) and the primary and secondary water recycle tanks (T-9 and T-12) are all fixed-roof, closed-vent storage vessels from which all vapors are passively routed through activated carbon adsorbers. The control efficiency of the carbon adsorbers is at least 95% for organic compounds and at least 98% for benzene. The carbon in these systems is changed over every 40 days for the adsorber that vents tanks T-1, T-2, T-5, T-6, T-9 and T-12. The adsorber that serves the furnace feed hopper T-18 is changed every 38 days. The changeout time for each of these adsorbers has been set based on engineering calculations to assure that the carbon does not approach its maximum collection efficiency.

The holding and discharge water tank, tank T-11, which is used for water and not spent carbon, is subject to recordkeeping and monitoring requirements, but is exempt from the RCRA Subpart CC and benzene Subpart FF air emission control requirements. Under Subpart CC, a tank in which the entering material has an average VOC concentration less than 500 mg/L (i.e., < 500 parts per million by weight or ppmw) is exempt from the RCRA Subpart CC air emission control requirements (40 CFR 265.1082(c)). In accordance with this program, annual monitoring of the material in tank T-11 is conducted and has indicated that the average VOC concentration in the water is less than 500 mg/L. Tank T-11 water is also monitored for benzene annually and has to date been found to contain less than 10 mg/L benzene, the trigger level at which USEPA's Subpart FF benzene NESHAP air emission requirements would be needed.

Process equipment (e.g., piping, valves, flanges, hatches, etc.) is also regularly monitored and inspected to minimize potential fugitive emissions in accordance with the facility's RCRA

compliance program and the benzene NESHAP Subpart FF requirements. Annual air monitoring, in accordance with Subpart FF, is conducted to measure any VOC emissions from tanks, the furnace feed hopper, carbon adsorbers, piping, and other equipment involved in the handling of spent carbon. The Westates monitoring program examines more than 80 potential emission locations at the facility (e.g., flanges, equipment doors, valves, carbon adsorber outlets, etc.). An instrument reading, using USEPA's Method 21, of more than 500 parts per million by volume (ppmv) in air above background is used as a trigger under Subpart FF indicating unacceptable VOC emissions. Measurements made on process equipment (e.g., piping, valves, flanges, hatches, etc.) have exceeded the 500 ppmw trigger only once from 1995 through 2001 (the hatch of recycle water tank T-9 had been left ajar).[2] In this instance, the hatch was immediately closed. Other than this instance, the measured VOC concentrations at process equipment potential emission locations using Method 21 have typically been no more than 1-10 ppmv above background levels.

Visual inspections of facility equipment and processes also occur on a daily, weekly, quarterly and bi-annual basis. The inspection forms used by Westates to conduct these inspections are included in Appendix D. On a daily basis, for example, all drums, vessels and bags are checked for leaks, corrosion, and complete closure and the storage tank systems are checked to ensure that there are no valve leaks, no cracks in piping, no corrosion, that overfill protection systems are functioning and that all monitoring equipment is functioning. Dust collection systems are checked weekly for leaks and to assure adequate pressure drop. A detailed inspection of all seals, inlets and outlets of pumps and valves is performed on a monthly basis. Visual inspections are also conducted to search for cracks, holes, loose connections or gaps in all fixed-roofs, seals, access doors, ductwork, piping, connections and all other openings of equipment used to manage spent carbon. These openings are required to be maintained in a closed, sealed position at all times when spent carbon is present except when it is necessary to use the opening for sampling or removal, or for equipment inspection, maintenance or repair.

4.3.1.4 Spent Carbon Reactivation

Potential emissions associated with spent carbon reactivation are routed through the facility's air pollution control (APC) equipment and then discharged through the facility stack. The high temperature reactivation process and APC employed at the facility are extremely effective in minimizing and removing potential pollutants from the exhaust stack gases. As noted in Section 4.2, potential risks associated with stack emissions will be considered in the risk assessment. Fugitive emissions from the reactivation furnace are, however, prevented by the design of the process which utilizes a totally sealed system. Facility inspection procedures also ensure the integrity of the equipment.

4.3.1.5 Production and Bagging of Reactivated Carbon

Potential fugitive dusts associated with production and bagging of reactivated carbon are controlled through the use of an exhaust system which draws air from the product piping and bagging equipment to the product-side baghouse (BH-1). Not only are product bags connected

[2] VOC concentrations greater than 500 ppmw have been observed using the Method 21 sampling not for process equipment but rather in the immediate vicinity of spent carbon barrels at the moment they are opened for unloading and during unloading.

with tight seals to the bagging equipment while filling, but the piping inserted into bags being filled exhausts air to baghouse BH-1. Almost the entire reactivated carbon product consists of small pellets or granules. Based on data from January 2000 to October 2001, only 3.7% of the reactivated product was screened into the smallest "fines" category (i.e., close to powdered activated carbon). Of this percentage, approximately 88% is fed directly to bagging equipment with the remainder (powdered activated carbon) collected in the product-side baghouse fabric filters. The baghouse is shaken periodically, and then a rotary valve scrapes the product directly from the filters into supersacks that are tightly sealed onto the base of the baghouse. When full, the supersacks are manually closed and sealed. This process produces roughly one bag of fine powdered activated carbon per week. The reactivated carbon product is no longer subject to RCRA regulations.

4.3.1.6 Potential Fugitive Emissions from Other Sources

All spent carbon received at the facility is maintained inside sealed containers which are regularly inspected until they are unloaded. Spent carbon is never stored in storage piles anywhere at the facility. The only time spent carbon is ever exposed to the ambient air is during unloading. Once unloaded into the hoppers, all spent carbon is maintained in a slurry form (roughly 44% water) and is enclosed in process equipment (e.g., storage tanks) until it is sent to the combustion system.

All roads used by vehicles transporting spent carbon and reactivated carbon at the facility are paved, thereby minimizing potential fugitive dust emissions. Since spent carbon remains containerized until unloading, fugitive dust emissions that could potentially occur from vehicle movement would only contain native soils, not spent carbon. In addition, the length of paved road segments used by vehicles at the facility is very limited (no more than about 1/4 mile) and vehicle speeds are kept very slow at all times on facility roads (typically less than 5 miles per hour). These factors all limit the likelihood of fugitive dust emissions of soil due to vehicular traffic at the facility. Vehicles carrying spent carbon occasionally wait on the shoulder of the paved facility driveway for their turn to unload their spent carbon; in this case, the vehicle will be at a standstill except when pulling off or on the pavement. The potential for fugitive dust emissions of soil from non-paved surfaces is, therefore, negligible due to the infrequent need for vehicles to pull over while waiting their turn coupled with the fact that the vehicles on the driveway shoulder are not moving except when pulling off or on the paved surface.

4.3.2 Exposure Assessment for Fugitive Emissions

4.3.2.1 Potential Fugitive Emission Sources Selected for Evaluation

The requirements of the benzene Subpart FF regulations minimize potential fugitive volatile organic emissions associated with spent carbon containers and spent carbon storage and process equipment. The combustion process effectively destroys VOCs on spent carbon, thus fugitive VOC emissions will not occur during production and bagging of reactivated carbon. Spent carbon is only exposed to the ambient air during unloading, and there is thus some potential for fugitive VOC emissions during this activity. The potential impact of fugitive VOC emissions in outdoor ambient air will be lower for unloading activities at the indoor hopper compared to the

outdoor hopper because the indoor environment will hinder release and dispersion of potential VOC emissions into the outdoor environment.

Fugitive dust emissions associated with spent carbon may occur during unloading of dry spent carbon at the hoppers. Fugitive dust emissions associated with reactivated carbon could potentially occur during production and bagging activities. At all other points in the facility's process, spent carbon and reactivated carbon are maintained in enclosed systems with no contact with the ambient air. Also, after unloading until combustion, all spent carbon is maintained in a slurry form and will not generate fugitive dusts. There is, however, a potential for spent carbon fugitive dust emissions to occur during unloading of dry spent carbon at the two hoppers even though these emissions are reduced through the use of an exhaust system at the hoppers as well as through the use of a water spray during unloading. Fugitive dust emissions during production and bagging of reactivated carbon are minimized by routing all product through a well-controlled piping and bagging system equipped with highly localized air emission controls at the point of potential dust generation. Thus, fugitive dust emissions associated with reactivated carbon are likely to be negligible.

Based on the discussion provided above, the potential fugitive emission source related to spent carbon considered most likely to impact ambient air is the unloading of spent carbon at the outdoor hopper. Thus, this fugitive emission source will be addressed in the risk assessment, focusing on both fugitive dust emissions as well as fugitive VOC emissions.

ATTACHMENT D

STACK EMISSIONS RISK ASSESSMENT:

ACUTE INHALATION RISK RESULTS

USING MAXIMUM MEASURED STACK EMISSION RATES

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
MAXIMUM MEASURED STACK EMISSION RATES (a)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (b)
A_1 max hourly impact point (stack)	
Arsenic	8.2E-02
Nitrogen dioxide	3.9E-02
Sulfur dioxide	1.4E-02
Chlorine	8.9E-03
Hydrogen chloride	4.0E-03
Beryllium	3.1E-03
Cadmium	1.3E-03
Nickel	2.7E-04
Lead	2.6E-04
Copper	2.2E-04
Mercury	3.9E-05
Hexachlorobenzene	9.9E-06
Mercuric chloride	9.7E-06
Chlorophenyl-phenylether, 4-	8.9E-06
Chloroform (Trichloromethane)	6.6E-06
Benzidine	6.0E-06
Dibromo-3-chloropropane, 1,2-	5.1E-06
Thallium (I)	4.7E-06
Manganese	3.0E-06
Vanadium	2.7E-06
Hexachlorocyclopentadiene	2.2E-06
Silver	1.9E-06
4,6-Dinitro-2-methylphenol	1.3E-06
Zinc	9.8E-07
Barium	9.1E-07
Pentachlorophenol	6.1E-07
Aluminum	5.9E-07
Tetrachloroethylene (Perchloroethylene)	5.7E-07
Chromium	5.2E-07
Chromium, hexavalent	5.2E-07
Selenium	4.1E-07
Fluoranthene	3.5E-07
PentaCDF, 2,3,4,7,8-	3.3E-07
Nitrosodipropylamine, n-	2.9E-07
Antimony	1.7E-07
Bromoform (tribromomethane)	1.7E-07
Chlorobenzene	1.6E-07
Benzoic Acid	1.3E-07
Dinitrotoluene, 2,4-	1.3E-07
Benzene	1.2E-07
Methylene chloride	1.2E-07
3-Penten-2-one, 4-methyl	1.1E-07
Bromodichloromethane	1.1E-07
Ethylhexyl phthalate, bis-2-	1.1E-07
Dinitrotoluene, 2,6-	1.1E-07
Dibromochloromethane	1.0E-07
Methyl bromide (Bromomethane)	8.5E-08
Dinitrophenol, 2,4-	7.2E-08
Nitrophenol, 4-	6.9E-08
Nitroaniline, 3-	6.9E-08
Chloronaphthalene,2-	6.6E-08
Dichlorobenzidine, 3,3'-	5.1E-08
Methylene bromide	5.1E-08
Pentachloronitrobenzene (PCNB)	4.2E-08
Toluene	4.2E-08
Cobalt	3.9E-08
Chlorobenzilate	3.2E-08
Dimethylphenol, 2,4-	3.0E-08
Acrylonitrile	3.0E-08
Nitrophenol, 2-	2.6E-08
Heptachlor	2.4E-08
Carbon Tetrachloride	2.4E-08
Carbazole	2.3E-08
Benzaldehyde	2.3E-08
Dinitrobenzene, 1,3-	2.2E-08
Methyl ethyl ketone (2-Butanone)	2.1E-08
Benzyl alcohol	2.1E-08
Phenanthrene	1.6E-08
Nitroaniline, 4-	1.5E-08
Benzonitrile	1.5E-08
Di-n-butyl phthalate	1.5E-08

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
MAXIMUM MEASURED STACK EMISSION RATES (a)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (b)
Aniline	1.4E-08
Carbon Disulfide	1.4E-08
Methyl chloride (Chloromethane)	1.3E-08
Heptachlor epoxide	1.3E-08
Phenol	1.2E-08
TetraCDF, 2,3,7,8-	1.1E-08
Endrin	9.5E-09
Chlorophenol, 2-	8.5E-09
Chloroaniline, p-	8.3E-09
Trichlorobenzene, 1,2,3-	6.8E-09
Acetone	6.8E-09
Bromophenyl-phenylether, 4-	6.7E-09
Chloro-3-methylphenol, 4-	6.5E-09
Hexachloro-1,3-butadiene (Perchlorobutadiene)	6.3E-09
Naphthalene	6.3E-09
Acetophenone	6.3E-09
HexaCDF, 1,2,3,6,7,8-	6.2E-09
Cresol, o-	6.2E-09
HexaCDF, 2,3,4,6,7,8-	5.8E-09
N-nitrosodimethylamine	5.5E-09
Butylbenzylphthalate	4.4E-09
Chlordane	4.3E-09
Dichlorobenzene, 1,3-	4.2E-09
2,5-Dimethylheptane	4.1E-09
Diethyl phthalate	4.0E-09
Acenaphthylene	4.0E-09
Tetrachloroethane, 1,1,2,2-	3.9E-09
Vinyl Acetate	3.8E-09
HexaCDF, 1,2,3,4,7,8-	3.8E-09
HexaCDD, 1,2,3,4,7,8-	3.6E-09
Dichloropropene, 1,3- (cis)	3.5E-09
Xylene, p-	3.4E-09
Xylene, m-	3.4E-09
Bis(2-chloroethoxy) methane	3.3E-09
Trichlorophenol, 2,4,5-	3.2E-09
PentaCDF, 1,2,3,7,8-	3.2E-09
Nitroaniline, 2-	3.1E-09
Nitrobenzene	3.1E-09
Dichlorophenol, 2,4-	2.9E-09
Benzo(b)fluoranthene	2.9E-09
2-Hexanone	2.8E-09
Hexachloroethane (Perchloroethane)	2.8E-09
Cresol, p-	2.7E-09
Cresol, m-	2.7E-09
Dimethyl phthalate	2.7E-09
PentaCDD, 1,2,3,7,8-	2.6E-09
Endosulfan I	2.6E-09
Trichlorophenol, 2,4,6-	2.5E-09
BHC, beta-	2.4E-09
Pyridine	2.2E-09
Dibenzofuran	2.1E-09
Diphenylamine	2.1E-09
Bromobenzene	2.0E-09
Indeno(1,2,3-cd) pyrene	1.9E-09
Tetrachlorobenzene, 1,2,4,5-	1.9E-09
Aldrin	1.9E-09
Nitrosodiphenylamine, N-	1.9E-09
Isophorone	1.9E-09
Pentachlorobenzene	1.8E-09
Di-n-octylphthalate	1.7E-09
Trichlorobenzene, 1,2,4-	1.6E-09
TetraCDD, 2,3,7,8-	1.6E-09
Chrysene	1.5E-09
Aroclor 1254	1.4E-09
Diphenylhydrazine,1,2-	1.4E-09
3-Ethyl benzaldehyde	1.3E-09
4-Ethyl benzaldehyde	1.3E-09
Trichloropropane, 1,2,3-	1.2E-09
DDT, 4-4'-	1.2E-09
Butylbenzene, sec	1.2E-09
Xylene, o-	1.2E-09
1,1-Dichloropropene	1.0E-09
Trichloroethane, 1,1,2-	9.5E-10
Dieldrin	9.2E-10

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
MAXIMUM MEASURED STACK EMISSION RATES (a)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (b)
BHC, alpha-	9.0E-10
Benzo(a)Anthracene	8.7E-10
Styrene	8.1E-10
Bis(2-chlorethyl)ether	8.1E-10
Benzo(k)fluoranthene	7.8E-10
2,2'-oxybis (1-Chloropropane)	7.7E-10
Iodomethane	7.2E-10
Methyl isobutyl ketone	5.6E-10
Benzo(a)pyrene	5.0E-10
gamma-BHC (Lindane)	4.6E-10
OctaCDF, 1,2,3,4,6,7,8,9-	4.4E-10
Ethylene dibromide	3.9E-10
Trichloroethylene	3.6E-10
Tetrahydrofuran	3.6E-10
Pyrene	3.5E-10
HexaCDD, 1,2,3,7,8,9-	3.5E-10
DDD, 4,4'-	3.5E-10
Tetrachloroethane, 1,1,1,2-	3.1E-10
HexaCDD, 1,2,3,6,7,8-	3.0E-10
1,3-Dichloropropane	3.0E-10
Butylbenzene, n-	2.9E-10
Dichloroethylene 1,1-	2.8E-10
2,2-Dichloropropane	2.8E-10
Butylbenzene, tert	2.7E-10
Vinyl Chloride	2.5E-10
Trichloroethane, 1,1,1-	2.4E-10
Anthracene	2.3E-10
Acenaphthene	2.2E-10
2-Methylnaphthalene	2.1E-10
Trimethylbenzene, 1,3,5-	1.9E-10
Dichlorobenzene, 1,2-	1.7E-10
Dichloroethane, 1,2- (Ethylene Dichloride)	1.6E-10
HeptaCDF, 1,2,3,4,6,7,8-	1.5E-10
Methoxychlor	1.1E-10
Dichlorobenzene,1,4-	1.0E-10
DDE, 4,4'-	9.8E-11
Fluorene	8.6E-11
Cumene (Isopropylbenzene)	8.5E-11
OctaCDD, 1,2,3,4,6,7,8,9-	7.9E-11
2-Chlorotoluene	7.5E-11
4-Chlorotoluene	7.5E-11
Ethylene Glycol	6.5E-11
Propylbenzene, n-	6.2E-11
Trichlorofluoromethane (Freon 11)	5.4E-11
1,2,4-Trimethylbenzene	5.4E-11
Dichloroethylene, cis-1,2-	4.8E-11
Ethylbenzene	4.7E-11
Dichloropropane, 1,2-	4.7E-11
HexaCDF, 1,2,3,7,8,9-	3.3E-11
Chloroethane	3.1E-11
Dichlorodifluoromethane	3.1E-11
Bromochloromethane	3.0E-11
Benzo(g,h,i)perylene	3.0E-11
methyl tert-butyl ether	2.4E-11
HeptaCDF, 1,2,3,4,7,8,9-	2.1E-11
Propylene oxide	1.7E-11
Dichloroethylene-1,2 (trans)	1.5E-11
Dichloroethane 1,1-	1.5E-11
HeptaCDD, 1,2,3,4,6,7,8-	7.7E-12
Methyl methacrylate	4.1E-12
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	2.0E-12
Dibenz(a,h)anthracene	1.9E-12
Dioxane, 1,4-	1.5E-12
Acrylic Acid	1.6E-13
1-Hexane (n-hexane)	2.8E-14
Endosulfan sulfate	0.0E+00
2,5-Dione, 3-hexene	0.0E+00
Benzo(e)pyrene	0.0E+00
Perylene	0.0E+00
Phosphine imide, P,P,P-triphenyl	0.0E+00
Diallate	0.0E+00
9-Octadecenamide (oleamide)	0.0E+00
delta-BHC	0.0E+00
2-Methyl octane	0.0E+00

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
MAXIMUM MEASURED STACK EMISSION RATES (a)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (b)
Endosulfan II	0.0E+00
Endrin ketone	0.0E+00
3-Penten-2-one (ethylidene acetone)	0.0E+00
2,5-Dimethylfuran	0.0E+00
Endrin aldehyde	0.0E+00
3-Hexen-2-one	0.0E+00
Benzoic acid, methyl ester (methyl benzoate)	0.0E+00
Isopropyl toluene, p-	0.0E+00
Total (c)	1.5E-01
A_2 closest business	
Nitrogen dioxide	3.9E-02
Arsenic	3.3E-02
Sulfur dioxide	1.4E-02
Chlorine	9.0E-03
Hydrogen chloride	4.0E-03
Beryllium	1.3E-03
Cadmium	5.2E-04
Nickel	1.1E-04
Lead	1.0E-04
Copper	9.0E-05
Mercury	3.9E-05
Hexachlorobenzene	9.9E-06
Mercuric chloride	9.7E-06
Chlorophenyl-phenylether, 4-	9.0E-06
Chloroform (Trichloromethane)	6.7E-06
Benzidine	5.8E-06
Dibromo-3-chloropropane, 1,2-	5.2E-06
Hexachlorocyclopentadiene	2.2E-06
Thallium (I)	1.9E-06
4,6-Dinitro-2-methylphenol	1.3E-06
Manganese	1.2E-06
Vanadium	1.1E-06
Silver	7.7E-07
Pentachlorophenol	6.1E-07
Tetrachloroethylene (Perchloroethylene)	5.7E-07
Zinc	3.9E-07
Barium	3.7E-07
Fluoranthene	3.5E-07
PentaCDF, 2,3,4,7,8-	3.2E-07
Nitrosodipropylamine, n-	2.9E-07
Aluminum	2.4E-07
Chromium	2.1E-07
Chromium, hexavalent	2.1E-07
Antimony	1.7E-07
Bromoform (tribromomethane)	1.7E-07
Selenium	1.6E-07
Chlorobenzene	1.6E-07
Benzoic Acid	1.3E-07
Dinitrotoluene, 2,4-	1.3E-07
Benzene	1.2E-07
Methylene chloride	1.2E-07
3-Penten-2-one, 4-methyl	1.1E-07
Bromodichloromethane	1.1E-07
Ethylhexyl phthalate, bis-2-	1.1E-07
Dinitrotoluene, 2,6-	1.1E-07
Dibromochloromethane	1.0E-07
Methyl bromide (Bromomethane)	8.6E-08
Dinitrophenol, 2,4-	7.3E-08
Nitrophenol, 4-	7.0E-08
Nitroaniline, 3-	7.0E-08
Chloronaphthalene,2-	6.6E-08
Methylene bromide	5.1E-08
Dichlorobenzidine, 3,3'-	5.1E-08
Pentachloronitrobenzene (PCNB)	4.2E-08
Toluene	4.2E-08
Chlorobenzilate	3.2E-08
Dimethylphenol, 2,4-	3.1E-08
Acrylonitrile	3.0E-08
Nitrophenol, 2-	2.6E-08
Heptachlor	2.4E-08
Carbon Tetrachloride	2.4E-08
Carbazole	2.3E-08

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
MAXIMUM MEASURED STACK EMISSION RATES (a)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (b)
Benzaldehyde	2.3E-08
Dinitrobenzene, 1,3-	2.2E-08
Methyl ethyl ketone (2-Butanone)	2.1E-08
Benzyl alcohol	2.1E-08
Phenanthrene	1.6E-08
Cobalt	1.6E-08
Nitroaniline, 4-	1.5E-08
Benzonitrile	1.5E-08
Di-n-butyl phthalate	1.5E-08
Aniline	1.4E-08
Carbon Disulfide	1.4E-08
Methyl chloride (Chloromethane)	1.3E-08
Heptachlor epoxide	1.3E-08
Phenol	1.2E-08
TetraCDF, 2,3,7,8-	1.1E-08
Endrin	9.5E-09
Chlorophenol, 2-	8.6E-09
Chloroaniline, p-	8.3E-09
Trichlorobenzene, 1,2,3-	6.9E-09
Acetone	6.8E-09
Bromophenyl-phenylether, 4-	6.7E-09
Chloro-3-methylphenol, 4-	6.6E-09
Hexachloro-1,3-butadiene (Perchlorobutadiene)	6.4E-09
Naphthalene	6.4E-09
Acetophenone	6.3E-09
Cresol, o-	6.2E-09
HexaCDF, 1,2,3,6,7,8-	6.0E-09
HexaCDF, 2,3,4,6,7,8-	5.7E-09
N-nitrosodimethylamine	5.5E-09
Butylbenzylphthalate	4.4E-09
Chlordane	4.3E-09
Dichlorobenzene, 1,3-	4.2E-09
2,5-Dimethylheptane	4.1E-09
Diethyl phthalate	4.0E-09
Acenaphthylene	4.0E-09
Tetrachloroethane, 1,1,2,2-	3.9E-09
Vinyl Acetate	3.9E-09
HexaCDF, 1,2,3,4,7,8-	3.7E-09
Dichloropropene, 1,3- (cis)	3.5E-09
HexaCDD, 1,2,3,4,7,8-	3.5E-09
Xylene, p-	3.4E-09
Xylene, m-	3.4E-09
Bis(2-chloroethoxy) methane	3.3E-09
Trichlorophenol, 2,4,5-	3.2E-09
Nitroaniline, 2-	3.2E-09
Nitrobenzene	3.1E-09
PentaCDF, 1,2,3,7,8-	3.1E-09
Dichlorophenol, 2,4-	2.9E-09
Benzo(b)fluoranthene	2.9E-09
2-Hexanone	2.8E-09
Hexachloroethane (Perchloroethane)	2.8E-09
Cresol, p-	2.7E-09
Cresol, m-	2.7E-09
Dimethyl phthalate	2.7E-09
Endosulfan I	2.6E-09
Trichlorophenol, 2,4,6-	2.6E-09
PentaCDD, 1,2,3,7,8-	2.5E-09
BHC, beta-	2.4E-09
Pyridine	2.2E-09
Dibenzofuran	2.1E-09
Diphenylamine	2.1E-09
Bromobenzene	2.0E-09
Tetrachlorobenzene, 1,2,4,5-	1.9E-09
Aldrin	1.9E-09
Nitrosodiphenylamine, N-	1.9E-09
Isophorone	1.9E-09
Pentachlorobenzene	1.8E-09
Di-n-octylphthalate	1.7E-09
Trichlorobenzene, 1,2,4-	1.6E-09
TetraCDD, 2,3,7,8-	1.5E-09
Chrysene	1.5E-09
Aroclor 1254	1.5E-09
Diphenylhydrazine,1,2-	1.4E-09
3-Ethyl benzaldehyde	1.4E-09

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
MAXIMUM MEASURED STACK EMISSION RATES (a)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (b)
4-Ethyl benzaldehyde	1.4E-09
Trichloropropane, 1,2,3-	1.2E-09
DDT, 4-4'-	1.2E-09
Butylbenzene, sec	1.2E-09
Xylene, o-	1.2E-09
1,1-Dichloropropene	1.0E-09
Trichloroethane, 1,1,2-	9.6E-10
Dieldrin	9.2E-10
BHC, alpha-	9.0E-10
Benzo(a)Anthracene	8.6E-10
Styrene	8.2E-10
Bis(2-chlorethyl)ether	8.1E-10
2,2'-oxybis (1-Chloropropane)	7.7E-10
Indeno(1,2,3-cd) pyrene	7.7E-10
Benzo(k)fluoranthene	7.6E-10
Iodomethane	7.2E-10
Methyl isobutyl ketone	5.6E-10
Benzo(a)pyrene	4.9E-10
gamma-BHC (Lindane)	4.6E-10
OctaCDF, 1,2,3,4,6,7,8,9-	4.2E-10
Ethylene dibromide	3.9E-10
Trichloroethylene	3.6E-10
Tetrahydrofuran	3.6E-10
Pyrene	3.6E-10
DDD, 4,4'-	3.5E-10
HexaCDD, 1,2,3,7,8,9-	3.4E-10
Tetrachloroethane, 1,1,1,2-	3.2E-10
1,3-Dichloropropane	3.0E-10
HexaCDD, 1,2,3,6,7,8-	2.9E-10
Butylbenzene, n-	2.9E-10
Dichloroethylene 1,1-	2.8E-10
2,2-Dichloropropane	2.8E-10
Butylbenzene, tert	2.8E-10
Vinyl Chloride	2.6E-10
Trichloroethane, 1,1,1-	2.4E-10
Anthracene	2.3E-10
Acenaphthene	2.2E-10
2-Methylnaphthalene	2.1E-10
Trimethylbenzene, 1,3,5-	1.9E-10
Dichlorobenzene, 1,2-	1.7E-10
Dichloroethane, 1,2- (Ethylene Dichloride)	1.6E-10
HeptaCDF, 1,2,3,4,6,7,8-	1.5E-10
Methoxychlor	1.1E-10
Dichlorobenzene,1,4-	1.0E-10
DDE, 4,4'-	9.8E-11
Fluorene	8.7E-11
Cumene (Isopropylbenzene)	8.5E-11
OctaCDD, 1,2,3,4,6,7,8,9-	7.7E-11
2-Chlorotoluene	7.5E-11
4-Chlorotoluene	7.5E-11
Ethylene Glycol	6.5E-11
Propylbenzene, n-	6.2E-11
Trichlorofluoromethane (Freon 11)	5.5E-11
1,2,4-Trimethylbenzene	5.4E-11
Dichloroethylene, cis-1,2-	4.9E-11
Ethylbenzene	4.7E-11
Dichloropropane, 1,2-	4.7E-11
HexaCDF, 1,2,3,7,8,9-	3.2E-11
Chloroethane	3.1E-11
Dichlorodifluoromethane	3.1E-11
Bromochloromethane	3.0E-11
Benzo(g,h,i)perylene	2.9E-11
methyl tert-butyl ether	2.4E-11
HeptaCDF, 1,2,3,4,7,8,9-	2.1E-11
Propylene oxide	1.7E-11
Dichloroethylene-1,2 (trans)	1.5E-11
Dichloroethane 1,1-	1.5E-11
HeptaCDD, 1,2,3,4,6,7,8-	7.5E-12
Methyl methacrylate	4.1E-12
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	2.0E-12
Dioxane, 1,4-	1.6E-12
Dibenz(a,h)anthracene	8.0E-13
Acrylic Acid	1.6E-13
1-Hexane (n-hexane)	2.8E-14

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
MAXIMUM MEASURED STACK EMISSION RATES (a)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (b)
Endosulfan sulfate	0.0E+00
2,5-Dione, 3-hexene	0.0E+00
Benzo(e)pyrene	0.0E+00
Perylene	0.0E+00
Phosphine imide, P,P,P-triphenyl	0.0E+00
Diallate	0.0E+00
9-Octadecenamide (oleamide)	0.0E+00
delta-BHC	0.0E+00
2-Methyl octane	0.0E+00
Endosulfan II	0.0E+00
Endrin ketone	0.0E+00
3-Penten-2-one (ethylidene acetone)	0.0E+00
2,5-Dimethylfuran	0.0E+00
Endrin aldehyde	0.0E+00
3-Hexen-2-one	0.0E+00
Benzoic acid, methyl ester (methyl benzoate)	0.0E+00
Isopropyl toluene, p-	0.0E+00
Total (c)	1.0E-01
R_1 resident	
Nitrogen dioxide	1.6E-02
Arsenic	1.2E-02
Sulfur dioxide	5.8E-03
Chlorine	3.7E-03
Hydrogen chloride	1.6E-03
Beryllium	4.5E-04
Cadmium	1.8E-04
Nickel	3.8E-05
Lead	3.7E-05
Copper	3.2E-05
Mercury	1.6E-05
Hexachlorobenzene	4.0E-06
Mercuric chloride	4.0E-06
Chlorophenyl-phenylether, 4-	3.7E-06
Chloroform (Trichloromethane)	2.7E-06
Benzidine	2.6E-06
Dibromo-3-chloropropane, 1,2-	2.1E-06
Hexachlorocyclopentadiene	9.1E-07
Thallium (I)	6.7E-07
4,6-Dinitro-2-methylphenol	5.3E-07
Manganese	4.2E-07
Vanadium	3.8E-07
Silver	2.7E-07
Pentachlorophenol	2.5E-07
Tetrachloroethylene (Perchloroethylene)	2.3E-07
Fluoranthene	1.4E-07
PentaCDF, 2,3,4,7,8-	1.4E-07
Zinc	1.4E-07
Barium	1.3E-07
Nitrosodipropylamine, n-	1.2E-07
Aluminum	8.4E-08
Chromium	7.4E-08
Chromium, hexavalent	7.4E-08
Antimony	7.0E-08
Bromoform (tribromomethane)	6.8E-08
Chlorobenzene	6.4E-08
Selenium	5.8E-08
Benzoic Acid	5.4E-08
Dinitrotoluene, 2,4-	5.4E-08
Benzene	4.9E-08
Methylene chloride	4.7E-08
Ethylhexyl phthalate, bis-2-	4.7E-08
3-Penten-2-one, 4-methyl	4.6E-08
Bromodichloromethane	4.5E-08
Dinitrotoluene, 2,6-	4.3E-08
Dibromochloromethane	4.2E-08
Methyl bromide (Bromomethane)	3.5E-08
Dinitrophenol, 2,4-	3.0E-08
Nitrophenol, 4-	2.8E-08
Nitroaniline, 3-	2.8E-08
Chloronaphthalene,2-	2.7E-08
Dichlorobenzidine, 3,3'-	2.2E-08
Methylene bromide	2.1E-08

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
MAXIMUM MEASURED STACK EMISSION RATES (a)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (b)
Pentachloronitrobenzene (PCNB)	1.7E-08
Toluene	1.7E-08
Chlorobenzilate	1.3E-08
Dimethylphenol, 2,4-	1.2E-08
Acrylonitrile	1.2E-08
Nitrophenol, 2-	1.1E-08
Heptachlor	9.7E-09
Carbon Tetrachloride	9.7E-09
Carbazole	9.5E-09
Benzaldehyde	9.4E-09
Dinitrobenzene, 1,3-	8.9E-09
Methyl ethyl ketone (2-Butanone)	8.4E-09
Benzyl alcohol	8.4E-09
Phenanthrene	6.7E-09
Nitroaniline, 4-	6.1E-09
Benzonitrile	6.1E-09
Di-n-butyl phthalate	6.0E-09
Aniline	5.8E-09
Carbon Disulfide	5.6E-09
Cobalt	5.5E-09
Methyl chloride (Chloromethane)	5.2E-09
Heptachlor epoxide	5.2E-09
Phenol	4.8E-09
TetraCDF, 2,3,7,8-	4.6E-09
Endrin	3.9E-09
Chlorophenol, 2-	3.5E-09
Chloroaniline, p-	3.4E-09
Trichlorobenzene, 1,2,3-	2.8E-09
Acetone	2.8E-09
Bromophenyl-phenylether, 4-	2.7E-09
Chloro-3-methylphenol, 4-	2.7E-09
HexaCDF, 1,2,3,6,7,8-	2.7E-09
Hexachloro-1,3-butadiene (Perchlorobutadiene)	2.6E-09
Naphthalene	2.6E-09
Acetophenone	2.6E-09
Cresol, o-	2.5E-09
HexaCDF, 2,3,4,6,7,8-	2.5E-09
N-nitrosodimethylamine	2.3E-09
Butylbenzylphthalate	1.8E-09
Chlordane	1.7E-09
Dichlorobenzene, 1,3-	1.7E-09
2,5-Dimethylheptane	1.7E-09
Diethyl phthalate	1.6E-09
HexaCDF, 1,2,3,4,7,8-	1.6E-09
Acenaphthylene	1.6E-09
Tetrachloroethane, 1,1,2,2-	1.6E-09
Vinyl Acetate	1.6E-09
HexaCDD, 1,2,3,4,7,8-	1.5E-09
Dichloropropene, 1,3- (cis)	1.4E-09
Xylene, p-	1.4E-09
Xylene, m-	1.4E-09
Bis(2-chloroethoxy) methane	1.4E-09
PentaCDF, 1,2,3,7,8-	1.3E-09
Trichlorophenol, 2,4,5-	1.3E-09
Nitroaniline, 2-	1.3E-09
Nitrobenzene	1.3E-09
Dichlorophenol, 2,4-	1.2E-09
Benzo(b)fluoranthene	1.2E-09
2-Hexanone	1.1E-09
Hexachloroethane (Perchloroethane)	1.1E-09
PentaCDD, 1,2,3,7,8-	1.1E-09
Cresol, p-	1.1E-09
Cresol, m-	1.1E-09
Dimethyl phthalate	1.1E-09
Endosulfan I	1.1E-09
Trichlorophenol, 2,4,6-	1.0E-09
BHC, beta-	9.6E-10
Pyridine	9.2E-10
Dibenzofuran	8.7E-10
Diphenylamine	8.7E-10
Bromobenzene	8.1E-10
Aldrin	7.9E-10
Tetrachlorobenzene, 1,2,4,5-	7.9E-10
Nitrosodiphenylamine, N-	7.8E-10

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
MAXIMUM MEASURED STACK EMISSION RATES (a)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (b)
Isophorone	7.8E-10
Pentachlorobenzene	7.3E-10
Di-n-octylphthalate	7.1E-10
TetraCDD, 2,3,7,8-	6.5E-10
Trichlorobenzene, 1,2,4-	6.5E-10
Chrysene	6.3E-10
Aroclor 1254	5.9E-10
Diphenylhydrazine,1,2-	5.7E-10
3-Ethyl benzaldehyde	5.5E-10
4-Ethyl benzaldehyde	5.5E-10
Trichloropropane, 1,2,3-	5.0E-10
DDT, 4-4'-	4.9E-10
Butylbenzene, sec	4.8E-10
Xylene, o-	4.7E-10
1,1-Dichloropropene	4.2E-10
Trichloroethane, 1,1,2-	3.9E-10
Dieldrin	3.8E-10
BHC, alpha-	3.7E-10
Benzo(a)Anthracene	3.7E-10
Styrene	3.3E-10
Benzo(k)fluoranthene	3.3E-10
Bis(2-chlorethyl)ether	3.3E-10
2,2'-oxybis (1-Chloropropane)	3.2E-10
Iodomethane	3.0E-10
Indeno(1,2,3-cd) pyrene	2.7E-10
Methyl isobutyl ketone	2.3E-10
Benzo(a)pyrene	2.1E-10
OctaCDF, 1,2,3,4,6,7,8,9-	1.9E-10
gamma-BHC (Lindane)	1.9E-10
Ethylene dibromide	1.6E-10
HexaCDD, 1,2,3,7,8,9-	1.5E-10
Trichloroethylene	1.5E-10
Tetrahydrofuran	1.5E-10
Pyrene	1.5E-10
DDD, 4,4'-	1.4E-10
HexaCDD, 1,2,3,6,7,8-	1.3E-10
Tetrachloroethane, 1,1,1,2-	1.3E-10
1,3-Dichloropropane	1.2E-10
Butylbenzene, n-	1.2E-10
Dichloroethylene 1,1-	1.1E-10
2,2-Dichloropropane	1.1E-10
Butylbenzene, tert	1.1E-10
Vinyl Chloride	1.0E-10
Trichloroethane, 1,1,1-	9.9E-11
Anthracene	9.3E-11
Acenaphthene	9.0E-11
2-Methylnaphthalene	8.7E-11
Trimethylbenzene, 1,3,5-	7.9E-11
Dichlorobenzene, 1,2-	6.9E-11
Dichloroethane, 1,2- (Ethylene Dichloride)	6.5E-11
HeptaCDF, 1,2,3,4,6,7,8-	6.5E-11
Methoxychlor	4.4E-11
Dichlorobenzene,1,4-	4.1E-11
DDE, 4,4'-	4.0E-11
Fluorene	3.5E-11
Cumene (Isopropylbenzene)	3.5E-11
OctaCDD, 1,2,3,4,6,7,8,9-	3.4E-11
2-Chlorotoluene	3.1E-11
4-Chlorotoluene	3.1E-11
Ethylene Glycol	2.7E-11
Propylbenzene, n-	2.5E-11
Trichlorofluoromethane (Freon 11)	2.2E-11
1,2,4-Trimethylbenzene	2.2E-11
Dichloroethylene, cis-1,2-	2.0E-11
Ethylbenzene	1.9E-11
Dichloropropane, 1,2-	1.9E-11
HexaCDF, 1,2,3,7,8,9-	1.4E-11
Benzo(g,h,i)perylene	1.3E-11
Chloroethane	1.3E-11
Dichlorodifluoromethane	1.3E-11
Bromochloromethane	1.2E-11
methyl tert-butyl ether	9.7E-12
HeptaCDF, 1,2,3,4,7,8,9-	9.2E-12
Propylene oxide	6.9E-12

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
MAXIMUM MEASURED STACK EMISSION RATES (a)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (b)
Dichloroethylene-1,2 (trans)	6.3E-12
Dichloroethane 1,1-	6.0E-12
HeptaCDD, 1,2,3,4,6,7,8-	3.3E-12
Methyl methacrylate	1.7E-12
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	8.1E-13
Dioxane, 1,4-	6.3E-13
Dibenz(a,h)anthracene	2.9E-13
Acrylic Acid	6.4E-14
1-Hexane (n-hexane)	1.1E-14
Endosulfan sulfate	0.0E+00
2,5-Dione, 3-hexene	0.0E+00
Benzo(e)pyrene	0.0E+00
Perylene	0.0E+00
Phosphine imide, P,P,P-triphenyl	0.0E+00
Diallate	0.0E+00
9-Octadecenamide (oleamide)	0.0E+00
delta-BHC	0.0E+00
2-Methyl octane	0.0E+00
Endosulfan II	0.0E+00
Endrin ketone	0.0E+00
3-Penten-2-one (ethylidene acetone)	0.0E+00
2,5-Dimethylfuran	0.0E+00
Endrin aldehyde	0.0E+00
3-Hexen-2-one	0.0E+00
Benzoic acid, methyl ester (methyl benzoate)	0.0E+00
Isopropyl toluene, p-	0.0E+00
Total (c)	4.0E-02
R_2 resident	
Nitrogen dioxide	1.1E-02
Arsenic	7.0E-03
Sulfur dioxide	3.9E-03
Chlorine	2.4E-03
Hydrogen chloride	1.1E-03
Beryllium	2.6E-04
Cadmium	1.1E-04
Nickel	2.3E-05
Lead	2.2E-05
Copper	1.9E-05
Mercury	1.1E-05
Hexachlorobenzene	2.7E-06
Mercuric chloride	2.7E-06
Chlorophenyl-phenylether, 4-	2.5E-06
Chloroform (Trichloromethane)	1.8E-06
Benzidine	1.7E-06
Dibromo-3-chloropropane, 1,2-	1.4E-06
Hexachlorocyclopentadiene	6.1E-07
Thallium (I)	4.0E-07
4,6-Dinitro-2-methylphenol	3.5E-07
Manganese	2.5E-07
Vanadium	2.3E-07
Pentachlorophenol	1.7E-07
Silver	1.6E-07
Tetrachloroethylene (Perchloroethylene)	1.6E-07
Fluoranthene	9.5E-08
PentaCDF, 2,3,4,7,8-	9.5E-08
Zinc	8.3E-08
Nitrosodipropylamine, n-	7.8E-08
Barium	7.7E-08
Aluminum	5.0E-08
Antimony	4.7E-08
Bromoform (tribromomethane)	4.6E-08
Chromium	4.4E-08
Chromium, hexavalent	4.4E-08
Chlorobenzene	4.3E-08
Benzoic Acid	3.6E-08
Dinitrotoluene, 2,4-	3.6E-08
Selenium	3.5E-08
Benzene	3.3E-08
Ethylhexyl phthalate, bis-2-	3.2E-08
Methylene chloride	3.2E-08
3-Penten-2-one, 4-methyl	3.1E-08
Bromodichloromethane	3.0E-08

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
MAXIMUM MEASURED STACK EMISSION RATES (a)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (b)
Dinitrotoluene, 2,6-	2.9E-08
Dibromochloromethane	2.8E-08
Methyl bromide (Bromomethane)	2.3E-08
Dinitrophenol, 2,4-	2.0E-08
Nitrophenol, 4-	1.9E-08
Nitroaniline, 3-	1.9E-08
Chloronaphthalene,2-	1.8E-08
Dichlorobenzidine, 3,3'-	1.5E-08
Methylene bromide	1.4E-08
Pentachloronitrobenzene (PCNB)	1.1E-08
Toluene	1.1E-08
Chlorobenzilate	9.0E-09
Dimethylphenol, 2,4-	8.3E-09
Acrylonitrile	8.1E-09
Nitrophenol, 2-	7.2E-09
Heptachlor	6.5E-09
Carbon Tetrachloride	6.5E-09
Carbazole	6.4E-09
Benzaldehyde	6.3E-09
Dinitrobenzene, 1,3-	6.0E-09
Methyl ethyl ketone (2-Butanone)	5.6E-09
Benzyl alcohol	5.6E-09
Phenanthrene	4.5E-09
Nitroaniline, 4-	4.1E-09
Benzonitrile	4.1E-09
Di-n-butyl phthalate	4.0E-09
Aniline	3.9E-09
Carbon Disulfide	3.7E-09
Methyl chloride (Chloromethane)	3.5E-09
Heptachlor epoxide	3.5E-09
Cobalt	3.3E-09
Phenol	3.2E-09
TetraCDF, 2,3,7,8-	3.1E-09
Endrin	2.6E-09
Chlorophenol, 2-	2.3E-09
Chloroaniline, p-	2.3E-09
Trichlorobenzene, 1,2,3-	1.9E-09
Acetone	1.9E-09
Bromophenyl-phenylether, 4-	1.8E-09
HexaCDF, 1,2,3,6,7,8-	1.8E-09
Chloro-3-methylphenol, 4-	1.8E-09
Hexachloro-1,3-butadiene (Perchlorobutadiene)	1.7E-09
Naphthalene	1.7E-09
Acetophenone	1.7E-09
Cresol, o-	1.7E-09
HexaCDF, 2,3,4,6,7,8-	1.7E-09
N-nitrosodimethylamine	1.5E-09
Butylbenzylphthalate	1.2E-09
Chlordane	1.2E-09
Dichlorobenzene, 1,3-	1.2E-09
2,5-Dimethylheptane	1.1E-09
HexaCDF, 1,2,3,4,7,8-	1.1E-09
Diethyl phthalate	1.1E-09
Acenaphthylene	1.1E-09
Tetrachloroethane, 1,1,2,2-	1.1E-09
Vinyl Acetate	1.1E-09
HexaCDD, 1,2,3,4,7,8-	1.0E-09
Dichloropropene, 1,3- (cis)	9.6E-10
Xylene, p-	9.3E-10
Xylene, m-	9.3E-10
PentaCDF, 1,2,3,7,8-	9.1E-10
Bis(2-chloroethoxy) methane	9.1E-10
Trichlorophenol, 2,4,5-	8.8E-10
Nitroaniline, 2-	8.6E-10
Nitrobenzene	8.6E-10
Dichlorophenol, 2,4-	8.0E-10
Benzo(b)fluoranthene	7.8E-10
2-Hexanone	7.6E-10
Hexachloroethane (Perchloroethane)	7.6E-10
PentaCDD, 1,2,3,7,8-	7.5E-10
Cresol, p-	7.4E-10
Cresol, m-	7.4E-10
Dimethyl phthalate	7.3E-10
Endosulfan I	7.0E-10

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
MAXIMUM MEASURED STACK EMISSION RATES (a)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (b)
Trichlorophenol, 2,4,6-	7.0E-10
BHC, beta-	6.5E-10
Pyridine	6.1E-10
Dibenzofuran	5.8E-10
Diphenylamine	5.8E-10
Bromobenzene	5.4E-10
Aldrin	5.3E-10
Tetrachlorobenzene, 1,2,4,5-	5.3E-10
Nitrosodiphenylamine, N-	5.2E-10
Isophorone	5.2E-10
Pentachlorobenzene	4.9E-10
Di-n-octylphthalate	4.8E-10
TetraCDD, 2,3,7,8-	4.4E-10
Trichlorobenzene, 1,2,4-	4.3E-10
Chrysene	4.3E-10
Aroclor 1254	4.0E-10
Diphenylhydrazine,1,2-	3.8E-10
3-Ethyl benzaldehyde	3.7E-10
4-Ethyl benzaldehyde	3.7E-10
Trichloropropane, 1,2,3-	3.4E-10
DDT, 4-4'-	3.3E-10
Butylbenzene, sec	3.2E-10
Xylene, o-	3.2E-10
1,1-Dichloropropene	2.8E-10
Trichloroethane, 1,1,2-	2.6E-10
Dieldrin	2.5E-10
Benzo(a)Anthracene	2.5E-10
BHC, alpha-	2.5E-10
Benzo(k)fluoranthene	2.2E-10
Styrene	2.2E-10
Bis(2-chlorethyl)ether	2.2E-10
2,2'-oxybis (1-Chloropropane)	2.1E-10
Iodomethane	2.0E-10
Indeno(1,2,3-cd) pyrene	1.6E-10
Methyl isobutyl ketone	1.5E-10
Benzo(a)pyrene	1.4E-10
OctaCDF, 1,2,3,4,6,7,8,9-	1.3E-10
gamma-BHC (Lindane)	1.3E-10
Ethylene dibromide	1.1E-10
HexaCDD, 1,2,3,7,8,9-	1.0E-10
Trichloroethylene	9.9E-11
Tetrahydrofuran	9.9E-11
Pyrene	9.7E-11
DDD, 4,4'-	9.7E-11
HexaCDD, 1,2,3,6,7,8-	8.8E-11
Tetrachloroethane, 1,1,1,2-	8.6E-11
1,3-Dichloropropane	8.2E-11
Butylbenzene, n-	7.9E-11
Dichloroethylene 1,1-	7.6E-11
2,2-Dichloropropane	7.6E-11
Butylbenzene, tert	7.5E-11
Vinyl Chloride	7.0E-11
Trichloroethane, 1,1,1-	6.6E-11
Anthracene	6.2E-11
Acenaphthene	6.0E-11
2-Methylnaphthalene	5.8E-11
Trimethylbenzene, 1,3,5-	5.3E-11
Dichlorobenzene, 1,2-	4.6E-11
HeptaCDF, 1,2,3,4,6,7,8-	4.4E-11
Dichloroethane, 1,2- (Ethylene Dichloride)	4.3E-11
Methoxychlor	3.0E-11
Dichlorobenzene,1,4-	2.8E-11
DDE, 4,4'-	2.7E-11
Fluorene	2.4E-11
Cumene (Isopropylbenzene)	2.3E-11
OctaCDD, 1,2,3,4,6,7,8,9-	2.3E-11
2-Chlorotoluene	2.1E-11
4-Chlorotoluene	2.0E-11
Ethylene Glycol	1.8E-11
Propylbenzene, n-	1.7E-11
Trichlorofluoromethane (Freon 11)	1.5E-11
1,2,4-Trimethylbenzene	1.5E-11
Dichloroethylene, cis-1,2-	1.3E-11
Ethylbenzene	1.3E-11

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
MAXIMUM MEASURED STACK EMISSION RATES (a)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (b)
Dichloropropane, 1,2-	1.3E-11
HexaCDF, 1,2,3,7,8,9-	9.6E-12
Benzo(g,h,i)perylene	8.8E-12
Chloroethane	8.6E-12
Dichlorodifluoromethane	8.4E-12
Bromochloromethane	8.3E-12
methyl tert-butyl ether	6.5E-12
HeptaCDF, 1,2,3,4,7,8,9-	6.2E-12
Propylene oxide	4.6E-12
Dichloroethylene-1,2 (trans)	4.2E-12
Dichloroethane 1,1-	4.0E-12
HeptaCDD, 1,2,3,4,6,7,8-	2.3E-12
Methyl methacrylate	1.1E-12
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	5.4E-13
Dioxane, 1,4-	4.2E-13
Dibenz(a,h)anthracene	1.7E-13
Acrylic Acid	4.3E-14
1-Hexane (n-hexane)	7.6E-15
Endosulfan sulfate	0.0E+00
2,5-Dione, 3-hexene	0.0E+00
Benzo(e)pyrene	0.0E+00
Perylene	0.0E+00
Phosphine imide, P,P,P-triphenyl	0.0E+00
Diallate	0.0E+00
9-Octadecenamide (oleamide)	0.0E+00
delta-BHC	0.0E+00
2-Methyl octane	0.0E+00
Endosulfan II	0.0E+00
Endrin ketone	0.0E+00
3-Penten-2-one (ethylidene acetone)	0.0E+00
2,5-Dimethylfuran	0.0E+00
Endrin aldehyde	0.0E+00
3-Hexen-2-one	0.0E+00
Benzoic acid, methyl ester (methyl benzoate)	0.0E+00
Isopropyl toluene, p-	0.0E+00
Total (c)	2.6E-02
R_3 resident farmer	
Nitrogen dioxide	1.0E-02
Arsenic	6.6E-03
Sulfur dioxide	3.6E-03
Chlorine	2.3E-03
Hydrogen chloride	1.0E-03
Beryllium	2.5E-04
Cadmium	1.0E-04
Nickel	2.1E-05
Lead	2.1E-05
Copper	1.8E-05
Mercury	1.0E-05
Hexachlorobenzene	2.6E-06
Mercuric chloride	2.5E-06
Chlorophenyl-phenylether, 4-	2.3E-06
Chloroform (Trichloromethane)	1.7E-06
Benzidine	1.7E-06
Dibromo-3-chloropropane, 1,2-	1.3E-06
Hexachlorocyclopentadiene	5.8E-07
Thallium (I)	3.8E-07
4,6-Dinitro-2-methylphenol	3.3E-07
Manganese	2.4E-07
Vanadium	2.1E-07
Pentachlorophenol	1.6E-07
Silver	1.5E-07
Tetrachloroethylene (Perchloroethylene)	1.5E-07
PentaCDF, 2,3,4,7,8-	9.1E-08
Fluoranthene	9.0E-08
Zinc	7.8E-08
Nitrosodipropylamine, n-	7.4E-08
Barium	7.3E-08
Aluminum	4.7E-08
Antimony	4.4E-08
Bromoform (tribromomethane)	4.3E-08
Chromium	4.2E-08
Chromium, hexavalent	4.2E-08

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
MAXIMUM MEASURED STACK EMISSION RATES (a)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (b)
Chlorobenzene	4.0E-08
Benzoic Acid	3.4E-08
Dinitrotoluene, 2,4-	3.4E-08
Selenium	3.3E-08
Benzene	3.1E-08
Ethylhexyl phthalate, bis-2-	3.0E-08
Methylene chloride	3.0E-08
3-Penten-2-one, 4-methyl	2.9E-08
Bromodichloromethane	2.9E-08
Dinitrotoluene, 2,6-	2.7E-08
Dibromochloromethane	2.7E-08
Methyl bromide (Bromomethane)	2.2E-08
Dinitrophenol, 2,4-	1.9E-08
Nitrophenol, 4-	1.8E-08
Nitroaniline, 3-	1.8E-08
Chloronaphthalene,2-	1.7E-08
Dichlorobenzidine, 3,3'-	1.4E-08
Methylene bromide	1.3E-08
Pentachloronitrobenzene (PCNB)	1.1E-08
Toluene	1.1E-08
Chlorobenzilate	8.5E-09
Dimethylphenol, 2,4-	7.8E-09
Acrylonitrile	7.6E-09
Nitrophenol, 2-	6.7E-09
Heptachlor	6.1E-09
Carbon Tetrachloride	6.1E-09
Carbazole	6.0E-09
Benzaldehyde	5.9E-09
Dinitrobenzene, 1,3-	5.6E-09
Methyl ethyl ketone (2-Butanone)	5.3E-09
Benzyl alcohol	5.3E-09
Phenanthrene	4.2E-09
Nitroaniline, 4-	3.8E-09
Benzonitrile	3.8E-09
Di-n-butyl phthalate	3.8E-09
Aniline	3.7E-09
Carbon Disulfide	3.5E-09
Methyl chloride (Chloromethane)	3.3E-09
Heptachlor epoxide	3.3E-09
Cobalt	3.1E-09
Phenol	3.1E-09
TetraCDF, 2,3,7,8-	2.9E-09
Endrin	2.5E-09
Chlorophenol, 2-	2.2E-09
Chloroaniline, p-	2.1E-09
Trichlorobenzene, 1,2,3-	1.8E-09
Acetone	1.8E-09
HexaCDF, 1,2,3,6,7,8-	1.7E-09
Bromophenyl-phenylether, 4-	1.7E-09
Chloro-3-methylphenol, 4-	1.7E-09
Hexachloro-1,3-butadiene (Perchlorobutadiene)	1.6E-09
Naphthalene	1.6E-09
HexaCDF, 2,3,4,6,7,8-	1.6E-09
Acetophenone	1.6E-09
Cresol, o-	1.6E-09
N-nitrosodimethylamine	1.4E-09
Butylbenzylphthalate	1.1E-09
Chlordane	1.1E-09
Dichlorobenzene, 1,3-	1.1E-09
HexaCDF, 1,2,3,4,7,8-	1.1E-09
2,5-Dimethylheptane	1.1E-09
Diethyl phthalate	1.0E-09
Acenaphthylene	1.0E-09
Tetrachloroethane, 1,1,2,2-	1.0E-09
HexaCDD, 1,2,3,4,7,8-	1.0E-09
Vinyl Acetate	9.9E-10
Dichloropropene, 1,3- (cis)	9.1E-10
Xylene, p-	8.8E-10
Xylene, m-	8.8E-10
PentaCDF, 1,2,3,7,8-	8.7E-10
Bis(2-chloroethoxy) methane	8.5E-10
Trichlorophenol, 2,4,5-	8.3E-10
Nitroaniline, 2-	8.1E-10
Nitrobenzene	8.1E-10

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
MAXIMUM MEASURED STACK EMISSION RATES (a)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (b)
Dichlorophenol, 2,4-	7.5E-10
Benzo(b)fluoranthene	7.4E-10
PentaCDD, 1,2,3,7,8-	7.2E-10
2-Hexanone	7.2E-10
Hexachloroethane (Perchloroethane)	7.2E-10
Cresol, p-	7.0E-10
Cresol, m-	7.0E-10
Dimethyl phthalate	6.9E-10
Endosulfan I	6.6E-10
Trichlorophenol, 2,4,6-	6.6E-10
BHC, beta-	6.1E-10
Pyridine	5.8E-10
Dibenzofuran	5.5E-10
Diphenylamine	5.5E-10
Bromobenzene	5.1E-10
Aldrin	5.0E-10
Tetrachlorobenzene, 1,2,4,5-	5.0E-10
Nitrosodiphenylamine, N-	4.9E-10
Isophorone	4.9E-10
Pentachlorobenzene	4.6E-10
Di-n-octylphthalate	4.5E-10
TetraCDD, 2,3,7,8-	4.1E-10
Trichlorobenzene, 1,2,4-	4.1E-10
Chrysene	4.0E-10
Aroclor 1254	3.7E-10
Diphenylhydrazine,1,2-	3.6E-10
3-Ethyl benzaldehyde	3.5E-10
4-Ethyl benzaldehyde	3.5E-10
Trichloropropane, 1,2,3-	3.2E-10
DDT, 4-4'-	3.1E-10
Butylbenzene, sec	3.0E-10
Xylene, o-	3.0E-10
1,1-Dichloropropene	2.6E-10
Trichloroethane, 1,1,2-	2.5E-10
Dieldrin	2.4E-10
Benzo(a)Anthracene	2.4E-10
BHC, alpha-	2.3E-10
Benzo(k)fluoranthene	2.1E-10
Styrene	2.1E-10
Bis(2-chlorethyl)ether	2.1E-10
2,2'-oxybis (1-Chloropropane)	2.0E-10
Iodomethane	1.9E-10
Indeno(1,2,3-cd) pyrene	1.5E-10
Methyl isobutyl ketone	1.4E-10
Benzo(a)pyrene	1.4E-10
OctaCDF, 1,2,3,4,6,7,8,9-	1.2E-10
gamma-BHC (Lindane)	1.2E-10
Ethylene dibromide	1.0E-10
HexaCDD, 1,2,3,7,8,9-	9.9E-11
Trichloroethylene	9.4E-11
Tetrahydrofuran	9.4E-11
Pyrene	9.1E-11
DDD, 4,4'-	9.1E-11
HexaCDD, 1,2,3,6,7,8-	8.4E-11
Tetrachloroethane, 1,1,1,2-	8.1E-11
1,3-Dichloropropane	7.7E-11
Butylbenzene, n-	7.4E-11
Dichloroethylene 1,1-	7.2E-11
2,2-Dichloropropane	7.1E-11
Butylbenzene, tert	7.1E-11
Vinyl Chloride	6.6E-11
Trichloroethane, 1,1,1-	6.3E-11
Anthracene	5.8E-11
Acenaphthene	5.7E-11
2-Methylnaphthalene	5.5E-11
Trimethylbenzene, 1,3,5-	5.0E-11
Dichlorobenzene, 1,2-	4.4E-11
HeptaCDF, 1,2,3,4,6,7,8-	4.2E-11
Dichloroethane, 1,2- (Ethylene Dichloride)	4.1E-11
Methoxychlor	2.8E-11
Dichlorobenzene,1,4-	2.6E-11
DDE, 4,4'-	2.5E-11
Fluorene	2.2E-11
OctaCDD, 1,2,3,4,6,7,8,9-	2.2E-11

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
MAXIMUM MEASURED STACK EMISSION RATES (a)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (b)
Cumene (Isopropylbenzene)	2.2E-11
2-Chlorotoluene	1.9E-11
4-Chlorotoluene	1.9E-11
Ethylene Glycol	1.7E-11
Propylbenzene, n-	1.6E-11
Trichlorofluoromethane (Freon 11)	1.4E-11
1,2,4-Trimethylbenzene	1.4E-11
Dichloroethylene, cis-1,2-	1.3E-11
Ethylbenzene	1.2E-11
Dichloropropane, 1,2-	1.2E-11
HexaCDF, 1,2,3,7,8,9-	9.2E-12
Benzo(g,h,i)perylene	8.4E-12
Chloroethane	8.1E-12
Dichlorodifluoromethane	7.9E-12
Bromochloromethane	7.8E-12
methyl tert-butyl ether	6.1E-12
HeptaCDF, 1,2,3,4,7,8,9-	6.0E-12
Propylene oxide	4.3E-12
Dichloroethylene-1,2 (trans)	4.0E-12
Dichloroethane 1,1-	3.8E-12
HeptaCDD, 1,2,3,4,6,7,8-	2.2E-12
Methyl methacrylate	1.1E-12
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	5.1E-13
Dioxane, 1,4-	4.0E-13
Dibenz(a,h)anthracene	1.6E-13
Acrylic Acid	4.0E-14
1-Hexane (n-hexane)	7.1E-15
Endosulfan sulfate	0.0E+00
2,5-Dione, 3-hexene	0.0E+00
Benzo(e)pyrene	0.0E+00
Perylene	0.0E+00
Phosphine imide, P,P,P-triphenyl	0.0E+00
Diallate	0.0E+00
9-Octadecenamide (oleamide)	0.0E+00
delta-BHC	0.0E+00
2-Methyl octane	0.0E+00
Endosulfan II	0.0E+00
Endrin ketone	0.0E+00
3-Penten-2-one (ethylidene acetone)	0.0E+00
2,5-Dimethylfuran	0.0E+00
Endrin aldehyde	0.0E+00
3-Hexen-2-one	0.0E+00
Benzoic acid, methyl ester (methyl benzoate)	0.0E+00
Isopropyl toluene, p-	0.0E+00
Total (c)	2.4E-02
R_4 resident farmer	
Nitrogen dioxide	1.6E-02
Arsenic	1.1E-02
Sulfur dioxide	5.9E-03
Chlorine	3.7E-03
Hydrogen chloride	1.7E-03
Beryllium	4.2E-04
Cadmium	1.7E-04
Nickel	3.6E-05
Lead	3.5E-05
Copper	3.0E-05
Mercury	1.6E-05
Mercuric chloride	4.1E-06
Hexachlorobenzene	4.1E-06
Chlorophenyl-phenylether, 4-	3.7E-06
Benzidine	2.8E-06
Chloroform (Trichloromethane)	2.8E-06
Dibromo-3-chloropropane, 1,2-	2.2E-06
Hexachlorocyclopentadiene	9.4E-07
Thallium (I)	6.3E-07
4,6-Dinitro-2-methylphenol	5.4E-07
Manganese	4.0E-07
Vanadium	3.6E-07
Silver	2.6E-07
Pentachlorophenol	2.6E-07
Tetrachloroethylene (Perchloroethylene)	2.4E-07
PentaCDF, 2,3,4,7,8-	1.5E-07

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
MAXIMUM MEASURED STACK EMISSION RATES (a)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (b)
Fluoranthene	1.5E-07
Zinc	1.3E-07
Barium	1.2E-07
Nitrosodipropylamine, n-	1.2E-07
Aluminum	8.0E-08
Antimony	7.2E-08
Chromium	7.0E-08
Chromium, hexavalent	7.0E-08
Bromoform (tribromomethane)	7.0E-08
Chlorobenzene	6.6E-08
Benzoic Acid	5.6E-08
Dinitrotoluene, 2,4-	5.5E-08
Selenium	5.5E-08
Ethylhexyl phthalate, bis-2-	5.1E-08
Benzene	5.1E-08
Methylene chloride	4.9E-08
3-Penten-2-one, 4-methyl	4.7E-08
Bromodichloromethane	4.6E-08
Dinitrotoluene, 2,6-	4.4E-08
Dibromochloromethane	4.3E-08
Methyl bromide (Bromomethane)	3.6E-08
Dinitrophenol, 2,4-	3.0E-08
Nitrophenol, 4-	2.9E-08
Nitroaniline, 3-	2.9E-08
Chloronaphthalene,2-	2.8E-08
Dichlorobenzidine, 3,3'-	2.3E-08
Methylene bromide	2.1E-08
Pentachloronitrobenzene (PCNB)	1.8E-08
Toluene	1.8E-08
Chlorobenzilate	1.4E-08
Dimethylphenol, 2,4-	1.3E-08
Acrylonitrile	1.2E-08
Nitrophenol, 2-	1.1E-08
Heptachlor	1.0E-08
Carbon Tetrachloride	9.9E-09
Carbazole	9.8E-09
Benzaldehyde	9.6E-09
Dinitrobenzene, 1,3-	9.2E-09
Methyl ethyl ketone (2-Butanone)	8.6E-09
Benzyl alcohol	8.6E-09
Phenanthrene	6.8E-09
Nitroaniline, 4-	6.2E-09
Benzonitrile	6.2E-09
Di-n-butyl phthalate	6.2E-09
Aniline	6.0E-09
Carbon Disulfide	5.7E-09
Methyl chloride (Chloromethane)	5.4E-09
Heptachlor epoxide	5.3E-09
Cobalt	5.2E-09
Phenol	5.0E-09
TetraCDF, 2,3,7,8-	4.8E-09
Endrin	4.0E-09
Chlorophenol, 2-	3.6E-09
Chloroaniline, p-	3.5E-09
HexaCDF, 1,2,3,6,7,8-	2.9E-09
Trichlorobenzene, 1,2,3-	2.9E-09
Acetone	2.9E-09
Bromophenyl-phenylether, 4-	2.8E-09
HexaCDF, 2,3,4,6,7,8-	2.7E-09
Chloro-3-methylphenol, 4-	2.7E-09
Hexachloro-1,3-butadiene (Perchlorobutadiene)	2.6E-09
Naphthalene	2.6E-09
Acetophenone	2.6E-09
Cresol, o-	2.6E-09
N-nitrosodimethylamine	2.3E-09
Butylbenzylphthalate	1.9E-09
HexaCDF, 1,2,3,4,7,8-	1.8E-09
Chlordane	1.8E-09
Dichlorobenzene, 1,3-	1.8E-09
2,5-Dimethylheptane	1.7E-09
HexaCDD, 1,2,3,4,7,8-	1.7E-09
Diethyl phthalate	1.7E-09
Acenaphthylene	1.7E-09
Tetrachloroethane, 1,1,2,2-	1.6E-09

ACUTE INHALATION RISK RESULTS

REACTIVATION FACILITY STACK EMISSIONS -
MAXIMUM MEASURED STACK EMISSION RATES (a)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (b)
Vinyl Acetate	1.6E-09
Dichloropropene, 1,3- (cis)	1.5E-09
PentaCDF, 1,2,3,7,8-	1.5E-09
Xylene, p-	1.4E-09
Xylene, m-	1.4E-09
Bis(2-chloroethoxy) methane	1.4E-09
Trichlorophenol, 2,4,5-	1.3E-09
Nitroaniline, 2-	1.3E-09
Nitrobenzene	1.3E-09
Dichlorophenol, 2,4-	1.2E-09
PentaCDD, 1,2,3,7,8-	1.2E-09
Benzo(b)fluoranthene	1.2E-09
2-Hexanone	1.2E-09
Hexachloroethane (Perchloroethane)	1.2E-09
Cresol, p-	1.1E-09
Cresol, m-	1.1E-09
Dimethyl phthalate	1.1E-09
Endosulfan I	1.1E-09
Trichlorophenol, 2,4,6-	1.1E-09
BHC, beta-	9.9E-10
Pyridine	9.4E-10
Dibenzofuran	8.9E-10
Diphenylamine	8.9E-10
Bromobenzene	8.3E-10
Aldrin	8.1E-10
Tetrachlorobenzene, 1,2,4,5-	8.1E-10
Nitrosodiphenylamine, N-	8.0E-10
Isophorone	7.9E-10
Pentachlorobenzene	7.5E-10
Di-n-octylphthalate	7.4E-10
TetraCDD, 2,3,7,8-	6.8E-10
Chrysene	6.6E-10
Trichlorobenzene, 1,2,4-	6.6E-10
Aroclor 1254	6.1E-10
Diphenylhydrazine,1,2-	5.8E-10
3-Ethyl benzaldehyde	5.7E-10
4-Ethyl benzaldehyde	5.7E-10
Trichloropropane, 1,2,3-	5.2E-10
DDT, 4-4'-	5.1E-10
Butylbenzene, sec	4.9E-10
Xylene, o-	4.9E-10
1,1-Dichloropropene	4.3E-10
Trichloroethane, 1,1,2-	4.0E-10
Benzo(a)Anthracene	3.9E-10
Dieldrin	3.8E-10
BHC, alpha-	3.8E-10
Benzo(k)fluoranthene	3.6E-10
Styrene	3.4E-10
Bis(2-chlorethyl)ether	3.4E-10
2,2'-oxybis (1-Chloropropane)	3.2E-10
Iodomethane	3.0E-10
Indeno(1,2,3-cd) pyrene	2.6E-10
Methyl isobutyl ketone	2.3E-10
Benzo(a)pyrene	2.3E-10
OctaCDF, 1,2,3,4,6,7,8,9-	2.1E-10
gamma-BHC (Lindane)	1.9E-10
HexaCDD, 1,2,3,7,8,9-	1.7E-10
Ethylene dibromide	1.6E-10
Trichloroethylene	1.5E-10
Tetrahydrofuran	1.5E-10
DDD, 4,4'-	1.5E-10
Pyrene	1.5E-10
HexaCDD, 1,2,3,6,7,8-	1.4E-10
Tetrachloroethane, 1,1,1,2-	1.3E-10
1,3-Dichloropropane	1.2E-10
Butylbenzene, n-	1.2E-10
Dichloroethylene 1,1-	1.2E-10
2,2-Dichloropropane	1.2E-10
Butylbenzene, tert	1.2E-10
Vinyl Chloride	1.1E-10
Trichloroethane, 1,1,1-	1.0E-10
Anthracene	9.5E-11
Acenaphthene	9.2E-11
2-Methylnaphthalene	8.9E-11

ACUTE INHALATION RISK RESULTS

**REACTIVATION FACILITY STACK EMISSIONS -
MAXIMUM MEASURED STACK EMISSION RATES (a)**

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (b)
Trimethylbenzene, 1,3,5-	8.1E-11
HeptaCDF, 1,2,3,4,6,7,8-	7.1E-11
Dichlorobenzene, 1,2-	7.1E-11
Dichloroethane, 1,2- (Ethylene Dichloride)	6.6E-11
Methoxychlor	4.6E-11
Dichlorobenzene,1,4-	4.2E-11
DDE, 4,4'-	4.1E-11
OctaCDD, 1,2,3,4,6,7,8,9-	3.8E-11
Fluorene	3.6E-11
Cumene (Isopropylbenzene)	3.6E-11
2-Chlorotoluene	3.1E-11
4-Chlorotoluene	3.1E-11
Ethylene Glycol	2.7E-11
Propylbenzene, n-	2.6E-11
Trichlorofluoromethane (Freon 11)	2.3E-11
1,2,4-Trimethylbenzene	2.3E-11
Dichloroethylene, cis-1,2-	2.0E-11
Ethylbenzene	2.0E-11
Dichloropropane, 1,2-	2.0E-11
HexaCDF, 1,2,3,7,8,9-	1.5E-11
Benzo(g,h,i)perylene	1.4E-11
Chloroethane	1.3E-11
Dichlorodifluoromethane	1.3E-11
Bromochloromethane	1.3E-11
HeptaCDF, 1,2,3,4,7,8,9-	1.0E-11
methyl tert-butyl ether	9.9E-12
Propylene oxide	7.0E-12
Dichloroethylene-1,2 (trans)	6.5E-12
Dichloroethane 1,1-	6.2E-12
HeptaCDD, 1,2,3,4,6,7,8-	3.7E-12
Methyl methacrylate	1.7E-12
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	8.3E-13
Dioxane, 1,4-	6.5E-13
Dibenz(a,h)anthracene	2.7E-13
Acrylic Acid	6.5E-14
1-Hexane (n-hexane)	1.2E-14
Endosulfan sulfate	0.0E+00
2,5-Dione, 3-hexene	0.0E+00
Benzo(e)pyrene	0.0E+00
Perylene	0.0E+00
Phosphine imide, P,P,P-triphenyl	0.0E+00
Diallate	0.0E+00
9-Octadecenamide (oleamide)	0.0E+00
delta-BHC	0.0E+00
2-Methyl octane	0.0E+00
Endosulfan II	0.0E+00
Endrin ketone	0.0E+00
3-Penten-2-one (ethylidene acetone)	0.0E+00
2,5-Dimethylfuran	0.0E+00
Endrin aldehyde	0.0E+00
3-Hexen-2-one	0.0E+00
Benzoic acid, methyl ester (methyl benzoate)	0.0E+00
Isopropyl toluene, p-	0.0E+00
Total (c)	4.0E-02

NC = Not calculated.

(a) For those compounds with emission rates based on stack test data, emission rates for this acute analysis were based on maximum measured stack test measurements. For the remaining compounds (i.e., with emission rates based on proposed permit limits or calculated based on feed rate and destruction and removal efficiency), the emission rates for this acute analysis were the same as those used in the chronic risk assessment. The emission rates are listed in Table 3 in the Response to USEPA Comment Document.

(b) Acute hazard quotients were calculated for all compounds with stack air emission rates and acute inhalation toxicity criteria.

ACUTE INHALATION RISK RESULTS

**REACTIVATION FACILITY STACK EMISSIONS -
MAXIMUM MEASURED STACK EMISSION RATES (a)**

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (b)

(c) The total is based on the sum of all chemical-specific hazard quotients regardless of the type of health effects of the summed compounds. A total value summed across all compounds is used as a screening tool only, to determine if additional evaluation for specific types of health effects is warranted (i.e., if the total value is greater than 1).

ATTACHMENT E

FUGITIVE EMISSIONS RISK ASSESSMENT:

ACUTE INHALATION RISK RESULTS

USING MAXIMUM MODELED FUGITIVE EMISSION RATES

ACUTE INHALATION RISK RESULTS
FUGITIVE AIR EMISSIONS DURING UNLOADING AT OUTDOOR HOPPER

Emission Rates Based On Maximum Concentration in Spent Carbon Unloaded at Outdoor Hopper H-1 Over 4-Year Period (2003-2006 Data)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
A_1 maximum impact point (stack emissions)	
Benzene	7.0E-03
Chloroform (Trichloromethane)	3.8E-03
Tetrachloroethylene (Perchloroethylene)	4.4E-04
Vinyl Chloride	8.3E-05
Toluene	6.6E-05
Acrylonitrile	4.3E-05
Cyclohexane	2.7E-05
Styrene	1.7E-05
Arsenic	1.0E-05
Trichloroethylene	3.6E-06
Ethylbenzene	2.9E-06
1-Hexane (n-hexane)	2.6E-06
Nickel	1.2E-06
Dichlorobenzene,1,4-	3.2E-07
Cadmium	7.0E-08
Beryllium	5.2E-08
Naphthalene	2.8E-08
Copper	2.4E-08
Cobalt	7.1E-09
Chromium	5.2E-09
Ethylene Dibromide	1.4E-12
1,3-Butadiene	0.0E+00
Chromium, hexavalent	0.0E+00
Total (b)	1.2E-02
A_2 closest business	
Benzene	1.6E-02
Chloroform (Trichloromethane)	8.4E-03
Tetrachloroethylene (Perchloroethylene)	9.8E-04
Vinyl Chloride	1.8E-04
Toluene	1.5E-04
Acrylonitrile	9.5E-05
Cyclohexane	5.9E-05
Styrene	3.8E-05
Arsenic	2.3E-05
Trichloroethylene	8.1E-06
Ethylbenzene	6.4E-06
1-Hexane (n-hexane)	5.7E-06
Nickel	2.7E-06
Dichlorobenzene,1,4-	7.1E-07
Cadmium	1.6E-07
Beryllium	1.2E-07
Naphthalene	6.2E-08
Copper	5.4E-08
Cobalt	1.6E-08
Chromium	1.2E-08
Ethylene Dibromide	3.2E-12
1,3-Butadiene	0.0E+00
Chromium, hexavalent	0.0E+00
Total (b)	2.6E-02
A_3 maximum impact point (hopper fugitive emissions)	
Benzene	3.9E-01
Chloroform (Trichloromethane)	2.1E-01
Tetrachloroethylene (Perchloroethylene)	2.4E-02
Vinyl Chloride	4.6E-03
Toluene	3.6E-03
Acrylonitrile	2.4E-03
Cyclohexane	1.5E-03
Styrene	9.5E-04
Arsenic	5.6E-04
Trichloroethylene	2.0E-04
Ethylbenzene	1.6E-04

ACUTE INHALATION RISK RESULTS
FUGITIVE AIR EMISSIONS DURING UNLOADING AT OUTDOOR HOPPER

Emission Rates Based On Maximum Concentration in Spent Carbon Unloaded at Outdoor Hopper H-1 Over 4-Year Period (2003-2006 Data)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
1-Hexane (n-hexane)	1.4E-04
Nickel	6.8E-05
Dichlorobenzene,1,4-	1.8E-05
Cadmium	3.9E-06
Beryllium	2.9E-06
Naphthalene	1.5E-06
Copper	1.3E-06
Cobalt	3.9E-07
Chromium	2.9E-07
Ethylene Dibromide	7.9E-11
1,3-Butadiene	0.0E+00
Chromium, hexavalent	0.0E+00
Total (b)	6.3E-01
R_1 resident	
Benzene	9.6E-04
Chloroform (Trichloromethane)	5.2E-04
Tetrachloroethylene (Perchloroethylene)	6.1E-05
Vinyl Chloride	1.1E-05
Toluene	9.0E-06
Acrylonitrile	5.8E-06
Cyclohexane	3.6E-06
Styrene	2.4E-06
Arsenic	1.4E-06
Trichloroethylene	5.0E-07
Ethylbenzene	3.9E-07
1-Hexane (n-hexane)	3.5E-07
Nickel	1.7E-07
Dichlorobenzene,1,4-	4.4E-08
Cadmium	9.6E-09
Beryllium	7.1E-09
Naphthalene	3.8E-09
Copper	3.3E-09
Cobalt	9.7E-10
Chromium	7.1E-10
Ethylene Dibromide	2.0E-13
1,3-Butadiene	0.0E+00
Chromium, hexavalent	0.0E+00
Total (b)	1.6E-03
R_2 resident	
Benzene	8.9E-04
Chloroform (Trichloromethane)	4.8E-04
Tetrachloroethylene (Perchloroethylene)	5.6E-05
Vinyl Chloride	1.0E-05
Toluene	8.3E-06
Acrylonitrile	5.4E-06
Cyclohexane	3.3E-06
Styrene	2.2E-06
Arsenic	1.3E-06
Trichloroethylene	4.6E-07
Ethylbenzene	3.6E-07
1-Hexane (n-hexane)	3.2E-07
Nickel	1.6E-07
Dichlorobenzene,1,4-	4.1E-08
Cadmium	8.8E-09
Beryllium	6.5E-09
Naphthalene	3.5E-09
Copper	3.1E-09
Cobalt	8.9E-10
Chromium	6.6E-10
Ethylene Dibromide	1.8E-13
1,3-Butadiene	0.0E+00
Chromium, hexavalent	0.0E+00
Total (b)	1.4E-03

ACUTE INHALATION RISK RESULTS
FUGITIVE AIR EMISSIONS DURING UNLOADING AT OUTDOOR HOPPER

Emission Rates Based On Maximum Concentration in Spent Carbon Unloaded at Outdoor Hopper H-1 Over 4-Year Period (2003-2006 Data)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
R_3 resident farmer	
Benzene	7.2E-04
Chloroform (Trichloromethane)	3.9E-04
Tetrachloroethylene (Perchloroethylene)	4.5E-05
Vinyl Chloride	8.5E-06
Toluene	6.7E-06
Acrylonitrile	4.4E-06
Cyclohexane	2.7E-06
Styrene	1.8E-06
Arsenic	1.0E-06
Trichloroethylene	3.7E-07
Ethylbenzene	3.0E-07
1-Hexane (n-hexane)	2.6E-07
Nickel	1.3E-07
Dichlorobenzene,1,4-	3.3E-08
Cadmium	7.2E-09
Beryllium	5.3E-09
Naphthalene	2.9E-09
Copper	2.5E-09
Cobalt	7.2E-10
Chromium	5.3E-10
Ethylene Dibromide	1.5E-13
1,3-Butadiene	0.0E+00
Chromium, hexavalent	0.0E+00
Total (b)	1.2E-03
R_4 resident farmer	
Benzene	9.3E-04
Chloroform (Trichloromethane)	5.0E-04
Tetrachloroethylene (Perchloroethylene)	5.8E-05
Vinyl Chloride	1.1E-05
Toluene	8.6E-06
Acrylonitrile	5.6E-06
Cyclohexane	3.5E-06
Styrene	2.3E-06
Arsenic	1.4E-06
Trichloroethylene	4.8E-07
Ethylbenzene	3.8E-07
1-Hexane (n-hexane)	3.4E-07
Nickel	1.6E-07
Dichlorobenzene,1,4-	4.2E-08
Cadmium	9.2E-09
Beryllium	6.8E-09
Naphthalene	3.7E-09
Copper	3.2E-09
Cobalt	9.3E-10
Chromium	6.9E-10
Ethylene Dibromide	1.9E-13
1,3-Butadiene	0.0E+00
Chromium, hexavalent	0.0E+00
Total (b)	1.5E-03
R_5 resident	
Benzene	1.2E-03
Chloroform (Trichloromethane)	6.2E-04
Tetrachloroethylene (Perchloroethylene)	7.3E-05
Vinyl Chloride	1.4E-05
Toluene	1.1E-05
Acrylonitrile	7.0E-06
Cyclohexane	4.4E-06
Styrene	2.8E-06
Arsenic	1.7E-06
Trichloroethylene	6.0E-07
Ethylbenzene	4.8E-07

ACUTE INHALATION RISK RESULTS
FUGITIVE AIR EMISSIONS DURING UNLOADING AT OUTDOOR HOPPER

Emission Rates Based On Maximum Concentration in Spent Carbon Unloaded at Outdoor Hopper H-1 Over 4-Year Period (2003-2006 Data)

COMPOUND	ACUTE INHALATION HAZARD QUOTIENT (a)
1-Hexane (n-hexane)	4.2E-07
Nickel	2.0E-07
Dichlorobenzene,1,4-	5.3E-08
Cadmium	1.2E-08
Beryllium	8.5E-09
Naphthalene	4.6E-09
Copper	4.0E-09
Cobalt	1.2E-09
Chromium	8.6E-10
Ethylene Dibromide	2.4E-13
1,3-Butadiene	0.0E+00
Chromium, hexavalent	0.0E+00
Total (b)	1.9E-03
R_6 resident	
Benzene	5.2E-04
Chloroform (Trichloromethane)	2.8E-04
Tetrachloroethylene (Perchloroethylene)	3.3E-05
Vinyl Chloride	6.1E-06
Toluene	4.9E-06
Acrylonitrile	3.2E-06
Cyclohexane	2.0E-06
Styrene	1.3E-06
Arsenic	7.6E-07
Trichloroethylene	2.7E-07
Ethylbenzene	2.1E-07
1-Hexane (n-hexane)	1.9E-07
Nickel	9.2E-08
Dichlorobenzene,1,4-	2.4E-08
Cadmium	5.2E-09
Beryllium	3.8E-09
Naphthalene	2.1E-09
Copper	1.8E-09
Cobalt	5.2E-10
Chromium	3.9E-10
Ethylene Dibromide	1.1E-13
1,3-Butadiene	0.0E+00
Chromium, hexavalent	0.0E+00
Total (b)	8.5E-04

(a) Acute hazard quotients were calculated for all compounds with fugitive air emission rates and acute inhalation toxicity criteria.

(b) The total is based on the sum of all chemical-specific hazard quotients regardless of the type of health effects of the summed compounds. A total value summed across all compounds is used as a screening tool only, to determine if additional evaluation for specific types of health effects is warranted (i.e., if the total value is greater than 1).

ATTACHMENT F

FACILITY EFFLUENT MONITORING REPORTS FOR 2005-2006

(PROVIDED IN SEPARATE PDF FILE)

Siemens Water Technologies Corp
Report on Compliance with Categorical Pretreatment Standards
Summary of Sample Results - June 2005

Analyte	CWT Limits 40 CFR 437.46(b)		Method 200.7 / 7470	Sample Result[1]			
Metals - 200.7 / 7470	Maximum Daily[1]	Monthly Average[1]	Reporting Limit[1]	IOF0712-01	NA	NA	NA
Antimony (200.7)	0.249	0.206	0.010	ND			
Arsenic (200.7)	0.162	0.104	0.0050	0.013			
Cadmium (200.7)	0.474	0.0962	0.0050	ND			
Chromium (200.7)	0.947	0.487	0.0050	0.005			
Cobalt (200.7)	0.192	0.124	0.010	ND			
Copper (200.7)	0.405	0.301	0.010	ND			
Lead (200.7)	0.222	0.172	0.0050	ND			
Mercury (7470)	0.00234	0.000739	0.00020	ND			
Nickel (200.7)	3.95	1.45	0.010	ND			
Silver (200.7)	0.120	0.0351	0.010	ND			
Tin (200.7)	0.409	0.120	0.10	ND			
Titanium (200.7)	0.0947	0.0618	0.0050	ND			
Vanadium (200.7)	0.218	0.0662	0.010	ND			
Zinc (200.7)	2.87	0.641	0.020	ND			

Analyte	CWT Limits 40 CFR 437.46(b)		Method 625	Sample Result[1]			
Organics - 625	Maximum Daily[1]	Monthly Average[1]	Reporting Limit[1]	IOF0712-02	IOF0712-03	IOF0712-04	IOF0712-05
2,3-Dichloroaniline	0.0731	0.0361	0.005	ND	ND	ND	ND
Bis(2-ethylhexyl) phthalate	0.267	0.158	0.01	ND	ND	ND	ND
Carbazole	0.392	0.233	0.005	ND	ND	ND	ND
o-Cresol	1.92	0.561	0.005	ND	ND	ND	ND
p-Cresol	0.698	0.205	0.005	ND	ND	ND	ND
n-Decane	5.79	3.31	0.005	ND	ND	ND	ND
Fluoranthene	0.787	0.393	0.01	ND	ND	ND	ND
n-Octadecane	1.22	0.925	0.005	ND	ND	ND	ND
2,4,6-Trichlorophenol	0.155	0.106	0.01	ND	ND	ND	ND

Analyte	CWT Limits		Method 413.1	Sample Result[1]			
Oil & Grease - 413.1	Maximum Daily[1]	Monthly Average[1]	Reporting Limit[1]	IOF0712-02	IOF0712-03	IOF0712-04	IOF0712-05
Oil and Grease	127	38	5	ND	ND	ND	ND

[1] mg/l (ppm)

ND - Analyte Not Detected at or above reporting limit

Siemens Water Technologies Corp
Report on Compliance with Categorical Pretreatment Standards
Summary of Sample Results - December 2005

Analyte	CWT Limits 40 CFR 437.46(b)		Method 200.7 / 7470	Sample Result[1]			
Metals - 200.7 / 7470	Maximum Daily[1]	Monthly Average[1]	Reporting Limit[1]	IOL1934-01	NA	NA	NA
Antimony (200.7)	0.249	0.206	0.010	ND			
Arsenic (200.7)	0.162	0.104	0.0050	0.011			
Cadmium (200.7)	0.474	0.0962	0.0050	ND			
Chromium (200.7)	0.947	0.487	0.0050	0.0059			
Cobalt (200.7)	0.192	0.124	0.010	ND			
Copper (200.7)	0.405	0.301	0.010	ND			
Lead (200.7)	0.222	0.172	0.0050	ND			
Mercury (7470)	0.00234	0.000739	0.00020	ND			
Nickel (200.7)	3.95	1.45	0.010	ND			
Silver (200.7)	0.120	0.0351	0.010	ND			
Tin (200.7)	0.409	0.120	0.10	ND			
Titanium (200.7)	0.0947	0.0618	0.0050	ND			
Vanadium (200.7)	0.218	0.0662	0.010	ND			
Zinc (200.7)	2.87	0.641	0.020	ND			

Analyte	CWT Limits 40 CFR 437.46(b)		Method 625	Sample Result[2]			
Organics - 625	Maximum Daily[1]	Monthly Average[1]	Reporting Limit[2]	IOL1934-02	IOL1934-03	IOL1934-04	IOL1934-05
Bis(2-ethylhexyl) phthalate	0.267	0.158	9.6	ND	ND	ND	ND
Carbazole	0.392	0.233	4.8	ND	ND	ND	ND
o-Cresol	1.92	0.561	4.8	ND	ND	ND	ND
p-Cresol	0.698	0.205	4.8	ND	ND	ND	ND
n-Decane	5.79	3.31	4.8	ND	ND	ND	ND
Fluoranthene	0.787	0.393	9.6	ND	ND	ND	ND
n-Octadecane	1.22	0.925	4.8	ND	ND	ND	ND
2,4,6-Trichlorophenol	0.155	0.106	9.6	ND	ND	ND	ND

Analyte	CWT Limits		Method 413.1	Sample Result[1]			
Oil & Grease - 413.1	Maximum Daily[1]	Monthly Average[1]	Reporting Limit[1]	IOL1934-02	IOL1934-03	IOL1934-04	IOL1934-05
Oil and Grease	127	38	4.8	ND	ND	ND	ND

[1] mg/l (ppm) [2] ug/l (ppb)

ND - Analyte Not Detected at or above reporting limit

Siemens Water Technologies Corp
Report on Compliance with Categorical Pretreatment Standards
Summary of Sample Results - June 2006

Analyte	CWT Limits 40 CFR 437.46(b)		Method 200.7 / 7470	Sample Result[1]			
Metals - 200.7 / 7470	Maximum Daily[1]	Monthly Average[1]	Reporting Limit[1]	IPE2573-01	NA	NA	NA
Antimony (200.7)	0.249	0.206	0.010	ND			
Arsenic (200.7)	0.162	0.104	0.0050	0.012			
Cadmium (200.7)	0.474	0.0962	0.0050	ND			
Chromium (200.7)	0.947	0.487	0.0050	ND			
Cobalt (200.7)	0.192	0.124	0.010	ND			
Copper (200.7)	0.405	0.301	0.010	ND			
Lead (200.7)	0.222	0.172	0.0050	ND			
Mercury (7470)	0.00234	0.000739	0.00020	ND			
Nickel (200.7)	3.95	1.45	0.010	ND			
Silver (200.7)	0.120	0.0351	0.010	ND			
Tin (200.7)	0.409	0.120	0.10	ND			
Titanium (200.7)	0.0947	0.0618	0.0050	ND			
Vanadium (200.7)	0.218	0.0662	0.010	0.031			
Zinc (200.7)	2.87	0.641	0.020	ND			

Analyte	CWT Limits 40 CFR 437.46(b)		Method 625	Sample Result[2]			
Organics - 625	Maximum Daily[1]	Monthly Average[1]	Reporting Limit[2]	IPE2573-02	IPE2573-03	IPE2573-04	IPE2573-05
Bis(2-ethylhexyl) phthalate	0.267	0.158	9.5	ND	ND	ND	ND
Carbazole	0.392	0.233	4.8	ND	ND	ND	ND
o-Cresol	1.92	0.561	4.8	ND	ND	ND	ND
p-Cresol	0.698	0.205	4.8	ND	ND	ND	ND
n-Decane	5.79	3.31	4.8	ND	ND	ND	ND
Fluoranthene	0.787	0.393	9.5	ND	ND	ND	ND
n-Octadecane	1.22	0.925	4.8	ND	ND	ND	ND
2,4,6-Trichlorophenol	0.155	0.106	9.5	ND	ND	ND	ND

Analyte	CWT Limits		Method 413.1	Sample Result[1]			
Oil & Grease - 413.1	Maximum Daily[1]	Monthly Average[1]	Reporting Limit[1]	IPE2573-02	IPE2573-03	IPE2573-04	IPE2573-05
Oil and Grease	127	38	4.8	ND	ND	ND	ND

[1] mg/l (ppm) [2] ug/l (ppb)

ND - Analyte Not Detected at or above reporting limit

Siemens Water Technologies Corp
Report on Compliance with Categorical Pretreatment Standards
Summary of Sample Results - December 2006

Analyte	CWT Limits 40 CFR 437.46(b)		Method 200.7 / 7470	Sample Result[1]			
Metals - 200.7 / 7470	Maximum Daily[1]	Monthly Average[1]	Reporting Limit[1]	IPL1042-01	NA	NA	NA
Antimony (200.7)	0.249	0.206	0.010	ND			
Arsenic (200.7)	0.162	0.104	0.010	ND			
Cadmium (200.7)	0.474	0.0962	0.0050	ND			
Chromium (200.7)	0.947	0.487	0.0050	ND			
Cobalt (200.7)	0.192	0.124	0.010	ND			
Copper (200.7)	0.405	0.301	0.010	ND			
Lead (200.7)	0.222	0.172	0.0050	ND			
Mercury (7470)	0.00234	0.000739	0.00020	ND			
Nickel (200.7)	3.95	1.45	0.010	ND			
Silver (200.7)	0.120	0.0351	0.010	ND			
Tin (200.7)	0.409	0.120	0.10	ND			
Titanium (200.7)	0.0947	0.0618	0.0050	ND			
Vanadium (200.7)	0.218	0.0662	0.010	ND			
Zinc (200.7)	2.87	0.641	0.020	ND			

Analyte	CWT Limits 40 CFR 437.46(b)		Method 625	Sample Result[2]			
Organics - 625	Maximum Daily[1]	Monthly Average[1]	Reporting Limit[2]	IPL1042-02	IPL1042-03	IPL1042-04	IPL1042-05
Bis(2-ethylhexyl) phthalate	0.267	0.158	9.5	ND	ND	ND	ND
Carbazole	0.392	0.233	4.8	ND	ND	ND	ND
o-Cresol	1.92	0.561	4.8	ND	ND	ND	ND
p-Cresol	0.698	0.205	4.8	ND	ND	ND	ND
n-Decane	5.79	3.31	4.8	ND	ND	ND	ND
Fluoranthene	0.787	0.393	9.5	ND	ND	ND	ND
n-Octadecane	1.22	0.925	4.8	ND	ND	ND	ND
2,4,6-Trichlorophenol	0.155	0.106	9.5	ND	ND	ND	ND

Analyte	CWT Limits		Method 413.1	Sample Result[1]			
Oil & Grease - 413.1	Maximum Daily[1]	Monthly Average[1]	Reporting Limit[1]	IPL1042-02	IPL1042-03	IPL1042-04	IPL1042-05
Oil and Grease	127	38	4.8	ND	ND	ND	ND

[1] mg/l (ppm) [2] ug/l (ppb)

ND - Analyte Not Detected at or above reporting limit

Table 3-9. Makeup Water, Caustic, and Scrubber Purge POHC Concentration

Constituent	Makeup Water (ug/L)				Caustic (ug/L)				Scrubber Blowdown (ug/L)				POTW Discharge (ug/L)			
	Run 1	Run 2	Run 3	Average	Run 1	Run 2	Run 3	Average	Run 1	Run 2	Run 3	Average	Run 1	Run 2	Run 3	Average
Metals																
Aluminum	< 1.10E+02	< 1.10E+02	< 1.10E+02	< 1.10E+02	< 4.40E+02	NA	NA	< 4.40E+02	1.37E+04	1.17E+04	1.76E+04	1.43E+04	1.14E+02	< 1.10E+02	1.48E+02	< 1.24E+02
Antimony	< 1.40E+01	< 1.40E+01	< 1.40E+01	< 1.40E+01	< 5.60E+01	NA	NA	< 5.60E+01	< 1.40E+01	< 1.40E+01	1.77E+01	< 1.52E+01	< 1.40E+01	< 1.40E+01	< 1.40E+01	< 1.40E+01
Arsenic	< 5.10E+00	5.90E+00	< 5.10E+00	< 5.37E+00	< 2.04E+01	NA	NA	< 2.04E+01	3.67E+01	2.61E+01	3.93E+01	3.40E+01	1.37E+01	1.26E+01	1.19E+01	1.27E+01
Barium	5.12E+01	6.19E+01	4.92E+01	5.08E+01	3.63E+02	NA	NA	3.63E+02	8.74E+02	7.65E+02	1.13E+03	9.23E+02	2.47E+02	2.26E+02	2.36E+02	2.37E+02
Beryllium	< 1.80E+00	< 1.80E+00	< 1.80E+00	< 1.80E+00	< 7.20E+00	NA	NA	< 7.20E+00	3.80E+00	3.70E+00	5.40E+00	4.30E+00	< 1.80E+00	< 1.80E+00	< 1.80E+00	< 1.80E+00
Cadmium	< 8.20E-01	< 8.20E-01	< 8.20E-01	< 8.20E-01	< 3.30E+00	NA	NA	< 3.30E+00	1.13E+01	1.17E+01	1.37E+01	1.22E+01	< 8.20E-01	< 8.20E-01	2.40E+00	< 1.35E+00
Chromium *	< 3.90E+00	< 3.90E+00	< 3.90E+00	< 3.90E+00	3.64E+02	NA	NA	3.64E+02	1.72E+03	1.75E+03	2.90E+03	2.12E+03	2.46E+01	1.30E+01	2.51E+01	2.09E+01
Cobalt	< 2.20E+00	< 2.20E+00	< 2.20E+00	< 2.20E+00	< 8.80E+00	NA	NA	< 8.80E+00	3.15E+01	2.64E+01	4.05E+01	3.28E+01	< 2.20E+00	< 2.20E+00	< 2.20E+00	< 2.20E+00
Copper	< 7.00E+00	< 7.00E+00	< 7.00E+00	< 7.00E+00	< 2.80E+01	NA	NA	< 2.80E+01	1.78E+03	9.65E+02	6.69E+02	1.14E+03	< 7.00E+00	< 7.00E+00	< 7.00E+00	< 7.00E+00
Lead *	< 3.70E+00	< 3.70E+00	< 3.70E+00	< 3.70E+00	9.75E+01	NA	NA	9.75E+01	7.21E+02	5.92E+02	1.51E+03	9.41E+02	< 3.70E+00	< 3.70E+00	< 3.70E+00	< 3.70E+00
Manganese	1.54E+01	1.85E+01	1.40E+01	1.60E+01	7.48E+01	NA	NA	7.48E+01	3.38E+03	3.10E+03	4.32E+03	3.60E+03	1.15E+02	6.12E+01	8.59E+01	8.74E+01
Mercury	< 6.00E-02	< 6.00E-02	< 6.00E-02	< 6.00E-02	3.50E+00	NA	NA	3.50E+00	3.50E-01	4.20E-01	4.50E-01	4.07E-01	< 6.00E-02	< 6.00E-02	< 6.00E-02	< 6.00E-02
Nickel	< 3.80E+00	< 3.80E+00	< 3.80E+00	< 3.80E+00	1.50E+02	NA	NA	1.50E+02	4.33E+02	3.97E+02	4.05E+02	4.12E+02	< 3.80E+00	< 3.80E+00	4.80E+00	< 4.13E+00
Selenium	< 4.30E+00	< 4.30E+00	< 4.30E+00	< 4.30E+00	< 1.72E+01	NA	NA	< 1.72E+01	1.19E+01	8.80E+00	1.21E+01	1.09E+01	1.10E+01	1.00E+01	9.00E+00	1.00E+01
Silver	< 9.70E+00	< 9.70E+00	< 9.70E+00	< 9.70E+00	5.30E+01	NA	NA	5.30E+01	< 9.70E+00	< 9.70E+00	< 9.70E+00	< 9.70E+00	< 9.70E+00	< 9.70E+00	< 9.70E+00	< 9.70E+00
Thallium	< 1.00E+01	< 1.00E+01	< 1.00E+01	< 1.00E+01	< 4.00E+01	NA	NA	< 4.00E+01	< 1.00E+01	< 1.00E+01	< 1.00E+01	< 1.00E+01	< 1.00E+01	< 1.00E+01	< 1.00E+01	< 1.00E+01
Vanadium	< 5.00E+00	< 5.00E+00	< 5.00E+00	< 5.00E+00	< 2.00E+01	NA	NA	< 2.00E+01	8.43E+01	5.81E+01	1.09E+02	8.38E+01	2.56E+01	1.66E+01	2.10E+01	2.11E+01
Zinc	< 3.80E+00	< 3.80E+00	< 3.80E+00	< 3.80E+00	2.04E+02	NA	NA	2.04E+02	7.65E+02	5.64E+02	6.45E+02	6.58E+02	< 3.80E+00	< 3.80E+00	< 3.80E+00	< 3.80E+00
Volatile Organics																
Acetone	4.40E+00	3.80E+00	4.50E+00	4.23E+00	4.50E+00	NA	NA	4.50E+00	ND	4.10E+00	3.60E+00	3.85E+00	3.70E+00	3.70E+00	4.80E+00	4.07E+00
Bromobenzene	ND	ND	ND	ND	1.80E-01	NA	NA	1.80E-01	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	3.20E+00	4.10E+00	2.50E+00	3.27E+00	8.60E-01	NA	NA	8.60E-01	ND	ND	ND	ND	ND	8.90E-01	1.00E+00	9.45E-01
Bromoform	4.00E+01	3.20E+01	2.80E+01	3.33E+01	2.80E+00	NA	NA	ND	9.90E-01	9.20E-01	1.00E+00	9.70E-01	2.00E+00	2.00E+00	2.10E+00	2.03E+00
Carbon disulfide	ND	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	1.60E-01	1.60E-01
Chlorodibromomethane	1.30E+01	1.30E+01	8.90E+00	1.18E+01	1.00E+00	NA	NA	1.00E+00	9.20E-01	8.70E-01	8.90E-01	8.93E-01	1.40E+00	1.30E+00	1.40E+00	1.37E+00
Chloroform	5.60E-01	6.40E-01	6.20E-01	6.07E-01	1.70E-01	NA	NA	1.70E-01	ND	ND	ND	ND	1.40E-01	1.50E-01	1.40E-01	1.43E-01
1,2-Dichloroethane	ND	1.30E-01	1.20E-01	1.25E-01	1.30E-01	NA	NA	1.30E-01	ND	ND	ND	ND	ND	ND	ND	ND
Iodomethane	ND	ND	ND	ND	ND	NA	NA	ND	5.50E-01	ND	ND	5.50E-01	ND	ND	ND	ND
Methylene chloride *	5.50E-01	2.40E+00	2.00E+00	1.65E+00	5.30E-01	NA	NA	ND	ND	2.30E+00	8.40E-01	1.57E+00	3.50E-01	2.00E+00	6.50E-01	1.00E+00
Tetrachloroethene *	3.30E-01	3.10E-01	4.50E-01	3.63E-01	2.40E-01	NA	NA	2.40E-01	ND	ND	ND	ND	1.30E-01	ND	ND	1.30E-01
Toluene *	ND	4.10E-01	3.10E-01	3.60E-01	ND	NA	NA	ND	ND	4.10E-01	ND	4.10E-01	ND	4.30E-01	1.20E-01	2.75E-01
Semivolatile Organics																
bis(2-ethylhexyl)phthalate	ND	ND	ND	ND	4.10E+01	NA	NA		ND	ND	ND	ND	ND	ND	ND	ND

Note: Only detected organics shown on this table.

* These compounds were spiked into the feed materials during the PDT.

USFILTER W ATES
P.O. Box 3308
2523 Mutahar Street
Parker, AZ 85344

Telephone 928-669-5758
Facsimile 928-669-5775

VIA Certified Mail

August 1, 2005

Mr. Andy Jones
Plant Manager
Colorado River Sewage System Joint Venture
P.O. Box 628
Parker, Arizona 85344

Re: Westates Carbon-Arizona, Inc.
Priority Pollutants Testing Report 2005

Dear Mr. Jones:

In accordance with our Industrial Wastewater Discharge Permit Number 1002-96, I am submitting the 2005 Priority Pollutants Testing Report, per our agreement, for analytes from 40 CFR Part 122, Table 2 and Table 5. As per your verbal request we have also tested analytes contained in Table III and IV.

Please call if you have any questions or require any further information.

Sincerely,

Deborah Foster
EHS Specialist

Del Mar Analytical

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2520 E. Sunset Rd. #3, Las Vegas, NV 89120 (702) 798-3620 FAX (702) 798-3621

LABORATORY REPORT

Prepared For: U.S. Filter/Westates Carbon
P.O. Box 3308
Parker, AZ 85344
Attention: Deborah Foster

Project: TTO

Sampled: 07/13/05
Received: 07/14/05
Issued: 07/27/05 17:35

NELAP #01108CA California ELAP#1197 CSDLAC #10117

The results listed within this Laboratory Report pertain only to the samples tested in the laboratory. The analyses contained in this report were performed in accordance with the applicable certifications as noted. All soil samples are reported on a wet weight basis unless otherwise noted in the report. This Laboratory Report is confidential and is intended for the sole use of Del Mar Analytical and its client. This report shall not be reproduced, except in full, without written permission from Del Mar Analytical. The Chain(s) of Custody, 4 pages, are included and are an integral part of this report.
This entire report was reviewed and approved for release.

SAMPLE CROSS REFERENCE

SUBCONTRACTED: Refer to the last page for specific subcontract laboratory information included in this report.

LABORATORY ID	CLIENT ID	MATRIX
1OG0857-01	TTO	Water

Reviewed By:

Del Mar Analytical, Irvine
Kathleen A. Robb
Project Manager

Del Mar Analytical

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U.S. Filter/Westates Carbon
P.O. Box 3308
Parker, AZ 85344
Attention: Deborah Foster

Project ID: TTO
Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

VOLATILE ORGANICS by GC/MS (EPA 5030B/8260B)

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IOG0857-01 (TTO - Water)								
Reporting Units: ug/l								
Acrolein	EPA 8260B	5G16003	50	ND	1	7/16/2005	7/16/2005	
Acrylonitrile	EPA 8260B	5G16003	50	ND	1	7/16/2005	7/16/2005	
2-Chloroethyl vinyl ether	EPA 8260B	5G16003	5.0	ND	1	7/16/2005	7/16/2005	
Surrogate: Dibromofluoromethane (80-120%)				*99 %*				
Surrogate: Toluene-d8 (80-120%)				*102 %*				
Surrogate: 4-Bromofluorobenzene (80-120%)				*96 %*				

Del Mar Analytical, Irvine
Kathleen A. Robb
Project Manager

Del Mar Analytical

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U.S. Filter/Westates Carbon
P.O. Box 3308
Parker, AZ 85344
Attention: Deborah Foster

Project ID: TTO

Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

VOLATILE ORGANICS by GC/MS (EPA 5035/8260B)

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IOG0857-01 (TTO - Water) - cont.								
Reporting Units: ug/l								
Benzene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Bromobenzene	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
Bromochloromethane	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
Bromodichloromethane	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Bromoform	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
Bromomethane	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
n-Butylbenzene	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
sec-Butylbenzene	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
tert-Butylbenzene	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
Carbon Disulfide	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
Carbon tetrachloride	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
Chlorobenzene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Chloroethane	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
Chloroform	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Chloromethane	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
2-Chlorotoluene	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
4-Chlorotoluene	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
Dibromochloromethane	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,2-Dibromo-3-chloropropane	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
1,2-Dibromoethane (EDB)	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Dibromomethane	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,2-Dichlorobenzene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,3-Dichlorobenzene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,4-Dichlorobenzene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Dichlorodifluoromethane	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
1,1-Dichloroethane	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,2-Dichloroethane	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,1-Dichloroethene	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
cis-1,2-Dichloroethene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
trans-1,2-Dichloroethene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,2-Dichloropropane	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,3-Dichloropropane	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
2,2-Dichloropropane	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,1-Dichloropropene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
cis-1,3-Dichloropropene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
trans-1,3-Dichloropropene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Ethylbenzene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Hexachlorobutadiene	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
Isopropylbenzene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
p-Isopropyltoluene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Methylene chloride	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	

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P.O. Box 3308
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Attention: Deborah Foster

Project ID: TTO

Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

VOLATILE ORGANICS by GC/MS (EPA 5035/8260B)

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IOG0857-01 (TTO - Water) - cont.								
Reporting Units: ug/l								
Naphthalene	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
n-Propylbenzene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Styrene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,1,1,2-Tetrachloroethane	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
1,1,2,2-Tetrachloroethane	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Tetrachloroethene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Toluene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,2,3-Trichlorobenzene	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
1,2,4-Trichlorobenzene	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
1,1,1-Trichloroethane	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,1,2-Trichloroethane	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Trichloroethene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Trichlorofluoromethane	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
1,2,3-Trichloropropane	EPA 8260B	5G21019	10	ND	1	7/21/2005	7/21/2005	
1,2,4-Trimethylbenzene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,3,5-Trimethylbenzene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Vinyl acetate	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
Vinyl chloride	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
o-Xylene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
m,p-Xylenes	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Surrogate: Dibromofluoromethane (80-120%)				*99 %*				
Surrogate: Toluene-d8 (80-120%)				*104 %*				
Surrogate: 4-Bromofluorobenzene (80-120%)				*95 %*				

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SEMI-VOLATILE ORGANICS BY GC/MS (EPA 3520C/8270C)

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IOG0857-01 (TTO - Water)								
Reporting Units: ug/l								
Acenaphthene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Acenaphthylene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Aniline	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Anthracene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Benzidine	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	L
Benzoic acid	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
Benzo(a)anthracene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Benzo(b)fluoranthene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Benzo(k)fluoranthene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Benzo(g,h,i)perylene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Benzo(a)pyrene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Benzyl alcohol	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
Bis(2-chloroethoxy)methane	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Bis(2-chloroethyl)ether	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Bis(2-chloroisopropyl)ether	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Bis(2-ethylhexyl)phthalate	EPA 8270C	5G17017	50	ND	1	7/17/2005	7/20/2005	
4-Bromophenyl phenyl ether	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Butyl benzyl phthalate	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
4-Chloroaniline	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
2-Chloronaphthalene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
4-Chloro-3-methylphenol	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
2-Chlorophenol	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
4-Chlorophenyl phenyl ether	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Chrysene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Dibenz(a,h)anthracene	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
Dibenzofuran	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Di-n-butyl phthalate	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
1,3-Dichlorobenzene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
1,4-Dichlorobenzene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
1,2-Dichlorobenzene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
3,3-Dichlorobenzidine	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
2,4-Dichlorophenol	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Diethyl phthalate	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
2,4-Dimethylphenol	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
Dimethyl phthalate	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
4,6-Dinitro-2-methylphenol	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
2,4-Dinitrophenol	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
2,4-Dinitrotoluene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
2,6-Dinitrotoluene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Di-n-octyl phthalate	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
Fluoranthene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	

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SEMI-VOLATILE ORGANICS BY GC/MS (EPA 3520C/8270C)

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IOG0857-01 (TTO - Water) - cont.								
Reporting Units: ug/l								
Fluorene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Hexachlorobenzene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Hexachlorobutadiene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Hexachlorocyclopentadiene	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
Hexachloroethane	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Indeno(1,2,3-cd)pyrene	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
Isophorone	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
2-Methylnaphthalene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
2-Methylphenol	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
4-Methylphenol	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Naphthalene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
2-Nitroaniline	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
3-Nitroaniline	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
4-Nitroaniline	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
Nitrobenzene	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
2-Nitrophenol	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
4-Nitrophenol	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
N-Nitrosodiphenylamine	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
N-Nitroso-di-n-propylamine	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Pentachlorophenol	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
Phenanthrene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Phenol	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Pyrene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
1,2,4-Trichlorobenzene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
2,4,5-Trichlorophenol	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
2,4,6-Trichlorophenol	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
N-Nitrosodimethylamine	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	C
1,2-Diphenylhydrazine/Azobenzene	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
Surrogate: 2-Fluorophenol (30-120%)				*60 %*				
Surrogate: Phenol-d6 (35-120%)				*70 %*				
Surrogate: 2,4,6-Tribromophenol (45-120%)				*84 %*				
Surrogate: Nitrobenzene-d5 (45-120%)				*71 %*				
Surrogate: 2-Fluorobiphenyl (45-120%)				*75 %*				
Surrogate: Terphenyl-d14 (45-120%)				*80 %*				

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ORGANOCHLORINE PESTICIDES (EPA 3510C/8081A)

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IOG0857-01 (TTO - Water)								
Reporting Units: ug/l								
Aldrin	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
alpha-BHC	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
beta-BHC	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
delta-BHC	EPA 3510C/8081A	5G20057	0.20	ND	0.971	7/20/2005	7/20/2005	
gamma-BHC (Lindane)	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
Chlordane	EPA 3510C/8081A	5G20057	1.0	ND	0.971	7/20/2005	7/20/2005	
4,4'-DDD	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
4,4'-DDE	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
4,4'-DDT	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
Dieldrin	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
Endosulfan I	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
Endosulfan II	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
Endosulfan sulfate	EPA 3510C/8081A	5G20057	0.20	ND	0.971	7/20/2005	7/20/2005	
Endrin	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
Endrin aldehyde	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
Endrin ketone	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
Heptachlor	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
Heptachlor epoxide	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
Methoxychlor	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
Toxaphene	EPA 3510C/8081A	5G20057	5.0	ND	0.971	7/20/2005	7/20/2005	
Surrogate: Tetrachloro-m-xylene (35-115%)				*56 %*				
Surrogate: Decachlorobiphenyl (45-120%)				*73 %*				

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POLYCHLORINATED BIPHENYLS (EPA 3510C/8082)

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IOG0857-01 (TTO - Water)								
Reporting Units: ug/l								
Aroclor 1016	EPA 3510/8082	5G20057	1.0	ND	0.971	7/20/2005	7/22/2005	
Aroclor 1221	EPA 3510/8082	5G20057	1.0	ND	0.971	7/20/2005	7/22/2005	
Aroclor 1232	EPA 3510/8082	5G20057	1.0	ND	0.971	7/20/2005	7/22/2005	
Aroclor 1242	EPA 3510/8082	5G20057	1.0	ND	0.971	7/20/2005	7/22/2005	
Aroclor 1248	EPA 3510/8082	5G20057	1.0	ND	0.971	7/20/2005	7/22/2005	
Aroclor 1254	EPA 3510/8082	5G20057	1.0	ND	0.971	7/20/2005	7/22/2005	
Aroclor 1260	EPA 3510/8082	5G20057	1.0	ND	0.971	7/20/2005	7/22/2005	
Surrogate: Decachlorobiphenyl (45-120%)				*88 %*				

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METALS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IOG0857-01 (TTO - Water)								
Reporting Units: mg/l								
Aluminum	EPA 6010B	5G19086	0.050	**0.082**	1	7/19/2005	7/20/2005	
Antimony	EPA 6010B	5G18097	0.010	ND	1	7/18/2005	7/20/2005	
Arsenic	EPA 6010B	5G18097	0.0050	**0.0052**	1	7/18/2005	7/20/2005	
Barium	EPA 6010B	5G18097	0.010	**0.075**	1	7/18/2005	7/20/2005	
Boron	EPA 6010B	5G19086	0.050	**0.64**	1	7/19/2005	7/20/2005	
Chromium	EPA 6010B	5G18097	0.0050	ND	1	7/18/2005	7/20/2005	
Cobalt	EPA 6010B	5G18097	0.010	ND	1	7/18/2005	7/20/2005	
Copper	EPA 6010B	5G18097	0.010	ND	1	7/18/2005	7/20/2005	
Iron	EPA 6010B	5G19086	0.040	ND	1	7/19/2005	7/20/2005	
Magnesium	EPA 6010B	5G19086	0.020	**29**	1	7/19/2005	7/20/2005	
Manganese	EPA 6010B	5G19086	0.020	ND	1	7/19/2005	7/20/2005	
Mercury	EPA 7470A	5G19037	0.00020	ND	1	7/19/2005	7/19/2005	
Molybdenum	EPA 6010B	5G18097	0.020	ND	1	7/18/2005	7/20/2005	
Silver	EPA 6010B	5G18097	0.0070	ND	1	7/18/2005	7/20/2005	
Strontium	EPA 6010B	5G19086	0.020	**1.7**	1	7/19/2005	7/20/2005	
Thallium	EPA 6010B	5G18097	0.010	ND	1	7/18/2005	7/20/2005	
Tin	EPA 6010B	5G19086	0.10	ND	1	7/19/2005	7/20/2005	
Titanium	EPA 6010B	5G19086	0.0050	ND	1	7/19/2005	7/20/2005	
Vanadium	EPA 6010B	5G18097	0.010	ND	1	7/18/2005	7/20/2005	
Zinc	EPA 6010B	5G18097	0.020	ND	1	7/18/2005	7/20/2005	
Zirconium	EPA 6010B	5G25067	0.20	ND	1	7/25/2005	7/25/2005	

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U.S. Filter/Westates Carbon
P.O. Box 3308
Parker, AZ 85344
Attention: Deborah Foster

Project ID: TTO
Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

INORGANICS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IOG0857-01 (TTO - Water)								
Reporting Units: Color Units								
Color	SM2120B	5G14089	1.0	ND	1	7/14/2005	7/14/2005	pH
Sample ID: IOG0857-01 (TTO - Water)								
Reporting Units: mg/l								
Total Kjeldahl Nitrogen	SM4500-NORG,C	5G19066	0.50	**0.84**	1	7/19/2005	7/19/2005	
Ammonia-N	EPA 350.3	5G22113	0.50	ND	1	7/22/2005	7/22/2005	
Bromide	EPA 300.0	5G14039	0.50	**1.1**	1	7/14/2005	7/14/2005	
Total Cyanide	SM4500-CN-C,E	5G15075	0.025	ND	1	7/15/2005	7/18/2005	
Fluoride	EPA 300.0	5G14039	0.50	**1.8**	1	7/14/2005	7/14/2005	
Nitrate-N	EPA 300.0	5G14039	0.15	**2.7**	1	7/14/2005	7/14/2005	
Nitrite-N	EPA 300.0	5G14039	1.5	ND	10	7/14/2005	7/14/2005	RL-3
Oil & Grease	EPA 413.1	5G20078	5.0	ND	1	7/20/2005	7/20/2005	
Phenols	EPA 420.1	5G22080	0.10	ND	1	7/22/2005	7/22/2005	
Phosphorus	EPA 365.3	5G14075	0.050	**0.15**	1	7/14/2005	7/14/2005	
Residual Chlorine	EPA 330.5	5G14094	0.10	ND	1	7/14/2005	7/14/2005	
Sulfate	EPA 300.0	5G14039	5.0	**480**	10	7/14/2005	7/14/2005	
Sulfide	EPA 376.2	5G15045	0.10	ND	1	7/15/2005	7/15/2005	
Surfactants (MBAS)	SM5540-C	5G14118	0.10	ND	1	7/14/2005	7/14/2005	

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NITROGEN, ORGANIC (Calculation)

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IOG0857-01 (TTO - Water)								
Reporting Units: mg/l								
Organic Nitrogen - N	Calculation	5G25044	0.50	**0.84**	1	7/25/2005	7/25/2005	

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DIQUAT/PARAQUAT (EPA 549.2)

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IOG0857-01 (TTO - Water)								
Reporting Units: ug/l								
Diquat	EPA 549.2	C5G1809	4.0	ND	1	7/18/2005	7/18/2005	
Paraquat	EPA 549.2	C5G1809	20	ND	1	7/18/2005	7/18/2005	

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Received: 07/14/05

SHORT HOLD TIME DETAIL REPORT

	Hold Time (in days)	Date/Time Sampled	Date/Time Received	Date/Time Extracted	Date/Time Analyzed
Sample ID: TTO (IOG0857-01) - Water					
EPA 300.0	2	07/13/2005 14:00	07/14/2005 10:10	07/14/2005 16:00	07/14/2005 16:09
Nitrite-N				07/14/2005 16:00	07/14/2005 17:10
EPA 330.5	1	07/13/2005 14:00	07/14/2005 10:10	07/14/2005 16:08	07/14/2005 16:08
SM2120B	2	07/13/2005 14:00	07/14/2005 10:10	07/14/2005 14:00	07/14/2005 15:00
SM5540-C	2	07/13/2005 14:00	07/14/2005 10:10	07/14/2005 23:00	07/14/2005 23:35

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METHOD BLANK/QC DATA

VOLATILE ORGANICS by GC/MS (EPA 5030B/8260B)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G16003 Extracted: 07/16/05										
Blank Analyzed: 07/16/2005 (5G16003-BLK1)										
Acrolein	ND	50	ug/l							
Acrylonitrile	ND	50	ug/l							
2-Chloroethyl vinyl ether	ND	5.0	ug/l							
Surrogate: Dibromofluoromethane	*23.9*		*ug/l*	*25.0*		*96*	*80-120*			
Surrogate: Toluene-d8	*25.4*		*ug/l*	*25.0*		*102*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*24.2*		*ug/l*	*25.0*		*97*	*80-120*			
LCS Analyzed: 07/16/2005 (5G16003-BS1)										
2-Chloroethyl vinyl ether	29.4	5.0	ug/l	25.0		118	25-170			
Surrogate: Dibromofluoromethane	*24.5*		*ug/l*	*25.0*		*98*	*80-120*			
Surrogate: Toluene-d8	*25.4*		*ug/l*	*25.0*		*102*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*24.8*		*ug/l*	*25.0*		*99*	*80-120*			
Matrix Spike Analyzed: 07/16/2005 (5G16003-MS1)					**Source: IOG0808-01**					
2-Chloroethyl vinyl ether	27.1	5.0	ug/l	25.0	ND	108	25-170			
Surrogate: Dibromofluoromethane	*24.7*		*ug/l*	*25.0*		*99*	*80-120*			
Surrogate: Toluene-d8	*25.4*		*ug/l*	*25.0*		*102*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*24.7*		*ug/l*	*25.0*		*99*	*80-120*			
Matrix Spike Dup Analyzed: 07/16/2005 (5G16003-MSD1)					**Source: IOG0808-01**					
2-Chloroethyl vinyl ether	28.2	5.0	ug/l	25.0	ND	113	25-170	4	25	
Surrogate: Dibromofluoromethane	*25.3*		*ug/l*	*25.0*		*101*	*80-120*			
Surrogate: Toluene-d8	*25.8*		*ug/l*	*25.0*		*103*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*24.4*		*ug/l*	*25.0*		*98*	*80-120*			

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METHOD BLANK/QC DATA

VOLATILE ORGANICS by GC/MS (EPA 5035/8260B)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G21019 Extracted: 07/21/05										
Blank Analyzed: 07/21/2005 (5G21019-BLK1)										
Benzene	ND	2.0	ug/l							
Bromobenzene	ND	5.0	ug/l							
Bromochloromethane	ND	5.0	ug/l							
Bromodichloromethane	ND	2.0	ug/l							
Bromoform	ND	5.0	ug/l							
Bromomethane	ND	5.0	ug/l							
n-Butylbenzene	ND	5.0	ug/l							
sec-Butylbenzene	ND	5.0	ug/l							
tert-Butylbenzene	ND	5.0	ug/l							
Carbon Disulfide	ND	5.0	ug/l							
Carbon tetrachloride	ND	5.0	ug/l							
Chlorobenzene	ND	2.0	ug/l							
Chloroethane	ND	5.0	ug/l							
Chloroform	ND	2.0	ug/l							
Chloromethane	ND	5.0	ug/l							
2-Chlorotoluene	ND	5.0	ug/l							
4-Chlorotoluene	ND	5.0	ug/l							
Dibromochloromethane	ND	2.0	ug/l							
1,2-Dibromo-3-chloropropane	ND	5.0	ug/l							
1,2-Dibromoethane (EDB)	ND	2.0	ug/l							
Dibromomethane	ND	2.0	ug/l							
1,2-Dichlorobenzene	ND	2.0	ug/l							
1,3-Dichlorobenzene	ND	2.0	ug/l							
1,4-Dichlorobenzene	ND	2.0	ug/l							
Dichlorodifluoromethane	ND	5.0	ug/l							
1,1-Dichloroethane	ND	2.0	ug/l							
1,2-Dichloroethane	ND	2.0	ug/l							
1,1-Dichloroethene	ND	5.0	ug/l							
cis-1,2-Dichloroethene	ND	2.0	ug/l							
trans-1,2-Dichloroethene	ND	2.0	ug/l							
1,2-Dichloropropane	ND	2.0	ug/l							
1,3-Dichloropropane	ND	2.0	ug/l							
2,2-Dichloropropane	ND	2.0	ug/l							
1,1-Dichloropropene	ND	2.0	ug/l							
cis-1,3-Dichloropropene	ND	2.0	ug/l							

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METHOD BLANK/QC DATA

VOLATILE ORGANICS by GC/MS (EPA 5035/8260B)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G21019 Extracted: 07/21/05										
Blank Analyzed: 07/21/2005 (5G21019-BLK1)										
trans-1,3-Dichloropropene	ND	2.0	ug/l							
Ethylbenzene	ND	2.0	ug/l							
Hexachlorobutadiene	ND	5.0	ug/l							
Isopropylbenzene	ND	2.0	ug/l							
p-Isopropyltoluene	ND	2.0	ug/l							
Methylene chloride	ND	5.0	ug/l							
Naphthalene	ND	5.0	ug/l							
n-Propylbenzene	ND	2.0	ug/l							
Styrene	ND	2.0	ug/l							
1,1,1,2-Tetrachloroethane	ND	5.0	ug/l							
1,1,2,2-Tetrachloroethane	ND	2.0	ug/l							
Tetrachloroethene	ND	2.0	ug/l							
Toluene	ND	2.0	ug/l							
1,2,3-Trichlorobenzene	ND	5.0	ug/l							
1,2,4-Trichlorobenzene	ND	5.0	ug/l							
1,1,1-Trichloroethane	ND	2.0	ug/l							
1,1,2-Trichloroethane	ND	2.0	ug/l							
Trichloroethene	ND	2.0	ug/l							
Trichlorofluoromethane	ND	5.0	ug/l							
1,2,3-Trichloropropane	ND	10	ug/l							
1,2,4-Trimethylbenzene	ND	2.0	ug/l							
1,3,5-Trimethylbenzene	ND	2.0	ug/l							
Vinyl acetate	ND	5.0	ug/l							
Vinyl chloride	ND	5.0	ug/l							
o-Xylene	ND	2.0	ug/l							
m,p-Xylenes	ND	2.0	ug/l							
Surrogate: Dibromofluoromethane	*24.8*		*ug/l*	*25.0*		*99*	*80-120*			
Surrogate: Toluene-d8	*25.4*		*ug/l*	*25.0*		*102*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*23.7*		*ug/l*	*25.0*		*95*	*80-120*			

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METHOD BLANK/QC DATA

VOLATILE ORGANICS by GC/MS (EPA 5035/8260B)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G21019 Extracted: 07/21/05										
LCS Analyzed: 07/21/2005 (5G21019-BS1)										
Benzene	20.3	2.0	ug/l	25.0		81	65-120			
Bromobenzene	21.5	5.0	ug/l	25.0		86	70-120			
Bromochloromethane	22.5	5.0	ug/l	25.0		90	65-130			
Bromodichloromethane	20.0	2.0	ug/l	25.0		80	65-135			
Bromoform	19.3	5.0	ug/l	25.0		77	50-130			
Bromomethane	19.4	5.0	ug/l	25.0		78	60-140			
n-Butylbenzene	20.9	5.0	ug/l	25.0		84	70-125			
sec-Butylbenzene	20.0	5.0	ug/l	25.0		80	70-125			
tert-Butylbenzene	20.8	5.0	ug/l	25.0		83	70-125			
Carbon Disulfide	20.9	5.0	ug/l	25.0		84	50-130			
Carbon tetrachloride	19.9	5.0	ug/l	25.0		80	65-140			
Chlorobenzene	20.5	2.0	ug/l	25.0		82	70-125			
Chloroethane	19.5	5.0	ug/l	25.0		78	55-140			
Chloroform	20.9	2.0	ug/l	25.0		84	65-130			
Chloromethane	16.6	5.0	ug/l	25.0		66	40-140			
2-Chlorotoluene	20.9	5.0	ug/l	25.0		84	70-125			
4-Chlorotoluene	20.8	5.0	ug/l	25.0		83	70-125			
Dibromochloromethane	21.4	2.0	ug/l	25.0		86	65-140			
1,2-Dibromo-3-chloropropane	20.2	5.0	ug/l	25.0		81	45-135			
1,2-Dibromoethane (EDB)	22.2	2.0	ug/l	25.0		89	70-125			
Dibromomethane	22.2	2.0	ug/l	25.0		89	65-130			
1,2-Dichlorobenzene	20.3	2.0	ug/l	25.0		81	70-120			
1,3-Dichlorobenzene	19.8	2.0	ug/l	25.0		79	70-125			
1,4-Dichlorobenzene	20.1	2.0	ug/l	25.0		80	70-125			
Dichlorodifluoromethane	13.5	5.0	ug/l	25.0		54	25-155			
1,1-Dichloroethane	21.4	2.0	ug/l	25.0		86	65-130			
1,2-Dichloroethane	20.6	2.0	ug/l	25.0		82	60-140			
1,1-Dichloroethene	20.8	5.0	ug/l	25.0		83	70-130			
cis-1,2-Dichloroethene	20.5	2.0	ug/l	25.0		82	65-125			
trans-1,2-Dichloroethene	20.8	2.0	ug/l	25.0		83	65-130			
1,2-Dichloropropane	21.6	2.0	ug/l	25.0		86	65-125			
1,3-Dichloropropane	22.0	2.0	ug/l	25.0		88	65-125			
2,2-Dichloropropane	21.8	2.0	ug/l	25.0		87	60-145			
1,1-Dichloropropene	20.1	2.0	ug/l	25.0		80	70-130			
cis-1,3-Dichloropropene	21.6	2.0	ug/l	25.0		86	70-130			

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Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

METHOD BLANK/QC DATA

VOLATILE ORGANICS by GC/MS (EPA 5035/8260B)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G21019 Extracted: 07/21/05										
LCS Analyzed: 07/21/2005 (5G21019-BS1)										
trans-1,3-Dichloropropene	21.9	2.0	ug/l	25.0		88	65-130			
Ethylbenzene	20.6	2.0	ug/l	25.0		82	70-125			
Hexachlorobutadiene	17.0	5.0	ug/l	25.0		68	60-135			
Isopropylbenzene	22.5	2.0	ug/l	25.0		90	70-125			
p-Isopropyltoluene	19.2	2.0	ug/l	25.0		77	70-125			
Methylene chloride	22.6	5.0	ug/l	25.0		90	60-130			
Naphthalene	20.3	5.0	ug/l	25.0		81	50-140			
n-Propylbenzene	21.9	2.0	ug/l	25.0		88	70-125			
Styrene	22.4	2.0	ug/l	25.0		90	70-130			
1,1,1,2-Tetrachloroethane	21.0	5.0	ug/l	25.0		84	70-135			
1,1,2,2-Tetrachloroethane	25.8	2.0	ug/l	25.0		103	55-130			
Tetrachloroethene	19.4	2.0	ug/l	25.0		78	65-125			
Toluene	21.2	2.0	ug/l	25.0		85	70-125			
1,2,3-Trichlorobenzene	19.5	5.0	ug/l	25.0		78	60-130			
1,2,4-Trichlorobenzene	19.5	5.0	ug/l	25.0		78	65-135			
1,1,1-Trichloroethane	20.0	2.0	ug/l	25.0		80	65-135			
1,1,2-Trichloroethane	22.5	2.0	ug/l	25.0		90	65-125			
Trichloroethene	19.8	2.0	ug/l	25.0		79	70-125			
Trichlorofluoromethane	18.3	5.0	ug/l	25.0		73	60-140			
1,2,3-Trichloropropane	24.5	10	ug/l	25.0		98	55-130			
1,2,4-Trimethylbenzene	19.6	2.0	ug/l	25.0		78	70-125			
1,3,5-Trimethylbenzene	21.0	2.0	ug/l	25.0		84	70-125			
Vinyl acetate	15.6	5.0	ug/l	25.0		62	45-145			
Vinyl chloride	17.6	5.0	ug/l	25.0		70	50-130			
o-Xylene	20.4	2.0	ug/l	25.0		82	70-125			
m,p-Xylenes	40.0	2.0	ug/l	50.0		80	70-125			
Surrogate: Dibromofluoromethane	*25.0*		*ug/l*	*25.0*		*100*	*80-120*			
Surrogate: Toluene-d8	*25.7*		*ug/l*	*25.0*		*103*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*24.7*		*ug/l*	*25.0*		*99*	*80-120*			

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U.S. Filter/Westates Carbon
P.O. Box 3308
Parker, AZ 85344
Attention: Deborah Foster

Project ID: TTO
Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

METHOD BLANK/QC DATA

VOLATILE ORGANICS by GC/MS (EPA 5035/8260B)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G21019 Extracted: 07/21/05										
Matrix Spike Analyzed: 07/21/2005 (5G21019-MS1)					**Source: IOG0857-01**					
Benzene	25.1	2.0	ug/l	25.0	ND	100	60-125			
Bromobenzene	25.4	5.0	ug/l	25.0	ND	102	65-125			
Bromochloromethane	27.3	5.0	ug/l	25.0	ND	109	60-135			
Bromodichloromethane	24.6	2.0	ug/l	25.0	ND	98	65-135			
Bromoform	23.0	5.0	ug/l	25.0	2.6	82	50-135			
Bromomethane	25.2	5.0	ug/l	25.0	ND	101	50-145			
n-Butylbenzene	25.7	5.0	ug/l	25.0	ND	103	65-135			
sec-Butylbenzene	24.3	5.0	ug/l	25.0	ND	97	65-125			
tert-Butylbenzene	25.0	5.0	ug/l	25.0	ND	100	65-130			
Carbon Disulfide	23.4	5.0	ug/l	25.0	ND	94	40-140			
Carbon tetrachloride	25.1	5.0	ug/l	25.0	ND	100	65-140			
Chlorobenzene	25.0	2.0	ug/l	25.0	ND	100	70-125			
Chloroethane	24.9	5.0	ug/l	25.0	ND	100	50-140			
Chloroform	25.6	2.0	ug/l	25.0	ND	102	65-135			
Chloromethane	20.5	5.0	ug/l	25.0	ND	82	35-140			
2-Chlorotoluene	24.9	5.0	ug/l	25.0	ND	100	65-135			
4-Chlorotoluene	25.0	5.0	ug/l	25.0	ND	100	65-135			
Dibromochloromethane	26.2	2.0	ug/l	25.0	ND	105	60-140			
1,2-Dibromo-3-chloropropane	23.1	5.0	ug/l	25.0	ND	92	40-150			
1,2-Dibromoethane (EDB)	26.5	2.0	ug/l	25.0	ND	106	65-130			
Dibromomethane	26.1	2.0	ug/l	25.0	ND	104	60-135			
1,2-Dichlorobenzene	24.6	2.0	ug/l	25.0	ND	98	70-125			
1,3-Dichlorobenzene	24.2	2.0	ug/l	25.0	ND	97	70-125			
1,4-Dichlorobenzene	24.4	2.0	ug/l	25.0	ND	98	70-125			
Dichlorodifluoromethane	18.4	5.0	ug/l	25.0	ND	74	15-155			
1,1-Dichloroethane	26.3	2.0	ug/l	25.0	ND	105	60-130			
1,2-Dichloroethane	24.9	2.0	ug/l	25.0	ND	100	60-140			
1,1-Dichloroethene	25.3	5.0	ug/l	25.0	ND	101	60-135			
cis-1,2-Dichloroethene	25.2	2.0	ug/l	25.0	ND	101	60-130			
trans-1,2-Dichloroethene	25.8	2.0	ug/l	25.0	ND	103	60-135			
1,2-Dichloropropane	26.1	2.0	ug/l	25.0	ND	104	60-125			
1,3-Dichloropropane	26.1	2.0	ug/l	25.0	ND	104	60-135			
2,2-Dichloropropane	27.8	2.0	ug/l	25.0	ND	111	60-145			
1,1-Dichloropropene	24.9	2.0	ug/l	25.0	ND	100	65-135			
cis-1,3-Dichloropropene	26.0	2.0	ug/l	25.0	ND	104	65-135			

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Attention: Deborah Foster

Project ID: TTO
Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

METHOD BLANK/QC DATA

VOLATILE ORGANICS by GC/MS (EPA 5035/8260B)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G21019 Extracted: 07/21/05										
Matrix Spike Analyzed: 07/21/2005 (5G21019-MS1)					**Source: IOG0857-01**					
trans-1,3-Dichloropropene	25.9	2.0	ug/l	25.0	ND	104	65-140			
Ethylbenzene	25.0	2.0	ug/l	25.0	ND	100	65-130			
Hexachlorobutadiene	20.6	5.0	ug/l	25.0	ND	82	60-135			
Isopropylbenzene	26.2	2.0	ug/l	25.0	ND	105	65-130			
p-Isopropyltoluene	23.2	2.0	ug/l	25.0	ND	93	65-125			
Methylene chloride	28.0	5.0	ug/l	25.0	ND	112	55-130			
Naphthalene	22.9	5.0	ug/l	25.0	ND	92	45-145			
n-Propylbenzene	25.9	2.0	ug/l	25.0	ND	104	65-130			
Styrene	16.4	2.0	ug/l	25.0	ND	66	45-145			
1,1,1,2-Tetrachloroethane	25.6	5.0	ug/l	25.0	ND	102	65-140			
1,1,2,2-Tetrachloroethane	28.9	2.0	ug/l	25.0	ND	116	55-140			
Tetrachloroethene	24.5	2.0	ug/l	25.0	ND	98	60-130			
Toluene	25.5	2.0	ug/l	25.0	ND	102	65-125			
1,2,3-Trichlorobenzene	22.8	5.0	ug/l	25.0	ND	91	55-135			
1,2,4-Trichlorobenzene	23.6	5.0	ug/l	25.0	ND	94	60-135			
1,1,1-Trichloroethane	24.9	2.0	ug/l	25.0	ND	100	65-140			
1,1,2-Trichloroethane	26.2	2.0	ug/l	25.0	ND	105	60-130			
Trichloroethene	24.3	2.0	ug/l	25.0	ND	97	60-125			
Trichlorofluoromethane	23.2	5.0	ug/l	25.0	ND	93	55-145			
1,2,3-Trichloropropane	27.8	10	ug/l	25.0	ND	111	50-135			
1,2,4-Trimethylbenzene	23.5	2.0	ug/l	25.0	ND	94	55-130			
1,3,5-Trimethylbenzene	25.0	2.0	ug/l	25.0	ND	100	65-130			
Vinyl acetate	19.8	5.0	ug/l	25.0	ND	79	40-150			
Vinyl chloride	19.2	5.0	ug/l	25.0	ND	77	40-135			
o-Xylene	24.5	2.0	ug/l	25.0	ND	98	60-125			
m,p-Xylenes	48.8	2.0	ug/l	50.0	ND	98	60-130			
Surrogate: Dibromofluoromethane	*25.0*		*ug/l*	*25.0*		*100*	*80-120*			
Surrogate: Toluene-d8	*25.7*		*ug/l*	*25.0*		*103*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*24.6*		*ug/l*	*25.0*		*98*	*80-120*			

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Project ID: TTO
Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

METHOD BLANK/QC DATA

VOLATILE ORGANICS by GC/MS (EPA 5035/8260B)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G21019 Extracted: 07/21/05										
Matrix Spike Dup Analyzed: 07/21/2005 (5G21019-MSD1)					**Source: IOG0857-01**					
Benzene	23.8	2.0	ug/l	25.0	ND	95	60-125	5	20	
Bromobenzene	23.3	5.0	ug/l	25.0	ND	93	65-125	9	20	
Bromochloromethane	26.0	5.0	ug/l	25.0	ND	104	60-135	5	25	
Bromodichloromethane	22.7	2.0	ug/l	25.0	ND	91	65-135	8	20	
Bromoform	22.5	5.0	ug/l	25.0	2.6	80	50-135	2	25	
Bromomethane	23.4	5.0	ug/l	25.0	ND	94	50-145	7	25	
n-Butylbenzene	25.0	5.0	ug/l	25.0	ND	100	65-135	3	20	
sec-Butylbenzene	23.6	5.0	ug/l	25.0	ND	94	65-125	3	20	
tert-Butylbenzene	24.0	5.0	ug/l	25.0	ND	96	65-130	4	20	
Carbon Disulfide	23.8	5.0	ug/l	25.0	ND	95	40-140	2	20	
Carbon tetrachloride	23.6	5.0	ug/l	25.0	ND	94	65-140	6	25	
Chlorobenzene	23.7	2.0	ug/l	25.0	ND	95	70-125	5	20	
Chloroethane	23.5	5.0	ug/l	25.0	ND	94	50-140	6	25	
Chloroform	24.5	2.0	ug/l	25.0	ND	98	65-135	4	20	
Chloromethane	19.4	5.0	ug/l	25.0	ND	78	35-140	6	25	
2-Chlorotoluene	23.2	5.0	ug/l	25.0	ND	93	65-135	7	20	
4-Chlorotoluene	23.3	5.0	ug/l	25.0	ND	93	65-135	7	20	
Dibromochloromethane	24.8	2.0	ug/l	25.0	ND	99	60-140	5	25	
1,2-Dibromo-3-chloropropane	23.8	5.0	ug/l	25.0	ND	95	40-150	3	30	
1,2-Dibromoethane (EDB)	25.2	2.0	ug/l	25.0	ND	101	65-130	5	25	
Dibromomethane	25.0	2.0	ug/l	25.0	ND	100	60-135	4	25	
1,2-Dichlorobenzene	23.6	2.0	ug/l	25.0	ND	94	70-125	4	20	
1,3-Dichlorobenzene	22.9	2.0	ug/l	25.0	ND	92	70-125	6	20	
1,4-Dichlorobenzene	23.0	2.0	ug/l	25.0	ND	92	70-125	6	20	
Dichlorodifluoromethane	17.4	5.0	ug/l	25.0	ND	70	15-155	6	30	
1,1-Dichloroethane	25.2	2.0	ug/l	25.0	ND	101	60-130	4	20	
1,2-Dichloroethane	23.3	2.0	ug/l	25.0	ND	93	60-140	7	20	
1,1-Dichloroethene	23.7	5.0	ug/l	25.0	ND	95	60-135	7	20	
cis-1,2-Dichloroethene	24.1	2.0	ug/l	25.0	ND	96	60-130	4	20	
trans-1,2-Dichloroethene	24.8	2.0	ug/l	25.0	ND	99	60-135	4	20	
1,2-Dichloropropane	24.6	2.0	ug/l	25.0	ND	98	60-125	6	20	
1,3-Dichloropropane	25.2	2.0	ug/l	25.0	ND	101	60-135	4	25	
2,2-Dichloropropane	28.5	2.0	ug/l	25.0	ND	114	60-145	2	25	
1,1-Dichloropropene	23.4	2.0	ug/l	25.0	ND	94	65-135	6	20	
cis-1,3-Dichloropropene	24.1	2.0	ug/l	25.0	ND	96	65-135	8	20	

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Project ID: TTO
Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

METHOD BLANK/QC DATA

VOLATILE ORGANICS by GC/MS (EPA 5035/8260B)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G21019 Extracted: 07/21/05										
Matrix Spike Dup Analyzed: 07/21/2005 (5G21019-MSD1)					**Source: IOG0857-01**					
trans-1,3-Dichloropropene	24.1	2.0	ug/l	25.0	ND	96	65-140	7	25	
Ethylbenzene	23.8	2.0	ug/l	25.0	ND	95	65-130	5	20	
Hexachlorobutadiene	20.9	5.0	ug/l	25.0	ND	84	60-135	1	20	
Isopropylbenzene	24.8	2.0	ug/l	25.0	ND	99	65-130	5	20	
p-Isopropyltoluene	22.6	2.0	ug/l	25.0	ND	90	65-125	3	20	
Methylene chloride	26.4	5.0	ug/l	25.0	ND	106	55-130	6	20	
Naphthalene	24.6	5.0	ug/l	25.0	ND	98	45-145	7	30	
n-Propylbenzene	24.4	2.0	ug/l	25.0	ND	98	65-130	6	20	
Styrene	14.0	2.0	ug/l	25.0	ND	56	45-145	16	30	
1,1,1,2-Tetrachloroethane	24.2	5.0	ug/l	25.0	ND	97	65-140	6	20	
1,1,2,2-Tetrachloroethane	28.7	2.0	ug/l	25.0	ND	115	55-140	1	30	
Tetrachloroethene	23.3	2.0	ug/l	25.0	ND	93	60-130	5	20	
Toluene	23.9	2.0	ug/l	25.0	ND	96	65-125	6	20	
1,2,3-Trichlorobenzene	23.5	5.0	ug/l	25.0	ND	94	55-135	3	20	
1,2,4-Trichlorobenzene	23.6	5.0	ug/l	25.0	ND	94	60-135	0	20	
1,1,1-Trichloroethane	24.3	2.0	ug/l	25.0	ND	97	65-140	2	20	
1,1,2-Trichloroethane	25.0	2.0	ug/l	25.0	ND	100	60-130	5	25	
Trichloroethene	22.5	2.0	ug/l	25.0	ND	90	60-125	8	20	
Trichlorofluoromethane	21.8	5.0	ug/l	25.0	ND	87	55-145	6	25	
1,2,3-Trichloropropane	27.0	10	ug/l	25.0	ND	108	50-135	3	30	
1,2,4-Trimethylbenzene	22.3	2.0	ug/l	25.0	ND	89	55-130	5	25	
1,3,5-Trimethylbenzene	23.6	2.0	ug/l	25.0	ND	94	65-130	6	20	
Vinyl acetate	19.9	5.0	ug/l	25.0	ND	80	40-150	1	30	
Vinyl chloride	18.2	5.0	ug/l	25.0	ND	73	40-135	5	30	
o-Xylene	23.1	2.0	ug/l	25.0	ND	92	60-125	6	20	
m,p-Xylenes	46.6	2.0	ug/l	50.0	ND	93	60-130	5	25	
Surrogate: Dibromofluoromethane	*24.9*		*ug/l*	*25.0*		*100*	*80-120*			
Surrogate: Toluene-d8	*25.2*		*ug/l*	*25.0*		*101*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*24.5*		*ug/l*	*25.0*		*98*	*80-120*			

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Project ID: TTO
Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

METHOD BLANK/QC DATA

SEMI-VOLATILE ORGANICS BY GC/MS (EPA 3520C/8270C)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G17017 Extracted: 07/17/05										
Blank Analyzed: 07/20/2005 (5G17017-BLK1)										
Acenaphthene	ND	10	ug/l							
Acenaphthylene	ND	10	ug/l							
Aniline	ND	10	ug/l							
Anthracene	ND	10	ug/l							
Benzidine	ND	20	ug/l							
Benzoic acid	ND	20	ug/l							
Benzo(a)anthracene	ND	10	ug/l							
Benzo(b)fluoranthene	ND	10	ug/l							
Benzo(k)fluoranthene	ND	10	ug/l							
Benzo(g,h,i)perylene	ND	10	ug/l							
Benzo(a)pyrene	ND	10	ug/l							
Benzyl alcohol	ND	20	ug/l							
Bis(2-chloroethoxy)methane	ND	10	ug/l							
Bis(2-chloroethyl)ether	ND	10	ug/l							
Bis(2-chloroisopropyl)ether	ND	10	ug/l							
Bis(2-ethylhexyl)phthalate	ND	50	ug/l							
4-Bromophenyl phenyl ether	ND	10	ug/l							
Butyl benzyl phthalate	ND	20	ug/l							
4-Chloroaniline	ND	10	ug/l							
2-Chloronaphthalene	ND	10	ug/l							
4-Chloro-3-methylphenol	ND	20	ug/l							
2-Chlorophenol	ND	10	ug/l							
4-Chlorophenyl phenyl ether	ND	10	ug/l							
Chrysene	ND	10	ug/l							
Dibenz(a,h)anthracene	ND	20	ug/l							
Dibenzofuran	ND	10	ug/l							
Di-n-butyl phthalate	ND	20	ug/l							
1,3-Dichlorobenzene	ND	10	ug/l							
1,4-Dichlorobenzene	ND	10	ug/l							
1,2-Dichlorobenzene	ND	10	ug/l							
3,3-Dichlorobenzidine	ND	20	ug/l							
2,4-Dichlorophenol	ND	10	ug/l							
Diethyl phthalate	ND	10	ug/l							
2,4-Dimethylphenol	ND	20	ug/l							
Dimethyl phthalate	ND	10	ug/l							

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U.S. Filter/Westates Carbon
P.O. Box 3308
Parker, AZ 85344
Attention: Deborah Foster

Project ID: TTO
Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

METHOD BLANK/QC DATA

SEMI-VOLATILE ORGANICS BY GC/MS (EPA 3520C/8270C)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G17017 Extracted: 07/17/05										
Blank Analyzed: 07/20/2005 (5G17017-BLK1)										
4,6-Dinitro-2-methylphenol	ND	20	ug/l							
2,4-Dinitrophenol	ND	20	ug/l							
2,4-Dinitrotoluene	ND	10	ug/l							
2,6-Dinitrotoluene	ND	10	ug/l							
Di-n-octyl phthalate	ND	20	ug/l							
Fluoranthene	ND	10	ug/l							
Fluorene	ND	10	ug/l							
Hexachlorobenzene	ND	10	ug/l							
Hexachlorobutadiene	ND	10	ug/l							
Hexachlorocyclopentadiene	ND	20	ug/l							
Hexachloroethane	ND	10	ug/l							
Indeno(1,2,3-cd)pyrene	ND	20	ug/l							
Isophorone	ND	10	ug/l							
2-Methylnaphthalene	ND	10	ug/l							
2-Methylphenol	ND	10	ug/l							
4-Methylphenol	ND	10	ug/l							
Naphthalene	ND	10	ug/l							
2-Nitroaniline	ND	20	ug/l							
3-Nitroaniline	ND	20	ug/l							
4-Nitroaniline	ND	20	ug/l							
Nitrobenzene	ND	20	ug/l							
2-Nitrophenol	ND	10	ug/l							
4-Nitrophenol	ND	20	ug/l							
N-Nitrosodiphenylamine	ND	10	ug/l							
N-Nitroso-di-n-propylamine	ND	10	ug/l							
Pentachlorophenol	ND	20	ug/l							
Phenanthrene	ND	10	ug/l							
Phenol	ND	10	ug/l							
Pyrene	ND	10	ug/l							
1,2,4-Trichlorobenzene	ND	10	ug/l							
2,4,5-Trichlorophenol	ND	20	ug/l							
2,4,6-Trichlorophenol	ND	20	ug/l							
N-Nitrosodimethylamine	ND	20	ug/l							
1,2-Diphenylhydrazine/Azobenzene	ND	20	ug/l							
Surrogate: 2-Fluorophenol	*121*		*ug/l*	*200*		*60*	*30-120*			

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SEMI-VOLATILE ORGANICS BY GC/MS (EPA 3520C/8270C)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G17017 Extracted: 07/17/05										
Blank Analyzed: 07/20/2005 (5G17017-BLK1)										
Surrogate: Phenol-d6	*137*		*ug/l*	*200*		*68*	*35-120*			
Surrogate: 2,4,6-Tribromophenol	*164*		*ug/l*	*200*		*82*	*45-120*			
Surrogate: Nitrobenzene-d5	*71.7*		*ug/l*	*100*		*72*	*45-120*			
Surrogate: 2-Fluorobiphenyl	*77.0*		*ug/l*	*100*		*77*	*45-120*			
Surrogate: Terphenyl-d14	*78.7*		*ug/l*	*100*		*79*	*45-120*			
LCS Analyzed: 07/20/2005 (5G17017-BS1)										M-NR1
Acenaphthene	86.7	10	ug/l	100		87	55-120			
Acenaphthylene	89.0	10	ug/l	100		89	55-120			
Aniline	81.3	10	ug/l	100		81	35-120			
Anthracene	79.9	10	ug/l	100		80	55-120			
Benzidine	173	20	ug/l	100		173	20-160			L
Benzoic acid	69.7	20	ug/l	100		70	35-120			
Benzo(a)anthracene	81.7	10	ug/l	100		82	60-120			
Benzo(b)fluoranthene	89.1	10	ug/l	100		89	50-120			
Benzo(k)fluoranthene	89.2	10	ug/l	100		89	50-120			
Benzo(g,h,i)perylene	93.7	10	ug/l	100		94	40-125			
Benzo(a)pyrene	77.0	10	ug/l	100		77	55-120			
Benzyl alcohol	58.4	20	ug/l	100		58	45-120			
Bis(2-chloroethoxy)methane	84.1	10	ug/l	100		84	55-120			
Bis(2-chloroethyl)ether	83.6	10	ug/l	100		84	50-120			
Bis(2-chloroisopropyl)ether	84.8	10	ug/l	100		85	45-120			
Bis(2-ethylhexyl)phthalate	83.4	50	ug/l	100		83	60-130			
4-Bromophenyl phenyl ether	85.3	10	ug/l	100		85	50-120			
Butyl benzyl phthalate	85.2	20	ug/l	100		85	55-125			
4-Chloroaniline	78.4	10	ug/l	100		78	50-120			
2-Chloronaphthalene	79.5	10	ug/l	100		80	55-120			
4-Chloro-3-methylphenol	84.0	20	ug/l	100		84	60-120			
2-Chlorophenol	77.6	10	ug/l	100		78	45-120			
4-Chlorophenyl phenyl ether	89.9	10	ug/l	100		90	55-120			
Chrysene	87.0	10	ug/l	100		87	60-120			
Dibenz(a,h)anthracene	96.1	20	ug/l	100		96	45-130			
Dibenzofuran	85.1	10	ug/l	100		85	60-120			
Di-n-butyl phthalate	76.3	20	ug/l	100		76	55-125			
1,3-Dichlorobenzene	74.2	10	ug/l	100		74	35-120			
1,4-Dichlorobenzene	72.9	10	ug/l	100		73	35-120			

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U.S. Filter/Westates Carbon
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METHOD BLANK/QC DATA

SEMI-VOLATILE ORGANICS BY GC/MS (EPA 3520C/8270C)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G17017 Extracted: 07/17/05										
LCS Analyzed: 07/20/2005 (5G17017-BS1)										M-NR1
1,2-Dichlorobenzene	74.8	10	ug/l	100		75	35-120			
3,3-Dichlorobenzidine	90.4	20	ug/l	100		90	45-130			
2,4-Dichlorophenol	77.7	10	ug/l	100		78	55-120			
Diethyl phthalate	86.1	10	ug/l	100		86	55-120			
2,4-Dimethylphenol	63.8	20	ug/l	100		64	30-120			
Dimethyl phthalate	84.3	10	ug/l	100		84	60-120			
4,6-Dinitro-2-methylphenol	85.2	20	ug/l	100		85	50-120			
2,4-Dinitrophenol	89.2	20	ug/l	100		89	40-120			
2,4-Dinitrotoluene	93.9	10	ug/l	100		94	60-120			
2,6-Dinitrotoluene	81.3	10	ug/l	100		81	60-120			
Di-n-octyl phthalate	84.2	20	ug/l	100		84	60-130			
Fluoranthene	82.0	10	ug/l	100		82	55-120			
Fluorene	89.0	10	ug/l	100		89	60-120			
Hexachlorobenzene	85.7	10	ug/l	100		86	50-120			
Hexachlorobutadiene	76.7	10	ug/l	100		77	40-120			
Hexachlorocyclopentadiene	90.5	20	ug/l	100		90	15-120			
Hexachloroethane	76.3	10	ug/l	100		76	35-120			
Indeno(1,2,3-cd)pyrene	90.3	20	ug/l	100		90	40-130			
Isophorone	82.6	10	ug/l	100		83	50-120			
2-Methylnaphthalene	81.0	10	ug/l	100		81	50-120			
2-Methylphenol	79.4	10	ug/l	100		79	45-120			
4-Methylphenol	80.8	10	ug/l	100		81	45-120			
Naphthalene	78.8	10	ug/l	100		79	50-120			
2-Nitroaniline	84.6	20	ug/l	100		85	60-120			
3-Nitroaniline	94.0	20	ug/l	100		94	55-120			
4-Nitroaniline	93.5	20	ug/l	100		94	50-125			
Nitrobenzene	79.1	20	ug/l	100		79	50-120			
2-Nitrophenol	82.1	10	ug/l	100		82	55-120			
4-Nitrophenol	78.4	20	ug/l	100		78	45-120			
N-Nitrosodiphenylamine	86.3	10	ug/l	100		86	55-120			
N-Nitroso-di-n-propylamine	88.8	10	ug/l	100		89	45-120			
Pentachlorophenol	91.4	20	ug/l	100		91	50-120			
Phenanthrene	80.2	10	ug/l	100		80	55-120			
Phenol	77.5	10	ug/l	100		78	45-120			
Pyrene	87.4	10	ug/l	100		87	50-120			

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METHOD BLANK/QC DATA

SEMI-VOLATILE ORGANICS BY GC/MS (EPA 3520C/8270C)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G17017 Extracted: 07/17/05										
LCS Analyzed: 07/20/2005 (5G17017-BS1)										M-NR1
1,2,4-Trichlorobenzene	75.1	10	ug/l	100		75	45-120			
2,4,5-Trichlorophenol	89.1	20	ug/l	100		89	60-120			
2,4,6-Trichlorophenol	80.8	20	ug/l	100		81	60-120			
N-Nitrosodimethylamine	84.9	20	ug/l	100		85	40-120			
1,2-Diphenylhydrazine/Azobenzene	86.6	20	ug/l	100		87	60-120			
Surrogate: 2-Fluorophenol	*148*		*ug/l*	*200*		*74*	*30-120*			
Surrogate: Phenol-d6	*161*		*ug/l*	*200*		*80*	*35-120*			
Surrogate: 2,4,6-Tribromophenol	*181*		*ug/l*	*200*		*90*	*45-120*			
Surrogate: Nitrobenzene-d5	*80.3*		*ug/l*	*100*		*80*	*45-120*			
Surrogate: 2-Fluorobiphenyl	*81.7*		*ug/l*	*100*		*82*	*45-120*			
Surrogate: Terphenyl-d14	*86.2*		*ug/l*	*100*		*86*	*45-120*			
LCS Dup Analyzed: 07/20/2005 (5G17017-BSD1)										
Acenaphthene	84.0	10	ug/l	100		84	55-120	3	20	
Acenaphthylene	87.2	10	ug/l	100		87	55-120	2	20	
Aniline	76.7	10	ug/l	100		77	35-120	6	25	
Anthracene	80.8	10	ug/l	100		81	55-120	1	20	
Benzidine	99.1	20	ug/l	100		99	20-160	54	35	*R-2*
Benzoic acid	87.7	20	ug/l	100		88	35-120	23	30	
Benzo(a)anthracene	86.0	10	ug/l	100		86	60-120	5	20	
Benzo(b)fluoranthene	88.7	10	ug/l	100		89	50-120	0	25	
Benzo(k)fluoranthene	86.9	10	ug/l	100		87	50-120	3	20	
Benzo(g,h,i)perylene	94.7	10	ug/l	100		95	40-125	1	25	
Benzo(a)pyrene	79.8	10	ug/l	100		80	55-120	4	25	
Benzyl alcohol	60.6	20	ug/l	100		61	45-120	4	20	
Bis(2-chloroethoxy)methane	83.2	10	ug/l	100		83	55-120	1	20	
Bis(2-chloroethyl)ether	81.7	10	ug/l	100		82	50-120	2	20	
Bis(2-chloroisopropyl)ether	81.1	10	ug/l	100		81	45-120	4	20	
Bis(2-ethylhexyl)phthalate	85.2	50	ug/l	100		85	60-130	2	20	
4-Bromophenyl phenyl ether	87.8	10	ug/l	100		88	50-120	3	25	
Butyl benzyl phthalate	83.2	20	ug/l	100		83	55-125	2	20	
4-Chloroaniline	77.3	10	ug/l	100		77	50-120	1	25	
2-Chloronaphthalene	81.4	10	ug/l	100		81	55-120	2	20	
4-Chloro-3-methylphenol	79.2	20	ug/l	100		79	60-120	6	25	
2-Chlorophenol	74.5	10	ug/l	100		74	45-120	4	25	
4-Chlorophenyl phenyl ether	87.0	10	ug/l	100		87	55-120	3	20	

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G17017 Extracted: 07/17/05										
LCS Dup Analyzed: 07/20/2005 (5G17017-BSD1)										
Chrysene	87.1	10	ug/l	100		87	60-120	0	20	
Dibenz(a,h)anthracene	97.1	20	ug/l	100		97	45-130	1	25	
Dibenzofuran	83.3	10	ug/l	100		83	60-120	2	20	
Di-n-butyl phthalate	77.2	20	ug/l	100		77	55-125	1	20	
1,3-Dichlorobenzene	72.2	10	ug/l	100		72	35-120	3	25	
1,4-Dichlorobenzene	70.2	10	ug/l	100		70	35-120	4	25	
1,2-Dichlorobenzene	72.6	10	ug/l	100		73	35-120	3	25	
3,3-Dichlorobenzidine	89.1	20	ug/l	100		89	45-130	1	25	
2,4-Dichlorophenol	76.5	10	ug/l	100		76	55-120	2	20	
Diethyl phthalate	83.2	10	ug/l	100		83	55-120	3	20	
2,4-Dimethylphenol	63.7	20	ug/l	100		64	30-120	0	25	
Dimethyl phthalate	84.4	10	ug/l	100		84	60-120	0	20	
4,6-Dinitro-2-methylphenol	82.9	20	ug/l	100		83	50-120	3	25	
2,4-Dinitrophenol	86.7	20	ug/l	100		87	40-120	3	25	
2,4-Dinitrotoluene	90.1	10	ug/l	100		90	60-120	4	20	
2,6-Dinitrotoluene	83.0	10	ug/l	100		83	60-120	2	20	
Di-n-octyl phthalate	87.3	20	ug/l	100		87	60-130	4	20	
Fluoranthene	79.8	10	ug/l	100		80	55-120	3	20	
Fluorene	85.8	10	ug/l	100		86	60-120	4	20	
Hexachlorobenzene	89.2	10	ug/l	100		89	50-120	4	20	
Hexachlorobutadiene	74.9	10	ug/l	100		75	40-120	2	25	
Hexachlorocyclopentadiene	88.4	20	ug/l	100		88	15-120	2	30	
Hexachloroethane	73.3	10	ug/l	100		73	35-120	4	25	
Indeno(1,2,3-cd)pyrene	90.1	20	ug/l	100		90	40-130	0	25	
Isophorone	83.7	10	ug/l	100		84	50-120	1	20	
2-Methylnaphthalene	78.7	10	ug/l	100		79	50-120	3	20	
2-Methylphenol	76.8	10	ug/l	100		77	45-120	3	20	
4-Methylphenol	79.3	10	ug/l	100		79	45-120	2	20	
Naphthalene	78.3	10	ug/l	100		78	50-120	1	20	
2-Nitroaniline	83.5	20	ug/l	100		84	60-120	1	20	
3-Nitroaniline	90.4	20	ug/l	100		90	55-120	4	25	
4-Nitroaniline	87.8	20	ug/l	100		88	50-125	6	20	
Nitrobenzene	79.1	20	ug/l	100		79	50-120	0	25	
2-Nitrophenol	79.7	10	ug/l	100		80	55-120	3	25	
4-Nitrophenol	74.7	20	ug/l	100		75	45-120	5	25	

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G17017 Extracted: 07/17/05										
LCS Dup Analyzed: 07/20/2005 (5G17017-BSD1)										
N-Nitrosodiphenylamine	88.2	10	ug/l	100		88	55-120	2	20	
N-Nitroso-di-n-propylamine	86.8	10	ug/l	100		87	45-120	2	20	
Pentachlorophenol	94.4	20	ug/l	100		94	50-120	3	25	
Phenanthrene	79.7	10	ug/l	100		80	55-120	1	20	
Phenol	74.4	10	ug/l	100		74	45-120	4	25	
Pyrene	83.4	10	ug/l	100		83	50-120	5	25	
1,2,4-Trichlorobenzene	75.3	10	ug/l	100		75	45-120	0	20	
2,4,5-Trichlorophenol	88.5	20	ug/l	100		88	60-120	1	20	
2,4,6-Trichlorophenol	82.1	20	ug/l	100		82	60-120	2	20	
N-Nitrosodimethylamine	72.3	20	ug/l	100		72	40-120	16	20	
1,2-Diphenylhydrazine/Azobenzene	82.7	20	ug/l	100		83	60-120	5	25	
Surrogate: 2-Fluorophenol	*133*		*ug/l*	*200*		*66*	*30-120*			
Surrogate: Phenol-d6	*147*		*ug/l*	*200*		*74*	*35-120*			
Surrogate: 2,4,6-Tribromophenol	*181*		*ug/l*	*200*		*90*	*45-120*			
Surrogate: Nitrobenzene-d5	*79.2*		*ug/l*	*100*		*79*	*45-120*			
Surrogate: 2-Fluorobiphenyl	*83.5*		*ug/l*	*100*		*84*	*45-120*			
Surrogate: Terphenyl-d14	*83.1*		*ug/l*	*100*		*83*	*45-120*			

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Attention: Deborah Foster

Project ID: TTO
Report Number: IOG0857

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METHOD BLANK/QC DATA

ORGANOCHLORINE PESTICIDES (EPA 3510C/8081A)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G20057 Extracted: 07/20/05										
Blank Analyzed: 07/20/2005-07/22/2005 (5G20057-BLK1)										
Aldrin	ND	0.10	ug/l							
alpha-BHC	ND	0.10	ug/l							
beta-BHC	ND	0.10	ug/l							
delta-BHC	ND	0.20	ug/l							
gamma-BHC (Lindane)	ND	0.10	ug/l							
Chlordane	ND	1.0	ug/l							
4,4'-DDD	ND	0.10	ug/l							
4,4'-DDE	ND	0.10	ug/l							
4,4'-DDT	ND	0.10	ug/l							
Dieldrin	ND	0.10	ug/l							
Endosulfan I	ND	0.10	ug/l							
Endosulfan II	ND	0.10	ug/l							
Endosulfan sulfate	ND	0.20	ug/l							
Endrin	ND	0.10	ug/l							
Endrin aldehyde	ND	0.10	ug/l							
Endrin ketone	ND	0.10	ug/l							
Heptachlor	ND	0.10	ug/l							
Heptachlor epoxide	ND	0.10	ug/l							
Methoxychlor	ND	0.10	ug/l							
Toxaphene	ND	5.0	ug/l							
Surrogate: Tetrachloro-m-xylene	*0.352*		*ug/l*	*0.500*		*70*	*35-115*			
Surrogate: Decachlorobiphenyl	*0.446*		*ug/l*	*0.500*		*89*	*45-120*			
LCS Analyzed: 07/20/2005 (5G20057-BS1)										**M-NR1**
Aldrin	0.356	0.10	ug/l	0.500		71	40-115			
alpha-BHC	0.435	0.10	ug/l	0.500		87	45-115			
beta-BHC	0.397	0.10	ug/l	0.500		79	50-115			
delta-BHC	0.447	0.20	ug/l	0.500		89	55-120			
gamma-BHC (Lindane)	0.431	0.10	ug/l	0.500		86	45-115			
4,4'-DDD	0.462	0.10	ug/l	0.500		92	60-120			
4,4'-DDE	0.446	0.10	ug/l	0.500		89	55-120			
4,4'-DDT	0.443	0.10	ug/l	0.500		89	60-120			
Dieldrin	0.437	0.10	ug/l	0.500		87	55-120			
Endosulfan I	0.417	0.10	ug/l	0.500		83	50-115			
Endosulfan II	0.433	0.10	ug/l	0.500		87	60-125			
Endosulfan sulfate	0.471	0.20	ug/l	0.500		94	60-120			

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ORGANOCHLORINE PESTICIDES (EPA 3510C/8081A)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G20057 Extracted: 07/20/05										
LCS Analyzed: 07/20/2005 (5G20057-BS1)										M-NR1
Endrin	0.441	0.10	ug/l	0.500		88	55-125			
Endrin aldehyde	0.443	0.10	ug/l	0.500		89	55-115			
Endrin ketone	0.441	0.10	ug/l	0.500		88	60-115			
Heptachlor	0.370	0.10	ug/l	0.500		74	45-115			
Heptachlor epoxide	0.416	0.10	ug/l	0.500		83	50-115			
Methoxychlor	0.454	0.10	ug/l	0.500		91	60-120			
Surrogate: Tetrachloro-m-xylene	*0.338*		*ug/l*	*0.500*		*68*	*35-115*			
Surrogate: Decachlorobiphenyl	*0.439*		*ug/l*	*0.500*		*88*	*45-120*			
LCS Dup Analyzed: 07/20/2005 (5G20057-BSD1)										
Aldrin	0.341	0.10	ug/l	0.500		68	40-115	4	30	
alpha-BHC	0.422	0.10	ug/l	0.500		84	45-115	3	30	
beta-BHC	0.386	0.10	ug/l	0.500		77	50-115	3	30	
delta-BHC	0.433	0.20	ug/l	0.500		87	55-120	3	30	
gamma-BHC (Lindane)	0.419	0.10	ug/l	0.500		84	45-115	3	30	
4,4'-DDD	0.439	0.10	ug/l	0.500		88	60-120	5	30	
4,4'-DDE	0.425	0.10	ug/l	0.500		85	55-120	5	30	
4,4'-DDT	0.420	0.10	ug/l	0.500		84	60-120	5	30	
Dieldrin	0.417	0.10	ug/l	0.500		83	55-120	5	30	
Endosulfan I	0.398	0.10	ug/l	0.500		80	50-115	5	30	
Endosulfan II	0.411	0.10	ug/l	0.500		82	60-125	5	30	
Endosulfan sulfate	0.445	0.20	ug/l	0.500		89	60-120	6	30	
Endrin	0.421	0.10	ug/l	0.500		84	55-125	5	30	
Endrin aldehyde	0.379	0.10	ug/l	0.500		76	55-115	16	30	
Endrin ketone	0.415	0.10	ug/l	0.500		83	60-115	6	30	
Heptachlor	0.356	0.10	ug/l	0.500		71	45-115	4	30	
Heptachlor epoxide	0.400	0.10	ug/l	0.500		80	50-115	4	30	
Methoxychlor	0.430	0.10	ug/l	0.500		86	60-120	5	30	
Surrogate: Tetrachloro-m-xylene	*0.337*		*ug/l*	*0.500*		*67*	*35-115*			
Surrogate: Decachlorobiphenyl	*0.410*		*ug/l*	*0.500*		*82*	*45-120*			

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POLYCHLORINATED BIPHENYLS (EPA 3510C/8082)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G20057 Extracted: 07/20/05										
Blank Analyzed: 07/20/2005-07/22/2005 (5G20057-BLK1)										
Aroclor 1016	ND	1.0	ug/l							
Aroclor 1221	ND	1.0	ug/l							
Aroclor 1232	ND	1.0	ug/l							
Aroclor 1242	ND	1.0	ug/l							
Aroclor 1248	ND	1.0	ug/l							
Aroclor 1254	ND	1.0	ug/l							
Aroclor 1260	ND	1.0	ug/l							
Surrogate: Decachlorobiphenyl	*0.513*		*ug/l*	*0.500*		*103*	*45-120*			
LCS Analyzed: 07/22/2005 (5G20057-BS2)										M-NR1
Aroclor 1016	3.51	1.0	ug/l	4.00		88	50-115			
Aroclor 1260	3.67	1.0	ug/l	4.00		92	55-115			
Surrogate: Decachlorobiphenyl	*0.521*		*ug/l*	*0.500*		*104*	*45-120*			
LCS Dup Analyzed: 07/22/2005 (5G20057-BSD2)										
Aroclor 1016	3.23	1.0	ug/l	4.00		81	50-115	8	30	
Aroclor 1260	3.37	1.0	ug/l	4.00		84	55-115	9	25	
Surrogate: Decachlorobiphenyl	*0.479*		*ug/l*	*0.500*		*96*	*45-120*			

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METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G18097 Extracted: 07/18/05										
Blank Analyzed: 07/19/2005 (5G18097-BLK1)										
Antimony	ND	0.010	mg/l							
Arsenic	ND	0.0050	mg/l							
Barium	ND	0.010	mg/l							
Chromium	ND	0.0050	mg/l							
Cobalt	ND	0.010	mg/l							
Copper	ND	0.010	mg/l							
Molybdenum	ND	0.020	mg/l							
Silver	ND	0.0070	mg/l							
Thallium	ND	0.010	mg/l							
Vanadium	ND	0.010	mg/l							
Zinc	ND	0.020	mg/l							
LCS Analyzed: 07/19/2005 (5G18097-BS1)										
Antimony	1.07	0.010	mg/l	1.00		107	80-120			
Arsenic	1.00	0.0050	mg/l	1.00		100	80-120			
Barium	0.954	0.010	mg/l	1.00		95	80-120			
Chromium	0.986	0.0050	mg/l	1.00		99	80-120			
Cobalt	1.02	0.010	mg/l	1.00		102	80-120			
Copper	1.01	0.010	mg/l	1.00		101	80-120			
Molybdenum	0.956	0.020	mg/l	1.00		96	80-120			
Silver	0.507	0.0070	mg/l	0.500		101	80-120			
Thallium	0.962	0.010	mg/l	1.00		96	80-120			
Vanadium	0.988	0.010	mg/l	1.00		99	80-120			
Zinc	0.959	0.020	mg/l	1.00		96	80-120			
Matrix Spike Analyzed: 07/19/2005 (5G18097-MS1)					**Source: IOG0791-01**					
Antimony	0.998	0.010	mg/l	1.00	ND	100	75-125			
Arsenic	0.946	0.0050	mg/l	1.00	0.0099	94	75-125			
Barium	0.888	0.010	mg/l	1.00	0.024	86	75-125			
Chromium	0.897	0.0050	mg/l	1.00	ND	90	75-125			
Cobalt	0.946	0.010	mg/l	1.00	ND	95	75-125			
Copper	1.02	0.010	mg/l	1.00	ND	102	75-125			
Molybdenum	1.09	0.020	mg/l	1.00	0.21	88	75-125			
Silver	0.476	0.0070	mg/l	0.500	ND	95	75-125			
Thallium	0.837	0.010	mg/l	1.00	ND	84	75-125			
Vanadium	0.925	0.010	mg/l	1.00	0.0044	92	75-125			

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G18097 Extracted: 07/18/05										
Matrix Spike Analyzed: 07/19/2005 (5G18097-MS1)					Source: IOG0791-01					
Zinc	0.910	0.020	mg/l	1.00	ND	91	75-125			
Matrix Spike Dup Analyzed: 07/19/2005 (5G18097-MSD1)					Source: IOG0791-01					
Antimony	0.994	0.010	mg/l	1.00	ND	99	75-125	0	20	
Arsenic	0.945	0.0050	mg/l	1.00	0.0099	94	75-125	0	20	
Barium	0.879	0.010	mg/l	1.00	0.024	86	75-125	1	20	
Chromium	0.886	0.0050	mg/l	1.00	ND	89	75-125	1	20	
Cobalt	0.937	0.010	mg/l	1.00	ND	94	75-125	1	20	
Copper	1.01	0.010	mg/l	1.00	ND	101	75-125	1	20	
Molybdenum	1.08	0.020	mg/l	1.00	0.21	87	75-125	1	20	
Silver	0.471	0.0070	mg/l	0.500	ND	94	75-125	1	20	
Thallium	0.837	0.010	mg/l	1.00	ND	84	75-125	0	20	
Vanadium	0.916	0.010	mg/l	1.00	0.0044	91	75-125	1	20	
Zinc	0.900	0.020	mg/l	1.00	ND	90	75-125	1	20	
Batch: 5G19037 Extracted: 07/19/05										
Blank Analyzed: 07/19/2005 (5G19037-BLK1)										
Mercury	ND	0.00020	mg/l							
LCS Analyzed: 07/19/2005 (5G19037-BS1)										
Mercury	0.00823	0.00020	mg/l	0.00800		103	90-115			
Matrix Spike Analyzed: 07/19/2005 (5G19037-MS1)					Source: IOG0937-01					
Mercury	0.00796	0.00020	mg/l	0.00800	ND	100	75-120			
Matrix Spike Dup Analyzed: 07/19/2005 (5G19037-MSD1)					Source: IOG0937-01					
Mercury	0.00788	0.00020	mg/l	0.00800	ND	98	75-120	1	20	

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METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G19086 Extracted: 07/19/05										
Blank Analyzed: 07/20/2005 (5G19086-BLK1)										
Aluminum	ND	0.050	mg/l							
Boron	ND	0.050	mg/l							
Iron	ND	0.040	mg/l							
Magnesium	ND	0.020	mg/l							
Manganese	ND	0.020	mg/l							
Strontium	ND	0.020	mg/l							
Tin	ND	0.10	mg/l							
Titanium	ND	0.0050	mg/l							
LCS Analyzed: 07/20/2005 (5G19086-BS1)										
Aluminum	0.972	0.050	mg/l	1.00		97	80-120			
Boron	1.01	0.050	mg/l	1.00		101	80-120			
Iron	1.04	0.040	mg/l	1.00		104	80-120			
Magnesium	4.92	0.020	mg/l	5.00		98	80-120			
Manganese	1.02	0.020	mg/l	1.00		102	80-120			
Strontium	0.985	0.020	mg/l	1.00		98	80-120			
Tin	0.973	0.10	mg/l	1.00		97	80-120			
Titanium	1.03	0.0050	mg/l	1.00		103	80-120			
Matrix Spike Analyzed: 07/20/2005 (5G19086-MS1)					**Source: IOG0857-01**					
Aluminum	1.06	0.050	mg/l	1.00	0.082	98	75-125			
Boron	1.66	0.050	mg/l	1.00	0.64	102	75-125			
Iron	0.991	0.040	mg/l	1.00	0.034	96	75-125			
Magnesium	33.0	0.020	mg/l	5.00	29	80	75-125			
Manganese	0.938	0.020	mg/l	1.00	0.010	93	75-125			
Strontium	2.68	0.020	mg/l	1.00	1.7	98	75-125			
Tin	0.933	0.10	mg/l	1.00	0.0053	93	75-125			
Titanium	0.987	0.0050	mg/l	1.00	0.0034	98	75-125			

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METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G19086 Extracted: 07/19/05										
Matrix Spike Dup Analyzed: 07/20/2005 (5G19086-MSD1)					Source: IOG0857-01					
Aluminum	1.11	0.050	mg/l	1.00	0.082	103	75-125	5	20	
Boron	1.74	0.050	mg/l	1.00	0.64	110	75-125	5	20	
Iron	1.02	0.040	mg/l	1.00	0.034	99	75-125	3	20	
Magnesium	34.4	0.020	mg/l	5.00	29	108	75-125	4	20	
Manganese	0.977	0.020	mg/l	1.00	0.010	97	75-125	4	20	
Strontium	2.76	0.020	mg/l	1.00	1.7	106	75-125	3	20	
Tin	0.950	0.10	mg/l	1.00	0.0053	94	75-125	2	20	
Titanium	1.02	0.0050	mg/l	1.00	0.0034	102	75-125	3	20	
Batch: 5G25067 Extracted: 07/25/05										
Blank Analyzed: 07/25/2005 (5G25067-BLK1)										
Zirconium	ND	0.20	mg/l							
LCS Analyzed: 07/25/2005 (5G25067-BS1)										
Zirconium	1.01	0.20	mg/l	1.00		101	80-120			
Matrix Spike Analyzed: 07/25/2005 (5G25067-MS1)					Source: IOG1423-01					
Zirconium	1.02	0.20	mg/l	1.00	ND	102	75-125			
Matrix Spike Dup Analyzed: 07/25/2005 (5G25067-MSD1)					Source: IOG1423-01					
Zirconium	1.03	0.20	mg/l	1.00	ND	103	75-125	1	20	

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INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G14039 Extracted: 07/14/05										
Blank Analyzed: 07/14/2005 (5G14039-BLK1)										
Bromide	ND	0.50	mg/l							
Fluoride	ND	0.50	mg/l							
Nitrate-N	ND	0.15	mg/l							
Nitrite-N	ND	0.15	mg/l							
Sulfate	ND	0.50	mg/l							
LCS Analyzed: 07/14/2005 (5G14039-BS1)										
Bromide	4.88	0.50	mg/l	5.00		98	90-110			
Fluoride	4.68	0.50	mg/l	5.00		94	90-110			
Nitrate-N	1.08	0.15	mg/l	1.13		96	90-110			
Nitrite-N	1.47	0.15	mg/l	1.52		97	90-110			
Sulfate	9.53	0.50	mg/l	10.0		95	90-110			*M-3*
Matrix Spike Analyzed: 07/14/2005 (5G14039-MS1)					**Source: IOG0829-01**					
Bromide	4.97	0.50	mg/l	5.00	ND	99	80-120			
Fluoride	4.98	0.50	mg/l	5.00	0.18	96	80-120			
Nitrate-N	6.59	0.15	mg/l	1.13	5.2	123	80-120			*M-HA*
Nitrite-N	1.54	0.15	mg/l	1.52	ND	101	80-120			
Matrix Spike Dup Analyzed: 07/14/2005 (5G14039-MSD1)					**Source: IOG0829-01**					
Bromide	4.71	0.50	mg/l	5.00	ND	94	80-120	5	20	
Fluoride	4.91	0.50	mg/l	5.00	0.18	95	80-120	1	20	
Nitrate-N	6.54	0.15	mg/l	1.13	5.2	119	80-120	1	20	
Nitrite-N	1.50	0.15	mg/l	1.52	ND	99	80-120	3	20	
Batch: 5G14075 Extracted: 07/14/05										
Blank Analyzed: 07/14/2005 (5G14075-BLK1)										
Phosphorus	ND	0.050	mg/l							

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Kathleen A. Robb
Project Manager

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U.S. Filter/Westates Carbon
P.O. Box 3308
Parker, AZ 85344
Attention: Deborah Foster

Project ID: TTO
Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G14075 Extracted: 07/14/05										
LCS Analyzed: 07/14/2005 (5G14075-BS1)										
Phosphorus	0.915	0.050	mg/l	1.00		92	80-120			
Matrix Spike Analyzed: 07/14/2005 (5G14075-MS1)					Source: IOG0784-01					
Phosphorus	1.25	0.050	mg/l	1.00	0.37	88	65-130			
Matrix Spike Dup Analyzed: 07/14/2005 (5G14075-MSD1)					Source: IOG0784-01					
Phosphorus	1.31	0.050	mg/l	1.00	0.37	94	65-130	5	15	
Batch: 5G14089 Extracted: 07/14/05										
Duplicate Analyzed: 07/14/2005 (5G14089-DUP1)					Source: IOG0808-01					
Color	10.0	1.0	Color Units		10			0	20	*pH*
Batch: 5G14094 Extracted: 07/14/05										
Duplicate Analyzed: 07/14/2005 (5G14094-DUP1)					Source: IOG0812-01					
Residual Chlorine	ND	0.10	mg/l		ND				20	
Batch: 5G14118 Extracted: 07/14/05										
Blank Analyzed: 07/14/2005 (5G14118-BLK1)										
Surfactants (MBAS)	ND	0.10	mg/l							
LCS Analyzed: 07/14/2005 (5G14118-BS1)										
Surfactants (MBAS)	0.255	0.10	mg/l	0.250		102	90-110			

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METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G14118 Extracted: 07/14/05										
Matrix Spike Analyzed: 07/14/2005 (5G14118-MS1)					**Source: IOG0833-01**					
Surfactants (MBAS)	0.271	0.10	mg/l	0.250	ND	108	50-125			
Matrix Spike Dup Analyzed: 07/14/2005 (5G14118-MSD1)					**Source: IOG0833-01**					
Surfactants (MBAS)	0.299	0.10	mg/l	0.250	ND	120	50-125	10	20	
Batch: 5G15045 Extracted: 07/15/05										
Blank Analyzed: 07/15/2005 (5G15045-BLK1)										
Sulfide	ND	0.10	mg/l							
LCS Analyzed: 07/15/2005 (5G15045-BS1)										
Sulfide	0.567	0.10	mg/l	0.560		101	80-120			
Matrix Spike Analyzed: 07/15/2005 (5G15045-MS1)					**Source: IOG0959-02**					
Sulfide	0.547	0.10	mg/l	0.560	0.010	96	70-130			
Matrix Spike Dup Analyzed: 07/15/2005 (5G15045-MSD1)					**Source: IOG0959-02**					
Sulfide	0.527	0.10	mg/l	0.560	0.010	92	70-130	4	30	
Batch: 5G15075 Extracted: 07/15/05										
Blank Analyzed: 07/18/2005 (5G15075-BLK1)										
Total Cyanide	ND	0.025	mg/l							
LCS Analyzed: 07/18/2005 (5G15075-BS1)										
Total Cyanide	0.191	0.025	mg/l	0.200		96	90-110			

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METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G15075 Extracted: 07/15/05										
Matrix Spike Analyzed: 07/18/2005 (5G15075-MS1)					**Source: IOG0684-02**					
Total Cyanide	0.214	0.025	mg/l	0.200	ND	107	70-115			
Matrix Spike Dup Analyzed: 07/18/2005 (5G15075-MSD1)					**Source: IOG0684-02**					
Total Cyanide	0.188	0.025	mg/l	0.200	ND	94	70-115	13	15	
Batch: 5G19066 Extracted: 07/19/05										
Blank Analyzed: 07/19/2005 (5G19066-BLK1)										
Total Kjeldahl Nitrogen	ND	0.50	mg/l							
LCS Analyzed: 07/19/2005 (5G19066-BS1)										
Total Kjeldahl Nitrogen	11.5	0.50	mg/l	10.0		115	85-120			
LCS Dup Analyzed: 07/19/2005 (5G19066-BSD1)										
Total Kjeldahl Nitrogen	11.2	0.50	mg/l	10.0		112	85-120	3	15	
Matrix Spike Analyzed: 07/19/2005 (5G19066-MS1)					**Source: IOG0863-02**					
Total Kjeldahl Nitrogen	11.8	0.50	mg/l	10.0	0.84	110	85-120			
Matrix Spike Dup Analyzed: 07/19/2005 (5G19066-MSD1)					**Source: IOG0863-02**					
Total Kjeldahl Nitrogen	12.3	0.50	mg/l	10.0	0.84	115	85-120	4	15	
Batch: 5G20078 Extracted: 07/20/05										
Blank Analyzed: 07/20/2005 (5G20078-BLK1)										
Oil & Grease	ND	5.0	mg/l							

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METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G20078 Extracted: 07/20/05										
LCS Analyzed: 07/20/2005 (5G20078-BS1)										**M-NR1**
Oil & Grease	16.0	5.0	mg/l	20.0		80	65-120			
LCS Dup Analyzed: 07/20/2005 (5G20078-BSD1)										
Oil & Grease	15.5	5.0	mg/l	20.0		78	65-120	3	20	
Batch: 5G22080 Extracted: 07/22/05										
Blank Analyzed: 07/22/2005 (5G22080-BLK1)										
Phenols	ND	0.10	mg/l							
LCS Analyzed: 07/22/2005 (5G22080-BS1)										
Phenols	0.508	0.10	mg/l	0.500		102	90-110			
Matrix Spike Analyzed: 07/22/2005 (5G22080-MS1)					**Source: IOG0903-08**					
Phenols	0.508	0.10	mg/l	0.500	ND	102	65-155			
Matrix Spike Dup Analyzed: 07/22/2005 (5G22080-MSD1)					**Source: IOG0903-08**					
Phenols	0.526	0.10	mg/l	0.500	ND	105	65-155	3	20	
Batch: 5G22113 Extracted: 07/22/05										
Blank Analyzed: 07/22/2005 (5G22113-BLK1)										
Ammonia-N	ND	0.50	mg/l							
LCS Analyzed: 07/22/2005 (5G22113-BS1)										
Ammonia-N	0.993	0.50	mg/l	1.00		99	85-115			

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METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G22113 Extracted: 07/22/05										
Matrix Spike Analyzed: 07/22/2005 (5G22113-MS1)					Source: IOG0857-01					
Ammonia-N	1.74	0.50	mg/l	2.00	ND	87	75-125			
Matrix Spike Dup Analyzed: 07/22/2005 (5G22113-MSD1)					Source: IOG0857-01					
Ammonia-N	1.83	0.50	mg/l	2.00	ND	92	75-125	5	15	

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Project ID: TTO
Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

METHOD BLANK/QC DATA

DIQUAT/PARAQUAT (EPA 549.2)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: C5G1809 Extracted: 07/18/05										
Blank Analyzed: 07/18/2005 (C5G1809-BLK1)										
Diquat	ND	4.0	ug/l							
Paraquat	ND	20	ug/l							
LCS Analyzed: 07/18/2005 (C5G1809-BS1)										
Diquat	32.5	4.0	ug/l	40.0		81	70-120			
Paraquat	32.7	20	ug/l	40.0		82	65-120			
LCS Dup Analyzed: 07/18/2005 (C5G1809-BSD1)										
Diquat	32.7	4.0	ug/l	40.0		82	70-120	1	20	
Paraquat	33.1	20	ug/l	40.0		83	65-120	1	20	
Matrix Spike Analyzed: 07/18/2005 (C5G1809-MS1)					Source: COG0352-01					
Diquat	34.8	4.0	ug/l	40.0	ND	87	70-120			
Paraquat	35.5	20	ug/l	40.0	ND	89	65-120			

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P.O. Box 3308
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Attention: Deborah Foster

Project ID: TTO

Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

DATA QUALIFIERS AND DEFINITIONS

C	Calibration Verification recovery was above the method control limit for this analyte. Analyte not detected, data not impacted.
L	Laboratory Control Sample recovery was above the method control limits. Analyte not detected, data not impacted.
M-3	Results exceeded the linear range in the MS/MSD and therefore are not available for reporting. The batch was accepted based on acceptable recovery in the Blank Spike (LCS).
M-HA	Due to high levels of analyte in the sample, the MS/MSD calculation does not provide useful spike recovery information. See Blank Spike (LCS).
M-NRI	There was no MS/MSD analyzed with this batch due to insufficient sample volume. See Blank Spike/Blank Spike Duplicate.
pH	pH = 7
R-2	The RPD exceeded the method control limit.
RL-3	Reporting limit raised due to high concentrations of non-target analytes.
ND	Analyte NOT DETECTED at or above the reporting limit or MDL, if MDL is specified.
RPD	Relative Percent Difference

ADDITIONAL COMMENTS

For 1,2-Diphenylhydrazine:

The result for 1,2-Diphenylhydrazine is based upon the reading of its breakdown product, Azobenzene.

Del Mar Analytical, Irvine
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Sampled: 07/13/05
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Certification Summary

Del Mar Analytical, Irvine

Method	Matrix	Nelac	California
Calculation	Water	X	X
EPA 300.0	Water	X	X
EPA 330.5	Water	X	X
EPA 350.3	Water	X	X
EPA 3510/8082	Water	X	X
EPA 3510C/8081A	Water	X	X
EPA 365.3	Water	X	X
EPA 376.2	Water	X	X
EPA 413.1	Water	X	X
EPA 420.1	Water	X	X
EPA 6010B	Water	X	X
EPA 7470A	Water	X	X
EPA 8260B	Water	X	X
EPA 8270C	Water	X	X
SM2120B	Water	N/A	N/A
SM4500-CN-C,E	Water	X	X
SM4500-NORG,C	Water		X
SM5540-C	Water	X	X

Nevada and NELAP provide analyte specific accreditations. Analyte specific information for Del Mar Analytical may be obtained by contacting the laboratory or visiting our website at www.dmalabs.com.

Subcontracted Laboratories

Del Mar Analytical - Colton *California Cert #1169, Arizona Cert #AZ0062, Nevada Cert #CA-242*
1014 E. Cooley Drive, Suite AB - Colton, CA 92324
Method Performed: EPA 549.2
Samples: IOG0857-01

Test America, Inc.
2960 Foster Creighton Drive - Nashville, TN 37204
Analysis Performed: 8151A (Herbicides)
Samples: IOG0857-01

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SUBCONTRACT ORDER - PROJECT # IOG0857

SENDING LABORATORY:	RECEIVING LABORATORY:
Del Mar Analytical, Irvine 17461 Derian Avenue. Suite 100 Irvine, CA 92614 Phone: (949) 261-1022 Fax: (949) 261-1228 Project Manager: Kathleen A. Robb	Del Mar Analytical - Colton 1014 E. Cooley Drive, Suite AB Colton, CA 92324 Phone :(909) 370-4667 Fax: (909) 370-1046 COG0448

Analysis	Expiration	Due	Comments
Sample ID: IOG0857-01 Water	**Sampled: 07/13/05 14:00**		
549.1-Diquat	07/20/05 14:00	07/25/05 12:00	std TAT- sub to DMAC-see comments

Containers Supplied:
1 L Brown Poly (IOG0857-01V)

SAMPLE INTEGRITY:

All containers intact:	☑ Yes ☐ No	Sample labels/COC agree:	☑ Yes ☐ No	Samples Received On Ice:	☑ Yes ☐ No
Custody Seals Present:	☐ Yes ☐ No	Samples Preserved Properly:	☑ Yes ☐ No	Samples Received at (temp):	6°

Released By	Date	Time	Received By	Date	Time
[signature]			A. Greco	7-14-05	[illegible]
Anthony Greco	7-14-05	1500	[signature]	7/14/05	1500

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CHAIN OF CUSTODY FORM

IOG0857

Client Name/Address: Usf Westates PO BOX 3308 Parker AZ

P.O. #:

Project: TTO

Project Manager/Phone Number: Foster 928 669 5758

Phone Number:

Sampler:

Fax Number:

ANALYSIS REQUIRED: Metals w/NDES; Hg M7470/7471; total cyanide; total phenols; O+G 413.1; Sulfide 376.2; Residual Chlorine; total phosp(as P); TKN; NH3

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041

Sample Description	Sample Matrix	Container Type	# of Containers	Sampling Date/Time	Preservation	Metals w/NDES	Hg M7470/7471	total cyanide	total phenols	O+G 413.1	Sulfide 376.2	Residual Chlorine	total phosp(as P)	TKN	NH3	Special Instructions
TTO	H2O	500ml	1	7/12-13	HNO3	X	X									
			1		NAOH			X								
		Lamb	2		H2SO4				X							
			2		HCL					X						
		500ml	1		NAOH/ZN						X					
		150ml	1		—							X				
		500ml	2		H2SO4								X	X		

VB

Relinquished By	Date/Time:	Received By	Date/Time:
N Foster	7/13/05 2PM		
Relinquished By	Date/Time:	Received By	Date/Time:
Relinquished By	Date/Time:	Received By [signature]	7-14-05 10:10

Turnaround Time: (check)
Same Day ______ 72 Hours ______
24 Hours ______ 5 days ______
48 hours ______ normal ✱
Sample Integrity: (Check)
Intact ✓ On Ice: ✓ 10°C

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CHAIN OF CUSTODY FORM

Client Name/Address: USF Westates	P.O. #:	ANALYSIS REQUIRED
	Project:	
Project Manager/Phone Number:	Phone Number:	
Sampler:	Fax Number:	

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041

Sample Description	Sample Matrix	Container Type	# of Containers	Sampling Date/Time	Preservation	Special Instructions
FTD	H2O	500ml	2	7/12-13	—	
		VOA	4		HCl	
		VOA	3		—	
		Lamb	1		—	
		Lamb	1		—	
		Lamb	1		—	

Relinquished By	Date/Time:	Received By	Date/Time:
[signature]	7/13/05 2pm		
Relinquished By	Date/Time:	Received By	Date/Time:
Relinquished By	Date/Time:	Received By [signature]	Date/Time: 7-14-05 10:10

Turnaround Time: (check)
Same Day _____ 72 Hours _____
24 Hours _____ 5 days _____
48 hours _____ normal ✓

Sample Integrity: (Check)
Intact ✓ On Ice: ✓ 18°C

73

Del Mar Analytical

17461 Derian, Irvine, CA 92614 (949) 261-1022 FAX (949) 260-3299
1014 E. Cooley Dr., Suite A, Colton, CA 92324 (909) 370-4667 FAX (909) 370-1046
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9830 South 51st St., Suite B-120, Phoenix AZ 85044 (480) 785-0043 FAX (480) 785-0851
2520 E. Sunset Rd. #3, Las Vegas, NV 89120 (702) 798-3620 FAX (702) 798-3621

CHAIN OF CUSTODY FORM

Client Name/Address: USF Westates

P.O. #:

Project:

Project Manager/Phone Number:

Sampler:

Phone Number:

Fax Number:

ANALYSIS REQUIRED: 549.2; extras

041

Sample Description	Sample Matrix	Container Type	# of Containers	Sampling Date/Time	Preservation	549.2	extras	Special Instructions
TTO	H2O	LBrN	1	7/12-13	NaS04	X		
↓	↓	LAMB	4	↓	—		X	

Relinquished By	Date/Time:	Received By	Date/Time:
[signature]	7/13/05 2pm		
Relinquished By	Date/Time:	Received By	Date/Time:
Relinquished By	Date/Time:	Received By [signature]	7-14-05 10:10

Turnaround Time: (check)

Same Day ______ 72 Hours ______

24 Hours ______ 5 days ______

48 hours ______ normal X

Sample Integrity: (Check)

Intact ✓ On Ice: ✓ 10°C

Melting ice

Del Mar Analytical

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2520 E. Sunset Rd. #3, Las Vegas, NV 89120 (702) 798-3620 FAX (702) 798-3621

CHAIN OF CUSTODY FORM

IOG0857

Client Name/Address: USF Westates, PO BOX 3308, Parker AZ

P.O. #:

Project: TTO

Project Manager/Phone Number: Foster 928 669 5758

Phone Number:

Sampler:

Fax Number:

ANALYSIS REQUIRED: Metals 6010B; Hg 7470/7471; total cyanide; total phenols; O+G 413.1; Sulfide 376.2; Residual chlorine; total phos (365.3); NH3, TKN

1/3

041

Sample Description	Sample Matrix	Container Type	# of Containers	Sampling Date/Time	Preservation	Metals 6010B	Hg 7470/7471	total cyanide	total phenols	O+G 413.1	Sulfide 376.2	Residual chlorine	total phos (365.3)	NH3, TKN	Special Instructions
TTO	H2O	500ml	1	7/12-13	HNO3	X	X								
↓	↓	↓	1	↓	NAOH			X							
↓	↓	1 Amb	2	↓	H2SO4				X						
↓	↓	↓	2	↓	HCL					X					
↓	↓	500ml	1	↓	NAOH/ZN						X				
↓	↓	50ml	1	↓	—							X			
↓	↓	500ml	2	↓	H2SO4								X	X	

VB

Relinquished By	Date/Time:	Received By	Date/Time:
N Foster	7/13/05 2pm		
Relinquished By	Date/Time:	Received By	Date/Time:
Relinquished By	Date/Time:	Received By [signature]	7-14-05 10:10

Turnaround Time: (check)
Same Day ____ 72 Hours ____
24 Hours ____ 5 days ____
48 hours ____ normal ⊗

Sample Integrity: (Check)
Intact ✓ On Ice: ✓ 10°C

Del Mar Analytical

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2520 E. Sunset Rd. #3, Las Vegas, NV 89120 (702) 798-3620 FAX (702) 798-3621

CHAIN OF CUSTODY FORM

Client Name/Address: USF Westates	P.O. #:	ANALYSIS REQUIRED
	Project:	
Project Manager/Phone Number:	Phone Number:	
Sampler:	Fax Number:	

ANALYSIS REQUIRED: Color, Br, F, NO3, NO2, SO4, MBAS, 8260B + CS2, VIN Acet, 2 CVE, Acrolein, Acrylonitrile via 8260B, 8270D+ NDMA, 8081/8082, 8151A

2/3

041

Sample Description	Sample Matrix	Container Type	# of Containers	Sampling Date/Time	Preservation	Special Instructions
FTO	H2O	500ml	2	7/12-13	—	
		VOA	4		HCl	
		VOA	3		—	
		Lamb	1		—	
		LAMB	1		—	
		LAMB	1		—	

Relinquished By	Date/Time:	Received By	Date/Time:
N Foster	7/13/05 2pm		
Relinquished By	Date/Time:	Received By	Date/Time:
Relinquished By	Date/Time:	Received By	Date/Time:
		Federal Exp	7-14-05 10:10

Turnaround Time: (check)
Same Day _____ 72 Hours _____
24 Hours _____ 5 days _____
48 hours _____ normal ✓

Sample Integrity: (Check)
Intact ✓ On Ice: ✓ 18°C

3/3

17461 Derian, Irvine, CA 92614 (949) 261-1022 FAX (949) 260-3299
1014 E. Cooley Dr. Suite A, Colton, CA 92324 (909) 370-4667 FAX (909) 370-1046
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2520 E. Sunset Rd. #3, Las Vegas, NV 89120 (702) 798-3620 FAX (702) 798-3621

Del Mar Analytical

CHAIN OF CUSTODY FORM

Client Name/Address: USF Westates	P.O. #:	ANALYSIS REQUIRED
	Project:	8449.2 Extras (041)
Project Manager/Phone Number:	Phone Number:	
Sampler:	Fax Number:	

Sample Description	Sample Matrix	Container Type	# of Containers	Sampling Date/Time	Preservation	8449.2	Extras	Special Instructions
TTO	H2O	LBRN	1	7/12-13	H2SO4	X	X	
↓	↓	LAMB	4	↓	—			

Relinquished By	Date/Time:	Received By	Date/Time:
[signature]	7/13/05 2pm		
Relinquished By	Date/Time:	Received By	Date/Time:
Relinquished By	Date/Time:	Received By	Date/Time:
		[signature]	7-14-05 10:10

Turnaround Time: (check)
Same Day _____ 72 Hours _____
24 Hours _____ 5 days _____
48 hours _____ normal X
Sample Integrity: (Check)
Intact ✓ On Ice: ✓ 10°C
Melting ICE

Del Mar Analytical

17461 Derian Ave., Suite 100, Irvine CA 92614 (949) 261-1022 FAX (949) 260-3297
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2520 E. Sunset Rd. #3, Las Vegas, NV 89120 (702) 798-3620 FAX (702) 798-3621

August 16, 2005

U.S. Filter/ Westates Carbon
P.O. Box 3308
Parker, AZ 85344

Attention: Deborah Foster

Project: Semi-Annual
TTO
Sampled: 07/13/05
Del Mar Analytical Number: IOG0857

Dear Ms. Foster:

Test America Analytical Testing Corporation reperformed the 8151A Herbicides for confirmation purposes in regards to the referenced project above. Please use the following cross-reference table when reviewing your results.

U.S. Filter ID	Del Mar ID	Test America ID
TTO	IOG0857-01	05-A102935

Attached is the original report from the subcontract laboratory. If you have any questions or require further assistance, please contact me at (949) 261-1022, extension 218.

Sincerely yours,
DEL MAR ANALYTICAL

Kathleen A. Robb
Project Manager

Enclosure

TestAmerica
ANALYTICAL TESTING CORPORATION
2960 Foster Creighton Drive • Nashville, Tennessee 37204
800-765-0980 • 615-726-3404 Fax

ANALYTICAL REPORT

DEL MAR ANALYTICAL, IRVINE 11405
MICHELE HARPER
17461 DERIAN, STE 100
IRVINE, CA 92614

Lab Number: 05-A102935
Sample ID: IOG0857-01
Sample Type: Ground water
Site ID:

Project: IOG0857
Project Name:
Sampler:

Date Collected: 7/13/05
Time Collected: 14:00
Date Received: 7/19/05
Time Received: 9:55

Analyte	Result	Units	Report Limit	Dil Factor	Analysis Date	Analysis Time	Analyst	Method	Batch
PESTICIDES/PCB's/HERBICIDES									
2,4-D	ND	mg/l	0.00500	1	7/20/05	19:04	K. Burritt	8151A	440
2,4,5-T	ND	mg/l	0.00050	1	7/20/05	19:04	K. Burritt	8151A	440
2,4,5-TP	ND	mg/l	0.00050	1	7/20/05	19:04	K. Burritt	8151A	440
Dalapon	ND	mg/l	0.0200	1	7/20/05	19:04	K. Burritt	8151A	440
2,4-DB	ND	mg/l	0.00500	1	7/20/05	19:04	K. Burritt	8151A	440
Dicamba	ND	mg/l	0.00050	1	7/20/05	19:04	K. Burritt	8151A	440
Dichloroprop	ND	mg/l	0.00500	1	7/20/05	19:04	K. Burritt	8151A	440
Dinoseb	ND	mg/l	0.00250	1	7/20/05	19:04	K. Burritt	8151A	440
MCPA	ND	mg/l	0.500	1	7/20/05	19:04	K. Burritt	8151A	440
MCPP	ND	mg/l	0.500	1	7/20/05	19:04	K. Burritt	8151A	440
Pentachlorophenol	ND	mg/l	0.00050	1	7/20/05	19:04	K. Burritt	8151A	440
4-Nitrophenol	ND	mg/l	0.00050	1	7/20/05	19:04	K. Burritt	8151A	440

Sample Extraction Data

Parameter	Wt/Vol Extracted	Extract Vol	Date	Time	Analyst	Method
Herbicides	1000 ml	10.0 ml	7/19/05		J. Davis	8151/615

Surrogate	% Recovery	Target Range
surr-DCAA	92.	51. - 136.

Sample report continued . . .

TestAmerica
ANALYTICAL TESTING CORPORATION
2960 Foster Creighton Drive • Nashville, Tennessee 37204
800-765-0980 • 615-726-3404 Fax

ANALYTICAL REPORT

Laboratory Number: 05-A102935
Sample ID: IOG0857-01

LABORATORY COMMENTS:
ND = Not detected at the report limit.
B = Analyte was detected in the method blank.
J = Estimated Value below Report Limit.
E = Estimated Value above the calibration limit of the instrument.
# = Recovery outside Laboratory historical or method prescribed limits.

End of Sample Report.

TestAmerica
ANALYTICAL TESTING CORPORATION
2960 Foster Creighton Drive • Nashville, Tennessee 37204
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PROJECT QUALITY CONTROL DATA
Project Number: IOG0857
Project Name:
Page: 1
Laboratory Receipt Date: 7/19/05

Matrix Spike Recovery

Note: If Blank is referenced as the sample spiked, insufficient volume was received for the defined analytical batch for MS/MSD analysis on an true sample matrix. Laboratory reagent water was used for QC purposes.

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery	Target Range	Q.C. Batch	Spike Sample
PEST/PCB/HERB PARAMETERS								
2,4-D	mg/l	< 0.00006	0.00363	0.00500	73	35. - 141.	440	blank
2,4,5-T	mg/l	< 0.00003	0.00341	0.00500	68	25. - 149.	440	blank
2,4,5-TP	mg/l	< 0.00003	0.00431	0.00500	86	31. - 137.	440	blank
Dalapon	mg/l	< 0.00002	0.00018	0.00500	4#	10. - 101.	440	blank
2,4-DB	mg/l	< 0.00009	0.00702	0.00500	140	34. - 153.	440	blank
Dicamba	mg/l	< 0.00006	0.00338	0.00500	68	23. - 157.	440	blank
Dichloroprop	mg/l	< 0.00006	0.00403	0.00500	81	45. - 152.	440	blank
Dinoseb	mg/l	< 0.00005	0.00384	0.00500	77	27. - 129.	440	blank
MCPA	mg/l	< 0.00410	0.214	0.500	43	26. - 139.	440	blank
MCPP	mg/l	< 0.00700	0.539	0.500	108	24. - 164.	440	blank
Pentachlorophenol	mg/l	< 0.00003	0.00297	0.00500	59	25. - 133.	440	blank
4-Nitrophenol	mg/l	< 0.00005	< 0.00050	0.00500	N/A	21. - 133.	440	blank

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch
PEST/PCB/HERB PARAMETERS						
2,4-D	mg/l	0.00363	0.00408	11.67	34.	440
2,4,5-T	mg/l	0.00341	0.00381	11.08	51.	440
2,4,5-TP	mg/l	0.00431	0.00482	11.17	44.	440
Dalapon	mg/l	0.00018	0.00018	0.00	89.	440
2,4-DB	mg/l	0.00702	0.00659	6.32	33.	440
Dicamba	mg/l	0.00338	0.00369	8.77	48.	440
Dichloroprop	mg/l	0.00403	0.00455	12.12	41.	440
Dinoseb	mg/l	0.00384	0.00416	8.00	50.	440
MCPA	mg/l	0.214	0.309	36.33	50.	440
MCPP	mg/l	0.539	0.596	10.04	45.	440
Pentachlorophenol	mg/l	0.00297	0.00335	12.03	49.	440
4-Nitrophenol	mg/l	< 0.00050	0.00373	152.72#	55.	440

Project QC continued . . .

TestAmerica
ANALYTICAL TESTING CORPORATION
2960 Foster Creighton Drive • Nashville, Tennessee 37204
800-765-0980 • 615-726-3404 Fax

PROJECT QUALITY CONTROL DATA
Project Number: IOG0857
Project Name:

Laboratory Receipt Date: 7/19/05

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery	Target Range	Q.C. Batch
PEST/PCB/HERB PARAMETERS						
2,4-D	mg/l	0.00500	0.00398	80	35 - 141	440
2,4,5-T	mg/l	0.00500	0.00374	75	33 - 136	440
2,4,5-TP	mg/l	0.00500	0.00477	95	33 - 136	440
Dalapon	mg/l	0.00500	0.00025	5 #	10 - 101	440
2,4-DB	mg/l	0.00500	0.00633	127	38 - 143	440
Dicamba	mg/l	0.00500	0.00361	72	23 - 157	440
Dichloroprop	mg/l	0.00500	0.00443	89	50 - 143	440
Dinoseb	mg/l	0.00500	0.00384	77	28 - 127	440
MCPA	mg/l	0.500	0.311	62	26 - 139	440
MCPP	mg/l	0.500	0.525	105	24 - 164	440
Pentachlorophenol	mg/l	0.00500	0.00328	66	33 - 130	440
4-Nitrophenol	mg/l	0.00500	0.00364	73	23 - 125	440
Surr-DCAA	% Rec			102	51 - 136	440

Duplicates

Analyte	units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch	Sample Dup'd

Blank Data

Analyte	Blank Value	Units	Q.C. Batch	Date Analyzed	Time Analyzed

Project QC continued . . .

Del Mar Analytical

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2520 E. Sunset Rd., Suite #3, Las Vegas, NV 89120 Ph (702) 798-3620 Fax (702) 798-3621

423201

SUBCONTRACT ORDER - PROJECT # IOG0857

SENDING LABORATORY:	RECEIVING LABORATORY:
Del Mar Analytical, Irvine 17461 Derian Avenue, Suite 100 11405 Irvine, CA 92614 Phone: (949) 261-1022 Fax: (949) 261-1228 Project Manager: Kathleen A. Robb	Test America, Inc. 2960 Foster Creighton Drive Nashville, TN 37204 Phone :800/765-0980 Fax: 615/726-0954

Standard TAT is requested unless specific due date is requested => Due Date:_____ Initials:_____

Analysis	Expiration	Comments
Sample ID: IOG0857-01 Water	**Sampled: 07/13/05 14:00**	
8151A (Herbicides)	07/20/05 14:00	Needs Arizona Certification 102935

Containers Supplied:
1 L Amber (IOG0857-01Z)

SAMPLE INTEGRITY:

All containers intact: ☒ Yes ☐ No Sample labels/COC agree: ☒ Yes ☐ No Samples Received On Ice:: ☒ Yes ☐ No
Custody Seals Present: ☒ Yes ☐ No Samples Preserved Properly: ☒ Yes ☐ No Samples Received at (temp): 5.0°C

Released By	Date	Time	Received By	Date	Time
	7.18.05	15:30		7/19/05	955
Released By	Date	Time	Received By	Date	Time

TestAmerica
INCORPORATED

Sample NonConformance/COC Revision Form

Initiated by:	JDJacobs	Phone:	9492611022	NC Closed	☑
Client Name:	DEL MAR ANALYT	Sample Range:	102935	Date Closed	7/19/2005
Client Contact:	MICHELE HARPE	SDG:	423201		
Client Account:	11405	Analyst:	71		
Date Created:	7/19/2005	Supervisor:	Paul Buckingham		
NC #:	102935	NC Type:	NC Analytical 1		
Project Name:		Terminal Manager:			
Project Number:	IOG0857				
Project Origin	AZ				
Regulatory :					

Process: HERB List?
Action: Herb List: Long

Corrected By: Kenny Bundy
Closed: ☑ kbundy

Comments:

Comment added by: JDJacobs on 7/19/2005 2:11:02 PM
NC closed with out comments

****

Comment added by: kbundy on 7/19/2005 2:04:51 PM
Long list herbicides.

****

Added Without Comments

TestAmerica
ANALYTICAL TESTING CORPORATION

Nashville Division

COOLER RECEIPT FORM BC# 423201

Client Name : Del Mar Analytical

Cooler Received/Opened On: 7/19/05 Accessioned By: James D. Jacobs

Log-in Personnel Signature

1. Temperature of Cooler when triaged: 5.7 Degrees Celsius
2. Were custody seals on outside of cooler?..... YES...NO...NA
   a. If yes, how many and where: 1 Back
3. Were custody seals on containers?..... NO...YES...NA
4. Were the seals intact, signed, and dated correctly?..... YES...NO...NA
5. Were custody papers inside cooler?..... YES...NO...NA
6. Were custody papers properly filled out (ink, signed, etc)?..... YES...NO...NA
7. Did you sign the custody papers in the appropriate place?..... YES...NO...NA
8. What kind of packing material used? Bubblewrap Peanuts Vermiculite Foam Insert Ziplock baggies Paper Other None
9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None
10. Did all containers arrive in good condition (unbroken)?..... YES...NO...NA
11. Were all container labels complete (#, date, signed, pres., etc)?..... YES...NO...NA
12. Did all container labels and tags agree with custody papers?..... YES...NO...NA
13. Were correct containers used for the analysis requested?..... YES...NO...NA
14. a. Were VOA vials received?..... YES...NO...NA
    b. Was there any observable head space present in any VOA vial?..... NO...YES...NA
15. Was sufficient amount of sample sent in each container?..... YES...NO...NA
16. Were correct preservatives used?..... YES...NO...NA
    If not, record standard ID of preservative used here_____
17. Was residual chlorine present?..... NO...YES...NA
18. Indicate the Airbill Tracking Number (last 4 digits for Fedex only) and Name of Courier below:

    1Z1AE5870198963060

    Fed-Ex UPS Velocity DHL Route Off-street Misc.
19. If a Non-Conformance exists, see attached or comments below:

BIS = Broken in shipment
Cooler Receipt Form

LF-1
End of Form

Revised 4/5/05

Del Mar Analytical

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2520 E. Sunset Rd., Suite #3, Las Vegas, NV 89120 Ph (702) 798-3620 Fax (702) 798-3621

SUBCONTRACT ORDER - PROJECT # IOG0857

SENDING LABORATORY:

Del Mar Analytical, Irvine
17461 Derian Avenue. Suite 100
Irvine, CA 92614
Phone: (949) 261-1022
Fax: (949) 261-1228
Project Manager: Kathleen A. Robb

RECEIVING LABORATORY:

Test America, Inc.
2960 Foster Creighton Drive
Nashville, TN 37204
Phone :800/765-0980
Fax: 615/726-0954

Standard TAT is requested unless specific due date is requested => Due Date:_____ Initials:_____

Analysis	Expiration	Comments
Sample ID: IOG0857-01 Water	**Sampled: 07/13/05 14:00**	
8151A (Herbicides)	07/20/05 14:00	Needs Arizona Certification

Containers Supplied:
1 L Amber (IOG0857-01Z)

SAMPLE INTEGRITY:

All containers intact: ☐ Yes ☐ No Sample labels/COC agree: ☐ Yes ☐ No Samples Received On Ice:: ☐ Yes ☐ No
Custody Seals Present: ☐ Yes ☐ No Samples Preserved Properly: ☐ Yes ☐ No Samples Received at (temp): _____

Released By	Date	Time	Received By	Date	Time
Released By	Date	Time	Received By	Date	Time

Del Mar Analytical

17461 Derian Ave., Suite 100, Irvine, CA 92614 (949) 261-1022 FAX (949) 260-3297
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2520 E. Sunset Rd. #3, Las Vegas, NV 89120 (702) 798-3620 FAX (702) 798-3621

LABORATORY REPORT

Prepared For: U.S. Filter/Westates Carbon
P.O. Box 3308
Parker, AZ 85344
Attention: Deborah Foster

Project: TTO

Sampled: 07/13/05
Received: 07/14/05
Issued: 07/27/05 17:35

NELAP #01108CA California ELAP#1197 CSDLAC #10117

The results listed within this Laboratory Report pertain only to the samples tested in the laboratory. The analyses contained in this report were performed in accordance with the applicable certifications as noted. All soil samples are reported on a wet weight basis unless otherwise noted in the report. This Laboratory Report is confidential and is intended for the sole use of Del Mar Analytical and its client. This report shall not be reproduced, except in full, without written permission from Del Mar Analytical. The Chain(s) of Custody, 4 pages, are included and are an integral part of this report.
This entire report was reviewed and approved for release.

SAMPLE CROSS REFERENCE

SUBCONTRACTED Refer to the last page for specific subcontract laboratory information included in this report.

LABORATORY ID	CLIENT ID	MATRIX
IOG0857-01	TTO	Water

Reviewed
2,4 D request

Reviewed By:

Del Mar Analytical, Irvine
Kathleen A. Robb
Project Manager

Del Mar Analytical

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U.S. Filter/Westates Carbon
P.O. Box 3308
Parker, AZ 85344
Attention: Deborah Foster

Project ID: TTO

Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

VOLATILE ORGANICS by GC/MS (EPA 5030B/8260B)

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IOG0857-01 (TTO - Water)								
Reporting Units: ug/l								
Acrolein	EPA 8260B	5G16003	50	ND	1	7/16/2005	7/16/2005	
Acrylonitrile	EPA 8260B	5G16003	50	ND	1	7/16/2005	7/16/2005	
2-Chloroethyl vinyl ether	EPA 8260B	5G16003	5.0	ND	1	7/16/2005	7/16/2005	
Surrogate: Dibromofluoromethane (80-120%)				*99 %*				
Surrogate: Toluene-d8 (80-120%)				*102 %*				
Surrogate: 4-Bromofluorobenzene (80-120%)				*96 %*				

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VOLATILE ORGANICS by GC/MS (EPA 5035/8260B)

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IOG0857-01 (TTO - Water) - cont.								
Reporting Units: ug/l								
Benzene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Bromobenzene	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
Bromochloromethane	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
Bromodichloromethane	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Bromoform	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
Bromomethane	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
n-Butylbenzene	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
sec-Butylbenzene	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
tert-Butylbenzene	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
Carbon Disulfide	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
Carbon tetrachloride	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
Chlorobenzene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Chloroethane	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
Chloroform	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Chloromethane	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
2-Chlorotoluene	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
4-Chlorotoluene	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
Dibromochloromethane	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,2-Dibromo-3-chloropropane	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
1,2-Dibromoethane (EDB)	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Dibromomethane	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,2-Dichlorobenzene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,3-Dichlorobenzene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,4-Dichlorobenzene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Dichlorodifluoromethane	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
1,1-Dichloroethane	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,2-Dichloroethane	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,1-Dichloroethene	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
cis-1,2-Dichloroethene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
trans-1,2-Dichloroethene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,2-Dichloropropane	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,3-Dichloropropane	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
2,2-Dichloropropane	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,1-Dichloropropene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
cis-1,3-Dichloropropene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
trans-1,3-Dichloropropene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Ethylbenzene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Hexachlorobutadiene	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
Isopropylbenzene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
p-Isopropyltoluene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Methylene chloride	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	

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Project ID: TTO

Report Number: IOG0857

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Received: 07/14/05

VOLATILE ORGANICS by GC/MS (EPA 5035/8260B)

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IOG0857-01 (TTO - Water) - cont.								
Reporting Units: ug/l								
Naphthalene	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
n-Propylbenzene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Styrene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,1,1,2-Tetrachloroethane	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
1,1,2,2-Tetrachloroethane	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Tetrachloroethene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Toluene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,2,3-Trichlorobenzene	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
1,2,4-Trichlorobenzene	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
1,1,1-Trichloroethane	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,1,2-Trichloroethane	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Trichloroethene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Trichlorofluoromethane	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
1,2,3-Trichloropropane	EPA 8260B	5G21019	10	ND	1	7/21/2005	7/21/2005	
1,2,4-Trimethylbenzene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
1,3,5-Trimethylbenzene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Vinyl acetate	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
Vinyl chloride	EPA 8260B	5G21019	5.0	ND	1	7/21/2005	7/21/2005	
o-Xylene	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
m,p-Xylenes	EPA 8260B	5G21019	2.0	ND	1	7/21/2005	7/21/2005	
Surrogate: Dibromofluoromethane (80-120%)				*99 %*				
Surrogate: Toluene-d8 (80-120%)				*104 %*				
Surrogate: 4-Bromofluorobenzene (80-120%)				*95 %*				

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SEMI-VOLATILE ORGANICS BY GC/MS (EPA 3520C/8270C)

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IOG0857-01 (TTO - Water)								
Reporting Units: ug/l								
Acenaphthene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Acenaphthylene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Aniline	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Anthracene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Benzidine	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	L
Benzoic acid	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
Benzo(a)anthracene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Benzo(b)fluoranthene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Benzo(k)fluoranthene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Benzo(g,h,i)perylene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Benzo(a)pyrene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Benzyl alcohol	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
Bis(2-chloroethoxy)methane	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Bis(2-chloroethyl)ether	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Bis(2-chloroisopropyl)ether	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Bis(2-ethylhexyl)phthalate	EPA 8270C	5G17017	50	ND	1	7/17/2005	7/20/2005	
4-Bromophenyl phenyl ether	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Butyl benzyl phthalate	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
4-Chloroaniline	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
2-Chloronaphthalene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
4-Chloro-3-methylphenol	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
2-Chlorophenol	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
4-Chlorophenyl phenyl ether	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Chrysene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Dibenz(a,h)anthracene	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
Dibenzofuran	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Di-n-butyl phthalate	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
1,3-Dichlorobenzene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
1,4-Dichlorobenzene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
1,2-Dichlorobenzene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
3,3-Dichlorobenzidine	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
2,4-Dichlorophenol	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Diethyl phthalate	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
2,4-Dimethylphenol	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
Dimethyl phthalate	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
4,6-Dinitro-2-methylphenol	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
2,4-Dinitrophenol	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
2,4-Dinitrotoluene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
2,6-Dinitrotoluene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Di-n-octyl phthalate	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
Fluoranthene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	

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SEMI-VOLATILE ORGANICS BY GC/MS (EPA 3520C/8270C)

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IOG0857-01 (TTO - Water) - cont.								
Reporting Units: ug/l								
Fluorene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Hexachlorobenzene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Hexachlorobutadiene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Hexachlorocyclopentadiene	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
Hexachloroethane	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Indeno(1,2,3-cd)pyrene	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
Isophorone	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
2-Methylnaphthalene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
2-Methylphenol	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
4-Methylphenol	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Naphthalene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
2-Nitroaniline	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
3-Nitroaniline	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
4-Nitroaniline	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
Nitrobenzene	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
2-Nitrophenol	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
4-Nitrophenol	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
N-Nitrosodiphenylamine	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
N-Nitroso-di-n-propylamine	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Pentachlorophenol	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
Phenanthrene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Phenol	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
Pyrene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
1,2,4-Trichlorobenzene	EPA 8270C	5G17017	10	ND	1	7/17/2005	7/20/2005	
2,4,5-Trichlorophenol	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
2,4,6-Trichlorophenol	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
N-Nitrosodimethylamine	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	C
1,2-Diphenylhydrazine/Azobenzene	EPA 8270C	5G17017	20	ND	1	7/17/2005	7/20/2005	
Surrogate: 2-Fluorophenol (30-120%)				*60 %*				
Surrogate: Phenol-d6 (35-120%)				*70 %*				
Surrogate: 2,4,6-Tribromophenol (45-120%)				*84 %*				
Surrogate: Nitrobenzene-d5 (45-120%)				*71 %*				
Surrogate: 2-Fluorobiphenyl (45-120%)				*75 %*				
Surrogate: Terphenyl-d14 (45-120%)				*80 %*				

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ORGANOCHLORINE PESTICIDES (EPA 3510C/8081A)

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IOG0857-01 (TTO - Water)								
Reporting Units: ug/l								
Aldrin	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
alpha-BHC	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
beta-BHC	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
delta-BHC	EPA 3510C/8081A	5G20057	0.20	ND	0.971	7/20/2005	7/20/2005	
gamma-BHC (Lindane)	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
Chlordane	EPA 3510C/8081A	5G20057	1.0	ND	0.971	7/20/2005	7/20/2005	
4,4'-DDD	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
4,4'-DDE	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
4,4'-DDT	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
Dieldrin	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
Endosulfan I	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
Endosulfan II	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
Endosulfan sulfate	EPA 3510C/8081A	5G20057	0.20	ND	0.971	7/20/2005	7/20/2005	
Endrin	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
Endrin aldehyde	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
Endrin ketone	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
Heptachlor	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
Heptachlor epoxide	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
Methoxychlor	EPA 3510C/8081A	5G20057	0.10	ND	0.971	7/20/2005	7/20/2005	
Toxaphene	EPA 3510C/8081A	5G20057	5.0	ND	0.971	7/20/2005	7/20/2005	
Surrogate: Tetrachloro-m-xylene (35-115%)				*56 %*				
Surrogate: Decachlorobiphenyl (45-120%)				*73 %*				

Del Mar Analytical, Irvine
Kathleen A. Robb
Project Manager

Del Mar Analytical

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U.S. Filter/Westates Carbon
P.O. Box 3308
Parker, AZ 85344
Attention: Deborah Foster

Project ID: TTO

Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

POLYCHLORINATED BIPHENYLS (EPA 3510C/8082)

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IOG0857-01 (TTO - Water)								
Reporting Units: ug/l								
Aroclor 1016	EPA 3510/8082	5G20057	1.0	ND	0.971	7/20/2005	7/22/2005	
Aroclor 1221	EPA 3510/8082	5G20057	1.0	ND	0.971	7/20/2005	7/22/2005	
Aroclor 1232	EPA 3510/8082	5G20057	1.0	ND	0.971	7/20/2005	7/22/2005	
Aroclor 1242	EPA 3510/8082	5G20057	1.0	ND	0.971	7/20/2005	7/22/2005	
Aroclor 1248	EPA 3510/8082	5G20057	1.0	ND	0.971	7/20/2005	7/22/2005	
Aroclor 1254	EPA 3510/8082	5G20057	1.0	ND	0.971	7/20/2005	7/22/2005	
Aroclor 1260	EPA 3510/8082	5G20057	1.0	ND	0.971	7/20/2005	7/22/2005	
Surrogate: Decachlorobiphenyl (45-120%)				*88 %*				

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Project Manager

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U.S. Filter/Westates Carbon
P.O. Box 3308
Parker, AZ 85344
Attention: Deborah Foster

Project ID: TTO
Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

METALS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IOG0857-01 (TTO - Water)								
Reporting Units: mg/l								
Aluminum	EPA 6010B	5G19086	0.050	**0.082**	1	7/19/2005	7/20/2005	
Antimony	EPA 6010B	5G18097	0.010	ND	1	7/18/2005	7/20/2005	
Arsenic	EPA 6010B	5G18097	0.0050	**0.0052**	1	7/18/2005	7/20/2005	
Barium	EPA 6010B	5G18097	0.010	**0.075**	1	7/18/2005	7/20/2005	
Boron	EPA 6010B	5G19086	0.050	**0.64**	1	7/19/2005	7/20/2005	
Chromium	EPA 6010B	5G18097	0.0050	ND	1	7/18/2005	7/20/2005	
Cobalt	EPA 6010B	5G18097	0.010	ND	1	7/18/2005	7/20/2005	
Copper	EPA 6010B	5G18097	0.010	ND	1	7/18/2005	7/20/2005	
Iron	EPA 6010B	5G19086	0.040	ND	1	7/19/2005	7/20/2005	
Magnesium	EPA 6010B	5G19086	0.020	**29**	1	7/19/2005	7/20/2005	
Manganese	EPA 6010B	5G19086	0.020	ND	1	7/19/2005	7/20/2005	
Mercury	EPA 7470A	5G19037	0.00020	ND	1	7/19/2005	7/19/2005	
Molybdenum	EPA 6010B	5G18097	0.020	ND	1	7/18/2005	7/20/2005	
Silver	EPA 6010B	5G18097	0.0070	ND	1	7/18/2005	7/20/2005	
Strontium	EPA 6010B	5G19086	0.020	**1.7**	1	7/19/2005	7/20/2005	
Thallium	EPA 6010B	5G18097	0.010	ND	1	7/18/2005	7/20/2005	
Tin	EPA 6010B	5G19086	0.10	ND	1	7/19/2005	7/20/2005	
Titanium	EPA 6010B	5G19086	0.0050	ND	1	7/19/2005	7/20/2005	
Vanadium	EPA 6010B	5G18097	0.010	ND	1	7/18/2005	7/20/2005	
Zinc	EPA 6010B	5G18097	0.020	ND	1	7/18/2005	7/20/2005	
Zirconium	EPA 6010B	5G25067	0.20	ND	1	7/25/2005	7/25/2005	

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U.S. Filter/Westates Carbon
P.O. Box 3308
Parker, AZ 85344
Attention: Deborah Foster

Project ID: TTO

Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

INORGANICS

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IOG0857-01 (TTO - Water)								
Reporting Units: Color Units								
Color	SM2120B	5G14089	1.0	ND	1	7/14/2005	7/14/2005	pH
Sample ID: IOG0857-01 (TTO - Water)								
Reporting Units: mg/l								
Total Kjeldahl Nitrogen	SM4500-NORG,C	5G19066	0.50	**0.84**	1	7/19/2005	7/19/2005	
Ammonia-N	EPA 350.3	5G22113	0.50	ND	1	7/22/2005	7/22/2005	
Bromide	EPA 300.0	5G14039	0.50	**1.1**	1	7/14/2005	7/14/2005	
Total Cyanide	SM4500-CN-C,E	5G15075	0.025	ND	1	7/15/2005	7/18/2005	
Fluoride	EPA 300.0	5G14039	0.50	**1.8**	1	7/14/2005	7/14/2005	
Nitrate-N	EPA 300.0	5G14039	0.15	**2.7**	1	7/14/2005	7/14/2005	
Nitrite-N	EPA 300.0	5G14039	1.5	ND	10	7/14/2005	7/14/2005	RL-3
Oil & Grease	EPA 413.1	5G20078	5.0	ND	1	7/20/2005	7/20/2005	
Phenols	EPA 420.1	5G22080	0.10	ND	1	7/22/2005	7/22/2005	
Phosphorus	EPA 365.3	5G14075	0.050	**0.15**	1	7/14/2005	7/14/2005	
Residual Chlorine	EPA 330.5	5G14094	0.10	ND	1	7/14/2005	7/14/2005	
Sulfate	EPA 300.0	5G14039	5.0	**480**	10	7/14/2005	7/14/2005	
Sulfide	EPA 376.2	5G15045	0.10	ND	1	7/15/2005	7/15/2005	
Surfactants (MBAS)	SM5540-C	5G14118	0.10	ND	1	7/14/2005	7/14/2005	

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U.S. Filter/Westates Carbon
P.O. Box 3308
Parker, AZ 85344
Attention: Deborah Foster

Project ID: TTO
Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

NITROGEN, ORGANIC (Calculation)

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IOG0857-01 (TTO - Water)								
Reporting Units: mg/l								
Organic Nitrogen - N	Calculation	5G25044	0.50	0.84	1	7/25/2005	7/25/2005	

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U.S. Filter/Westates Carbon
P.O. Box 3308
Parker, AZ 85344
Attention: Deborah Foster

Project ID: TTO
Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

DIQUAT/PARAQUAT (EPA 549.2)

Analyte	Method	Batch	Reporting Limit	Sample Result	Dilution Factor	Date Extracted	Date Analyzed	Data Qualifiers
Sample ID: IOG0857-01 (TTO - Water)								
Reporting Units: ug/l								
Diquat	EPA 549.2	C5G1809	4.0	ND	1	7/18/2005	7/18/2005	
Paraquat	EPA 549.2	C5G1809	20	ND	1	7/18/2005	7/18/2005	

Del Mar Analytical, Irvine
Kathleen A. Robb
Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION
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ANALYTICAL REPORT

DEL MAR ANALYTICAL, IRVINE 11405
MICHELE HARPER
17461 DERIAN, STE 100
IRVINE, CA 92614

Lab Number: 05-A102935
Sample ID: IOG0857-01
Sample Type: Ground water
Site ID:

Project: IOG0857
Project Name:
Sampler:

Date Collected: 7/13/05
Time Collected: 14:00
Date Received: 7/19/05
Time Received: 9:55

Analyte	Result	Units	Report Limit	Dil Factor	Analysis Date	Analysis Time	Analyst	Method	Batch
PESTICIDES/PCB's/HERBICIDES									
2,4-D	0.00818	mg/l	0.00500	1	7/20/05	19:04	K. Burritt	8151A	440
2,4,5-T	ND	mg/l	0.00050	1	7/20/05	19:04	K. Burritt	8151A	440
2,4,5-TP	ND	mg/l	0.00050	1	7/20/05	19:04	K. Burritt	8151A	440
Dalapon	ND	mg/l	0.0200	1	7/20/05	19:04	K. Burritt	8151A	440
2,4-DB	ND	mg/l	0.00500	1	7/20/05	19:04	K. Burritt	8151A	440
Dicamba	ND	mg/l	0.00050	1	7/20/05	19:04	K. Burritt	8151A	440
Dichloroprop	ND	mg/l	0.00500	1	7/20/05	19:04	K. Burritt	8151A	440
Dinoseb	ND	mg/l	0.00250	1	7/20/05	19:04	K. Burritt	8151A	440
MCPA	ND	mg/l	0.500	1	7/20/05	19:04	K. Burritt	8151A	440
MCPP	ND	mg/l	0.500	1	7/20/05	19:04	K. Burritt	8151A	440
Pentachlorophenol	ND	mg/l	0.00050	1	7/20/05	19:04	K. Burritt	8151A	440
4-Nitrophenol	ND	mg/l	0.00050	1	7/20/05	19:04	K. Burritt	8151A	440

Sample Extraction Data

Parameter	Wt/Vol Extracted	Extract Vol	Date	Time	Analyst	Method
Herbicides	1000 ml	10.0 ml	7/19/05		J. Davis	8151/615

Surrogate	% Recovery	Target Range
surr-DCAA	92.	51. - 136.

Sample report continued . . .

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ANALYTICAL REPORT

Laboratory Number: 05-A102935
Sample ID: IOG0857-01

LABORATORY COMMENTS:
ND = Not detected at the report limit.
B = Analyte was detected in the method blank.
J = Estimated Value below Report Limit.
E = Estimated Value above the calibration limit of the instrument.
# = Recovery outside Laboratory historical or method prescribed limits.

End of Sample Report.

Del Mar Analytical

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July 27, 2005

U.S. Filter/ Westates Carbon
P.O. Box 3308
Parker, AZ 85344

Attention: Deborah Foster

Project: Semi-Annual
TTO
Sampled: 07/13/05
Del Mar Analytical Number: IOG0857

Dear Ms. Foster:

Test America Analytical Testing Corporation performed the 8151A Herbicides analysis for the referenced project above. Please use the following cross-reference table when reviewing your results.

U.S. Filter ID	Del Mar ID	Test America ID
TTO	IOG0857-01	05-A102935

Attached is the original report from the subcontract laboratory. If you have any questions or require further assistance, please contact me at (949) 261-1022, extension 218.

Sincerely yours,
DEL MAR ANALYTICAL

Kathleen A. Robb
Project Manager

Enclosure

TestAmerica
ANALYTICAL TESTING CORPORATION
2960 Foster Creighton Drive • Nashville, Tennessee 37204
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PROJECT QUALITY CONTROL DATA
Project Number: IOG0857
Project Name:

Laboratory Receipt Date: 7/19/05

Matrix Spike Recovery

Note: If Blank is referenced as the sample spiked, insufficient volume was received for the defined analytical batch for MS/MSD analysis on an true sample matrix. Laboratory reagent water was used for QC purposes.

Analyte	units	Orig. Val.	MS Val	Spike Conc	Recovery	Target Range	Q.C. Batch	Spike Sample
PEST/PCB/HERB PARAMETERS								
2,4-D	mg/l	< 0.00006	0.00363	0.00500	73	35. - 141.	440	blank
2,4,5-T	mg/l	< 0.00003	0.00341	0.00500	68	25. - 149.	440	blank
2,4,5-TP	mg/l	< 0.00003	0.00431	0.00500	86	31. - 137.	440	blank
Dalapon	mg/l	< 0.00002	0.00018	0.00500	4#	10. - 101.	440	blank
2,4-DB	mg/l	< 0.00009	0.00702	0.00500	140	34. - 153.	440	blank
Dicamba	mg/l	< 0.00006	0.00338	0.00500	68	23. - 157.	440	blank
Dichloroprop	mg/l	< 0.00006	0.00403	0.00500	81	45. - 152.	440	blank
Dinoseb	mg/l	< 0.00005	0.00384	0.00500	77	27. - 129.	440	blank
MCPA	mg/l	< 0.00410	0.214	0.500	43	26. - 139.	440	blank
MCPP	mg/l	< 0.00700	0.539	0.500	108	24. - 164.	440	blank
Pentachlorophenol	mg/l	< 0.00003	0.00297	0.00500	59	25. - 133.	440	blank
4-Nitrophenol	mg/l	< 0.00005	< 0.00050	0.00500	N/A	21. - 133.	440	blank

Matrix Spike Duplicate

Analyte	units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch
PEST/PCB/HERB PARAMETERS						
2,4-D	mg/l	0.00363	0.00408	11.67	34.	440
2,4,5-T	mg/l	0.00341	0.00381	11.08	51.	440
2,4,5-TP	mg/l	0.00431	0.00482	11.17	44.	440
Dalapon	mg/l	0.00018	0.00018	0.00	89.	440
2,4-DB	mg/l	0.00702	0.00659	6.32	33.	440
Dicamba	mg/l	0.00338	0.00369	8.77	48.	440
Dichloroprop	mg/l	0.00403	0.00455	12.12	41.	440
Dinoseb	mg/l	0.00384	0.00416	8.00	50.	440
MCPA	mg/l	0.214	0.309	36.33	50.	440
MCPP	mg/l	0.539	0.596	10.04	45.	440
Pentachlorophenol	mg/l	0.00297	0.00335	12.03	49.	440
4-Nitrophenol	mg/l	< 0.00050	0.00373	152.72#	55.	440

Project QC continued . . .

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PROJECT QUALITY CONTROL DATA
Project Number: IOG0857
Project Name:

Laboratory Receipt Date: 7/19/05

Laboratory Control Data

Analyte	units	Known Val.	Analyzed Val	% Recovery	Target Range	Q.C. Batch
PEST/PCB/HERB PARAMETERS						
2,4-D	mg/l	0.00500	0.00398	80	35 - 141	440
2,4,5-T	mg/l	0.00500	0.00374	75	33 - 136	440
2,4,5-TP	mg/l	0.00500	0.00477	95	33 - 136	440
Dalapon	mg/l	0.00500	0.00025	5 #	10 - 101	440
2,4-DB	mg/l	0.00500	0.00633	127	38 - 143	440
Dicamba	mg/l	0.00500	0.00361	72	23 - 157	440
Dichloroprop	mg/l	0.00500	0.00443	89	50 - 143	440
Dinoseb	mg/l	0.00500	0.00384	77	28 - 127	440
MCPA	mg/l	0.500	0.311	62	26 - 139	440
MCPP	mg/l	0.500	0.525	105	24 - 164	440
Pentachlorophenol	mg/l	0.00500	0.00328	66	33 - 130	440
4-Nitrophenol	mg/l	0.00500	0.00364	73	23 - 125	440
surr-DCAA	% Rec			102	51 - 136	440

Duplicates

Analyte	units	Orig. Val.	Duplicate	RPD	Limit	Q.C. Batch	Sample Dup'd

Blank Data

Analyte	Blank Value	Units	Q.C. Batch	Date Analyzed	Time Analyzed

Project QC continued . . .

TestAmerica
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PROJECT QUALITY CONTROL DATA
Project Number: IOG0857
Project Name:
Page: 3
Laboratory Receipt Date: 7/19/05

PEST/PCB/HERB PARAMETERS					
2,4-D	< 0.00006	mg/l	440	7/20/05	18:01
2,4,5-T	< 0.00003	mg/l	440	7/20/05	18:01
2,4,5-TP	< 0.00003	mg/l	440	7/20/05	18:01
Dalapon	< 0.00002	mg/l	440	7/20/05	18:01
2,4-DB	< 0.00009	mg/l	440	7/20/05	18:01
Dicamba	< 0.00006	mg/l	440	7/20/05	18:01
Dichloroprop	< 0.00006	mg/l	440	7/20/05	18:01
Dinoseb	< 0.00005	mg/l	440	7/20/05	18:01
MCPA	< 0.00410	mg/l	440	7/20/05	18:01
MCPP	< 0.00700	mg/l	440	7/20/05	18:01
Pentachlorophenol	< 0.00003	mg/l	440	7/20/05	18:01
4-Nitrophenol	< 0.00005	mg/l	440	7/20/05	18:01
surr-DCAA	80.	% Rec	440	7/20/05	18:01

= Value outside Laboratory historical or method prescribed QC limits.

End of Report for Project 423201

TestAmerica
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7/22/05

DEL MAR ANALYTICAL, IRVINE 11405
MICHELE HARPER
17461 DERIAN, STE 100
IRVINE, CA 92614

This report includes the analytical certificates of analysis for all samples listed below. These samples relate to your project identified below:

Project Name:
Project Number: IOG0857.
Laboratory Project Number: 423201.

An executed copy of the chain of custody, the project quality control data, and the sample receipt form are also included as an addendum to this report. Any QC recoveries outside laboratory control limits are flagged individually with an #. Sample specific comments and quality control statements are included in the Laboratory notes section of the analytical report for each sample report. If you have any questions relating to this analytical report, please contact your Laboratory Project Manager at 1-800-765-0980. Any opinions, if expressed, are outside the scope of the Laboratory's accreditation.

Sample Identification	Lab Number	Collection Date
IOG0857-01	05-A102935	7/13/05

TestAmerica
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Sample Identification	Lab Number	Collection Date

These results relate only to the items tested.
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Report Approved By: Gail A Lage Report Date: 7/22/05

Johnny A. Mitchell, Laboratory Director
Michael H. Dunn, M.S., Technical Director
Pamela A. Langford, Senior Project Manager
Eric S. Smith, QA/QC Director
Sandra McMillin, Technical Services
Gail A. Lage, Senior Project Manager
Glenn L. Norton, Technical Services
Kelly S. Comstock, Technical Services
Roxanne L. Connor, Senior Project Manag
Mark Hollingsworth, Director of Project

Laboratory Certification Number: AZ0473

Del Mar Analytical

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2520 E. Sunset Rd., Suite #3, Las Vegas, NV 89120 Ph (702) 798-3620 Fax (702) 798-3621

SUBCONTRACT ORDER - PROJECT # IOG0857

SENDING LABORATORY:

Del Mar Analytical, Irvine
17461 Derian Avenue. Suite 100
Irvine, CA 92614
Phone: (949) 261-1022
Fax: (949) 261-1228
Project Manager: Kathleen A. Robb

RECEIVING LABORATORY:

Test America, Inc.
2960 Foster Creighton Drive
Nashville, TN 37204
Phone :800/765-0980
Fax: 615/726-0954

Standard TAT is requested unless specific due date is requested => Due Date:_____ Initials:_____

Analysis	Expiration	Comments
Sample ID: IOG0857-01 Water	**Sampled: 07/13/05 14:00**	
8151A (Herbicides)	07/20/05 14:00	Needs Arizona Certification

Containers Supplied:
1 L Amber (IOG0857-01Z)

Scanned + emailed to Mary @ NCA to forward to T.A. Nashville

SAMPLE INTEGRITY:

All containers intact: ☐ Yes ☐ No Sample labels/COC agree: ☐ Yes ☐ No Samples Received On Ice:: ☐ Yes ☐ No
Custody Seals Present: ☐ Yes ☐ No Samples Preserved Properly: ☐ Yes ☐ No Samples Received at (temp): _____

Released By	Date	Time	Received By	Date	Time
Released By	Date	Time	Received By	Date	Time

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Standard TAT is requested unless specific due date is requested => Due Date:_____ Initials:_____

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Sample ID: IOG0857-01 Water	**Sampled: 07/13/05 14:00**	
8151A (Herbicides)	07/20/05 14:00	Needs Arizona Certification

Containers Supplied:
1 L Amber (IOG0857-01Z)

SAMPLE INTEGRITY:

All containers intact: ☐ Yes ☐ No Sample labels/COC agree: ☐ Yes ☐ No Samples Received On Ice:: ☐ Yes ☐ No
Custody Seals Present: ☐ Yes ☐ No Samples Preserved Properly: ☐ Yes ☐ No Samples Received at (temp): _____

Released By	Date	Time	Received By	Date	Time
Released By	Date	Time	Received By	Date	Time

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U.S. Filter/Westates Carbon
P.O. Box 3308
Parker, AZ 85344
Attention: Deborah Foster

Project ID: TTO

Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

SHORT HOLD TIME DETAIL REPORT

	Hold Time (in days)	Date/Time Sampled	Date/Time Received	Date/Time Extracted	Date/Time Analyzed
Sample ID: TTO (IOG0857-01) - Water					
EPA 300.0	2	07/13/2005 14:00	07/14/2005 10:10	07/14/2005 16:00	07/14/2005 16:09
Nitrite-N				07/14/2005 16:00	07/14/2005 17:10
EPA 330.5	1	07/13/2005 14:00	07/14/2005 10:10	07/14/2005 16:08	07/14/2005 16:08
SM2120B	2	07/13/2005 14:00	07/14/2005 10:10	07/14/2005 14:00	07/14/2005 15:00
SM5540-C	2	07/13/2005 14:00	07/14/2005 10:10	07/14/2005 23:00	07/14/2005 23:35

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Kathleen A. Robb
Project Manager

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U.S. Filter/Westates Carbon
P.O. Box 3308
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Attention: Deborah Foster

Project ID: TTO
Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

METHOD BLANK/QC DATA

VOLATILE ORGANICS by GC/MS (EPA 5030B/8260B)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G16003 Extracted: 07/16/05										
Blank Analyzed: 07/16/2005 (5G16003-BLK1)										
Acrolein	ND	50	ug/l							
Acrylonitrile	ND	50	ug/l							
2-Chloroethyl vinyl ether	ND	5.0	ug/l							
Surrogate: Dibromofluoromethane	*23.9*		*ug/l*	*25.0*		*96*	*80-120*			
Surrogate: Toluene-d8	*25.4*		*ug/l*	*25.0*		*102*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*24.2*		*ug/l*	*25.0*		*97*	*80-120*			
LCS Analyzed: 07/16/2005 (5G16003-BS1)										
2-Chloroethyl vinyl ether	29.4	5.0	ug/l	25.0		118	25-170			
Surrogate: Dibromofluoromethane	*24.5*		*ug/l*	*25.0*		*98*	*80-120*			
Surrogate: Toluene-d8	*25.4*		*ug/l*	*25.0*		*102*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*24.8*		*ug/l*	*25.0*		*99*	*80-120*			
Matrix Spike Analyzed: 07/16/2005 (5G16003-MS1)					**Source: IOG0808-01**					
2-Chloroethyl vinyl ether	27.1	5.0	ug/l	25.0	ND	108	25-170			
Surrogate: Dibromofluoromethane	*24.7*		*ug/l*	*25.0*		*99*	*80-120*			
Surrogate: Toluene-d8	*25.4*		*ug/l*	*25.0*		*102*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*24.7*		*ug/l*	*25.0*		*99*	*80-120*			
Matrix Spike Dup Analyzed: 07/16/2005 (5G16003-MSD1)					**Source: IOG0808-01**					
2-Chloroethyl vinyl ether	28.2	5.0	ug/l	25.0	ND	113	25-170	4	25	
Surrogate: Dibromofluoromethane	*25.3*		*ug/l*	*25.0*		*101*	*80-120*			
Surrogate: Toluene-d8	*25.8*		*ug/l*	*25.0*		*103*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*24.4*		*ug/l*	*25.0*		*98*	*80-120*			

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U.S. Filter/Westates Carbon
P.O. Box 3308
Parker, AZ 85344
Attention: Deborah Foster

Project ID: TTO
Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

METHOD BLANK/QC DATA

VOLATILE ORGANICS by GC/MS (EPA 5035/8260B)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G21019 Extracted: 07/21/05										
Blank Analyzed: 07/21/2005 (5G21019-BLK1)										
Benzene	ND	2.0	ug/l							
Bromobenzene	ND	5.0	ug/l							
Bromochloromethane	ND	5.0	ug/l							
Bromodichloromethane	ND	2.0	ug/l							
Bromoform	ND	5.0	ug/l							
Bromomethane	ND	5.0	ug/l							
n-Butylbenzene	ND	5.0	ug/l							
sec-Butylbenzene	ND	5.0	ug/l							
tert-Butylbenzene	ND	5.0	ug/l							
Carbon Disulfide	ND	5.0	ug/l							
Carbon tetrachloride	ND	5.0	ug/l							
Chlorobenzene	ND	2.0	ug/l							
Chloroethane	ND	5.0	ug/l							
Chloroform	ND	2.0	ug/l							
Chloromethane	ND	5.0	ug/l							
2-Chlorotoluene	ND	5.0	ug/l							
4-Chlorotoluene	ND	5.0	ug/l							
Dibromochloromethane	ND	2.0	ug/l							
1,2-Dibromo-3-chloropropane	ND	5.0	ug/l							
1,2-Dibromoethane (EDB)	ND	2.0	ug/l							
Dibromomethane	ND	2.0	ug/l							
1,2-Dichlorobenzene	ND	2.0	ug/l							
1,3-Dichlorobenzene	ND	2.0	ug/l							
1,4-Dichlorobenzene	ND	2.0	ug/l							
Dichlorodifluoromethane	ND	5.0	ug/l							
1,1-Dichloroethane	ND	2.0	ug/l							
1,2-Dichloroethane	ND	2.0	ug/l							
1,1-Dichloroethene	ND	5.0	ug/l							
cis-1,2-Dichloroethene	ND	2.0	ug/l							
trans-1,2-Dichloroethene	ND	2.0	ug/l							
1,2-Dichloropropane	ND	2.0	ug/l							
1,3-Dichloropropane	ND	2.0	ug/l							
2,2-Dichloropropane	ND	2.0	ug/l							
1,1-Dichloropropene	ND	2.0	ug/l							
cis-1,3-Dichloropropene	ND	2.0	ug/l							

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METHOD BLANK/QC DATA

VOLATILE ORGANICS by GC/MS (EPA 5035/8260B)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G21019 Extracted: 07/21/05										
Blank Analyzed: 07/21/2005 (5G21019-BLK1)										
trans-1,3-Dichloropropene	ND	2.0	ug/l							
Ethylbenzene	ND	2.0	ug/l							
Hexachlorobutadiene	ND	5.0	ug/l							
Isopropylbenzene	ND	2.0	ug/l							
p-Isopropyltoluene	ND	2.0	ug/l							
Methylene chloride	ND	5.0	ug/l							
Naphthalene	ND	5.0	ug/l							
n-Propylbenzene	ND	2.0	ug/l							
Styrene	ND	2.0	ug/l							
1,1,1,2-Tetrachloroethane	ND	5.0	ug/l							
1,1,2,2-Tetrachloroethane	ND	2.0	ug/l							
Tetrachloroethene	ND	2.0	ug/l							
Toluene	ND	2.0	ug/l							
1,2,3-Trichlorobenzene	ND	5.0	ug/l							
1,2,4-Trichlorobenzene	ND	5.0	ug/l							
1,1,1-Trichloroethane	ND	2.0	ug/l							
1,1,2-Trichloroethane	ND	2.0	ug/l							
Trichloroethene	ND	2.0	ug/l							
Trichlorofluoromethane	ND	5.0	ug/l							
1,2,3-Trichloropropane	ND	10	ug/l							
1,2,4-Trimethylbenzene	ND	2.0	ug/l							
1,3,5-Trimethylbenzene	ND	2.0	ug/l							
Vinyl acetate	ND	5.0	ug/l							
Vinyl chloride	ND	5.0	ug/l							
o-Xylene	ND	2.0	ug/l							
m,p-Xylenes	ND	2.0	ug/l							
Surrogate: Dibromofluoromethane	*24.8*		*ug/l*	*25.0*		*99*	*80-120*			
Surrogate: Toluene-d8	*25.4*		*ug/l*	*25.0*		*102*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*23.7*		*ug/l*	*25.0*		*95*	*80-120*			

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METHOD BLANK/QC DATA

VOLATILE ORGANICS by GC/MS (EPA 5035/8260B)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G21019 Extracted: 07/21/05										
LCS Analyzed: 07/21/2005 (5G21019-BS1)										
Benzene	20.3	2.0	ug/l	25.0		81	65-120			
Bromobenzene	21.5	5.0	ug/l	25.0		86	70-120			
Bromochloromethane	22.5	5.0	ug/l	25.0		90	65-130			
Bromodichloromethane	20.0	2.0	ug/l	25.0		80	65-135			
Bromoform	19.3	5.0	ug/l	25.0		77	50-130			
Bromomethane	19.4	5.0	ug/l	25.0		78	60-140			
n-Butylbenzene	20.9	5.0	ug/l	25.0		84	70-125			
sec-Butylbenzene	20.0	5.0	ug/l	25.0		80	70-125			
tert-Butylbenzene	20.8	5.0	ug/l	25.0		83	70-125			
Carbon Disulfide	20.9	5.0	ug/l	25.0		84	50-130			
Carbon tetrachloride	19.9	5.0	ug/l	25.0		80	65-140			
Chlorobenzene	20.5	2.0	ug/l	25.0		82	70-125			
Chloroethane	19.5	5.0	ug/l	25.0		78	55-140			
Chloroform	20.9	2.0	ug/l	25.0		84	65-130			
Chloromethane	16.6	5.0	ug/l	25.0		66	40-140			
2-Chlorotoluene	20.9	5.0	ug/l	25.0		84	70-125			
4-Chlorotoluene	20.8	5.0	ug/l	25.0		83	70-125			
Dibromochloromethane	21.4	2.0	ug/l	25.0		86	65-140			
1,2-Dibromo-3-chloropropane	20.2	5.0	ug/l	25.0		81	45-135			
1,2-Dibromoethane (EDB)	22.2	2.0	ug/l	25.0		89	70-125			
Dibromomethane	22.2	2.0	ug/l	25.0		89	65-130			
1,2-Dichlorobenzene	20.3	2.0	ug/l	25.0		81	70-120			
1,3-Dichlorobenzene	19.8	2.0	ug/l	25.0		79	70-125			
1,4-Dichlorobenzene	20.1	2.0	ug/l	25.0		80	70-125			
Dichlorodifluoromethane	13.5	5.0	ug/l	25.0		54	25-155			
1,1-Dichloroethane	21.4	2.0	ug/l	25.0		86	65-130			
1,2-Dichloroethane	20.6	2.0	ug/l	25.0		82	60-140			
1,1-Dichloroethene	20.8	5.0	ug/l	25.0		83	70-130			
cis-1,2-Dichloroethene	20.5	2.0	ug/l	25.0		82	65-125			
trans-1,2-Dichloroethene	20.8	2.0	ug/l	25.0		83	65-130			
1,2-Dichloropropane	21.6	2.0	ug/l	25.0		86	65-125			
1,3-Dichloropropane	22.0	2.0	ug/l	25.0		88	65-125			
2,2-Dichloropropane	21.8	2.0	ug/l	25.0		87	60-145			
1,1-Dichloropropene	20.1	2.0	ug/l	25.0		80	70-130			
cis-1,3-Dichloropropene	21.6	2.0	ug/l	25.0		86	70-130			

Del Mar Analytical, Irvine
Kathleen A. Robb
Project Manager

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U.S. Filter/Westates Carbon
P.O. Box 3308
Parker, AZ 85344
Attention: Deborah Foster

Project ID: TTO
Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

METHOD BLANK/QC DATA

VOLATILE ORGANICS by GC/MS (EPA 5035/8260B)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G21019 Extracted: 07/21/05										
LCS Analyzed: 07/21/2005 (5G21019-BS1)										
trans-1,3-Dichloropropene	21.9	2.0	ug/l	25.0		88	65-130			
Ethylbenzene	20.6	2.0	ug/l	25.0		82	70-125			
Hexachlorobutadiene	17.0	5.0	ug/l	25.0		68	60-135			
Isopropylbenzene	22.5	2.0	ug/l	25.0		90	70-125			
p-Isopropyltoluene	19.2	2.0	ug/l	25.0		77	70-125			
Methylene chloride	22.6	5.0	ug/l	25.0		90	60-130			
Naphthalene	20.3	5.0	ug/l	25.0		81	50-140			
n-Propylbenzene	21.9	2.0	ug/l	25.0		88	70-125			
Styrene	22.4	2.0	ug/l	25.0		90	70-130			
1,1,1,2-Tetrachloroethane	21.0	5.0	ug/l	25.0		84	70-135			
1,1,2,2-Tetrachloroethane	25.8	2.0	ug/l	25.0		103	55-130			
Tetrachloroethene	19.4	2.0	ug/l	25.0		78	65-125			
Toluene	21.2	2.0	ug/l	25.0		85	70-125			
1,2,3-Trichlorobenzene	19.5	5.0	ug/l	25.0		78	60-130			
1,2,4-Trichlorobenzene	19.5	5.0	ug/l	25.0		78	65-135			
1,1,1-Trichloroethane	20.0	2.0	ug/l	25.0		80	65-135			
1,1,2-Trichloroethane	22.5	2.0	ug/l	25.0		90	65-125			
Trichloroethene	19.8	2.0	ug/l	25.0		79	70-125			
Trichlorofluoromethane	18.3	5.0	ug/l	25.0		73	60-140			
1,2,3-Trichloropropane	24.5	10	ug/l	25.0		98	55-130			
1,2,4-Trimethylbenzene	19.6	2.0	ug/l	25.0		78	70-125			
1,3,5-Trimethylbenzene	21.0	2.0	ug/l	25.0		84	70-125			
Vinyl acetate	15.6	5.0	ug/l	25.0		62	45-145			
Vinyl chloride	17.6	5.0	ug/l	25.0		70	50-130			
o-Xylene	20.4	2.0	ug/l	25.0		82	70-125			
m,p-Xylenes	40.0	2.0	ug/l	50.0		80	70-125			
Surrogate: Dibromofluoromethane	*25.0*		*ug/l*	*25.0*		*100*	*80-120*			
Surrogate: Toluene-d8	*25.7*		*ug/l*	*25.0*		*103*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*24.7*		*ug/l*	*25.0*		*99*	*80-120*			

Del Mar Analytical, Irvine
Kathleen A. Robb
Project Manager

Del Mar Analytical

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U.S. Filter/Westates Carbon
P.O. Box 3308
Parker, AZ 85344
Attention: Deborah Foster

Project ID: TTO
Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

METHOD BLANK/QC DATA

VOLATILE ORGANICS by GC/MS (EPA 5035/8260B)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G21019 Extracted: 07/21/05										
Matrix Spike Analyzed: 07/21/2005 (5G21019-MS1)					Source: IOG0857-01					
Benzene	25.1	2.0	ug/l	25.0	ND	100	60-125			
Bromobenzene	25.4	5.0	ug/l	25.0	ND	102	65-125			
Bromochloromethane	27.3	5.0	ug/l	25.0	ND	109	60-135			
Bromodichloromethane	24.6	2.0	ug/l	25.0	ND	98	65-135			
Bromoform	23.0	5.0	ug/l	25.0	2.6	82	50-135			
Bromomethane	25.2	5.0	ug/l	25.0	ND	101	50-145			
n-Butylbenzene	25.7	5.0	ug/l	25.0	ND	103	65-135			
sec-Butylbenzene	24.3	5.0	ug/l	25.0	ND	97	65-125			
tert-Butylbenzene	25.0	5.0	ug/l	25.0	ND	100	65-130			
Carbon Disulfide	23.4	5.0	ug/l	25.0	ND	94	40-140			
Carbon tetrachloride	25.1	5.0	ug/l	25.0	ND	100	65-140			
Chlorobenzene	25.0	2.0	ug/l	25.0	ND	100	70-125			
Chloroethane	24.9	5.0	ug/l	25.0	ND	100	50-140			
Chloroform	25.6	2.0	ug/l	25.0	ND	102	65-135			
Chloromethane	20.5	5.0	ug/l	25.0	ND	82	35-140			
2-Chlorotoluene	24.9	5.0	ug/l	25.0	ND	100	65-135			
4-Chlorotoluene	25.0	5.0	ug/l	25.0	ND	100	65-135			
Dibromochloromethane	26.2	2.0	ug/l	25.0	ND	105	60-140			
1,2-Dibromo-3-chloropropane	23.1	5.0	ug/l	25.0	ND	92	40-150			
1,2-Dibromoethane (EDB)	26.5	2.0	ug/l	25.0	ND	106	65-130			
Dibromomethane	26.1	2.0	ug/l	25.0	ND	104	60-135			
1,2-Dichlorobenzene	24.6	2.0	ug/l	25.0	ND	98	70-125			
1,3-Dichlorobenzene	24.2	2.0	ug/l	25.0	ND	97	70-125			
1,4-Dichlorobenzene	24.4	2.0	ug/l	25.0	ND	98	70-125			
Dichlorodifluoromethane	18.4	5.0	ug/l	25.0	ND	74	15-155			
1,1-Dichloroethane	26.3	2.0	ug/l	25.0	ND	105	60-130			
1,2-Dichloroethane	24.9	2.0	ug/l	25.0	ND	100	60-140			
1,1-Dichloroethene	25.3	5.0	ug/l	25.0	ND	101	60-135			
cis-1,2-Dichloroethene	25.2	2.0	ug/l	25.0	ND	101	60-130			
trans-1,2-Dichloroethene	25.8	2.0	ug/l	25.0	ND	103	60-135			
1,2-Dichloropropane	26.1	2.0	ug/l	25.0	ND	104	60-125			
1,3-Dichloropropane	26.1	2.0	ug/l	25.0	ND	104	60-135			
2,2-Dichloropropane	27.8	2.0	ug/l	25.0	ND	111	60-145			
1,1-Dichloropropene	24.9	2.0	ug/l	25.0	ND	100	65-135			
cis-1,3-Dichloropropene	26.0	2.0	ug/l	25.0	ND	104	65-135			

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U.S. Filter/Westates Carbon
P.O. Box 3308
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Attention: Deborah Foster

Project ID: TTO

Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

METHOD BLANK/QC DATA

VOLATILE ORGANICS by GC/MS (EPA 5035/8260B)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G21019 Extracted: 07/21/05										
Matrix Spike Analyzed: 07/21/2005 (5G21019-MS1)					Source: IOG0857-01					
trans-1,3-Dichloropropene	25.9	2.0	ug/l	25.0	ND	104	65-140			
Ethylbenzene	25.0	2.0	ug/l	25.0	ND	100	65-130			
Hexachlorobutadiene	20.6	5.0	ug/l	25.0	ND	82	60-135			
Isopropylbenzene	26.2	2.0	ug/l	25.0	ND	105	65-130			
p-Isopropyltoluene	23.2	2.0	ug/l	25.0	ND	93	65-125			
Methylene chloride	28.0	5.0	ug/l	25.0	ND	112	55-130			
Naphthalene	22.9	5.0	ug/l	25.0	ND	92	45-145			
n-Propylbenzene	25.9	2.0	ug/l	25.0	ND	104	65-130			
Styrene	16.4	2.0	ug/l	25.0	ND	66	45-145			
1,1,1,2-Tetrachloroethane	25.6	5.0	ug/l	25.0	ND	102	65-140			
1,1,2,2-Tetrachloroethane	28.9	2.0	ug/l	25.0	ND	116	55-140			
Tetrachloroethene	24.5	2.0	ug/l	25.0	ND	98	60-130			
Toluene	25.5	2.0	ug/l	25.0	ND	102	65-125			
1,2,3-Trichlorobenzene	22.8	5.0	ug/l	25.0	ND	91	55-135			
1,2,4-Trichlorobenzene	23.6	5.0	ug/l	25.0	ND	94	60-135			
1,1,1-Trichloroethane	24.9	2.0	ug/l	25.0	ND	100	65-140			
1,1,2-Trichloroethane	26.2	2.0	ug/l	25.0	ND	105	60-130			
Trichloroethene	24.3	2.0	ug/l	25.0	ND	97	60-125			
Trichlorofluoromethane	23.2	5.0	ug/l	25.0	ND	93	55-145			
1,2,3-Trichloropropane	27.8	10	ug/l	25.0	ND	111	50-135			
1,2,4-Trimethylbenzene	23.5	2.0	ug/l	25.0	ND	94	55-130			
1,3,5-Trimethylbenzene	25.0	2.0	ug/l	25.0	ND	100	65-130			
Vinyl acetate	19.8	5.0	ug/l	25.0	ND	79	40-150			
Vinyl chloride	19.2	5.0	ug/l	25.0	ND	77	40-135			
o-Xylene	24.5	2.0	ug/l	25.0	ND	98	60-125			
m,p-Xylenes	48.8	2.0	ug/l	50.0	ND	98	60-130			
Surrogate: Dibromofluoromethane	*25.0*		*ug/l*	*25.0*		*100*	*80-120*			
Surrogate: Toluene-d8	*25.7*		*ug/l*	*25.0*		*103*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*24.6*		*ug/l*	*25.0*		*98*	*80-120*			

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Attention: Deborah Foster

Project ID: TTO
Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

METHOD BLANK/QC DATA

VOLATILE ORGANICS by GC/MS (EPA 5035/8260B)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G21019 Extracted: 07/21/05										
Matrix Spike Dup Analyzed: 07/21/2005 (5G21019-MSD1)					Source: IOG0857-01					
Benzene	23.8	2.0	ug/l	25.0	ND	95	60-125	5	20	
Bromobenzene	23.3	5.0	ug/l	25.0	ND	93	65-125	9	20	
Bromochloromethane	26.0	5.0	ug/l	25.0	ND	104	60-135	5	25	
Bromodichloromethane	22.7	2.0	ug/l	25.0	ND	91	65-135	8	20	
Bromoform	22.5	5.0	ug/l	25.0	2.6	80	50-135	2	25	
Bromomethane	23.4	5.0	ug/l	25.0	ND	94	50-145	7	25	
n-Butylbenzene	25.0	5.0	ug/l	25.0	ND	100	65-135	3	20	
sec-Butylbenzene	23.6	5.0	ug/l	25.0	ND	94	65-125	3	20	
tert-Butylbenzene	24.0	5.0	ug/l	25.0	ND	96	65-130	4	20	
Carbon Disulfide	23.8	5.0	ug/l	25.0	ND	95	40-140	2	20	
Carbon tetrachloride	23.6	5.0	ug/l	25.0	ND	94	65-140	6	25	
Chlorobenzene	23.7	2.0	ug/l	25.0	ND	95	70-125	5	20	
Chloroethane	23.5	5.0	ug/l	25.0	ND	94	50-140	6	25	
Chloroform	24.5	2.0	ug/l	25.0	ND	98	65-135	4	20	
Chloromethane	19.4	5.0	ug/l	25.0	ND	78	35-140	6	25	
2-Chlorotoluene	23.2	5.0	ug/l	25.0	ND	93	65-135	7	20	
4-Chlorotoluene	23.3	5.0	ug/l	25.0	ND	93	65-135	7	20	
Dibromochloromethane	24.8	2.0	ug/l	25.0	ND	99	60-140	5	25	
1,2-Dibromo-3-chloropropane	23.8	5.0	ug/l	25.0	ND	95	40-150	3	30	
1,2-Dibromoethane (EDB)	25.2	2.0	ug/l	25.0	ND	101	65-130	5	25	
Dibromomethane	25.0	2.0	ug/l	25.0	ND	100	60-135	4	25	
1,2-Dichlorobenzene	23.6	2.0	ug/l	25.0	ND	94	70-125	4	20	
1,3-Dichlorobenzene	22.9	2.0	ug/l	25.0	ND	92	70-125	6	20	
1,4-Dichlorobenzene	23.0	2.0	ug/l	25.0	ND	92	70-125	6	20	
Dichlorodifluoromethane	17.4	5.0	ug/l	25.0	ND	70	15-155	6	30	
1,1-Dichloroethane	25.2	2.0	ug/l	25.0	ND	101	60-130	4	20	
1,2-Dichloroethane	23.3	2.0	ug/l	25.0	ND	93	60-140	7	20	
1,1-Dichloroethene	23.7	5.0	ug/l	25.0	ND	95	60-135	7	20	
cis-1,2-Dichloroethene	24.1	2.0	ug/l	25.0	ND	96	60-130	4	20	
trans-1,2-Dichloroethene	24.8	2.0	ug/l	25.0	ND	99	60-135	4	20	
1,2-Dichloropropane	24.6	2.0	ug/l	25.0	ND	98	60-125	6	20	
1,3-Dichloropropane	25.2	2.0	ug/l	25.0	ND	101	60-135	4	25	
2,2-Dichloropropane	28.5	2.0	ug/l	25.0	ND	114	60-145	2	25	
1,1-Dichloropropene	23.4	2.0	ug/l	25.0	ND	94	65-135	6	20	
cis-1,3-Dichloropropene	24.1	2.0	ug/l	25.0	ND	96	65-135	8	20	

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U.S. Filter/Westates Carbon
P.O. Box 3308
Parker, AZ 85344
Attention: Deborah Foster

Project ID: TTO
Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

METHOD BLANK/QC DATA

VOLATILE ORGANICS by GC/MS (EPA 5035/8260B)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G21019 Extracted: 07/21/05										
Matrix Spike Dup Analyzed: 07/21/2005 (5G21019-MSD1)					Source: IOG0857-01					
trans-1,3-Dichloropropene	24.1	2.0	ug/l	25.0	ND	96	65-140	7	25	
Ethylbenzene	23.8	2.0	ug/l	25.0	ND	95	65-130	5	20	
Hexachlorobutadiene	20.9	5.0	ug/l	25.0	ND	84	60-135	1	20	
Isopropylbenzene	24.8	2.0	ug/l	25.0	ND	99	65-130	5	20	
p-Isopropyltoluene	22.6	2.0	ug/l	25.0	ND	90	65-125	3	20	
Methylene chloride	26.4	5.0	ug/l	25.0	ND	106	55-130	6	20	
Naphthalene	24.6	5.0	ug/l	25.0	ND	98	45-145	7	30	
n-Propylbenzene	24.4	2.0	ug/l	25.0	ND	98	65-130	6	20	
Styrene	14.0	2.0	ug/l	25.0	ND	56	45-145	16	30	
1,1,1,2-Tetrachloroethane	24.2	5.0	ug/l	25.0	ND	97	65-140	6	20	
1,1,2,2-Tetrachloroethane	28.7	2.0	ug/l	25.0	ND	115	55-140	1	30	
Tetrachloroethene	23.3	2.0	ug/l	25.0	ND	93	60-130	5	20	
Toluene	23.9	2.0	ug/l	25.0	ND	96	65-125	6	20	
1,2,3-Trichlorobenzene	23.5	5.0	ug/l	25.0	ND	94	55-135	3	20	
1,2,4-Trichlorobenzene	23.6	5.0	ug/l	25.0	ND	94	60-135	0	20	
1,1,1-Trichloroethane	24.3	2.0	ug/l	25.0	ND	97	65-140	2	20	
1,1,2-Trichloroethane	25.0	2.0	ug/l	25.0	ND	100	60-130	5	25	
Trichloroethene	22.5	2.0	ug/l	25.0	ND	90	60-125	8	20	
Trichlorofluoromethane	21.8	5.0	ug/l	25.0	ND	87	55-145	6	25	
1,2,3-Trichloropropane	27.0	10	ug/l	25.0	ND	108	50-135	3	30	
1,2,4-Trimethylbenzene	22.3	2.0	ug/l	25.0	ND	89	55-130	5	25	
1,3,5-Trimethylbenzene	23.6	2.0	ug/l	25.0	ND	94	65-130	6	20	
Vinyl acetate	19.9	5.0	ug/l	25.0	ND	80	40-150	1	30	
Vinyl chloride	18.2	5.0	ug/l	25.0	ND	73	40-135	5	30	
o-Xylene	23.1	2.0	ug/l	25.0	ND	92	60-125	6	20	
m,p-Xylenes	46.6	2.0	ug/l	50.0	ND	93	60-130	5	25	
Surrogate: Dibromofluoromethane	*24.9*		*ug/l*	*25.0*		*100*	*80-120*			
Surrogate: Toluene-d8	*25.2*		*ug/l*	*25.0*		*101*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*24.5*		*ug/l*	*25.0*		*98*	*80-120*			

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Project ID: TTO
Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

METHOD BLANK/QC DATA

SEMI-VOLATILE ORGANICS BY GC/MS (EPA 3520C/8270C)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G17017 Extracted: 07/17/05										
Blank Analyzed: 07/20/2005 (5G17017-BLK1)										
Acenaphthene	ND	10	ug/l							
Acenaphthylene	ND	10	ug/l							
Aniline	ND	10	ug/l							
Anthracene	ND	10	ug/l							
Benzidine	ND	20	ug/l							
Benzoic acid	ND	20	ug/l							
Benzo(a)anthracene	ND	10	ug/l							
Benzo(b)fluoranthene	ND	10	ug/l							
Benzo(k)fluoranthene	ND	10	ug/l							
Benzo(g,h,i)perylene	ND	10	ug/l							
Benzo(a)pyrene	ND	10	ug/l							
Benzyl alcohol	ND	20	ug/l							
Bis(2-chloroethoxy)methane	ND	10	ug/l							
Bis(2-chloroethyl)ether	ND	10	ug/l							
Bis(2-chloroisopropyl)ether	ND	10	ug/l							
Bis(2-ethylhexyl)phthalate	ND	50	ug/l							
4-Bromophenyl phenyl ether	ND	10	ug/l							
Butyl benzyl phthalate	ND	20	ug/l							
4-Chloroaniline	ND	10	ug/l							
2-Chloronaphthalene	ND	10	ug/l							
4-Chloro-3-methylphenol	ND	20	ug/l							
2-Chlorophenol	ND	10	ug/l							
4-Chlorophenyl phenyl ether	ND	10	ug/l							
Chrysene	ND	10	ug/l							
Dibenz(a,h)anthracene	ND	20	ug/l							
Dibenzofuran	ND	10	ug/l							
Di-n-butyl phthalate	ND	20	ug/l							
1,3-Dichlorobenzene	ND	10	ug/l							
1,4-Dichlorobenzene	ND	10	ug/l							
1,2-Dichlorobenzene	ND	10	ug/l							
3,3-Dichlorobenzidine	ND	20	ug/l							
2,4-Dichlorophenol	ND	10	ug/l							
Diethyl phthalate	ND	10	ug/l							
2,4-Dimethylphenol	ND	20	ug/l							
Dimethyl phthalate	ND	10	ug/l							

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Project ID: TTO
Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

METHOD BLANK/QC DATA

SEMI-VOLATILE ORGANICS BY GC/MS (EPA 3520C/8270C)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G17017 Extracted: 07/17/05										
Blank Analyzed: 07/20/2005 (5G17017-BLK1)										
4,6-Dinitro-2-methylphenol	ND	20	ug/l							
2,4-Dinitrophenol	ND	20	ug/l							
2,4-Dinitrotoluene	ND	10	ug/l							
2,6-Dinitrotoluene	ND	10	ug/l							
Di-n-octyl phthalate	ND	20	ug/l							
Fluoranthene	ND	10	ug/l							
Fluorene	ND	10	ug/l							
Hexachlorobenzene	ND	10	ug/l							
Hexachlorobutadiene	ND	10	ug/l							
Hexachlorocyclopentadiene	ND	20	ug/l							
Hexachloroethane	ND	10	ug/l							
Indeno(1,2,3-cd)pyrene	ND	20	ug/l							
Isophorone	ND	10	ug/l							
2-Methylnaphthalene	ND	10	ug/l							
2-Methylphenol	ND	10	ug/l							
4-Methylphenol	ND	10	ug/l							
Naphthalene	ND	10	ug/l							
2-Nitroaniline	ND	20	ug/l							
3-Nitroaniline	ND	20	ug/l							
4-Nitroaniline	ND	20	ug/l							
Nitrobenzene	ND	20	ug/l							
2-Nitrophenol	ND	10	ug/l							
4-Nitrophenol	ND	20	ug/l							
N-Nitrosodiphenylamine	ND	10	ug/l							
N-Nitroso-di-n-propylamine	ND	10	ug/l							
Pentachlorophenol	ND	20	ug/l							
Phenanthrene	ND	10	ug/l							
Phenol	ND	10	ug/l							
Pyrene	ND	10	ug/l							
1,2,4-Trichlorobenzene	ND	10	ug/l							
2,4,5-Trichlorophenol	ND	20	ug/l							
2,4,6-Trichlorophenol	ND	20	ug/l							
N-Nitrosodimethylamine	ND	20	ug/l							
1,2-Diphenylhydrazine/Azobenzene	ND	20	ug/l							
Surrogate: 2-Fluorophenol	*121*		*ug/l*	*200*		*60*	*30-120*			

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U.S. Filter/Westates Carbon
P.O. Box 3308
Parker, AZ 85344
Attention: Deborah Foster

Project ID: TTO
Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

METHOD BLANK/QC DATA

SEMI-VOLATILE ORGANICS BY GC/MS (EPA 3520C/8270C)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G17017 Extracted: 07/17/05										
Blank Analyzed: 07/20/2005 (5G17017-BLK1)										
Surrogate: Phenol-d6	*137*		*ug/l*	*200*		*68*	*35-120*			
Surrogate: 2,4,6-Tribromophenol	*164*		*ug/l*	*200*		*82*	*45-120*			
Surrogate: Nitrobenzene-d5	*71.7*		*ug/l*	*100*		*72*	*45-120*			
Surrogate: 2-Fluorobiphenyl	*77.0*		*ug/l*	*100*		*77*	*45-120*			
Surrogate: Terphenyl-d14	*78.7*		*ug/l*	*100*		*79*	*45-120*			
LCS Analyzed: 07/20/2005 (5G17017-BS1)										M-NR1
Acenaphthene	86.7	10	ug/l	100		87	55-120			
Acenaphthylene	89.0	10	ug/l	100		89	55-120			
Aniline	81.3	10	ug/l	100		81	35-120			
Anthracene	79.9	10	ug/l	100		80	55-120			
Benzidine	173	20	ug/l	100		173	20-160			*L*
Benzoic acid	69.7	20	ug/l	100		70	35-120			
Benzo(a)anthracene	81.7	10	ug/l	100		82	60-120			
Benzo(b)fluoranthene	89.1	10	ug/l	100		89	50-120			
Benzo(k)fluoranthene	89.2	10	ug/l	100		89	50-120			
Benzo(g,h,i)perylene	93.7	10	ug/l	100		94	40-125			
Benzo(a)pyrene	77.0	10	ug/l	100		77	55-120			
Benzyl alcohol	58.4	20	ug/l	100		58	45-120			
Bis(2-chloroethoxy)methane	84.1	10	ug/l	100		84	55-120			
Bis(2-chloroethyl)ether	83.6	10	ug/l	100		84	50-120			
Bis(2-chloroisopropyl)ether	84.8	10	ug/l	100		85	45-120			
Bis(2-ethylhexyl)phthalate	83.4	50	ug/l	100		83	60-130			
4-Bromophenyl phenyl ether	85.3	10	ug/l	100		85	50-120			
Butyl benzyl phthalate	85.2	20	ug/l	100		85	55-125			
4-Chloroaniline	78.4	10	ug/l	100		78	50-120			
2-Chloronaphthalene	79.5	10	ug/l	100		80	55-120			
4-Chloro-3-methylphenol	84.0	20	ug/l	100		84	60-120			
2-Chlorophenol	77.6	10	ug/l	100		78	45-120			
4-Chlorophenyl phenyl ether	89.9	10	ug/l	100		90	55-120			
Chrysene	87.0	10	ug/l	100		87	60-120			
Dibenz(a,h)anthracene	96.1	20	ug/l	100		96	45-130			
Dibenzofuran	85.1	10	ug/l	100		85	60-120			
Di-n-butyl phthalate	76.3	20	ug/l	100		76	55-125			
1,3-Dichlorobenzene	74.2	10	ug/l	100		74	35-120			
1,4-Dichlorobenzene	72.9	10	ug/l	100		73	35-120			

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METHOD BLANK/QC DATA

SEMI-VOLATILE ORGANICS BY GC/MS (EPA 3520C/8270C)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G17017 Extracted: 07/17/05										
LCS Analyzed: 07/20/2005 (5G17017-BS1)										M-NR1
1,2-Dichlorobenzene	74.8	10	ug/l	100		75	35-120			
3,3-Dichlorobenzidine	90.4	20	ug/l	100		90	45-130			
2,4-Dichlorophenol	77.7	10	ug/l	100		78	55-120			
Diethyl phthalate	86.1	10	ug/l	100		86	55-120			
2,4-Dimethylphenol	63.8	20	ug/l	100		64	30-120			
Dimethyl phthalate	84.3	10	ug/l	100		84	60-120			
4,6-Dinitro-2-methylphenol	85.2	20	ug/l	100		85	50-120			
2,4-Dinitrophenol	89.2	20	ug/l	100		89	40-120			
2,4-Dinitrotoluene	93.9	10	ug/l	100		94	60-120			
2,6-Dinitrotoluene	81.3	10	ug/l	100		81	60-120			
Di-n-octyl phthalate	84.2	20	ug/l	100		84	60-130			
Fluoranthene	82.0	10	ug/l	100		82	55-120			
Fluorene	89.0	10	ug/l	100		89	60-120			
Hexachlorobenzene	85.7	10	ug/l	100		86	50-120			
Hexachlorobutadiene	76.7	10	ug/l	100		77	40-120			
Hexachlorocyclopentadiene	90.5	20	ug/l	100		90	15-120			
Hexachloroethane	76.3	10	ug/l	100		76	35-120			
Indeno(1,2,3-cd)pyrene	90.3	20	ug/l	100		90	40-130			
Isophorone	82.6	10	ug/l	100		83	50-120			
2-Methylnaphthalene	81.0	10	ug/l	100		81	50-120			
2-Methylphenol	79.4	10	ug/l	100		79	45-120			
4-Methylphenol	80.8	10	ug/l	100		81	45-120			
Naphthalene	78.8	10	ug/l	100		79	50-120			
2-Nitroaniline	84.6	20	ug/l	100		85	60-120			
3-Nitroaniline	94.0	20	ug/l	100		94	55-120			
4-Nitroaniline	93.5	20	ug/l	100		94	50-125			
Nitrobenzene	79.1	20	ug/l	100		79	50-120			
2-Nitrophenol	82.1	10	ug/l	100		82	55-120			
4-Nitrophenol	78.4	20	ug/l	100		78	45-120			
N-Nitrosodiphenylamine	86.3	10	ug/l	100		86	55-120			
N-Nitroso-di-n-propylamine	88.8	10	ug/l	100		89	45-120			
Pentachlorophenol	91.4	20	ug/l	100		91	50-120			
Phenanthrene	80.2	10	ug/l	100		80	55-120			
Phenol	77.5	10	ug/l	100		78	45-120			
Pyrene	87.4	10	ug/l	100		87	50-120			

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METHOD BLANK/QC DATA

SEMI-VOLATILE ORGANICS BY GC/MS (EPA 3520C/8270C)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G17017 Extracted: 07/17/05										
LCS Analyzed: 07/20/2005 (5G17017-BS1)										M-NR1
1,2,4-Trichlorobenzene	75.1	10	ug/l	100		75	45-120			
2,4,5-Trichlorophenol	89.1	20	ug/l	100		89	60-120			
2,4,6-Trichlorophenol	80.8	20	ug/l	100		81	60-120			
N-Nitrosodimethylamine	84.9	20	ug/l	100		85	40-120			
1,2-Diphenylhydrazine/Azobenzene	86.6	20	ug/l	100		87	60-120			
Surrogate: 2-Fluorophenol	*148*		*ug/l*	*200*		*74*	*30-120*			
Surrogate: Phenol-d6	*161*		*ug/l*	*200*		*80*	*35-120*			
Surrogate: 2,4,6-Tribromophenol	*181*		*ug/l*	*200*		*90*	*45-120*			
Surrogate: Nitrobenzene-d5	*80.3*		*ug/l*	*100*		*80*	*45-120*			
Surrogate: 2-Fluorobiphenyl	*81.7*		*ug/l*	*100*		*82*	*45-120*			
Surrogate: Terphenyl-d14	*86.2*		*ug/l*	*100*		*86*	*45-120*			
LCS Dup Analyzed: 07/20/2005 (5G17017-BSD1)										
Acenaphthene	84.0	10	ug/l	100		84	55-120	3	20	
Acenaphthylene	87.2	10	ug/l	100		87	55-120	2	20	
Aniline	76.7	10	ug/l	100		77	35-120	6	25	
Anthracene	80.8	10	ug/l	100		81	55-120	1	20	
Benzidine	99.1	20	ug/l	100		99	20-160	54	35	*R-2*
Benzoic acid	87.7	20	ug/l	100		88	35-120	23	30	
Benzo(a)anthracene	86.0	10	ug/l	100		86	60-120	5	20	
Benzo(b)fluoranthene	88.7	10	ug/l	100		89	50-120	0	25	
Benzo(k)fluoranthene	86.9	10	ug/l	100		87	50-120	3	20	
Benzo(g,h,i)perylene	94.7	10	ug/l	100		95	40-125	1	25	
Benzo(a)pyrene	79.8	10	ug/l	100		80	55-120	4	25	
Benzyl alcohol	60.6	20	ug/l	100		61	45-120	4	20	
Bis(2-chloroethoxy)methane	83.2	10	ug/l	100		83	55-120	1	20	
Bis(2-chloroethyl)ether	81.7	10	ug/l	100		82	50-120	2	20	
Bis(2-chloroisopropyl)ether	81.1	10	ug/l	100		81	45-120	4	20	
Bis(2-ethylhexyl)phthalate	85.2	50	ug/l	100		85	60-130	2	20	
4-Bromophenyl phenyl ether	87.8	10	ug/l	100		88	50-120	3	25	
Butyl benzyl phthalate	83.2	20	ug/l	100		83	55-125	2	20	
4-Chloroaniline	77.3	10	ug/l	100		77	50-120	1	25	
2-Chloronaphthalene	81.4	10	ug/l	100		81	55-120	2	20	
4-Chloro-3-methylphenol	79.2	20	ug/l	100		79	60-120	6	25	
2-Chlorophenol	74.5	10	ug/l	100		74	45-120	4	25	
4-Chlorophenyl phenyl ether	87.0	10	ug/l	100		87	55-120	3	20	

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SEMI-VOLATILE ORGANICS BY GC/MS (EPA 3520C/8270C)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G17017 Extracted: 07/17/05										
LCS Dup Analyzed: 07/20/2005 (5G17017-BSD1)										
Chrysene	87.1	10	ug/l	100		87	60-120	0	20	
Dibenz(a,h)anthracene	97.1	20	ug/l	100		97	45-130	1	25	
Dibenzofuran	83.3	10	ug/l	100		83	60-120	2	20	
Di-n-butyl phthalate	77.2	20	ug/l	100		77	55-125	1	20	
1,3-Dichlorobenzene	72.2	10	ug/l	100		72	35-120	3	25	
1,4-Dichlorobenzene	70.2	10	ug/l	100		70	35-120	4	25	
1,2-Dichlorobenzene	72.6	10	ug/l	100		73	35-120	3	25	
3,3-Dichlorobenzidine	89.1	20	ug/l	100		89	45-130	1	25	
2,4-Dichlorophenol	76.5	10	ug/l	100		76	55-120	2	20	
Diethyl phthalate	83.2	10	ug/l	100		83	55-120	3	20	
2,4-Dimethylphenol	63.7	20	ug/l	100		64	30-120	0	25	
Dimethyl phthalate	84.4	10	ug/l	100		84	60-120	0	20	
4,6-Dinitro-2-methylphenol	82.9	20	ug/l	100		83	50-120	3	25	
2,4-Dinitrophenol	86.7	20	ug/l	100		87	40-120	3	25	
2,4-Dinitrotoluene	90.1	10	ug/l	100		90	60-120	4	20	
2,6-Dinitrotoluene	83.0	10	ug/l	100		83	60-120	2	20	
Di-n-octyl phthalate	87.3	20	ug/l	100		87	60-130	4	20	
Fluoranthene	79.8	10	ug/l	100		80	55-120	3	20	
Fluorene	85.8	10	ug/l	100		86	60-120	4	20	
Hexachlorobenzene	89.2	10	ug/l	100		89	50-120	4	20	
Hexachlorobutadiene	74.9	10	ug/l	100		75	40-120	2	25	
Hexachlorocyclopentadiene	88.4	20	ug/l	100		88	15-120	2	30	
Hexachloroethane	73.3	10	ug/l	100		73	35-120	4	25	
Indeno(1,2,3-cd)pyrene	90.1	20	ug/l	100		90	40-130	0	25	
Isophorone	83.7	10	ug/l	100		84	50-120	1	20	
2-Methylnaphthalene	78.7	10	ug/l	100		79	50-120	3	20	
2-Methylphenol	76.8	10	ug/l	100		77	45-120	3	20	
4-Methylphenol	79.3	10	ug/l	100		79	45-120	2	20	
Naphthalene	78.3	10	ug/l	100		78	50-120	1	20	
2-Nitroaniline	83.5	20	ug/l	100		84	60-120	1	20	
3-Nitroaniline	90.4	20	ug/l	100		90	55-120	4	25	
4-Nitroaniline	87.8	20	ug/l	100		88	50-125	6	20	
Nitrobenzene	79.1	20	ug/l	100		79	50-120	0	25	
2-Nitrophenol	79.7	10	ug/l	100		80	55-120	3	25	
4-Nitrophenol	74.7	20	ug/l	100		75	45-120	5	25	

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SEMI-VOLATILE ORGANICS BY GC/MS (EPA 3520C/8270C)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G17017 Extracted: 07/17/05										
LCS Dup Analyzed: 07/20/2005 (5G17017-BSD1)										
N-Nitrosodiphenylamine	88.2	10	ug/l	100		88	55-120	2	20	
N-Nitroso-di-n-propylamine	86.8	10	ug/l	100		87	45-120	2	20	
Pentachlorophenol	94.4	20	ug/l	100		94	50-120	3	25	
Phenanthrene	79.7	10	ug/l	100		80	55-120	1	20	
Phenol	74.4	10	ug/l	100		74	45-120	4	25	
Pyrene	83.4	10	ug/l	100		83	50-120	5	25	
1,2,4-Trichlorobenzene	75.3	10	ug/l	100		75	45-120	0	20	
2,4,5-Trichlorophenol	88.5	20	ug/l	100		88	60-120	1	20	
2,4,6-Trichlorophenol	82.1	20	ug/l	100		82	60-120	2	20	
N-Nitrosodimethylamine	72.3	20	ug/l	100		72	40-120	16	20	
1,2-Diphenylhydrazine/Azobenzene	82.7	20	ug/l	100		83	60-120	5	25	
Surrogate: 2-Fluorophenol	*133*		*ug/l*	*200*		*66*	*30-120*			
Surrogate: Phenol-d6	*147*		*ug/l*	*200*		*74*	*35-120*			
Surrogate: 2,4,6-Tribromophenol	*181*		*ug/l*	*200*		*90*	*45-120*			
Surrogate: Nitrobenzene-d5	*79.2*		*ug/l*	*100*		*79*	*45-120*			
Surrogate: 2-Fluorobiphenyl	*83.5*		*ug/l*	*100*		*84*	*45-120*			
Surrogate: Terphenyl-d14	*83.1*		*ug/l*	*100*		*83*	*45-120*			

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ORGANOCHLORINE PESTICIDES (EPA 3510C/8081A)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G20057 Extracted: 07/20/05										
Blank Analyzed: 07/20/2005-07/22/2005 (5G20057-BLK1)										
Aldrin	ND	0.10	ug/l							
alpha-BHC	ND	0.10	ug/l							
beta-BHC	ND	0.10	ug/l							
delta-BHC	ND	0.20	ug/l							
gamma-BHC (Lindane)	ND	0.10	ug/l							
Chlordane	ND	1.0	ug/l							
4,4'-DDD	ND	0.10	ug/l							
4,4'-DDE	ND	0.10	ug/l							
4,4'-DDT	ND	0.10	ug/l							
Dieldrin	ND	0.10	ug/l							
Endosulfan I	ND	0.10	ug/l							
Endosulfan II	ND	0.10	ug/l							
Endosulfan sulfate	ND	0.20	ug/l							
Endrin	ND	0.10	ug/l							
Endrin aldehyde	ND	0.10	ug/l							
Endrin ketone	ND	0.10	ug/l							
Heptachlor	ND	0.10	ug/l							
Heptachlor epoxide	ND	0.10	ug/l							
Methoxychlor	ND	0.10	ug/l							
Toxaphene	ND	5.0	ug/l							
Surrogate: Tetrachloro-m-xylene	*0.352*		*ug/l*	*0.500*		*70*	*35-115*			
Surrogate: Decachlorobiphenyl	*0.446*		*ug/l*	*0.500*		*89*	*45-120*			
LCS Analyzed: 07/20/2005 (5G20057-BS1)										M-NR1
Aldrin	0.356	0.10	ug/l	0.500		71	40-115			
alpha-BHC	0.435	0.10	ug/l	0.500		87	45-115			
beta-BHC	0.397	0.10	ug/l	0.500		79	50-115			
delta-BHC	0.447	0.20	ug/l	0.500		89	55-120			
gamma-BHC (Lindane)	0.431	0.10	ug/l	0.500		86	45-115			
4,4'-DDD	0.462	0.10	ug/l	0.500		92	60-120			
4,4'-DDE	0.446	0.10	ug/l	0.500		89	55-120			
4,4'-DDT	0.443	0.10	ug/l	0.500		89	60-120			
Dieldrin	0.437	0.10	ug/l	0.500		87	55-120			
Endosulfan I	0.417	0.10	ug/l	0.500		83	50-115			
Endosulfan II	0.433	0.10	ug/l	0.500		87	60-125			
Endosulfan sulfate	0.471	0.20	ug/l	0.500		94	60-120			

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METHOD BLANK/QC DATA

ORGANOCHLORINE PESTICIDES (EPA 3510C/8081A)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G20057 Extracted: 07/20/05										
LCS Analyzed: 07/20/2005 (5G20057-BS1)										M-NR1
Endrin	0.441	0.10	ug/l	0.500		88	55-125			
Endrin aldehyde	0.443	0.10	ug/l	0.500		89	55-115			
Endrin ketone	0.441	0.10	ug/l	0.500		88	60-115			
Heptachlor	0.370	0.10	ug/l	0.500		74	45-115			
Heptachlor epoxide	0.416	0.10	ug/l	0.500		83	50-115			
Methoxychlor	0.454	0.10	ug/l	0.500		91	60-120			
Surrogate: Tetrachloro-m-xylene	*0.338*		*ug/l*	*0.500*		*68*	*35-115*			
Surrogate: Decachlorobiphenyl	*0.439*		*ug/l*	*0.500*		*88*	*45-120*			
LCS Dup Analyzed: 07/20/2005 (5G20057-BSD1)										
Aldrin	0.341	0.10	ug/l	0.500		68	40-115	4	30	
alpha-BHC	0.422	0.10	ug/l	0.500		84	45-115	3	30	
beta-BHC	0.386	0.10	ug/l	0.500		77	50-115	3	30	
delta-BHC	0.433	0.20	ug/l	0.500		87	55-120	3	30	
gamma-BHC (Lindane)	0.419	0.10	ug/l	0.500		84	45-115	3	30	
4,4'-DDD	0.439	0.10	ug/l	0.500		88	60-120	5	30	
4,4'-DDE	0.425	0.10	ug/l	0.500		85	55-120	5	30	
4,4'-DDT	0.420	0.10	ug/l	0.500		84	60-120	5	30	
Dieldrin	0.417	0.10	ug/l	0.500		83	55-120	5	30	
Endosulfan I	0.398	0.10	ug/l	0.500		80	50-115	5	30	
Endosulfan II	0.411	0.10	ug/l	0.500		82	60-125	5	30	
Endosulfan sulfate	0.445	0.20	ug/l	0.500		89	60-120	6	30	
Endrin	0.421	0.10	ug/l	0.500		84	55-125	5	30	
Endrin aldehyde	0.379	0.10	ug/l	0.500		76	55-115	16	30	
Endrin ketone	0.415	0.10	ug/l	0.500		83	60-115	6	30	
Heptachlor	0.356	0.10	ug/l	0.500		71	45-115	4	30	
Heptachlor epoxide	0.400	0.10	ug/l	0.500		80	50-115	4	30	
Methoxychlor	0.430	0.10	ug/l	0.500		86	60-120	5	30	
Surrogate: Tetrachloro-m-xylene	*0.337*		*ug/l*	*0.500*		*67*	*35-115*			
Surrogate: Decachlorobiphenyl	*0.410*		*ug/l*	*0.500*		*82*	*45-120*			

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METHOD BLANK/QC DATA

POLYCHLORINATED BIPHENYLS (EPA 3510C/8082)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G20057 Extracted: 07/20/05										
Blank Analyzed: 07/20/2005-07/22/2005 (5G20057-BLK1)										
Aroclor 1016	ND	1.0	ug/l							
Aroclor 1221	ND	1.0	ug/l							
Aroclor 1232	ND	1.0	ug/l							
Aroclor 1242	ND	1.0	ug/l							
Aroclor 1248	ND	1.0	ug/l							
Aroclor 1254	ND	1.0	ug/l							
Aroclor 1260	ND	1.0	ug/l							
Surrogate: Decachlorobiphenyl	*0.513*		*ug/l*	*0.500*		*103*	*45-120*			
LCS Analyzed: 07/22/2005 (5G20057-BS2)										M-NR1
Aroclor 1016	3.51	1.0	ug/l	4.00		88	50-115			
Aroclor 1260	3.67	1.0	ug/l	4.00		92	55-115			
Surrogate: Decachlorobiphenyl	*0.521*		*ug/l*	*0.500*		*104*	*45-120*			
LCS Dup Analyzed: 07/22/2005 (5G20057-BSD2)										
Aroclor 1016	3.23	1.0	ug/l	4.00		81	50-115	8	30	
Aroclor 1260	3.37	1.0	ug/l	4.00		84	55-115	9	25	
Surrogate: Decachlorobiphenyl	*0.479*		*ug/l*	*0.500*		*96*	*45-120*			

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METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G18097 Extracted: 07/18/05										
Blank Analyzed: 07/19/2005 (5G18097-BLK1)										
Antimony	ND	0.010	mg/l							
Arsenic	ND	0.0050	mg/l							
Barium	ND	0.010	mg/l							
Chromium	ND	0.0050	mg/l							
Cobalt	ND	0.010	mg/l							
Copper	ND	0.010	mg/l							
Molybdenum	ND	0.020	mg/l							
Silver	ND	0.0070	mg/l							
Thallium	ND	0.010	mg/l							
Vanadium	ND	0.010	mg/l							
Zinc	ND	0.020	mg/l							
LCS Analyzed: 07/19/2005 (5G18097-BS1)										
Antimony	1.07	0.010	mg/l	1.00		107	80-120			
Arsenic	1.00	0.0050	mg/l	1.00		100	80-120			
Barium	0.954	0.010	mg/l	1.00		95	80-120			
Chromium	0.986	0.0050	mg/l	1.00		99	80-120			
Cobalt	1.02	0.010	mg/l	1.00		102	80-120			
Copper	1.01	0.010	mg/l	1.00		101	80-120			
Molybdenum	0.956	0.020	mg/l	1.00		96	80-120			
Silver	0.507	0.0070	mg/l	0.500		101	80-120			
Thallium	0.962	0.010	mg/l	1.00		96	80-120			
Vanadium	0.988	0.010	mg/l	1.00		99	80-120			
Zinc	0.959	0.020	mg/l	1.00		96	80-120			
Matrix Spike Analyzed: 07/19/2005 (5G18097-MS1)					**Source: IOG0791-01**					
Antimony	0.998	0.010	mg/l	1.00	ND	100	75-125			
Arsenic	0.946	0.0050	mg/l	1.00	0.0099	94	75-125			
Barium	0.888	0.010	mg/l	1.00	0.024	86	75-125			
Chromium	0.897	0.0050	mg/l	1.00	ND	90	75-125			
Cobalt	0.946	0.010	mg/l	1.00	ND	95	75-125			
Copper	1.02	0.010	mg/l	1.00	ND	102	75-125			
Molybdenum	1.09	0.020	mg/l	1.00	0.21	88	75-125			
Silver	0.476	0.0070	mg/l	0.500	ND	95	75-125			
Thallium	0.837	0.010	mg/l	1.00	ND	84	75-125			
Vanadium	0.925	0.010	mg/l	1.00	0.0044	92	75-125			

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METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G18097 Extracted: 07/18/05										
Matrix Spike Analyzed: 07/19/2005 (5G18097-MS1)					Source: IOG0791-01					
Zinc	0.910	0.020	mg/l	1.00	ND	91	75-125			
Matrix Spike Dup Analyzed: 07/19/2005 (5G18097-MSD1)					Source: IOG0791-01					
Antimony	0.994	0.010	mg/l	1.00	ND	99	75-125	0	20	
Arsenic	0.945	0.0050	mg/l	1.00	0.0099	94	75-125	0	20	
Barium	0.879	0.010	mg/l	1.00	0.024	86	75-125	1	20	
Chromium	0.886	0.0050	mg/l	1.00	ND	89	75-125	1	20	
Cobalt	0.937	0.010	mg/l	1.00	ND	94	75-125	1	20	
Copper	1.01	0.010	mg/l	1.00	ND	101	75-125	1	20	
Molybdenum	1.08	0.020	mg/l	1.00	0.21	87	75-125	1	20	
Silver	0.471	0.0070	mg/l	0.500	ND	94	75-125	1	20	
Thallium	0.837	0.010	mg/l	1.00	ND	84	75-125	0	20	
Vanadium	0.916	0.010	mg/l	1.00	0.0044	91	75-125	1	20	
Zinc	0.900	0.020	mg/l	1.00	ND	90	75-125	1	20	
Batch: 5G19037 Extracted: 07/19/05										
Blank Analyzed: 07/19/2005 (5G19037-BLK1)										
Mercury	ND	0.00020	mg/l							
LCS Analyzed: 07/19/2005 (5G19037-BS1)										
Mercury	0.00823	0.00020	mg/l	0.00800		103	90-115			
Matrix Spike Analyzed: 07/19/2005 (5G19037-MS1)					Source: IOG0937-01					
Mercury	0.00796	0.00020	mg/l	0.00800	ND	100	75-120			
Matrix Spike Dup Analyzed: 07/19/2005 (5G19037-MSD1)					Source: IOG0937-01					
Mercury	0.00788	0.00020	mg/l	0.00800	ND	98	75-120	1	20	

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METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G19086 Extracted: 07/19/05										
Blank Analyzed: 07/20/2005 (5G19086-BLK1)										
Aluminum	ND	0.050	mg/l							
Boron	ND	0.050	mg/l							
Iron	ND	0.040	mg/l							
Magnesium	ND	0.020	mg/l							
Manganese	ND	0.020	mg/l							
Strontium	ND	0.020	mg/l							
Tin	ND	0.10	mg/l							
Titanium	ND	0.0050	mg/l							
LCS Analyzed: 07/20/2005 (5G19086-BS1)										
Aluminum	0.972	0.050	mg/l	1.00		97	80-120			
Boron	1.01	0.050	mg/l	1.00		101	80-120			
Iron	1.04	0.040	mg/l	1.00		104	80-120			
Magnesium	4.92	0.020	mg/l	5.00		98	80-120			
Manganese	1.02	0.020	mg/l	1.00		102	80-120			
Strontium	0.985	0.020	mg/l	1.00		98	80-120			
Tin	0.973	0.10	mg/l	1.00		97	80-120			
Titanium	1.03	0.0050	mg/l	1.00		103	80-120			
Matrix Spike Analyzed: 07/20/2005 (5G19086-MS1)					Source: IOG0857-01					
Aluminum	1.06	0.050	mg/l	1.00	0.082	98	75-125			
Boron	1.66	0.050	mg/l	1.00	0.64	102	75-125			
Iron	0.991	0.040	mg/l	1.00	0.034	96	75-125			
Magnesium	33.0	0.020	mg/l	5.00	29	80	75-125			
Manganese	0.938	0.020	mg/l	1.00	0.010	93	75-125			
Strontium	2.68	0.020	mg/l	1.00	1.7	98	75-125			
Tin	0.933	0.10	mg/l	1.00	0.0053	93	75-125			
Titanium	0.987	0.0050	mg/l	1.00	0.0034	98	75-125			

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METALS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G19086 Extracted: 07/19/05										
Matrix Spike Dup Analyzed: 07/20/2005 (5G19086-MSD1)					Source: IOG0857-01					
Aluminum	1.11	0.050	mg/l	1.00	0.082	103	75-125	5	20	
Boron	1.74	0.050	mg/l	1.00	0.64	110	75-125	5	20	
Iron	1.02	0.040	mg/l	1.00	0.034	99	75-125	3	20	
Magnesium	34.4	0.020	mg/l	5.00	29	108	75-125	4	20	
Manganese	0.977	0.020	mg/l	1.00	0.010	97	75-125	4	20	
Strontium	2.76	0.020	mg/l	1.00	1.7	106	75-125	3	20	
Tin	0.950	0.10	mg/l	1.00	0.0053	94	75-125	2	20	
Titanium	1.02	0.0050	mg/l	1.00	0.0034	102	75-125	3	20	
Batch: 5G25067 Extracted: 07/25/05										
Blank Analyzed: 07/25/2005 (5G25067-BLK1)										
Zirconium	ND	0.20	mg/l							
LCS Analyzed: 07/25/2005 (5G25067-BS1)										
Zirconium	1.01	0.20	mg/l	1.00		101	80-120			
Matrix Spike Analyzed: 07/25/2005 (5G25067-MS1)					Source: IOG1423-01					
Zirconium	1.02	0.20	mg/l	1.00	ND	102	75-125			
Matrix Spike Dup Analyzed: 07/25/2005 (5G25067-MSD1)					Source: IOG1423-01					
Zirconium	1.03	0.20	mg/l	1.00	ND	103	75-125	1	20	

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INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G14039 Extracted: 07/14/05										
Blank Analyzed: 07/14/2005 (5G14039-BLK1)										
Bromide	ND	0.50	mg/l							
Fluoride	ND	0.50	mg/l							
Nitrate-N	ND	0.15	mg/l							
Nitrite-N	ND	0.15	mg/l							
Sulfate	ND	0.50	mg/l							
LCS Analyzed: 07/14/2005 (5G14039-BS1)										
Bromide	4.88	0.50	mg/l	5.00		98	90-110			
Fluoride	4.68	0.50	mg/l	5.00		94	90-110			
Nitrate-N	1.08	0.15	mg/l	1.13		96	90-110			
Nitrite-N	1.47	0.15	mg/l	1.52		97	90-110			
Sulfate	9.53	0.50	mg/l	10.0		95	90-110			*M-3*
Matrix Spike Analyzed: 07/14/2005 (5G14039-MS1)					**Source: IOG0829-01**					
Bromide	4.97	0.50	mg/l	5.00	ND	99	80-120			
Fluoride	4.98	0.50	mg/l	5.00	0.18	96	80-120			
Nitrate-N	6.59	0.15	mg/l	1.13	5.2	123	80-120			*M-HA*
Nitrite-N	1.54	0.15	mg/l	1.52	ND	101	80-120			
Matrix Spike Dup Analyzed: 07/14/2005 (5G14039-MSD1)					**Source: IOG0829-01**					
Bromide	4.71	0.50	mg/l	5.00	ND	94	80-120	5	20	
Fluoride	4.91	0.50	mg/l	5.00	0.18	95	80-120	1	20	
Nitrate-N	6.54	0.15	mg/l	1.13	5.2	119	80-120	1	20	
Nitrite-N	1.50	0.15	mg/l	1.52	ND	99	80-120	3	20	
Batch: 5G14075 Extracted: 07/14/05										
Blank Analyzed: 07/14/2005 (5G14075-BLK1)										
Phosphorus	ND	0.050	mg/l							

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U.S. Filter/Westates Carbon
P.O. Box 3308
Parker, AZ 85344
Attention: Deborah Foster

Project ID: TTO
Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G14075 Extracted: 07/14/05										
LCS Analyzed: 07/14/2005 (5G14075-BS1)										
Phosphorus	0.915	0.050	mg/l	1.00		92	80-120			
Matrix Spike Analyzed: 07/14/2005 (5G14075-MS1)					Source: IOG0784-01					
Phosphorus	1.25	0.050	mg/l	1.00	0.37	88	65-130			
Matrix Spike Dup Analyzed: 07/14/2005 (5G14075-MSD1)					Source: IOG0784-01					
Phosphorus	1.31	0.050	mg/l	1.00	0.37	94	65-130	5	15	
Batch: 5G14089 Extracted: 07/14/05										
Duplicate Analyzed: 07/14/2005 (5G14089-DUP1)					Source: IOG0808-01					
Color	10.0	1.0	Color Units		10			0	20	*pH*
Batch: 5G14094 Extracted: 07/14/05										
Duplicate Analyzed: 07/14/2005 (5G14094-DUP1)					Source: IOG0812-01					
Residual Chlorine	ND	0.10	mg/l		ND				20	
Batch: 5G14118 Extracted: 07/14/05										
Blank Analyzed: 07/14/2005 (5G14118-BLK1)										
Surfactants (MBAS)	ND	0.10	mg/l							
LCS Analyzed: 07/14/2005 (5G14118-BS1)										
Surfactants (MBAS)	0.255	0.10	mg/l	0.250		102	90-110			

Del Mar Analytical, Irvine
Kathleen A. Robb
Project Manager

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Report Number: IOG0857

Sampled: 07/13/05
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METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G14118 Extracted: 07/14/05										
Matrix Spike Analyzed: 07/14/2005 (5G14118-MS1)					Source: IOG0833-01					
Surfactants (MBAS)	0.271	0.10	mg/l	0.250	ND	108	50-125			
Matrix Spike Dup Analyzed: 07/14/2005 (5G14118-MSD1)					Source: IOG0833-01					
Surfactants (MBAS)	0.299	0.10	mg/l	0.250	ND	120	50-125	10	20	
Batch: 5G15045 Extracted: 07/15/05										
Blank Analyzed: 07/15/2005 (5G15045-BLK1)										
Sulfide	ND	0.10	mg/l							
LCS Analyzed: 07/15/2005 (5G15045-BS1)										
Sulfide	0.567	0.10	mg/l	0.560		101	80-120			
Matrix Spike Analyzed: 07/15/2005 (5G15045-MS1)					Source: IOG0959-02					
Sulfide	0.547	0.10	mg/l	0.560	0.010	96	70-130			
Matrix Spike Dup Analyzed: 07/15/2005 (5G15045-MSD1)					Source: IOG0959-02					
Sulfide	0.527	0.10	mg/l	0.560	0.010	92	70-130	4	30	
Batch: 5G15075 Extracted: 07/15/05										
Blank Analyzed: 07/18/2005 (5G15075-BLK1)										
Total Cyanide	ND	0.025	mg/l							
LCS Analyzed: 07/18/2005 (5G15075-BS1)										
Total Cyanide	0.191	0.025	mg/l	0.200		96	90-110			

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Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G15075 Extracted: 07/15/05										
Matrix Spike Analyzed: 07/18/2005 (5G15075-MS1)					Source: IOG0684-02					
Total Cyanide	0.214	0.025	mg/l	0.200	ND	107	70-115			
Matrix Spike Dup Analyzed: 07/18/2005 (5G15075-MSD1)					Source: IOG0684-02					
Total Cyanide	0.188	0.025	mg/l	0.200	ND	94	70-115	13	15	
Batch: 5G19066 Extracted: 07/19/05										
Blank Analyzed: 07/19/2005 (5G19066-BLK1)										
Total Kjeldahl Nitrogen	ND	0.50	mg/l							
LCS Analyzed: 07/19/2005 (5G19066-BS1)										
Total Kjeldahl Nitrogen	11.5	0.50	mg/l	10.0		115	85-120			
LCS Dup Analyzed: 07/19/2005 (5G19066-BSD1)										
Total Kjeldahl Nitrogen	11.2	0.50	mg/l	10.0		112	85-120	3	15	
Matrix Spike Analyzed: 07/19/2005 (5G19066-MS1)					Source: IOG0863-02					
Total Kjeldahl Nitrogen	11.8	0.50	mg/l	10.0	0.84	110	85-120			
Matrix Spike Dup Analyzed: 07/19/2005 (5G19066-MSD1)					Source: IOG0863-02					
Total Kjeldahl Nitrogen	12.3	0.50	mg/l	10.0	0.84	115	85-120	4	15	
Batch: 5G20078 Extracted: 07/20/05										
Blank Analyzed: 07/20/2005 (5G20078-BLK1)										
Oil & Grease	ND	5.0	mg/l							

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METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G20078 Extracted: 07/20/05										
LCS Analyzed: 07/20/2005 (5G20078-BS1)										M-NR1
Oil & Grease	16.0	5.0	mg/l	20.0		80	65-120			
LCS Dup Analyzed: 07/20/2005 (5G20078-BSD1)										
Oil & Grease	15.5	5.0	mg/l	20.0		78	65-120	3	20	
Batch: 5G22080 Extracted: 07/22/05										
Blank Analyzed: 07/22/2005 (5G22080-BLK1)										
Phenols	ND	0.10	mg/l							
LCS Analyzed: 07/22/2005 (5G22080-BS1)										
Phenols	0.508	0.10	mg/l	0.500		102	90-110			
Matrix Spike Analyzed: 07/22/2005 (5G22080-MS1)					**Source: IOG0903-08**					
Phenols	0.508	0.10	mg/l	0.500	ND	102	65-155			
Matrix Spike Dup Analyzed: 07/22/2005 (5G22080-MSD1)					**Source: IOG0903-08**					
Phenols	0.526	0.10	mg/l	0.500	ND	105	65-155	3	20	
Batch: 5G22113 Extracted: 07/22/05										
Blank Analyzed: 07/22/2005 (5G22113-BLK1)										
Ammonia-N	ND	0.50	mg/l							
LCS Analyzed: 07/22/2005 (5G22113-BS1)										
Ammonia-N	0.993	0.50	mg/l	1.00		99	85-115			

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METHOD BLANK/QC DATA

INORGANICS

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: 5G22113 Extracted: 07/22/05										
Matrix Spike Analyzed: 07/22/2005 (5G22113-MS1)					Source: IOG0857-01					
Ammonia-N	1.74	0.50	mg/l	2.00	ND	87	75-125			
Matrix Spike Dup Analyzed: 07/22/2005 (5G22113-MSD1)					Source: IOG0857-01					
Ammonia-N	1.83	0.50	mg/l	2.00	ND	92	75-125	5	15	

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Report Number: IOG0857

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METHOD BLANK/QC DATA

DIQUAT/PARAQUAT (EPA 549.2)

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Data Qualifiers
Batch: C5G1809 Extracted: 07/18/05										
Blank Analyzed: 07/18/2005 (C5G1809-BLK1)										
Diquat	ND	4.0	ug/l							
Paraquat	ND	20	ug/l							
LCS Analyzed: 07/18/2005 (C5G1809-BS1)										
Diquat	32.5	4.0	ug/l	40.0		81	70-120			
Paraquat	32.7	20	ug/l	40.0		82	65-120			
LCS Dup Analyzed: 07/18/2005 (C5G1809-BSD1)										
Diquat	32.7	4.0	ug/l	40.0		82	70-120	1	20	
Paraquat	33.1	20	ug/l	40.0		83	65-120	1	20	
Matrix Spike Analyzed: 07/18/2005 (C5G1809-MS1)					**Source: COG0352-01**					
Diquat	34.8	4.0	ug/l	40.0	ND	87	70-120			
Paraquat	35.5	20	ug/l	40.0	ND	89	65-120			

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U.S. Filter/Westates Carbon
P.O. Box 3308
Parker, AZ 85344
Attention: Deborah Foster

Project ID: TTO

Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

DATA QUALIFIERS AND DEFINITIONS

C	Calibration Verification recovery was above the method control limit for this analyte. Analyte not detected, data not impacted.
L	Laboratory Control Sample recovery was above the method control limits. Analyte not detected, data not impacted.
M-3	Results exceeded the linear range in the MS/MSD and therefore are not available for reporting. The batch was accepted based on acceptable recovery in the Blank Spike (LCS).
M-HA	Due to high levels of analyte in the sample, the MS/MSD calculation does not provide useful spike recovery information. See Blank Spike (LCS).
M-NR1	There was no MS/MSD analyzed with this batch due to insufficient sample volume. See Blank Spike/Blank Spike Duplicate.
pH	pH = 7
R-2	The RPD exceeded the method control limit.
RL-3	Reporting limit raised due to high concentrations of non-target analytes.
ND	Analyte NOT DETECTED at or above the reporting limit or MDL, if MDL is specified.
RPD	Relative Percent Difference

ADDITIONAL COMMENTS

For 1,2-Diphenylhydrazine:

The result for 1,2-Diphenylhydrazine is based upon the reading of its breakdown product, Azobenzene.

Del Mar Analytical, Irvine
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Report Number: IOG0857

Sampled: 07/13/05
Received: 07/14/05

Certification Summary

Del Mar Analytical, Irvine

Method	Matrix	Nelac	California
Calculation	Water	X	X
EPA 300.0	Water	X	X
EPA 330.5	Water	X	X
EPA 350.3	Water	X	X
EPA 3510/8082	Water	X	X
EPA 3510C/8081A	Water	X	X
EPA 365.3	Water	X	X
EPA 376.2	Water	X	X
EPA 413.1	Water	X	X
EPA 420.1	Water	X	X
EPA 6010B	Water	X	X
EPA 7470A	Water	X	X
EPA 8260B	Water	X	X
EPA 8270C	Water	X	X
SM2120B	Water	N/A	N/A
SM4500-CN-C,E	Water	X	X
SM4500-NORG,C	Water		X
SM5540-C	Water	X	X

Nevada and NELAP provide analyte specific accreditations. Analyte specific information for Del Mar Analytical may be obtained by contacting the laboratory or visiting our website at www.dmalabs.com.

Subcontracted Laboratories

Del Mar Analytical - Colton *California Cert #1169, Arizona Cert #AZ0062, Nevada Cert #CA-242*
1014 E. Cooley Drive, Suite AB - Colton, CA 92324
Method Performed: EPA 549.2
Samples: IOG0857-01

Test America, Inc.
2960 Foster Creighton Drive - Nashville, TN 37204
Analysis Performed: 8151A (Herbicides)
Samples: IOC0857-01

Del Mar Analytical, Irvine
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SUBCONTRACT ORDER - PROJECT # IOG0857

SENDING LABORATORY:
Del Mar Analytical, Irvine
17461 Derian Avenue. Suite 100
Irvine, CA 92614
Phone: (949) 261-1022
Fax: (949) 261-1228
Project Manager: Kathleen A. Robb

RECEIVING LABORATORY:
Del Mar Analytical - Colton
1014 E. Cooley Drive, Suite AB
Colton, CA 92324
Phone :(909) 370-4667
Fax: (909) 370-1046
COG 0448

Analysis	Expiration	Due	Comments
Sample ID: IOG0857-01 Water	**Sampled: 07/13/05 14:00**		
549.1-Diquat	07/20/05 14:00	07/25/05 12:00	std TAT- sub to DMAC-see comments

Containers Supplied:
1 L Brown Poly (IOG0857-01V)

SAMPLE INTEGRITY:

All containers intact: ☑ Yes ☐ No | Sample labels/COC agree: ☑ Yes ☐ No | Samples Received On Ice:: ☑ Yes ☐ No
Custody Seals Present: ☐ Yes ☐ No | Samples Preserved Properly: ☑ Yes ☐ No | Samples Received at (temp): 6°

Released By	Date	Time	Received By	Date	Time
Vas Bandy			L. Greco	7-14-05	
Anthony Greco	7-14-05	1500	Ashley Banks	7/14/05	1500

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CHAIN OF CUSTODY FORM

Client Name/Address:	P.O. #:	ANALYSIS REQUIRED
	Project: TTO	
Project Manager/Phone Number:	Phone Number:	
Sampler:	Fax Number:	

Sample Description	Sample Matrix	Container Type	# of Containers	Sampling Date/Time	Preservation	Special Instructions
TTO						

Relinquished By	Date/Time:	Received By	Date/Time:
Relinquished By	Date/Time:	Received By	Date/Time:
Relinquished By	Date/Time:	Received By	Date/Time:

Turnaround Time: (check)
Same Day _____ 72 Hours _____
24 Hours _____ 5 days _____
48 hours _____ normal _____
Sample Integrity: (Check)
Intact _____ On Ice: _____

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CHAIN OF CUSTODY FORM

Client Name/Address:	P.O. #:	ANALYSIS REQUIRED
	Project:	
Project Manager/Phone Number:	Phone Number:	
Sampler:	Fax Number:	

Sample Description	Sample Matrix	Container Type	# of Containers	Sampling Date/Time	Preservation	Special Instructions

Relinquished By	Date/Time:	Received By	Date/Time:
Relinquished By	Date/Time:	Received By	Date/Time:
Relinquished By	Date/Time:	Received By	Date/Time:

Turnaround Time: (check)
Same Day _____ 72 Hours _____
24 Hours _____ 5 days _____
48 hours _____ normal _____
Sample Integrity: (Check)
Intact _____ On Ice: _____

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CHAIN OF CUSTODY FORM

Client Name/Address:	P.O. #: Project:	ANALYSIS REQUIRED
Project Manager/Phone Number: Sampler:	Phone Number: Fax Number:	

Sample Description	Sample Matrix	Container Type	# of Containers	Sampling Date/Time	Preservation	Special Instructions

Relinquished By	Date/Time:	Received By	Date/Time:
Relinquished By	Date/Time:	Received By	Date/Time:
Relinquished By	Date/Time:	Received By	Date/Time:

Turnaround Time: (check)
Same Day _____ 72 Hours _____
24 Hours _____ 5 days _____
48 hours _____ normal _____
Sample Integrity: (Check)
Intact _____ On Ice: _____

ATTACHMENT G

EXCERPT FROM 2003 WORKING DRAFT RISK ASSESSMENT WORKPLAN FOR THE SIEMENS WATER TECHNOLOGIES CORP. CARBON REACTIVATION FACILITY:

APPENDIX A PROTOCOL FOR PROVIDING INFORMATION FROM THE COLORADO RIVER INDIAN TRIBES TO WESTATES (PREPARED BY THE COLORADO RIVER INDIAN TRIBES)

APPENDIX A
PROTOCOL FOR PROVIDING INFORMATION FROM THE COLORADO RIVER INDIAN TRIBES TO WESTATES
(Prepared by the Colorado River Indian Tribes)

Westates and/or its Consultants need to provide a written request for risk assessment information to the Colorado River Indian Tribes (CRIT) Attorney Generals (AG) office or its designee.

The CRIT AG office will process the request and determine the disposition of the information requested. The disposition may include one of the following:

a) Non-sensitive standard EPA guidance information

b) Non-sensitive site-specific information

c) Sensitive site-specific information

Information requests that qualify under conditions (a) non-sensitive standard and/or (b) non-sensitive site specific, will be processed as follows:

(1) If the response to Westates request is to be in writing, the CRIT AG office or its designee will determine the appropriate CRIT department or person to respond to the information request. The written response will be provided to the CRIT AG office for review and will be submitted by CRIT AG office to Westates.

(2) If response is to be verbal (i.e., telephone conversation, meeting, etc.), the CRIT AG office will determine the appropriate CRIT department or person for disseminating information. A representative of the CRIT AG office or their designee must be present for all communications. No direct contact can be made without a representative of the AG office present. The CRIT AG office or their designee will provide a written summary of phone call or meeting to Westates.

(3) If the requested information qualifies under condition (c) sensitive site-specific, the AG office will process the information according to the protocol listed under separate cover, entitled, “Process for Evaluating Human and Ecological Health Risks Specific to the Colorado Indian River Tribes”. This is a confidential process designed to achieve the following two objectives:

(a) To ensure protection of human health and ecological risks specific to cultural, medicinal, and/or spiritual practices of the Colorado River Indian Tribes that may be affected by the Westates facility operations, and

(b) To ensure the confidentiality of this sensitive information within the tribes.

The CRIT AG office or its designee will prepare an appropriate and relevant written response to Westates for inclusion into all risk assessment documents. This response is intended to satisfy any federal or state risk assessment requirements for the Westates facility operations.

Finally, the intent of this protocol is to ensure that Westates’ information needs are met in an appropriate and timely manner and that the CRIT AG office is completely aware of any information the tribe may provide to Westates and/or its consultants. The CRIT AG office will be responsible for obtaining Tribal Council permission for all information requests.

PROCESS FOR EVALUATING HUMAN AND ECOLOGICAL HEALTH RISKS SPECIFIC TO THE COLORADO RIVER INDIAN TRIBES

(Prepared by the Colorado River Indian Tribes)

The US EPA guidance to be used by Westates in conducting risk assessment for the facility is a prescriptive document with a standard set of exposure scenarios to be evaluated for potential human health and ecological risk. It is important that exposures to the tribes specific to cultural, medicinal, and/or spiritual activities or special dietary needs be evaluated in the risk assessment. It is equally important that these sacred practices remain confidential.

In order to adequately assess potential public health and ecological risk to the tribes and maintain strictest confidentiality, the following process will be used.

Human Health

1. ARCADIS risk assessor will design a series of questions to determine potential exposures for CRIT members that may not be accounted for in traditional USEPA risk assessment.
2. Information for this assessment of human health risks to be collected via a confidential questionnaire.
3. A follow up telephone conversation to clarify information and/or to seek additional information will be conducted after receipt of the questionnaires and preliminary review. This follow up will include the ARCADIS risk assessor, and a knowledgeable tribe member or designee. The follow up conversation will be conducted, as appropriate, for each tribe.
4. Human health information to be gathered from each of the tribes, to include, but not limited to the following:
    - plants, soil, animals used in cultural, medicinal, spiritual practices or special dietary needs
    - type of potential exposure during these practices, ie, ingestion, inhalation, and/or dermal contact with plants, soil, animals
    - how often/how long is the exposure (ie, 2 hours a day, every day, or once a year, etc.)
    - how much plant, soil, animal matter is used in the practice (one plant, two plants, only the roots, only leaves, only the animal hide, handful of soil, etc.)
    - type plants and/or animals used in practices
    - multiple exposures, i.e., is an individual likely to be exposed to one or more of these practices.
5. Information to be collated and compared to risk exposure calculations already prescribed in USEPA guidance and/or developed by Westates to determine the following:
    - Is the tribe specific exposure accounted for in the existing EPA guidance?

- If not, and the exposure is significant, can existing EPA guidance be modified?
- If not, exposure equations based on the information from the tribes will be created to assess exposure.

6. All information collected will be held in strictest confidence and returned to the tribe after all final risk assessment evaluations have been made.
7. It will not be necessary for assessment procedures for exact rituals or medicinal recipes be disclosed even to ARCADIS risk assessors.
8. Exposure to receptors due to subsistence fishing, hunting, and agriculture developed by Westates consultants will be reviewed by ARCADIS risk assessor to make sure full exposure is accounted for in the risk assessment.
9. ARCADIS will prepare text for inclusion in the risk assessment. This text is will summarize potential risks relative to tribal-specific cultural, medicinal, and/or spiritual activities or special dietary needs evaluated in the risk assessment. This text will be general and reviewed by Tribal council prior to release to Westates.

Ecological Health

1. ARCADIS risk assessor to work with tribal environmental officials to identify state and federal threatened and endangered species and species of special concern. The precise locations of prime habitat, nesting areas, etc. do not need to be provided even to ARCADIS. However, all potential critical habitat and threatened and endangered species and species of special concern, need to be identified.
2. ARCADIS will help the tribe prepare confidential survey information to be used in the ecological risk assessment. This may include, but not limited to the following:
    - Review the list of state and federal Threatened and Endangered Species/Species of Special Concern to determine if said species exist on tribal lands
    - Determine nature and extent of critical habitat and/or threatened and endangered species/species of special concern
    - Identify any flora/fauna species of specific tribal concern relative to cultural, medicinal, spiritual practices for each tribe.
    - Determine if existing ecological risk assessment will address all of these special ecological receptors
    - Identify methods for addressing these receptors, e.g. surrogate species, etc. to be included in the ecological risk assessment.
3. ARCADIS will prepare text for inclusion in the risk assessment. This text is will summarize potential risks to threatened and endangered species, species of special concern, and any tribal-specific species relative to cultural, medicinal, and/or spiritual activities. This text will be general and reviewed by Tribal council prior to release to Westates.

Process Flow Chart
(Prepared by the Colorado River Indian Tribes)