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Development of Toxics Emission Factors from Source Test Data Collected Under the Air Toxics Hot Spots Program

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

AIR RESOURCES BOARD
Research Division

DEVELOPMENT OF TOXICS EMISSION FACTORS FROM SOURCE TEST DATA COLLECTED UNDER THE AIR TOXICS HOT SPOTS PROGRAM

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The success of this program was due in part to the excellent cooperation from all of the districts that completed surveys and contributed source test reports. Guidance and test reports were also provided by California Air Resources Board Technical Support, Monitoring and Laboratory, and Research Divisions. This guidance helped in the development of a set of procedures that can be used to develop air toxics emission factors of known accuracy for a wide range of devices.

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TABLE OF CONTENTS

LIST OF TABLES

ABSTRACT

The California Air Resources Board sponsored a program to develop air toxic emission factors from source test data collected under the Air Toxics "Hot Spots" Information and Assessment Act of 1987 (AB2588). Over 1000 source tests have been collected and screened, and a subset of tests was validated in detail. The objective of the screening and detailed validation activities was to eliminate data points or sets with significant problems and/or reporting deficiencies. Through this process the best data sets were selected for emission factor development.

Over 3000 emission factors were developed for various source types including asphalt dryers, external combustion units, reciprocating internal combustion engines, turbines, glass and metal furnaces, polystyrene reactors, coating and plating operations, and fugitives. The substances quantified include: trace metals; polychlorinated dibenzo[p]dioxins and dibenzofurans; polycyclic aromatic hydrocarbons and other semivolatile organic compounds; benzene, toluene and other volatile organic compounds; formaldehyde and other aldehydes; and hydrochloric acid. The emission factor calculation procedures included categorizing each test by design and operating parameters. Statistics were then applied to determine which parameters had a primary impact on emissions. These primary parameters were used to identify distinct groups of devices. Several quality ratings were assigned to each emission factor and a graphical user interface (GUI) was developed to display the emission factors.

As a result of this study, air toxics emission factors have been developed using the best available source testing information. These emission factors can be used by facilities to develop more accurate and complete emission inventories without additional source testing. This report describes the validation and emission factor development procedures and resulting emission factors.

EXECUTIVE SUMMARY

Beginning in 1993, the California Air Resources Board (CARB) sponsored a program to develop air toxic emission factors from source test data collected under the Air Toxics "Hot Spots" Information and Assessment Act of 1987 (AB2588). During Part I of this effort over 750 source tests were collected covering a wide range of devices including asphalt dryers, boilers and heaters, reciprocating internal combustion engines, turbines, glass and metal furnaces, polystyrene reactors, and coating and plating operations. Development of air toxics emission factors for petroleum industry combustion sources was conducted under a separate program supported by the American Petroleum Institute (API) and the Western States Petroleum Association (WSPA). To expand the CATEF database, CARB funded a second part of the project. The primary sources of data were test reports that were not evaluated in Part I that contain sufficient documentation to characterize the process, and sampling and analysis procedures. Part II also includes additional collection of test reports from the districts and chrome plating tests from CARB.

The objective of the data collection phase of the project was to collect all testing information generated as a result of the AB2588 process. As a result of the Part I and II data collection efforts over 1000 tests have been collected from the districts. Several districts, however, did not have sufficient resources to identify if any additional tests had been conducted and/or provide copies of any identified additional test reports.

To develop emission factors based on the best available source tests, a comprehensive data validation procedure was developed. This procedure identified data points and data sets with significant problems and/or reporting deficiencies in three steps including: screening, detailed validation, and outlier analysis.

The following types of information were deemed necessary to develop emission factors for this project.

- Measurements of air toxics emissions
- Source classification code (SCC)
- Process rate in units compatible with the SCC
- Laboratory/sample data
- Key parameters specific to the source type
- Number of tests run

Detailed validation procedures were established to ensure that correct sampling and analysis procedures were used, to identify significant problems such as high field blanks, check calculations, and evaluate the accuracy of the test results. Specific validation procedures were developed for 19 test methods. After the validation activities were completed the emissions data from the remaining reports were extracted. This provided yet another quality assurance criterion for elimination of test report data from consideration and inclusion in the emission factors estimation process. For each test that was not rejected, 28 different items of information were extracted.

In summary, the emission factor database contains the information on the following:

- 65 types of Air pollution control device
- 65 different ARB ratings
- 9 different substance categories
- 93 different process materials
- 86 source category classifications
- 26 standard industrial classification codes
- 163 different toxic substances
- 43 different source system types.

This development of this information is described in Volume I of this report, which is available for public review. Volumes II and III, which are confidential and restricted from public distribution, contain a detailed listing of all sources and source categories, substances, test results and the results of each level of test report screening. The full database is available in a public release version as a graphical user interface (GUI) for computers operating with the Windows© 3.1, 95 and 97 operating systems. Use of the GUI is documented in a separate users manual available as a pdf document.

ACRONYMS

AB2588	Air Toxics "Hot Spots" Information and Assessment Act of 1987
AB	Afterburner
AF	Air Filter
AI	Ammonia Injection
Al	Aluminum
APC	Air Pollution Control
APCS	Air Pollution Control System
ATEDS	Air Toxic Emission Data System
BAAQMD	Bay Area Air Quality Management District
BH	Baghouse
BTX	Benzene, Toluene, and Xylene
C	Cyclone
CARB	California Air Resources Board
CB	Chevron Blade
CFS	Chemical Fume Suppressant
COC	Carbon Monoxide Oxidation Catalyst
CVAAS	Cold Vapor Atomic Absorption Spectrometry
CVR	Case Vapors Recovered
Cr	Chromium
Cr^{+6}	Chromium Hexavalent
DM	Demister
DMNP	Dist Mist NP mist suppressant
dscfm	Dry Standard Cubic Feet per Minute
dscf	Dry Standard Cubic Feet
GE EER	GE Energy and Environmental Research Corporation
EF	Emission Factor
EPA	Environmental Protection Agency
ESP	Electrostatic Precipitator
F	Filter of unknown type
F101	Fumetrol 101
F140	Fumetrol 140
FB	Foam Blanket
FBC	Fluidized Bed Combustor
FF	Fabric Filter
FI	Fume Incinerator
FPT	Floating Pinched Polypropylene Tubes
GFAAS	Graphite Furnace Atomic Absorption Spectrometry
H2S	Hydrogen Sulfide

HCHO	Formaldehyde
HCl	Hydrogen Chloride
HEPA	High Efficiency Particulate Arresting
HF	Hydrogen Fluoride
HNO3	Nitric Acid
Hp	Horse Power
H2S	Hydrogen Sulfide
HVLP	High Volume Low Pressure
ICAP	Inductively Coupled Argon Plasma
ICE	Internal Combustion Engine
IS	Internal Standards
LD	Laboratory Data or Location Data
LI	Lime Injection
lbs/MMcf	Pounds per Million Cubic Feet
lbs/Mgal	Pounds per Thousand Gallons
lbs/drum	Pounds per Drum
lbs/gal paint	Pounds per Gallon Paint
lbs/tons powder	Pounds per Tons Powder
lbs/lbs production	Pounds per Pounds Production
lbs/ton	Pounds per Ton
lbs/ton coke	Pounds per Ton Coke
lbs/ton production	Pounds per Ton Production
ME	Mist Eliminator
MMBtu	Million British Thermal Units
MC	Multicyclone
MMcf	Million Cubic Feet
MDL	Method Detection Limit
Mgal	Thousand Gallons
mg/amp-hr	Milligram per Amp-hour
mg/kg	Milligram per kilogram
MMT	Multiple Metals Train
MP	Mesh Pad
Ni	Nickel
NIOSH	National Institute of Occupation Safety and Hazard
NOx	Nitrogen oxides
O_2	Oxygen
PA	Paint Arrestor
PB	Polyballs
PBS	Packed Bed Scrubber
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls

PCDD	Polychlorinated Dibenzo-p-dioxin
PCDF	Polychlorinated Dibenzofuran
PE	Polyurethane
ppbv	Parts per Billion Volume
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RFG	Refinery Fuel Gas
ROC	Reactive Organic Compound
RSD	Relative Standard Deviation
S	Scrubber of unknown type
SCAQMD	South Coast Air Quality Management District
SCC	Source Classification Code
SCR	Selective Catalytic Reduction
SD	Spray Dryer
SIC	Standard Industrial Classification
SNCR	Selective Non Catalytic Reduction
SO2	Sulfur Dioxide
SVOC	Semi-Volatile Organic Compounds
THC	Total Hydrocarbons
Ti	Titanium
TO	Thermal Oxidizer
ug/l	Micrograms per litter
VC	Vinyl Chloride
VOC	Volatile Organic Compound
WC	Water Curtain
WS	Wet Scrubber
WSN	Water Spray Nozzle
WSPA	Western States Petroleum Association
WT	Water Trough

1.0 INTRODUCTION

In 1993, the California Air Resources Board (CARB) sponsored Part I of a program to develop air toxic emission factors from source test data collected under the Air Toxics "Hot Spots" Information and Assessment Act of 1987 (AB2588). Work for Part I was divided into two phases. The objective of Phase I was to collect all source tests prepared for AB2588, screen each test, conduct a detailed validation on selected tests, develop emission factor calculation procedures, and conduct a case study. Over 750 source tests were collected covering a wide range of devices including asphalt dryers, boilers and heaters, reciprocating internal combustion engines, turbines, glass and metal furnaces, polystyrene reactors, and coating and plating operations. During Phase II of Part I, emission factors were calculated from a selection of 177 priority tests. The substances quantified include: trace metals; polychlorinated dibenzo[*p*]dioxins (PCDD) and dibenzofurans (PCDF); polycyclic aromatic hydrocarbons (PAH) and other semivolatile organic compounds (SVOC); benzene, toluene and other volatile organic compounds (VOC); formaldehyde and other aldehydes; and hydrochloric acid (HCl). The emission factor calculation procedures included categorizing each test by design and operating parameters. Statistics were then applied to determine which parameters had a primary impact on emissions. These primary parameters were used to identify distinct groups of devices. Several quality ratings were assigned to each emission factor including the confidence interval, relative standard deviation, population rating, and source test method rating. The emission factors developed in Part I are contained in a report titled "Development of Toxics Emission Factors from Source Test Data Collected under the Air Toxics Hot Spots Program", April 11, 1996. The emission factors are also available in the California Air Toxics Emission Factors (CATEF) graphical user interface (GUI).

Development of air toxics emission factors for petroleum industry combustion sources was not funded by CARB during Part I. Instead, CARB agreed to provide the American Petroleum Institute (API) and the Western States Petroleum Association (WSPA) access to AB2588 petroleum industry air toxics source test results to use for the derivation of petroleum industry emission factors. In return for this access, API and WSPA agreed to use the CARB data validation procedures and provide the validated information to CARB for inclusion in the CATEF GUI. The results of this effort are described in the report "Air Toxics Emission Factors for Combustion Sources using Petroleum Based Fuels" released in August of 1998. 39 additional AB2588 source tests were evaluated as a result of the WSPA/API project.

216 test reports collected in Part I have been examined and used to develop emission factors. These tests were selected because they contain information for source types that have more widespread use and/or higher contributions to overall air toxic emissions. Many of the remaining tests collected in Part I can also be used to develop emission factors. To expand the CATEF database, CARB is funding a second part of the project. The primary sources of data are test reports that were not evaluated in Part I that contain sufficient documentation to characterize the process, and sampling and analysis procedures. Part II also includes additional

collection of test reports from the districts and chrome plating tests from CARB. The district data collection efforts focused on tests conducted since the completion of the Part I data collection activities. The objectives of this project include:

1) Developing a set of emission factors which can be used by the CARB and the Districts to check emissions data developed using other estimation techniques;

2) Developing a set of emission factors which can be used by facilities to accurately estimate emissions from a variety of source types;

3) Evaluating different devices and control technologies; and

4) Identifying areas where improvements are needed in air toxics inventories and source test methods.

The Part I data validation and emission factor development procedures was applied to all test reports evaluated in Part II. The Part I graphical user interface (GUI) was revised based on any new or updated emission factors.

Sections 2 through 5 of this report provide a discussion of the data collection, screening, validation, and data extraction activities for information evaluated and collected in Part II. The reader is referred to the Part I final report for a discussion of tests collected and evaluated during Part I. Updated and new emission factors are described and calculated in Section 6.0. Supporting documentation on emission factors that are not being revised is provided in the Part I final report. Tables 19 and 20 provides a complete list of emission factors developed in this project (Parts I and II).

2.0 DATA COLLECTION

The objective of the data collection phase of the project was to collect all testing information generated as a result of the AB2588 process. The reporting phase of theAB2588 program includes the preparation of Air Toxic Inventory Reports (ATIRs) which provide air toxics emissions by process. If source testing was conducted for a process, the results are included in the ATIR. The ATIRs are sent to the local air quality management. As a result of the Part I and II data collection efforts over 1000 tests have been collected from the districts. A complete inventory of the tests collected in Parts I and II of this project is provided in Attachment 2. A summary of the district data collection activities is provided Section 2.1. Chrome plating tests collected from CARB are described in Section 2.2. The Part I data collection efforts are described in the Part I final report.

2.1 Districts

As described above, source test reports are submitted to the districts with the ATIRs. Thus, copies of the test reports must be requested from the districts. A majority of the test reports submitted to the districts before 1994 were collected as a result of the Part I data collection activities. The Part II data collection efforts focused on collecting reports submitted after the Part I activities were completed. In addition, over 100 fugitive test reports identified at the Santa Barbara and Ventura AQMDs during Part I were collected. Similar to Part I, the Part II data collection activities included:

- **District survey.** The survey was designed to locate additional sources of test data. Each district was sent a list of test reports collected during Part I of the project. Districts were asked to provide any test reports not listed.

- **District data collection.** Data collection teams were sent to the South Coast, Santa Barbara, and Ventura Air Quality Management districts.

As shown in Table 1, only a few of the districts had additional test data. 61 source tests were obtained from these districts. In addition, 102 analysis of composition tests were collected from Ventura and Santa Barbara. These tests quantify fugitive emissions while source test reports quantify emissions from point sources. As noted in Table 1, several districts did not have sufficient resources to identify if any additional tests had been conducted and/or provide copies of any identified additional test reports. Mojave with over 30 additional test reports was the most noteworthy of these districts. Upon further review of Mojave's test reports it was decided that the reports covered devices that don't have widespread use. Thus, additional program resources were not allocated to collect the reports.

2.2 Chrome Plating Tests

As noted in the previous section, only a few additional source tests have been conducted since the Part I data collection activities were completed. As a result, CARB decided to review 86 chrome plating test reports that were conducted in California to demonstrate compliance with the NESHAP for hard and decorative electroplating and anodizing operations. CARB provided copies these reports for review.

3.0 SCREENING

To develop emission factors based on the best available source tests, a comprehensive data validation procedure was developed. This procedure identifies data points and data sets with significant problems and/or reporting deficiencies in three steps including: screening, detailed validation, and outlier analysis. The primary objective of the screening analysis is to eliminate test reports that do not provide sufficient process information to develop emission factors. The secondary objective of the screening analysis is to determine which tests provide sufficient supporting information for the detailed validation activities. The detailed validation procedures are described in Section 4.0 and the outlier analysis is described in Section 6.7. The screening procedure and results of the application of this procedure are described in this section.

3.1 Procedures

The following types of information are needed to develop emission factors for this project.

- Measurements of air toxics emissions: The focus of this project is on the development of air toxics emission factors for substances listed in AB2588.

- Source classification code (SCC): To standardize the categorization of equipment by their design and operating characteristics, the EPA and CARB have developed Source classification codes. SCCs are used in this project to allow the users to identify the appropriate emissions factors for their equipment.

- Process rate in units compatible with the SCC: Since an emission factor is typically normalized by the process rate, the measurement and reporting of process rates is necessary for the development of emission factors. In addition, it is essential that the process rate be reported in units corresponding to the device SCC, as these units are designated by CARB as the appropriate units for emission factors.

- Laboratory/sample data: Laboratory and sample data are necessary for the detailed validation process described in Section 4. This process includes checking of test procedures, calculations, and laboratory results and is critical to the validation of the emission data reported. In addition, without the lab/sample data the calculations cannot be checked.

- Key parameters specific to the source type: Most device types have one or more parameters associated with them that could affect emissions. For example, incinerator emissions are impacted by post-combustion air pollution control (APC) device used such as electrostatic precipitators or fabric filters. Tests that do not provide key parameters are rejected, since their emissions data can not be appropriately categorized and evaluated.

- Single run test: To provide an accurate representation of emissions variability CARB test methods require 3 test runs per condition.

Before beginning the detailed validation process each test was examined for the information listed above. Any test report missing one or more of the items was rejected. The following section provides results from the screening analysis.

3.2 Results

Table 2 summarizes the results of the screening analysis for the 1041 tests reviewed in Parts I and II. Screening results for each test are provided in Attachment 2. Over half of the tests collected did not pass the screening analysis and will not be used for emission factor development. Over half of the tests failing the screening analysis failed because either process rates were not provided or process rates were not provided in the correct units.

Also note that differences in hardware configuration (i.e. the presence of post combustion APCDs) do not necessarily lead to separate emission factors. In some cases there was no statistically significant difference between the emissions of certain substances from controlled and uncontrolled devices.

4.0 DETAILED VALIDATION

The detailed validation procedures include checking to ensure the correct sampling and analysis procedures were used, qualifying significant problems such as high field blanks, checking calculations, and evaluating the accuracy of the test results. The detailed validation procedures are only applied to those tests passing the screening process described in Section 3. The following subsections describe the procedures and results of the detailed validation process.

4.1 Procedures

Detailed validation procedures have been developed for all methods needed to quantify the substances listed in AB 2588 appendix D. Specifically validation procedures have been developed for the following methods:

11 - Hydrogen Sulfide (1983)
12 - Inorganic Lead - (March, 1986)
15 - Hydrogen Sulfide - (June, 1983)
101A - Mercury - (1986)
104 - Beryllium - (1986)
106 - Vinyl Chloride - (June, 1983)
410A/B - Benzene - (March, 1986)
421 - Hydrogen Chloride - (January, 1987 and December, 1991)
422 - Volatile Halogenated Organics - (January, 1987 and December, 1991)
423 - Inorganic Arsenic - (January, 1987)
424 - Cadmium - (1987)
425 - Total and Hexavalent Chromium - (January, 1987 and September, 1990)
428 - PCDD/PCDF and PCB - (March, 1988 and September, 1990)
429 - PAH - (September, 1989)
430 - Aldehydes - (September, 1989 and December, 1991)
433 - Nickel - (1989)
436 - Trace Metals - (March, 1991 and 1992)
EPA MMT - Trace Metals
EPA 306 - Total and Hexavalent Chromium

Attachment 3 provides validation procedures for each method. These procedures were developed using experience gained conducting air toxic source tests, and reviewing AB 2588 test reports, EPA and CARB test method documentation and CARB method review sheets. Primary parameters were identified to ensure critical data quality indicators were checked. The primary parameters provide an overall assessment of data quality but may not provide an indication of why a particular problem occurred. For example, if a method required field, reagent, and method blanks, only the field blank was considered a primary parameter because it indicates the total interference and/or contamination resulting from the field and laboratory activities. However, the

field blank does not indicate if the contamination resulted from the field and/or laboratory activities. For this project, it was more important to evaluate the overall quality of the emissions data.

A special note is warranted regarding the results from CARB method 430 for determination of aldehydes. Subsequent to the development of this method and its use in the development of test reports that make up this report, it was found that the method is not reliable for the determination of acrolein and crotonaldehyde. Specifically, it was found that upon derivatization by 2,4-dinitrophenylhydrazine these compounds decay in solution. Furthermore, many of the emission factors for acrolein are based on non-detect data. Therefore, while emission factors are provided for acrolein, the values shown should be used only as indications of possible lower bounds. This warning does not apply to formaldehyde and acetaldehyde emission factors.

Only those parameters provided in the test reports in the form required by the method were checked. For example, if the method required that field blank levels over 20% be flagged, the flags were transferred from the test report to the emission factor database. However, if the field blank levels were reported but not divided by the sample value, the ratios were not calculated. Instead a notation was made to indicate that field blanks were collected and analyzed but the results were not flagged appropriately. The only exceptions to this rule were for CARB Methods 430 and 436. For these two methods, field blank ratios were calculated because most contractors did not provide these ratios.

4.2 Results

The results of the detailed validation procedures are described in this section. The first subsection lists the source and fugitive tests reviewed. The second subsection summarizes the detailed validation results. Test-specific detailed validation results are provided in Attachment 2. The final subsection summarizes the detailed validation flags that will be included in the database.

Listing of Tests Reviewed

Tables 3 and 4 list the source and fugitive tests reviewed in Part II using the detailed validation procedures described above. Tests reviewed in Part I are provided in Attachment 2 and the Part I final report. Table 3 lists the 169 source tests reviewed by Report ID, Device ID, Tests, Device Type, Air Pollution Control System, Fuel, and Material. These parameters are described below:

- Report ID: This is the number that was assigned to a device or similar group of devices in each document during the initial screening phase. Similar devices all have the same primary characteristics such as an internal combustion engine. The report ID is a four-digit number followed by a letter. The four-digit number distinguishes different documents. A unique

letter is assigned to each device or group of devices in a document. If, for example, a document contained results for two boilers and an internal combustion engine, the devices would be given the same four digit number (####), but each would have its own letter identifier (e.g., ####A for the two boilers and ####B for the ICE).

- Device ID: This three-digit number is assigned to each device or group of interconnected devices upon entry into the database. Some facilities have a group of devices that emit to a common stack. For example, one facility in the screening database has six steam generators exhausting to one stack. These six steam generators would receive a single device ID. Each engineer entering data had his/her own assigned set so the person responsible for validating and extracting the results from a particular test could be tracked. In many cases, the report ID and device ID can be used to reference a device or group of interconnected devices. In some cases, however, a report ID references multiple devices. For example, report ID 2431A references 3 devices, device IDs 241 to 243, as shown in Table 3.

- Tests: As mentioned earlier, a test includes the quantification of air toxics and other emissions from a device or group of interconnected devices operating under one condition. A condition is defined as set of operating constraints that are fixed during a test. For example, one condition would be a boiler fired on natural gas under normal load. Another condition might be the same boiler fired on fuel oil under normal load. In this case, a single device ID would be assigned and 2 tests would be listed in Table 3.

- Device Type: This field displays the type of device such as internal combustion engine or plating operation.

- Air Pollution Control System: This field displays the type of control system. In some cases the control system may include multiple air pollution control devices. In these cases, each device is separated by the symbol "/".

- Fuel: This field displays the type of fuel consumed during the test. In some cases multiple fuels may have been fired. Each fuel is separated by the symbol "/". For some device types such as plating operations, fuel type is not applicable and is listed as "None".

- Material: This field displays the type of material processed during the test. In some cases multiple materials may have been processed. Each material is separated by the symbol "/". For some device types such as internal combustion engines, material type is not applicable and is listed as "None".

Table 4 lists the 81 fugitive tests reviewed by Report ID, Device ID, Tests, Device Type, and Material. Definitions for these parameters are the same as those listed above.

Detailed Validation Summary

Table 5 summarizes common problems found in the detailed validation analysis and problems that resulted in test data being rejected. Detailed validation results for each test are provided in Attachment 2 and validation flags are presented in the next subsection. Brief descriptions of each detailed validation note listed in Table 5 are provided below.

- Dioxins/Furans and PAH sampled using a single train. Initially, as per CARB instructions, the results from these reports were not reviewed or extracted. However, after data validation operations revealed that many of the dioxin/PAH tests were sampled using a single train, CARB reconsidered its initial position, and all results were validated, checked, and extracted as reported. All tests that used combined sampling and analysis for Dioxin and PAH were noted in the database.

- Separate front/back-half analyses were conducted for CARB 436. The results were not validated or extracted per the CARB's instructions.

- Used outdated method without CARB approval. For one test, the November 1990 draft of CARB 436 was used to quantify metals. Since the test was conducted in June of 1991, the March 1991 version of CARB 436 should have been used. Since approval was not granted by the CARB to use the November 1990 version, the results were not validated or extracted.

- CARB 421 sampling was not isokinetic and stack temp < 250F. When the stack temperature is below 250 °F, Method 421 requires that isokinetic sampling be conducted. 3 tests did not use isokinetic sampling even though the stack temperature was less than 250 °F. As required by CARB, the results were neither reviewed nor extracted.

- Naphthalene analyzed by CARB 410. Since naphthalene was quantified using an incorrect method these results were not validated or extracted.

- Nonisokinetic sampling CARB 429. The sampling methodology for 3 tests was modified for non-isokinetic testing by eliminating the glass nozzle and probe from the sampling train. These tests were conducted using a 3/8-inch diameter glass probe placed in the center of the exhaust stack. The glass probe was connected directly to a Teflon sample line. No mention of CARB approval was given for these modifications. The results were validated, extracted, and noted in the database.

- A full set of internal standards not used for method 429. CARB Method 429 requires spiking of 14 internal standards into each sample. 60 tests did not spike all 14 standards. Instead, most spiked and reported recoveries for about half of them. The results were validated and extracted and noted in the database.

- All sampling was done non-isokinetically. For a single test, CARB methods 421, 425, 428, 429, and 436 were all conducted non-isokinetically. Consequently, the results were neither validated nor extracted.

- Mercury not tested by CVAAS. CARB Method 436 specifies the use of CVAAS to quantify Mercury. For a single test this method was not used and the results were rejected.

- Did not use correct impingers for metals train. Two tests did not use the specified number of impingers for CARB Method 436 and the results were rejected as specified by the method.

Results of the calculation checks for both Parts I and II are given by device in Attachment 2. Most of the calculation errors for both Parts I and II occurred for CARB Method 430. Specifically contractors did not provide the reporting limit when the sample to blank ratio was less than 5. The results for these reports were not corrected and are noted in the database.

Detailed Validation Flags

After all the tests results were validated and extracted, the method validation sheets were compiled and the validation flags were entered into a database. The validation flags were then condensed and exported to a spreadsheet for tabular summation. The results of the Part II detailed data validation are summarized in the tables located in Attachment 4. Results from the Part I detailed validation are provided in the Part I final report. Attachment 4 contains one table per method. Each test method has a set of validation parameters that are used to verify proper sampling and analytical procedures. These parameters are organized into sections by type of sampling or analytical check. The sections are in boldface and shaded gray in the tables. A detailed review of a source test report can produce three basic responses with the corresponding flag notations for each validation parameter:

- Pass: A blank cell in the table

- Insufficient information to report a parameter: R, V, N, P, RN, PN

- Fail: Y, RF, PF

Consider Method 436 (1992) as an example. This method is applicable to the determination of trace metal emissions from stationary sources, and requires some of the more complex validation parameter checks. The table shows a total of 13 stacks (Stack IDs: 21310, 23010, 23310, 23510, 24710, 25910, 26010, 26110, 26210, 26310, 26410, 27910, and 43610) were sampled and analyzed using this method. The first three digits of the stack ID are the device ID and the last two digits identify each stack on the device. The stack ID is used in Attachment 4 because some devices have multiple stacks. Each of these stacks may have been tested and therefore validation was conducted on each stack. The following is a brief explanation of each notation with an example.

R This notation is used when it cannot be determined whether the parameter was conducted or not. It could not be determined whether field reagent blanks were collected once per test for four stacks (21310, 23310, 23510, and 26210).

V If values were not provided for a parameter, this notation is used. Three stacks (23010, 23510, and 24710) show values were not provided for pre-test leak rate.

N This notation is used when a parameter was not conducted. Pre- and/or post-test meter γ were not conducted for one stack (43610).

P This notation is used specifically for the Pitot tube semi-annual calibration sheet parameter. The validation sheet asks if the semi-annual calibration sheet is included in the report. Four stacks (21310, 23310, 24710, and 27910) failed to do so.

RN* Similar to the V notation, but applied to more detailed parameters that require run quantification. One pre-test leak rate could not be checked for one stack (21310).

PN* Again, similar to the V notation, but applied to more detailed parameters that require run and substance quantification. One stack (23510) shows that values for fifteen matrix spike recoveries could not be checked.

Y This notation is used when a parameter was conducted and failed. One stack (24710) failed to conduct at least 3 sampling runs.

RF* Similar to the Y notation, but applied to more detailed parameters that require run quantification. One stack (23010) reported isokinetic variation failure for one run.

PF* Again, similar to the Y notation, but applied to more detailed parameters that require run and substance quantification. For one stack (25910), it shows the sample/field ratio is less than 5 for eighteen points.

* Numbers before these notations represent how many times a parameter failed or could not be checked.

The following is a list summarizing the validation tables for each method. The list contains those parameters that were flagged for 50% or more of the devices in each table unless noted. By far, the most prevalent types of flags found in the tables are those associated with reporting. Still, there are plenty of failures that are noteworthy, but they are much less frequent. Note primary validation parameters are underlined and failures are in Italics. For more details on specific parameter failures, please see the tables in Attachment 4.

Method 11 (1983): Insufficient reporting - <u>Reagent blank not conducted daily</u>
Insufficient reporting - Iodine solution not used

Method 12 (1986): Insufficient reporting - Swirl check
Insufficient reporting - Semi-annual pitot tube calibration
Insufficient reporting - <u>Field reagent blank not conducted on 2 filters and 0.1N HNO3</u>
Insufficient reporting - Atomic absorption spectrometry not used
Insufficient reporting - Atomic absorption spectrometry not conducted in triplicate

Method 15 (1983): None

Method 101A (1986): Insufficient reporting - Swirl check
Insufficient reporting - Dry gas meter pre- and post-check
Insufficient reporting - Semi-annual pitot tube calibration
Insufficient reporting - Filter temperature
Failure - Field reagent blank not used to correct samples
Failure - Combined analysis not used

Method 104 (1986): Insufficient reporting - Swirl check
Insufficient reporting - Method 1 not used
Insufficient reporting - Nozzle size check
Insufficient reporting - Flow rate check
Insufficient reporting - Field reagent blank not conducted for acetone
Failure - Atomic absorption spectrometry not used

Method 106 (1983): *Failure* - GC/FID not used
Insufficient reporting - GC/FID not used
Insufficient reporting - 3-point calibration curve not conducted daily or before and after test

Method 306 (1990): Insufficient reporting - Swirl check

Method 410A (1986): Insufficient reporting - Leak check

Method 421 (1987): Insufficient reporting - Swirl check
Insufficient reporting - Nozzle size check
Insufficient reporting - Semi-annual pitot tube calibration
Insufficient reporting - Field reagent blank not conducted one per test
Insufficient reporting - Lab spike not conducted for 10% of samples
Insufficient reporting - Duplicate not conducted for each sample

Method 421 (1991): Insufficient reporting - Swirl check
Insufficient reporting - Water not used as impinger solution
Insufficient reporting - Lab spike not conducted prior, daily, and after every 40 samples

Method 422 (1987): None

Method 422 (1991): Insufficient reporting - Leak check
Insufficient reporting - Field spike not collected once per source

Method 423 (1987): Insufficient reporting - Filter temperature
Insufficient reporting - Flow rate check
Insufficient reporting - Combined analysis not used

Method 424 (1987): Insufficient reporting - Swirl check
Insufficient reporting - Nozzle size check
Insufficient reporting - Field reagent blank not conducted for two filters and 0.1N HNO3
Insufficient reporting - Atomic absorption spectrometry not conducted in triplicate

Method 425 (1987): Insufficient reporting - Swirl check
Insufficient reporting - Method 1 not used
Insufficient reporting - Dry gas meter pre- and post-check
Insufficient reporting - Semi-annual pitot tube calibration
Insufficient reporting - Matrix spike not conducted once per test for Hexavalent Chromium
Insufficient reporting - Matrix spike percent recovery for Hexavalent Chromium >10%
Insufficient reporting - Matrix spike not conducted daily for Total Chromium
Insufficient reporting - Duplicates not conducted for every 10 samples for Total Chromium

Method 425 (1990): Insufficient reporting - Probe proof not conducted per probe
Insufficient reporting - Matrix spike not conducted once per test for Hexavalent Chromium

Method 428 (1988): Insufficient reporting - Swirl check
Insufficient reporting - Nozzle size check
Insufficient reporting - Surrogate standards percent recovery
Insufficient reporting - Laboratory control spike percent accuracy
Failure - Internal standards percent recovery
Insufficient reporting - Internal standards percent recovery

Method 428 (1990): Insufficient reporting - Swirl check
Insufficient reporting - Surrogate standards percent recovery
Insufficient reporting - Laboratory control spike percent accuracy
Insufficient reporting - Internal standards percent recovery

Method 429 (1989): Insufficient reporting - Swirl check
Insufficient reporting - Surrogate standards not conducted once per test
Insufficient reporting - Laboratory control spike percent accuracy
Insufficient reporting - Internal standards not conducted once per run

Method 430 (1989): Insufficient reporting - Indication of leaks
Insufficient reporting - Matrix spike not conducted per test

Method 430 (1991): Insufficient reporting - Calibration check for each rotometer
Insufficient reporting - Indication of leaks
Insufficient reporting - Sampling dates not within 2 days of reagent blank check

Method 433 (1989): Insufficient reporting - Swirl check
Insufficient reporting - Nozzle size check
Insufficient reporting - Field reagent blank not conducted for two filters and 0.1N HNO3

EPA MMT (1989): Insufficient reporting - Duplicates percent difference (ICAP)
Insufficient reporting - Duplicates not conducted per run (CVAAS)

Method 436 (1992): Insufficient reporting - Swirl check
Failure - Sample/field blank ratio < 5
Insufficient reporting - Duplicates percent difference (ICAP)

SCAQMD 207.1 (1990):Insufficient reporting - Swirl check

Lastly, the tables in Attachment 4 do not specify validation results for individual hazardous air pollutants. Consequently, one cannot determine if any one substance failed method parameters more than others did by using these tables alone. Attachment 5, however, contains a table that provides such information. The table lists how many times a particular substance failed a validation parameter. It includes the Method, Version (Year), Failed Check, Substance, and Count. The table presents results for both isokinetic and non-isokinetic trains.

5.0 DATA EXTRACTION

Data extraction is the process of entering design and operating information, and emission results into a database. After the validation activities were completed as described in Section 4.0, the emissions data were extracted. If a critical validation parameter was not satisfied for a method, such as analyzing the front- and back-half component of a CARB 436 train, the emissions data for the method were not extracted. If several methods were not suitable for extraction in a single test report, the complete test report was rejected. If the test report did not provide sufficient information to develop emission factors, it also was rejected. For each test that was not rejected, the following information was extracted.

Device Information

1.) Source classification code (SCC)
2.) Standard industrial code (SIC)
3.) Control device type
4.) Fuel type or material processed
5.) Capacity
6.) Company
7.) Location
8.) Report Date

Sample and Analysis Procedures

1.) Sampling method
2.) Analysis method
3.) Contractor
4.) Detection limit based oon MDL or PQL

Run Information

1.) Process rate and unit (must be appropriate for emission factor development)
2.) Site run ID
3.) Date of Run
4.) Fuel/Material type burned/used during test
5.) Description of operation during test
6.) Stack flow rate (dscfm)
7.) Stack moisture (%)
8.) Stack temperature (F)
9.) Stack oxygen (%)

Emission Information

1.) Substance
2.) Detection indicator (Detected or Not Detected)
3.) Data quality flags
4.) Concentration value and unit
5.) Emission rate value and unit
6.) Emission factor value and unit

In some instances SCCs were not provided. In these cases SCCs were assigned if a clear category definition was available in the CARB listing. There were some instances where the SCC listing was not sufficient to distinguish between different types of equipment. For example, natural gas fired turbines have an SCC of 20200203 regardless of whether they are equipped with post combustion APCDs. Subgroups were developed to account for this following the guidelines described in Section 6.8. To summarize, however, no subgroups were specified in cases where the result provided no improvement in data quality. This includes cases where the subgroup would have too few members, or where the subgroup results were not statistically different from the SCC group as a whole.

Similarly, there were instances where emission data were valid but no SCC was available. An example would be field gas fired engines, for which the SCC for natural gas was assumed. In these cases an SCC was assigned as long as the emissions data from the unit were representative of the SCC group to which they were assigned, and as long as there were not enough units to define a subgroup. In future compilations these units may be reassigned as more data becomes available and if test results from additional units are incorporated.

6.0 EMISSION FACTORS

A procedure was developed to provide emission factors of known quality for a wide range of air toxics and source types. This procedure considers the design and operation of the sources, process stream characteristics, data quality, source population size, and emission factor variability. The procedure includes the following steps:

- Identify Design and Operating Parameters
- Identify Normalizing Units
- Assign Run Specific Method Ratings
- Calculate Run Specific Emission Factors
- Identify Major and Sub Group Evaluation Parameters
- Compile Detailed Data Listings
- Conduct Outlier Analysis
- Identify Sub Groups
- Calculate Emission Factors for each Sub Group
- Assign Sub Group Method and Population Ratings
- Assign CARB Overall Quality Rating
- Assign EPA Overall Quality Rating

Each of these steps is discussed below. The discussion includes a brief background, which describes why the step is needed and the approach used. The background is followed by a presentation of the results of applying the subject step to the data.

6.1 Design and Operating Parameters

Background. To develop emission factors, sources must be grouped by their design and operating characteristics. Ideally, emissions from devices in each group should be similar or have low variability when normalized. To define design and operating parameters, a literature review was conducted. AP-42 was one of the best sources of information identified. In addition to AP-42, EER used its experience in past programs such as the WSPA air toxic emission factor project to define design and operating parameters. Table 6 lists key parameters which may affect emissions from asphalt production, cement kilns, glass manufacturer, metal furnaces, polystyrene manufacture, chrome plating, surface coating, external combustion, internal combustion, gas turbines, and fugitives.

Results. Few reports contained all of the information listed in Table 6. Basic system type, feed material or fuel, and air pollution control system type were available for most sources. Unit capacity and manufacturer were available for approximately half the sources. Some information was available for metal furnace type and surface coating spray method.

6.2 Normalizing Units

Background. An emission factor characterizes air toxic emissions as a ratio of the amount of pollutant released to a process-released parameter. Emission factors are typically expressed in terms of mass of emission per mass or volume of fuel or material fed or product produced. Thus, the emission rate is normalized by the production rate or by the feed rate of fuel or material. This method of normalizing assumes that emissions are directly proportional to production rate or fuel or material feed rate. Based on established procedure, normalizing units were assigned based on the source classification codes (SCC).

Results. The first step in determining the appropriate normalizing units is to assign SCCs. Using a SCC look-up table from the ARB and descriptions provided in the test reports, SCCs were assigned for each test. Table 7 lists the SCCs assigned. For several tests, no SCC was available which adequately described the test. For example, several of the reciprocating internal combustion engines and one gas turbine were fired on field gas. For these sources, a natural gas SCC was used. In addition, one steam generator, and one heater fired natural and process gas simultaneously. SCCs were available for natural gas and process gas separately. However, a SCC was not available for simultaneous burning of natural and process gas. Therefore, both SCCs were used to describe the source in the database. Several of the turbines also fired multiple fuels simultaneously. SCCs describing each applicable fuel were listed in the database. For the internal combustion engines and heaters, additional SCCs must be requested from the EPA. The required normalizing units for each SCC also are provided in Table 7. Emission factors have been expressed in these units.

6.3 Run Specific Method Rating

Background. To compare and evaluate test results, it is important to denote the test methods that were used and the level of documentation that was provided. Various systems have been developed to categorize test methods and the level of documentation. For example, the EPA developed the system described below.

EPA Method Rating

A When tests are performed by a sound methodology and are reported in enough detail for adequate validation.

B When tests are performed by a generally sound methodology but lack enough detail for adequate validation.

C When tests are based on an untested or new methodology or are lacking a significant amount of background data.

D When tests are based on a generally unacceptable method but the method may provide an order-of-magnitude value for the source.

U Unrateable.

The EPA method rating were used for the Factor Information Retrieval (FIRE) system that includes criteria and air toxic emission factors. For the CARB emission factor project the EPA system was modified to distinguish between EPA and CARB methods as well as tests which provide sufficient documentation and those that do not. The method rating system used for CARB emission factor project is described below.

CARB Method Rating

A Test was performed using a new or old CARB methodology and sufficient documentation was provided to validate the results.

B Test was performed using a new or old EPA methodology and sufficient documentation was provided to validate the results.

C Test was performed using a new or old CARB methodology and insufficient documentation was provided to validate the results.

D Test was performed using a new or old EPA methodology and insufficient documentation was provided to validate the results.

E An assumption was made in the emission factor calculation that could significantly affect the accuracy of the results. Methods that do not have validation check procedures also were rated under this category.

F Emission data is unacceptable for inclusion in emission factor database. If a sampling problem or process upset occurred which significantly impacted the emission results, the emission results were excluded from emission factor calculations. A statistical test was used to identify outliers as described in section 6.7.

**It should be noted that the EPA methods are not considered inferior. However, the majority of the test methods were CARB's because the Hot Spots program mandated them. An EPA method could be used if there was no corresponding CARB test method or if the source asked for an equivalency determination. CARB and EPA test methods are different in many cases and can lead to different results. CARB test methods were rated higher than EPA's to provide consistent test result comparisons.

A test received an A or B (C or D) rating if a specified number of primary validation parameters could be checked. Primary validation parameters are those that indicate overall contamination, poor recovery, and imprecision. Primary parameters are identified in Table 8 for CARB and EPA methods. The table also provides the number of primary parameters per method and the number of primary parameters required to determine if sufficient documentation was provided. The number of parameters required to determine if sufficient documentation was provided was based on the following criteria.

Primary Parameters	Sufficient Documentation if
0 to 2	0 Missing
3 to 4	1 or fewer Missing
5 to 6	2 or fewer Missing

Results. Table 9 summarizes the ratings by method. The table lists the number of times the method was used for the tests extracted and validated during this project. Several methods including EPA 420.1, EPA M5, EPA 30, NIOSH 1612, SCAQMD 205.1, SCAQMD 25.1, and SCAQMD 5.2 received E ratings because no validation check procedures have been developed. These methods were only used for 26 tests and cover a small fraction of the data reviewed during this project. 36 E ratings were assigned because an assumption was made in the emission factor calculation that could significantly affect the accuracy of the results. These assumptions are discussed in Section 6.4. Data from 12 tests were identified as outliers and received F ratings as described in Section 6.7.

Sixty-five tests received G method ratings. A method rating of G was assigned when a substance was quantified using two test methods. In the validation process for the Multi-Metal Sampling Train (MMT), CARB required that one metal be sampled using one of the CARB metal specific sampling trains including CARB 101A, 104, 12, 423 or 433. The metal specific sampling train and MMT results were then compared. This process resulted in replicate results for one metal each time the MMT was used. For this project, the MMT results were used instead of the metal specific sampling train results as specified by CARB's Monitoring and Laboratory Division.

6.4 Run Specific Emission Factor Calculation

Background. A source test usually includes three runs per sample method. Emission factors must be calculated from each of these runs. Once appropriate groups have been defined (see Sections 6.5 and 6.8), run emission factors from one or more source tests are averaged together. In general, emission factors are calculated on a run basis using feed or production rates and air toxic emission rates. For combustion sources, when feed rates are not available, F-Factors can be used in combination with the stack oxygen and air toxic emission concentration using the following equation.

EF = FF*HV*(21/(21-02))*C

For Gas Fired:

EF = Emission Factor, lb/MMcf
FF = Fuel F-Factor, dscf @ No Excess Air/MMBtu
HV = Fuel Heating Value, MMBtu/MMcf
O_2 = Stack Oxygen
C = Substance Concentration, lb/dscf @ Stack Oxygen

For Liquid Fired:

EF = Emission Factor, lb/Mgal
FF = Fuel F-Factor, dscf @ No Excess Air/MMBtu
HV = Fuel Heating Value, MMBtu/Mgal
O_2 = Stack Oxygen
C = Substance Concentration, lb/dscf @ Stack Oxygen

For Solid Fired:

EF = Emission Factor, lb/ton
FF = Fuel F-Factor, dscf @ No Excess Air/MMBtu
HV = Fuel Heating Value, MMBtu/ton
O_2 = Stack Oxygen
C = Substance Concentration, lb/dscf @ Stack Oxygen

Results. Run specific emission factors were calculated for each source in the appropriate unit (see Table 7). For several sources, default parameters were used or other assumptions were made to calculate emission factors because the appropriate data were not provided in the source test report. These assumptions are described below.

Assumed Density (D): For several tests a density was required to convert the process rate into the appropriate normalizing parameter. For example, the emission factor may have been lbs/Mgal and the feed rate was provided in lbs/hr. For these sources a density was required to convert the mass feed rate to a volume feed rate. When the feed material was well characterized, the method rating was not changed to E. For example, distilled fired turbines were not rated as E but coating operations were when a density was not provided.

Assumed Heating Value (H): Three sources required that a heating value be assumed to calculate the emission factor. All of these sources were fired on well characterized fuels and since it is suspected that the heating value will not vary significantly, no revision of method rating was required.

Assumed Feed Equals Products (FEP): Four sources required the assumption that feed equals production. Emission factors for cement kilns, glass furnaces, and asphalt production must be expressed in lbs per ton production. The test reports for these sources only provided the feed rate of raw materials. To calculate the emission factor, the production rate was assumed to equal to the feed rate and a method rating of E was assigned.

Assumed Oxygen: For device 140 an oxygen was not available for the VOC sampling. The oxygen level was assumed to be equal to the reading from other measurement methods and the method rating was set to E.

6.5 Major and Sub Group Evaluation Parameters

Background. A key step in the emission factor development process is to identify devices which have similar designs and operation. The design and operating parameters selected to categorize the devices should impact air toxic emissions. If the parameters are defined appropriately and correct normalizing units are assigned, emission factors developed for each group of devices will be distinctive and will have low variability. These emission factors can be used to accurately assess emissions from similar devices. The first step in the categorization process is to divide the sources into major groups based on their primary design characteristics. Primary design characteristics are those parameters that are known to impact emissions such as basic system and feed type. For this study, emission data from different major groups were not combined when calculating emission factors.

The second step in the grouping process is to identify if any such groups are present within each major group. Sub group identification is based on an evaluation of secondary design and operating parameters. Before sub groups can be established, secondary design and operating parameters must be identified, detailed data listings must be prepared, and ouliers must be identified and eliminated from the analysis if sampling problems occurred. In addition , guidelines and statistical tests should be established to determine if sub groups are needed and appropriate. Secondary design and operating parameters are discussed and listed in this section. Detailed data

listings are described in Section 6.6. The outliers analysis is discussed in Section 6.7 and guidelines for establishing sub groups are presented in Section 6.8.

Results. Major groups have been identified for all devices as shown in Table 10. Each row of data describes a different major group. The first column of this table lists the major groups. Secondary parameters, which were considered when developing sub groups, are listed in the "Sub Group Parameters Evaluated" column. For example, APC system and SCC were evaluated for the major group Asphalt Prod., Diesel. The number of tests passing the detailed validation activities for Parts I and II are listed in the "Tests" column. The total number of tests available for emission factor development is provided in the "Total" column.

For some of the major groups, no sub group development is possible for one or more reasons. In addition, some of the sub group analyses from Part I do not need to be updated because no additional tests were collected or evaluated. These differences are distinguished in Table 10 by dividing the major groups into six sections including:

1. Part II Sub group Analysis – New and Updated Major Groups
2. Part I Sub group Analysis – No Additional Data Collected or Evaluated
3. No Sub group Analysis – No Difference in Design/Operation
4. No Sub group Analysis – No Difference in Samples
5. No Sub group Analysis – Single Test
6. No Sub group Analysis – Process Rate Not Available in Correct Units

Those major groups, which will be updated or are new are listed in the Part II Sub group Analysis section of Table 10. The sub group analysis for these major groups is provided in Section 6.8. Major groups, which will not be updated are listed in the Part I Sub group Analysis section of Table 10. The sub group analysis for these major groups is provided in Section 6.8 of the Part I final report and is not repeated in this report. Sections 3 to 6 of Table 10 list major groups were no sub group development is possible because no difference in design/operation or samples was found, single test, or the process rate was not available in the correct units.

6.6 Detailed Data Listings

Background. To investigate the impact of secondary design and operating parameters and evaluate outliers, lists of emission factors, design and operating parameters and data quality parameters must be compiled. These lists are used to identify trends and as inputs to the statistical evaluation procedures.

Results. The comparison parameters listed in Table 10 and normalized emissions data for new and updated emission factors (see Section 1 of Table 10) were compiled into 18 tables, one for each device type. Each of these tables was sorted by major group, category, substance, and normalized emissions. The number and type of design and operating parameters listed

dependent on the device type. For example, fuel type, SCC, strokes per cycle, capacity, condition, APC system, manufacturer, stack oxygen, and stack flow were listed for internal combustion engines. Because the detailed data listings contain confidential information they have not been provided in this report.

6.7 Outliner Analysis

Background. Before establishing sub groups outliers must be identified and evaluated. If an outlier results from a calculation or data entry error it can be corrected. Outliers resulting from sampling and analysis problems may be eliminated from data analysis activities. There are many approaches for identifying and handling outliers. For this study, the outlier analysis was conducted in two steps as described below.

i.) Conduct an outlier analysis per substance per test and per substance per major group. The Dixon test was used to identify outliers per substance per test and per substance per major group. To use the Dixon test, a group of data is selected and sorted from lowest to highest emissions. Then the high and low points are examined statistically in relation to the other points in the data set. The test will identify if the high and low points are outliers at a prescribed level of confidence. For this study the confidence level was 95%. It should be noted that when applying the Dixxon test to samples with three points many outliers are identified where two of the points in the data set have approximately equal values and third point is slightly higher. This commonly occurs when two points are not detected and the third point is detected. For this analysis, if the other two points in a data set had similar values and the outlier was within 1.2 order of magnitude of their value, no other checks or action was taken. These values were accepted as being within the expected precision of the test method.

ii.) Evaluate outlier points identified in Step I to determine if sampling problems, calculation errors, and process upsets occurred. Outliers with calculation errors were corrected and outliers with sampling problems were assigned a method rating of F for unacceptable. Emissions with method ratings of F were not used to develop emission factors. Outliers were not eliminated unless a sampling or process problem occurred. A major component of the outlier evaluation is problems found during the detailed validation of the test reports. The flags described in Attachment 3 indicate these problems.

Results. The statistical test described in Step (I) yielded 402 outliers by device and substance groupings and 641 outliers by major group and substance groupings. Combining the two analyses, the total number of outliers for the project is 830. As described in Step (ii) each outlier was examined to determine if any calculation errors, sampling problems, and process upsets occurred. As shown in Table 11, 108 of the 830 outliers identified had calculation errors,

sampling problems or process upsets. Only outliers with calculation errors, sampling problems or process upsets are shown in Table 11. The outliers are classified by major group, device ID, run ID, category, and substance. If the outlier was identified by the major group or device analysis this is indicated in the "Statistical Outliner Evaluation" columns. Results of the detailed outlier review are provided in the "Repot Review Results" columns. Additional information on the detailed review is provided in the "Comment" column. All outliers with calculation errors were corrected and included in the database. Outliers with process or method problems were rejected and not included in the emission factor analysis.

6.8 Sub Group Evaluation

Background. Sub groups may be developed for major groups with two or more sources. Major groups are discussed and identified in Section 6.5. As the number of sources increases the potential for sub group development also increases. Sub groups are developed when a secondary design or operating parameter is identified which impacts emissions. Engineering judgement and statistical analysis can be used to determine if the secondary parameters have a significant impact on emissions. If a secondary parameters doe impact emissions, sub groups are established resulting in lower emissions variability than present across the major group.

If the statistical analysis contradicts commonly accepted knowledge about emission behavior, sub groups should not be developed. For example, in Part I the APC system, comparison for natural gas fired asphalt production devices indicated wet scrubbers have significantly lower chromium emissions and lower emissions of most other metals than fabric filters. This results was nor expected since fabric filters control particulate matter better than wet scrubbers. The control of most metals correlates with particulate matter control. It is likely that another parameter such as the concentration of metals in the feed or differences in system configuration is responsible for the observed difference and not the APC system. Since additional investigation of the test results did not results did not explain the differences and the APC system was not responsible, no sub groups were developed.

In cases where a secondary parameter impacts one substance but not another, the data for both substances could be segregated into different sub groups. Another approach would be to segregate the data for the substance that was not impacted. This approach can generate a large number of sub groups with high variability. To reduce the number of sub groups and the variability of emissions data in each sub group, sub groups were identified in this project using the following two step process.

i.) Identify which secondary parameters (comparison parameters) identified in Table 9 impact the emissions data by reviewing data listings and using the t-Test. The t-Test uses the t distribution to determine if two samples are from the same population when the variances are unknown but equal. The test is applicable to samples containing less than 30 data points. A sample is a group of data with a distinct value or range of values

of the secondary parameter considered. If the t-Test indicated that two samples are not from the same population, the secondary parameter that the sample were grouped b y has a significant impact on emissions. It should be noted that the t-Test was only used to support the development of sub groups. In no case was the t-Test used to blindly develop sub groups. Before developing sub groups the results of the t-Test were examined to ensure they were reasonable based on engineering judgement.

ii.) Segregate tests in each major group onto sub groups based on the those secondary parameters identified in step I which impact the emissions data. Results from one device were not split into different sub groups. This approach is appropriate when a substance is impacted by the secondary parameters and when it is not impacted.

It should be noted that when a secondary parameter was found to have a significant impact on emissions and a source in the major group was missing information on the parameter, the source was eliminated from the emission factor development process. For example, in Part I it was found that strokes per cycle, 2 or 4, is a key parameter for reciprocating internal combustion engines (ICE). Four natural gas reciprocating ICE tests did not specify the strokes per cycle so they were eliminated. A sub group for sources with unknown strokes per cycle was not developed because the emission factors could not be applied to any source.

Results. The results of the statistical analysis described in Step (I) above for the major groups identified in Section 1 of Table 10 are provided in Attachment 6. Section 1 of Table 10 lists new or updated major groups with two or more tests. Statistical analyses for major groups which don't include new data (see Section 2 of Table 10) are provided the Part I final report. Sub groups cannot be developed for those major groups shown in Sections 3 through 6 of Table 10 for the following reasons: no difference in design/operation, no difference in samples, single test, or process rate not available in correct units. For these major groups all of the test data are simply averaged by major group and substance as described in Section 6.9. The remainder of this section described sub group development for those major groups listed in Section 1 of Table 10.

Attachment 6 includes a series of similar tables containing the results of the t-Test evaluation of each sub group evaluation parameter listed in Section 1 of Table 10. The tables in Attachment 6 are listed below.

Table A6-1. Source Classification Code Comparison.
Table A6-2. Air Pollution Control System Comparison.
Table A6-3. Reciprocating Internal Combustion Engine Strokes per Cycle Comparison.
Table A6-4. Reciprocating Internal Combustion Engine Oxygen Comparison.
Table A6-5. External Combustion Burner Type Comparison.
Table A6-6. External Combustion Excess Air Comparison.
Table A6-7. Gas Turbine Duct Burner Comparison.
Table A6-8. Chrome Plating APC System Comparison.

Table A6-9. Reciprocating Internal Combustion Engine Size Comparison.
Table A6-10. Oil Fired Asphalt Production Contractor Comparison.
Table A6-11. Fluidized Bed Combustion Fuel Type Comparison.
Table A6-12. Coating, Dryer and Incinerator Material Comparison.
Table A6-13. External Combustion Burner Type and Excess Air Comparison.
Table A6-14. Reciprocating Internal Combustion Engine Strokes per Cycle and Oxygen Comparison.
Table A6-15. Reciprocating Internal Combustion Engine Strokes per Cycle and Size Comparison.
Table A6-16. Reciprocating Internal Combustion Engine Strokes per Cycle, Oxygen and Size Comparison.

Each of these tables includes a description of the data sets being compared, number of points, average, standard deviation, and detection limit ratio (detect ratio). The detection ratio is the ratio of the sum of detected values to the sum of detected and non-detected values. A detect ratio of one indicated that all of the data was detected. A detect ratio of zero indicated that all of the data was not detected. If the difference between the data sets being compared is significant based on the t-Test, a "Yes" is provided in the last column of the table. If the difference is significant and the detection ratio of the higher data set is greater than zero, the higher data set is underlined. If the sample sizes are too small for statistical comparison, i.e. one run per data set only, an "NA" is given in the last column and none of the data sets are shaded or underlined.

Each section below provides a brief description of the sub group analysis for the major groups listed in Section 1 of Table 10. A list of final sub groups is provided in Table 12 for point source major groups. Table 13 provides a list of sub groups for fugitive major groups. It should be noted that Tables 12 and 13 provide all sub groups developed in Parts I and II. The sub groups in each major groups are compared statistically in Attachment 7.

Asphalt Production – Oil

Number of Tests – 4
Rejected Tests – All data from 158, PAH data only from 214 and 215
Significant Parameters – None
Sub Groups - None

Comments – The comparison of contractor A and B data indicated that emissions quantified in contractor A tests are in general higher and in many cases significantly higher than the contractor B. Many of the contractor A data points are non detects and the detection limits are much higher than contractor B. In particular, contract A PAH results for non detected are up to three orders of magnitude higher because LRMS was used instead of HRMS. Because of the uncertainty of the contractor A data. All data for test 158 were eliminated and all PAH data from tests 214 and 215 were eliminated. The only difference between the remaining tests is two tests

were conducted on a unit equipped with a baghouse and one test was conducted on a wet scrubber. The baghouse and wet scrubber emissions are similar as indicted by the statistical analysis. Thus, no sub groups will be developed.

Boiler – Fuel Oil

Number of Tests- 14
Rejected Tests – 1 (Fuel type not specified)
Significant Parameters – SCC (Electric Generation or Industrial)
Sub Groups – 2

Comments – Two new tests have been added to this major group bringing the total of tests to 14. One of the sources has a fabric filter and the rest are uncontrolled. The source with a fabric filter has the highest emissions. In addition, most of the data for this source are not detected and the specific fuel type is not identified. For these reasons, device 102 was eliminated from the emission factor development process. Examination of the data listing and SCC comparison indicates that the electric generation sources generally have lower emissions than the industrial type sources. This may indicate a relation between source size and emissions since the electric generation sources are larger than the industrial sources. Two sub groups will be developed, one for electric generation and one for industrial.

Boiler – Refinery Gas

Number of Tests – 7
Rejected Tests – PAH data for Report 2599B, E, G, H
Significant Parameters – Excess Air (>100% and <100%)
Sub groups – 2

Comments – Based on a review of the boiler detailed data listing it was found that PAH Data from tests in Document 2599 are two to three orders of magnitude higher than the other tests. Several reasons for the difference include: LRMS was used yielding high detection limits, none of the required internal standards were used in the analytical procedures, and high levels of contaminated were found in many samples. The omission of the required internal standards is a major failure and can impact the emissions results significantly. Because one of the objectives of this project is to develop accurate emission factors, PAH data from document 2599 were eliminated from the emissions factor development procedures.

The statistical analysis of boilers included a comparison of post-combustion air pollution control devices, excess air, burner type, and excess air/burner type. Statistical analyses for these parameters are provided in Attachment 6 of Volume 2. Observations from the comparisons are provided below:

- The post-combustion air pollution control system type comparison did not indicate any significant differences.

- From the detailed data listing it was observed that sources with high excess air have higher emissions. The excess air levels for five of the boilers ranged from 10 to 77%. One of the boilers had excess air levels ranging from 100 to 240. To determine if the differences observed in the detailed data listing were significant, data sets with excess air <100% were compared to data sets with excess air >100%. Five of Twenty Two organic HAP comparisons indicated that sources with excess air levels >100% have higher emissions. None of the comparisons indicated that sources with excess air levels <100% have higher emissions.

- The burner type comparison does not indicate any significant differences.

- The burner type and excess air comparison did not indicate any significant differences.

Based on the above observations sub groups for boilers with excess air >100% and <100% will be developed.

Catalytic Reformer

Number of Tests – 2
Rejected Tests – 0
Significant Parameters – APC System
Sub Groups – 2

Comments – Controlled and uncontrolled tests were conducted on a single catalytic reformer unit (CRU). The CRU has an activated carbon (AC) control system. Dioxins and Furans were the only air toxics quantified during the tests. A review of the APC system, comparison indicates that the AC system reduced 1 dioxin and 2 furans by about a half order of magnitude. Emissions of the other 22 congeners were not significantly different. Even though most dioxin and furan congeners did not differ significantly, sub groups for controlled and uncontrolled emissions will be developed for CRUs.

Coating, Base/Catalyst/Water Mix

Number of Tests – 4
Rejected Tests – 0
Significant Parameters – Paint Type (Distinguished by Chromium Content)
- APC System (S or AF)
Sub groups – 3

Comments – This major group includes test results from 4 coating operations. 3 units have air filters (Afs) and 1 unit has a scrubber (S). All 4 coating operations use water based paints. 2 of the units use paints with 26 wt% Cr and 2 use paints with 5.25 wt% Cr. The statistical comparisons indicate that the paints with 26 wt% Cr have higher emissions of both Total and Hexavalent Chromium. The scrubber also has higher emissions of both Total and Hexavalent Chromium than the air filter. Therefore, the emissions data will be divided into groups by paint Chromium content and APC system.

Coating – Powder

Number of Tests – 8
Rejected Tests – 0
Significant Parameters – Powder Type (Distinguished by Chromium Content)
- APC system (None or AF)
Sub groups – 8

Comments – No statistical comparison can be made because only one run was conducted per test condition for all but one test. However, the data clearly shows a dependence of chromium emissions on the percent of chromium in the feed. The higher the chromium content of the feed the higher the emissions. It also appears that controlled sources have lower emissions.

Dryer, Pot Ash

Number of Tests - 2
Rejected Tests – 0
Significant Parameters – APC System and Feed
Sub groups – 2

Comments – This major group includes two tests. One test was conducted on a sulfate of potash dryer controlled by a baghouse. The other test was conducted on a potash dryer controlled by a scrubber. Emissions from the sulfate of potash dryer are significantly higher than emissions from the potash dryer. Therefore, two sub groups will be developed.

Dryer, Sand/Gravel

Number of Tests – 2
Rejected Tests – 0
Significant Parameters – APC System, Materials
Sub groups – 2

Comments – This major group includes two tests at sand/gravel facilities. One facility has a Baghouse (BH) and the other uses a Caustic Scrubber (CS). The facility with the CS also

blends contaminated soils with the raw materials. No statistical comparisons could be conducted since the facilities did not quantify any of the same substances. Since the controls and materials are significantly different, sub groups will be developed for each facility.

Fluidized Bed Combustion – Biomass

Number of Tests – 4
Rejected Tests – 0
Significant Parameters – Waste Type (Agricultural Waste, Agricultural/Urban Wood Waste, Urban Wood Waste, Saw Mill Wood Waste)
Sub groups – 4

Comments – Emissions test results from one Fluidized Bed Combustion (FBC) unit have been added to this major group in Part II. The FBC unit was tested while firing a 50/50 mix of agricultural waste and urban wood waste and while firing just urban wood waste. Each of the four tests in this major group were conducted while firing different types of biomass including:

- Agricultural Waste
- Agricultural/Urban Wood Waste
- Urban Wood Waste
- Saw Mill Wood Waste

Two of the units tested had fabric filters and one unit had an ESP.

Statistical comparisons of the biomass types and particulate control systems are provided in Attachment 6. Only one significant difference was found in over 40 comparisons for the particulate control systems. When comparing the type of biomass burned, numerous significant differences were found. This indicated that the composition of the biomass burned has a significant impact on emissions. Many of the biomass type comparisons indicated that the tests conducted while firing agricultural waste or a combination of agricultural waste and urban wood waste have higher emissions. Sub groups will be developed based on the type of biomass fired. Therefore, each sub group will have a single test.

Furnace – Lead

Number of Tests – 4
Rejected Tests – 0
Significant Parameters – SCC
Sub groups – 2

Comments – This major group includes tests conducted on 4 lead melting pots at a battery component processing facility. Each melting pot includes a baghouse to control

particulate emissions. Three of the melting pots produce molten lead and one pot produces lead oxide. No statistical comparisons were conducted for this major group because the normalizing unit for the pots producing molten lead is different than the normalizing unit for the melting pot producing lead oxide. Therefore, sub groups were developed for the two processes (i.e., production of lead and production of lead oxide). No difference in the design/operation of the three lead melting pots was found in the report so emissions data from these tests will be included in a single sub group.

Heater – Refinery Gas

Number of Tests – 25
Rejected Tests – PAH data for Reports 2599A, B, C, D, N
Significant Parameters – Excess Air (>100% and <100%)
Sub groups – 2

Comments – Based on a review of the heater detailed data listing it was found that PAH data from tests in Document 2599 are two to three orders of magnitude higher than the other tests. PAH data from Document 2599 are significantly higher. Several reasons for the difference include: LRMS was used yielding high detection limits, none of the required internal standards were used in the analytical procedures, and high levels of contaminates were found in many samples. The omission of the required internal standards is a major failure and can impact the emission results significantly. Because one of the objectives of this project is to develop accurate emission factors, PAH data from document 2599 were eliminated from the emission factor development procedures.

The statistical analysis of heaters included a comparison of post-combustion air pollution control devices, excess air, burner type, and excess air burner type. Statistical analyses for these parameters are provided in Attachment 6. Observations from the comparisons are provided below:

- The comparison of post-combustion air pollution control devices indicated several significant differences. Most of the differences were detected for metals. Since the controls used including SCR and DeNOx are not expected to impact metals emissions, so sub groups were developed.

- From the detailed data listing it was observed that sources with high excess air have higher emissions. The excess air level for 20 of the heaters ranged from 9 to 80%. Two of the heaters had excess air levels ranging from 111 to 224. To determine if the differences observed in the detailed data listing were significant, data sets with excess air <100% were compared to data sets with excess air >100%. Twenty of Thirty organic HAP

comparisons indicated that sources with excess air levels >100% have higher emissions. None of the comparisons indicated that sources with excess air levels <100% have higher emissions.

- Only two organic substances (Fluoranthene and Pyrene) of 24 indicate LNBs have significantly higher emissions than CBs. If burner type was a key parameter it should impact the emissions of other organics significantly.

- When grouping by burner type and excess air, four significant differences are found. Two of these are likely a result of excess air levels and not the burner type. The remaining two significant differences are the same ones discussed in the burner type comparison above. These comparisons indicate that LNB have higher emissions. However, only two organics indicate that LNBs have higher emissions. If LNBs did have a significant impact on organic emissions it is expected that more substances would be impacted.

Based on the above observations sub groups for heaters with excess air >100% and <100% will be developed.

Internal Combustion Engine – Diesel

Number of Tests – 10
Rejected Tests – 0
Significant Parameters – SCC (Electric Generation, Industrial or Commercial/Institutional)
- Oxygen Level (<13% or >13%)
Sub groups – 5

Comments – Two additional units have been added to this major group in Part II. One unit was tested for ammonia emissions and the other unit was tested for PAH and formaldehyde emissions. The ammonia test is the first in the Diesel fired Internal Combustion Engine group.

In part I it was found that sources with a stack oxygen content greater than 13% have higher emissions than sources with oxygen <13%. In addition, it was found that emissions from commercial engines are lowest and electric generation engines are highest. Industrial engines have emissions between commercial and electric generation sources. This relation between source type and emissions may also be related to stack oxygen content since all of the electric generation sources have higher stack oxygen contents and all of the commercial sources have lower stack oxygen contents. The industrial sources are split roughly between high and low stack oxygen units. The new unit which was tested for PAH and formaldehyde emissions supports both the Part I observations on stack oxygen content and source type. Therefore, the same sub groups are proposed for Part II. Statistical comparisons of SCC, stack oxygen, and source size are provided in Attachment 6.

Internal Combustion Engine – Natural Gas

Number of Tests – 25
Rejected Tests – 4 (Strokes per cycle not specified)
Significant Parameters – Strokes (2 or 4)
- Oxygen (Rich or Lean)
- Capacity (>650 Hp or <650 Hp)
- APC System (None or NSCC)

Sub groups – 5

Comments – Three additional units have been added to this major group in Part II. Each of the units was tested for formaldehyde and two units were tested for benzene. Additional benzene, toluene, and xylene test results were added to Device ID 171. Two of the units being added to the database for this major group have non-selective catalytic converters (NSCC). None of the Part I units have post combustion controls.

Due to the larger sample size of the natural gas fired internal combustion engine major group, several secondary parameters were considered including APC system, strokes per cycle, rich or lean combustion, and source size. The statistical analysis of each of these parameters is provided in Attachment 6. Observations from the statistical analysis and detailed data listing are provided below.

- As noted previously two of the units added in Part II have NSCC. The statistical comparison of these units without post combustion controls indicates that NSCC provides lower emissions of both benzene and formaldehyde. Formaldehyde emissions are significantly lower.

- A comprehensive comparison of 2 and 4 stroke engines is not possible since most of the units in the database are 4 stroke engines. The statistical comparison of 2 and 4 stroke engines did not indicate any significant differences. However, since the analysis for field gas engines (see Part I final report) and theory indicates the engine configuration is important, the engines were divided into 2 and 4 stroke sub groups. The number of strokes per cycle could not be verified for four devices (156, 168, 169, 170). These devices were eliminated from the analysis and will not be included in the emissions factor development procedure. Only source 156 has a significant quantity of data.

- For the 4 stroke engines, the statistical comparisons indicated that sources with oxygen less than 2% (rich burn) have significantly higher emissions of many organics including PAHs than sources with oxygen greater than 2% (lean burn). Formaldehyde emissions are significantly higher for lean burn sources. No comparison of emissions from 2 stroke lean and rich burn engines was possible since all of the 2 stroke engines were lean burn.

- For the 4 stroke lean burn engines, 13 of 22 statistical comparisons indicated that sources with <650 Hp have significantly higher emissions than sources with >650 Hp. These comparisons included a range of organics including PAHs, aldehydes, benzene and toluene. The impact of size could not be evaluated for 4 stroke rich burn since all 4 stroke rich burn engines were <650 Hp.

Based on the above discussion, tests in the natural gas fired internal combustion engine major groups will be divided into sub groups by post combustion air pollution control system, strokes per cycle, rich or lean combustion, and source size.

Incinerator – Medical Waste

Number of Tests – 6
Rejected Tests – 3 (Missing Key Parameters)
Significant Parameters – Waste, Manufacturer, APC System
Sub groups – 3

Comments – Six medical waste incinerators are included in this major group. The characteristics of these incinerators are provided in Table 14. Five of the incinerators have two chambers and no post combustion controls. One incinerator has a scrubber and the number of chambers was not specified. None of the reports provided comprehensive design and operating data. Where available, the incinerator manufacturer and stack oxygen have been listed in Table 14. The waste type descriptions have been listed directly from the reports. No additional waste characteristics are provided in the reports.

A comparison of incinerator emissions by APC system is provided in Attachment 6. As shown in Table 14, HCl is the only substance, which can be compared by APC system The APC system comparison indicates that the scrubber has significantly lower HCl emissions. The difference in HCl emissions may also result partly from differences in the chlorine contents of the wastes burned. No information on waste chlorine content is provided in the reports.

Attachment 6 also includes a comparison of incinerator emissions by waste type. Dioxin/furan, PAH, hexavalent chromium, and formaldehyde emissions from systems without post combustion controls are compared. The HCl waste type comparison is most likely determined by the post combustion controls of the systems being compared. The dioxin/furan comparison indicates that the system which burns infectuous waste (Device ID 227) has significantly higher emissions than the systems which burn animal bedding (Device ID 226) and pathological waste (Device ID 208). The observed difference in emissions may also be a result of the incinerator design and operation. The infectious waste incinerator is an Incinomite with a stack temperature ranging from 457 to 502 and the incinerators with lower dioxin/furan emissions are manufactured by Ecolair and ThermTech. Both of these incinerators have higher

stack temperatures as shown in Table 14. The comparisons for PAH and formaldehyde emissions cannot be evaluated statistically because the sample sized are less than 3.

As described above the incinerators compared have a wide range of designs and operation. Each incinerator has a unique configuration and waste composition. As a result, none of the data will be combined. Instead, a separate group will be developed for each system. In order for these emissions factors to be applied to other systems some basic information must be available including manufacturer, waste type, and post combustion air pollution control system. Three of the tests (Device Ids 208, 226, and 227) provide this necessary information and will be developed into emission factors. Data from tests 245, 246, and 283 don't provide all of the necessary process characteristics. Therefore, these tests will be rejected and not included on factors. It should be noted that the tests, which will be developed into emission factors, don't contain comprehensive details on the process design/operation or waste characteristics. As a result, these emissions factors have high uncertainty.

Plating – Anodizing

Number of Tests – 6
Rejected Tests – 0
Significant Parameters – APC System
(Control systems with filter, controls systems without filter)
Sub groups –2

Comments – The anodizing operating data set includes 5 tests. As with the hard plating data sets few operational parameters were available. Al of the test were conducted on controlled units. The controls range from a wet scrubber to a mist eliminator/wet scrubber/HEPA combination. Only one of the tests was conducted on a system with a filter. The total chromium results for this test are lower than other tests which do not have filters. It should also be noted that all test results for the system with a filter were not detected. If more sensitive techniques were used it is likely that the filter results would be lower. In addition, because of the low sensitivity of the filter test, the hexavalent chromium results are higher than total chromium results. Statistical comparisons of the different systems are provided in Attachment 6. These comparisons are not very reliable since the anodizing data sets are small consisting of 1 to 2 tests each.

Based on the observations described above, two sub groups will be developed for anodizing operations including sub groups for devices with and without filters.

Plating – Decorative

Number of Tests – 2
Rejected Tests – 0

Significant Parameters – APC System
(Control systems with filter, controls systems without filter)
Sub group – 2

Comments – The decorative plating operation data set is very limited with only two tests. As shown in Table 15, one test was conducted on a system with a wet scrubber and the other on a system with a mist eliminator, mist suppressant, and HEPA. Emissions from the HEPA system are orders of magnitude lower than the system with a wet scrubber. The wet scrubber hexavalent chromium emissions are the highest of any plating operation including hard and anodizing operations. In addition, the wet scrubber hexavalent chromium emissions were not detected indicating a low sensitivity analysis technique and/or short sample time.

Based on the observations described above, two sub groups will be developed for decorative plating operations including sub groups for devices with and without filter. Emissions data for the sub group without a filter are considered very unreliable because low sensitivity techniques were used.

Plating – Hard

Number of Tests – 41
Rejected Tests – 1
Significant Parameters – APC System
(Control systems with filter, controls systems with filter, uncontrolled units)
Sub groups – 3

Discussion – The hard plating data set includes 41 tests quantifying hexavalent and total chromium emissions. While this is a large data set there are also 27 different air pollution control system configurations as shown in Table 15. In addition, most tests did not provide information on other potentially important parameters including amount of work, chemical or electrochemical activity, the strength and temperature of solution, and current densities. As a result of the wide range of control configurations and incomplete process descriptions it is difficult to identify the impact of specific control devices on emissions.

All of the tests except one had some type of control installed. The control devices can be segregated into four groups, mainly wet scrubber, chemical fume suppressants, mist eliminators, and filters. As shown in Table 15, most of the hard plating devices have wet scrubbers. The specific type of scrubber was not specified for 10 of the tests. Several chemical fume suppressants were used including Fumetrol 101, Fumetrol 140, foam blankets, and polypropylene balls. The mist eliminators included mesh-pad and Chevron-blade and most of the filters were HEPA's.

Examining the emissions data in the detailed data listing (see Section 6.6), no clear differences were found between devices with and without wet scrubbers, chemical fume suppressants, or mist eliminators. However, the detailed data listing shows that many of the lowest emitting devices had filters. The observation from the detailed data listing that air pollution control systems with filters have lower emissions is quantified statistically in Attachment 6. Attachment 6 provides a statistical comparison of both total and hexavalent chromium emissions by air pollution control system. The different control systems are distinguished by the presence of wet scrubbers, chemical fume suppressants, mist eliminators, and/or filters. Specific types of control are not compared such as F101 vs. F140 or HEPA vs. MP because this would yield small samples for comparison. Comparisons of samples with 1 test are not generally considered reliable. The comparisons for hard plating operations show that air pollution control systems with filters have statistically lower emissions. In only 6 comparisons did control systems with filters have statistically higher emissions. However, control systems without filters had statistically higher emissions in 62 comparisons.

Based on the discussion above three sub groups have been developed including systems with filters, systems without filters, and systems without controls. The first two sub groups are the same as those developed in Part I. The uncontrolled category is new.

Steam Generator – Natural Gas/CVRB

Number of Tests – 5
Rejected Tests – 0
Significant Parameters – None
Sub groups – 1

Comments – All sources in this category have low excess air and no post-combustion controls, so no comparison of the impact of these parameters was made. For naphthalene, conventional burners had higher emissions than low-NOx burners. Since this comparison was based on single source data sets and no other comparisons indicate conventional burners have higher emissions, sub groups based on burner type were not established.

Shredding and Delaquering – Aluminum

Number of Tests – 2
Rejected Tests – 0
Significant Parameters – APC System
Sub groups – 2

Comments – This major group includes two shredding and delaquering units. One unit has a venturi scrubber (VS) and the other has a baghouse (BH) to control particulate emissions. Dioxins and furans were quantified on the unit with a VS and metals on the unit with a BH. A statistical evaluation was not conducted because the same substances were not quantified on the

both units. Since metals and dioxins/furans could be impacted by the type of particulate control installed, sub groups were developed for each unit.

Turbines – Natural Gas

Number of Tests – 16
Rejected Tests – 0
Significant Parameters – SCC (Cogeneration or Noncongeneration)
Sub groups – 2

Comments – Seven additional turbines have been added as a results of the Part II activities. Three of these turbines have heat recovery steam generators and are classified as cogeneration operations. Duct burners, cogeneration and post combustion air pollution controls were the sub group parameters investigated for this major group. Statistical comparisons of these parameters are provided in Attachment 6. The comparison of post combustion air pollution control systems indicated that systems with SCR/COC had significantly higher emissions of some organics than systems without any post combustion controls. The observed difference is likely a result of another difference in design or operation.

The comparison of emissions from systems with and without cogeneration indicates that cogeneration systems have lower organic emissions. This is consistent with the Part I analysis. Reviewing the data it was found that systems with cogeneration have lower stack oxygen and are generally larger than systems without cogeneration. These factors may contribute to the lower organic emissions observed in the statistical comparisons.

Emissions from systems with and without duct burners also were compared. Duct burners are sometimes added to cogeneration systems to add supplement heat to the turbine exhaust before the heat recovery steam generator. No significant differences were found.

Based on the above discussion, sub groups will be developed for systems with and without cogeneration.

6.9 Sub Group Emission Factor Calculation

Background. Once sub groups have been established, run specific emission factors must be averaged for each substance in each sub group. For this project, the run specific emission factors were averaged arithmetically. It should be noted that most tests included three runs. Therefore, if a sub group included two tests the corresponding six run emission factors would be averaged. In addition to the arithmetic average, several statistics were calculated including the uncertainty, relative standard deviation, number of sources, detection ratio, and median, maximum and minimum emissions factors. The detect ratio is defined as the ratio of the sum of all of the data was detected. A detect ratio of zero indicates all of the data was not detected. The relative standard deviation and uncertainty are indicator of the precision and accuracy of the emissions

factors. The relative standard deviation is calculated as 100 times the standard deviation divided by the arithmetic average. The uncertainty is calculated as 100 times the 95% confidence interval divided by the arithmetic average. Ideally the relative standard deviation and uncertainty should be zero.

Results. Tables 19 and 20 list emission factors and corresponding sample statistics for point and fugitive sources, respectively. One set of emission factors is given per major and sub group. Descriptions of the major and sub groups are provided in Tables 12 and 13. The relative standard deviation and uncertainty information in Table 19 and 20 are summarized in Table 16 for each substance. The average relative standard deviation is 56% (42% Median) and the average uncertainty is 108% (Median 73%). To reduce these values would require additional sub groups. However, no additional sub groups were found. It should also be noted that creating additional sub groups reduces the size of the sample that reduces the representativeness of the emission factors.

6.10 Sub Group Method and Population Rating

Background. Once the emission factors have been calculate it is important to assign quality ratings to each emission factors. Several ratings can be assigned to each emission factor including method and population ratings. The method rating describes the test method that was used and the level of supporting document provided. The method rating used for this project is described in Section 6.3. It should be noted that the method rating is assigned on a run basis. When the runs are averaged together to calculate emissions factors for each substance in each sub group, the method rating must also be averaged. For example, if an average emissions factor was derived from one A rated run and one C rated run, B would be the resulting method rating.

The second rating is used to describe how well emissions can be estimated from the entire pool of sources. To provide an accurate estimate of emissions from the source pool, an emission factor should be derived from many randomly chosen facilities in the industry population. For this study, one of the following population ratings was assigned to each emission factor.

1 - Source test data taken from many randomly chosen facilities in the industry population (5 or more sources).
2 - Source test data taken from a reasonable number of facilities (3 to 4 sources).
3 - Source test data taken from a small number of facilities, and there may be reason to suspect that the facilities do not represent a random sample of the industry (<3 sources).

Population ratings were assigned based on a recommendation from the California Air Resources Board. This recommendation was to assign the population rating based on the number of sources as described above.

Results. Average method ratings are provided in Tables 19 and 20 for each emission factor. The method rating is the first character of the ARB rating. The population ratings are also provided in Tables 19 and 20. The second character of the ARB rating is the population rating.

6.11 CARB Overall Quality Rating

Background. Several indicators of data quality have been assigned to each emission factor. These indicators include the method rating, population rating, and indicators of variability such as the relative standard deviation and uncertainty. To summarize all of these indicators, a single CARB overall rating was developed. The CARB overall rating has the format "xy-vn" where "x" is the method rating, "y" is the population rating, and "n" is the order of magnitude difference between the minimum and maximum emission factors for each substance in each sub group. It should be noted that if the emission factor was developed from a single run, n was set to "-".

Results. CARB overall ratings are provided in the "ARB Rating" column of Tables 19 and 20 for each emission factor. The number of emission factors with each CARB overall rating are provided in Table 17. It should be noted that the EPA methods are not considered inferior. However, the Hot Spots Program mandated that an EPA method could be used only if there was no corresponding CARB test method or if the source asked for an equivalency determination. CARB and EPA test methods are different in many cases and can lead to different results. CARB test methods were rated higher than the EPA's to provide consistent test result comparisons.

6.12 EPA Overall Quality Rating

Rating. Similar to the CARB overall quality rating, the EPA has developed an overall quality rating used to designate the quality of each emission factor. This rating termed "factor quality rating" by the EPA considers the type of method used, level of supporting documentation available, and how well the population is represented. The EPA assigns factor quality ratings of A, B, C, D, and E as described below.

EPA Factor Quality Rating or Overall Quality Rating

A Excellent. Factors developed only from A-rated source test data taken from many randomly chosen facilities in the industry population. The source category is specific enough to minimize variability within the source population.

B Above average. Developed only from A-rated test data from a reasonable number of facilities. Although no specific bias is evident, it is not clear if the facilities

tested represent a random sample of the industry. AS with the A rating, the source is specific enough to minimize variability within the source population.

C Average. Developed from A- and B-rated test data from a reasonable number of facilities. Although no specific bias is evident, it is not clear if the facilities tested represent a random sample of the industry. As with the A rating, the source category is specific enough to minimize variability within the source population.

D Below average. Developed from A- and B-rated test data from a small number of facilities, and there may be reason to suspect that these facilities do not represent a random sample of the industry. There also may be evident of variability within the source population.

E Poor. The emission factor was developed from C- and D-rated test data, and there may be reason to suspect that the facilities tested do not represent a random sample of the industry. There also may be evident within the source category population.

EPA A through D test data/method ratings used to assign EPA factor quality factor quality are listed and described below

EPA Test Data Rating or Method Rating

A When tests are performed by a sound methodology and are reported in enough detail for adequate validation.

B When tests are performed by a generally sound methodology but lack enough detail for adequate validation.

C When tests are based on an untested or new methodology or are lacking a significantly amount of background data.

D When tests are based on a generally unacceptable method but the method may provide an order-of-magnitude value for the source.

Results. To allow comparison of the quality of CARB and EPA emission factors on a similar basis, EPA overall quality ratings or factor quality ratings were assigned to each CARB emission factor using the criteria provided in Table 18. The number of CARB emission factors with each EPA overall rating is provided within parentheses in Table 18. The EPA overall ratings shown in Table 18 were assigned for this project and are not official EPA ratings.

The definitions of the CARB and EPA method ratings provided in Tables 17 and 18 are different. The CARB method rating system was developed to distinguish between tests

conducted using EPA and CARB methods as well as tests that provide and do not provide sufficient documentation. The EPA method rating system does not identify the local, state or federal government agency that developed the test method. The CARB system does not denote tests based on untested/new methodologies or tests based on generally unacceptable order of magnitude methods (see EPA method ratings C and D). A CARB method rating for tests based on generally unacceptable order of magnitude methods is not needed, because these tests were not included in the CARB database.

To assign EPA overall quality ratings as described in the background section above, various terms such as many randomly chosen facilities, reasonable number of facilities, and small number of facilities had to be defined. In addition since EPA method ratings must be assigned to assign EPA overall quality ratings, EPA method rating terms such as sound methodology, adequate validation, and untested/new methodology were defined. Each EPA term along with the CARB definition used for this project is provided below.

EPA Term	CARB Definition
1. Many Randomly/Chosen Facilities	5 or more Sources
2. Reasonable Number of Facilities	3 to 4 Sources
3. Small Number of Facilities	<3 Sources
4. Sound Methodology	Current EPA or CRB Method
5. Adequate Validation	Adequate Validation if Specified Number of Primary Validation. Parameters could be checked (see Section 6.3)
6. Untested/New Methodology	Old versions of CARB or EPA test methods.

The CARB definitions were applied to assign EPA method and overall quality ratings.

TABLE 1. PART II DATA COLLECTION SUMMARY.

District	Number of Tests	Comment
Tests Collected During Part II		
Amador	0	No additional tests identified
Butte	1	
North Coast	1	
Placer	0	No additional tests identified
San Joaquin	2	
Santa Barbara	76	8 Source and 68 Fugitive tests
South Coast	39	
Ventura	43	9 Source and 34 Fugitive Tests
Tehema	1	
Tuolumne	0	No additional tests identified
Tests Not Collected During Part II		
Bay Area	2	No response
Lassen	2	ARB has two pooled test plans
Mojave	36	Move tests for unique devices and would not have general applicability
Sacramento	6	No response
San Diego	?	No response
Shasta	10	ARB has ten pooled test plans

TABLE 2. SCREENING RESULTS SUMMARY.

Screening Check	Number of Tests Failing Screening Check		
	Part I	Part II	Project
No Air Toxic Measurements	4	76	80
SCC Could Not be Assigned	0	33	33
Process Rate Not Available	302	69	371
No Laboratory or Sample Data Provided	0	29	29
Key Design and Operating Parameters not Provided	0	39	39
Single Run Test	0	34	34
Duplicate Reports	9	21	30
Wrong Method Used	0	1	1
Total	315	302	617

TABLE 3. PART II DETAILED VALIDATION SOURCE TEST LISTING.

Report ID	Device ID	Tests	Device Type	Air Pollution Control System	Fuel	Material
2524A	234	1	Anodizing tank	?	None	Aluminum
2364A	214	1	Asphalt production	C/BH	Back-up oil	Aggregate/asphalt
2365A	215	1	Asphalt production	C/BH	Back-up oil	Rocks/sand/ petroleum
2194A	216	1	Asphalt production	FF	?	Asphalt
2193A	217	1	Asphalt production	FI	Natural Gas	Flux
2099A	Rev	1	Asphalt production, crusher		None	Aggregate
2304D	280	1	Batteries, Cast on strap line	FI	None	Batteries
2304B	281	1	Batteries, Grid casting	?	None	Grids
2304A	282	1	Batteries, Post pour	?	None	Batteries
2512A	201	1	Boiler	LI/SNCR	Wood/biomass	None
2095A	218	1	Boiler	?	Coal/natural gas	None
2600A	261	1	Boiler	None	Refinery fuel gas	None
2623A	279	1	Boiler	AI/LI/B	Coal/coke	None
2599B	505	1	Boiler	SCR	Refinery fuel gas	None
2599E	508	1	Boiler	None	Refinery fuel gas	None
2599G	642	1	Boiler	None	Refinery fuel gas	None
2599H	643	1	Boiler	None	Refinery fuel gas	None
2487A	645	1	Boiler	?	Fuel oil no. 6	None
2599F	646	1	Boiler	None	Refinery fuel gas	None
2333A	209	1	Coating operation	AF	None	Poly-amide paint
2334A	210	1	Coating operation	?	None	Barium chromate primer
2197A	211	1	Coating operation	?	None	Acrylic enamel systems
2529B	252	1	Coating operation	?	None	Ni/Al thermal spray powder
2609A	270	1	Coating operation	FI	None	Water reducible paint
2610A	273	1	Coating operation	FI	None	Solvent reducible paint
2620A	278	1	Coating operation	S	None	Water reducible paint
2160A	Rev	1	Coating operation	?	None	Paint
2605A	263	1	Cogeneration unit	SCR/AI/COC/HPC	Natural gas/refinery gas	None
2607E	271	1	Cogeneration unit	SCR/COC	Natural gas/refinery gas/butane	None
2607F	272	1	Cogeneration unit	SCR/COC	Natural gas/refinery gas	None
2118A	212	1	Dehydrator	C	Natural gas	Sludge
2630A	289	1	Dehydrator	None	Natural gas	Glycol
2575A	205	1	Dryer	C/BH	?	Fiberboard
2353A	249	1	Dryer	BH	Diesel	Specialty sand
2082A	250	1	Dryer	?	?	Pot ash
2085A	251	1	Dryer	BH	?	Sulfate of pot ash
2317A	203	1	Flare	None	Landfill gas	None
2350A	213	1	Flare	None	Landfill gas	None

TABLE 3. PART II DETAILED VALIDATION SOURCE TEST LISTING.

Report ID	Device ID	Tests	Device Type	Air Pollution Control System	Fuel	Material
2624A	284	1	Flare	None	Landfill gas	None
2602A	260	1	Fluid Catalytic Cracking Unit	?	Refinery fuel gas	Oils
2204A	Rev	1	Air analysis at landfill		None	Landfill gas
2206A	Rev	1	Air analysis at landfill		None	Landfill gas
2010A	223	1	Furnace, Carbon	?	?	Precarbonized rayon
2016A	219	1	Furnace, melting pot	?	Natural gas	Lead
2016A	220	1	Furnace, melting pot	?	Natural gas	Lead
2016A	221	1	Furnace, melting pot	?	Natural gas	Lead
2016A	222	1	Furnace, melting pot	?	Natural gas	Lead
2531A	200	1	Furnace, Metal	None	Fuel oil no. 6	Metal
2131A	**	1	Furnace, Steel	BH	?	Steel
2488A	224	1	Heater	None	Natural gas	None
2117A	225	1	Heater	SCR	Refinery fuel gas	None
2601A	259	1	Heater	None	Refinery fuel gas	None
2604A	262	1	Heater	None	Refinery fuel gas	None
2605B	264	1	Heater	SCR/AI/COC/HPC	Refinery fuel gas	None
2607A	265	1	Heater	None	Refinery fuel gas	None
2607B	266	1	Heater	None	Refinery fuel gas	None
2607C	267	1	Heater	None	Refinery fuel gas	None
2607D	268	1	Heater	None	Refinery fuel gas	None
2607G	269	1	Heater	None	Refinery fuel gas	None
2598A	436	1	Heater	Thermal DeNOx	Refinery fuel gas	None
2599A	437	1	Heater	SCR	Refinery fuel gas	None
2599N	438	1	Heater	SCR	Refinery fuel gas	None
2300A	439	1	Heater	None	Refinery fuel gas	None
2300A	440	1	Heater	None	Refinery fuel gas	None
2300A	441	1	Heater	None	Refinery fuel gas	None
2300A	442	1	Heater	None	Refinery fuel gas	None
2300A	443	1	Heater	None	Refinery fuel gas	None
2599A	444	2	Heater	None	Refinery fuel gas	None
2124A	445	3	Heater	None	Refinery fuel gas	None
2599C	506	1	Heater	None	Refinery fuel gas	None
2599D	507	1	Heater	None	Refinery fuel gas	None
2599B	509	1	Heater	None	Refinery fuel gas	None
2103A	244	1	Incinerator	None	Natural gas	Infectuous waste
2558A	208	1	Incinerator, Onsite	?	Gas	Pathological waste
2422A	226	1	Incinerator, Onsite	?	?	Animal bedding
2103A	227	1	Incinerator, Onsite	None	Natural gas	Infectious waste
2410A	228	1	Incinerator, Onsite	SCR	Waste gas	?
2543A	229	1	Incinerator, Onsite	?	?	Coffee beans
2542A	230	1	Incinerator, Onsite	?	Diesel	Waste explosives
2398A	245	1	Incinerator, Onsite	?	Natural gas	Human carcasses
2398B	246	1	Incinerator, Onsite	?	Natural gas	Animal carcasses
2152A	247	1	Incinerator, Onsite	?	Propane	Bodies
2152A	248	1	Incinerator, Onsite	?	Propane	Bodies
2199A	283	1	Incinerator, Onsite	S	Natural gas	?

TABLE 3. PART II DETAILED VALIDATION SOURCE TEST LISTING.

Report ID	Device ID	Tests	Device Type	Air Pollution Control System	Fuel	Material
2185A	232	1	Kiln	CS	?	60% blue shale petroleum hydro
2395A	238	1	Oven	?	?	Coating of electric motor wires
2097A	237	1	Oven, Curing	?	Natural gas	Abrasive cutting tools
2191A	Rev	1	Oven, Conventional air	?	?	Bread
2187A	Rev	1	Oven, Conventional air	?	?	Bread
2456A	239	1	Plating operation	PBS	None	Chromic acid
2430A	240	1	Plating operation	DM/PB/F101	None	Chromic acid
2431A	241	1	Plating operation	DM/S/PB/F101	None	Chromic acid
2431A	242	1	Plating operation	DM/S/PB/F101	None	Chromic acid
2431A	243	1	Plating operation	DM/S/PB/F101	None	Chromic acid
2626A	286	1	Plating operation	S	None	Chromic acid
2847A, 2878A	286	1	Plating operation	S	None	Chromic acid
2866A, 2802A	455	1	Plating operation	S	None	Chromic acid
2819A	456	1	Plating operation	S	None	Chromic acid
2816A	457	1	Plating operation	DM/PBS/HEPA	None	Chromic acid
2832A	458	1	Plating operation	DM/S	None	Chromic acid
2874A	459	1	Plating operation	DM/S/F140	None	Chromic acid
2841A	460	1	Plating operation	DM/PBS/PB/F101	None	Chromic acid
2870A, 2849A	461	1	Plating operation	DM/PBS/FB/PB	None	Chromic acid
2837A	462	1	Plating operation	F140	None	Chromic acid
2868A	463	1	Plating operation	DM/PB/HEPA	None	Chromic acid
2883A	464	1	Plating operation	DM/PBS/HEPA	None	Chromic acid
2875A	465	1	Plating operation	PBS	None	Chromic acid
2852A	466	1	Plating operation	F140	None	Chromic acid
2850A	467	1	Plating operation	DM/S/F101/F140/ MP	None	Chromic acid
2850A	468	1	Plating operation	DM/S/F101/PB/MP	None	Chromic acid
2848A	469	1	Plating operation	PBS/F101/PB	None	Chromic acid
2815A	470	1	Plating operation	DM/DMNP/HEPA	None	Chromic acid
2814A	471	1	Plating operation	DM/HEPA	None	Chromic acid
?	472	1	Plating operation	DM/HEPA	None	Chromic acid
?	473	1	Plating operation	DM/HEPA	None	Chromic acid
2865A	474	1	Plating operation	S/FPT	None	Chromic acid
2800A	475	1	Plating operation	PBS/FB	None	Chromic acid
2867A	476	1	Plating operation	DM/S	None	Chromic acid
2823A	477	1	Plating operation	S/F	None	Chromic acid
2813A, 2879A	478	1	Plating operation	DM/PBS/PB	None	Chromic acid
2805A	479	1	Plating operation	PBS/DM	None	Chromic acid
2575B	206	1	Presser	None	None	Fiberboard
2492A	446	1	Reboiler	None	None	Triethylene Glycol
2492B	447	1	Reboiler	None	None	Ethylene Glycol

TABLE 3. PART II DETAILED VALIDATION SOURCE TEST LISTING.

Report ID	Device ID	Tests	Device Type	Air Pollution Control System	Fuel	Material
2460B	169	1	Reciprocating ICE	None	Natural gas	None
2460B	170	1	Reciprocating ICE	None	Natural gas	None
2460B	171	1	Reciprocating ICE	None	Natural gas	None
2436A	231	1	Reciprocating ICE	None	Diesel	None
2616A	274	1	Reciprocating ICE	NSCR	Natural gas	None
2616B	275	1	Reciprocating ICE	NSCR	Natural gas	None
2629A	288	1	Reciprocating ICE	SCR/AI	Diesel	None
2355A	448	1	Reciprocating ICE	None	Natural gas	None
2404A	Rev	5	Reciprocating ICE	?	Landfill gas	None
2631A	290	1	Rotary kiln	WS	Natural gas	?
2005A	235	1	Shredding and delaquering	BH	None	Aluminum
2072A	236	1	Shredding and delaquering	S	None	Aluminum
2324A	233	1	Delaquering	?	None	Aluminum
2407A	511	2	Steam generator	None	Natural/CVR gas	None
2407A	512	1	Steam generator	None	Natural/CVR gas	None
2407A	513	1	Steam generator	None	Natural/CVR gas	None
2502A	253	1	Thermal oxidizer	?	Natural gas	?
2009A	254	1	Turbine	None	Natural gas	None
2009A	255	1	Turbine	None	Natural gas	None
2102B	256	1	Turbine	None	Natural gas	None
2102B	257	1	Turbine	None	Natural gas	None
2130A	258	1	Turbine	None	Natural gas	None
2627A	287	1	Turbine	SI/AI/SCR	Natural gas	None
2459A	449	1	Turbine	SCR	Natural gas	None
2599K	451	1	Turbine	SCR/COC	RFG/NG	None
2599K	452	1	Turbine	SCR/COC	RFG/NG	None
2599J	510	2	Turbine	SCR/COC	NG/LPG/RFG	None
2599I	644	1	Turbine	COC	Refinery fuel gas	None
2477A	Rev	2	Turbine	?	Natural gas	None
2575B	207	1	Unloader	None	None	Fiberboard

** Data not extracted for this device (see Attachment 2 for additional details).

TABLE 4. PART II DETAILED VALIDATION FUGITIVE TEST LISTING.

Report ID	Device ID	Tests	Device Type	Material Used
2643A	301	1	Abrasive blasting	Dust
2642A	319	1	Aeration basin	Wastewater
2654A	349	1	Asphalt production, rock pile	Dust
2655A	350	1	Asphalt production, rock pile	Dust
2644A	296	1	Asphalt production, various	Rock plant mine feed
2644A	297	1	Asphalt production, various	Specialty mine feed
2642A	321	1	DAF tank	Wastewater
2652A	308	1	Flanges	Crude oil
2638A	298	1	Flanges	Field gas
2646A	314	1	Flanges	Field gas
2663A	324	1	Fugitives, misc.	Casing gas/natural gas
2663A	325	1	Fugitives, misc.	Casing gas/natural gas
2663A	327	1	Fugitives, misc.	Crude oil
2663A	328	1	Fugitives, misc.	Diesel
2663A	329	1	Fugitives, misc.	Lube oil
2663A	330	1	Fugitives, misc.	Lube oil
2665A	340	1	Fugitives, misc.	Lube oil
2661A	332	1	Fugitives, misc.	Sour water
2646A	312	1	Gas plant	Field gas
2661A	331	1	Gas processing	Fuel gas
2656A	334	1	Gas processing	Fuel gas
2665A	339	1	Gas processing	Fuel gas
2664A	343	1	Gas processing	Fuel gas
2664A	348	1	Gas processing	Fuel gas
2666A	370	1	Gas processing	Produced gas
2666A	371	1	Gas processing	Produced gas
2666A	372	1	Gas processing	Produced gas
2666A	373	1	Gas processing	Produced gas
2642A	317	1	Headworks	Wastewater
2639A	307	1	Main trap	Produced gas
2642A	318	1	Primary sedimentation tank	Wastewater
2642A	320	1	Solids odor processing	Sludge
2638A	300	1	Internal combustion engine	Diesel
2662A	355	1	Internal combustion engine	Lube oil/diesel
2640A	293	1	Tank headspace	Crude oil
2640A	295	1	Tank headspace	Crude oil
2641A	305	1	Tank headspace	Crude oil
2639A	306	1	Tank headspace	Crude oil
2648A	313	1	Tank headspace	Crude oil
2646A	315	1	Tank headspace	Crude oil
2646A	316	1	Tank headspace	Crude oil
2664A	341	1	Tank headspace	Crude oil
2664A	344	1	Tank headspace	Crude oil
2664A	345	1	Tank headspace	Crude oil
2666A	356	1	Tank headspace	Crude oil
2666A	358	1	Tank headspace	Crude oil
2666A	360	1	Tank headspace	Crude oil

TABLE 4. PART II DETAILED VALIDATION FUGITIVE TEST LISTING.

Report ID	Device ID	Tests	Device Type	Material Used
2666A	364	1	Tank headspace	Crude oil
2666A	366	1	Tank headspace	Crude oil
2666A	368	1	Tank headspace	Crude oil
2666A	374	1	Tank headspace	Crude oil
2656A	335	1	Tank headspace	Diluent
2664A	346	1	Tank headspace	Distillate oil
2640A	292	1	Tank headspace	Produced water
2640A	294	1	Tank headspace	Produced water
2638A	299	1	Tank headspace	Produced water
2646A	309	1	Tank headspace	Produced water
2646A	310	1	Tank headspace	Produced water
2646A	311	1	Tank headspace	Produced water
2663A	326	1	Tank headspace	Produced water
2666A	365	1	Tank headspace	Produced water
2666A	367	1	Tank headspace	Produced water
2665A	337	1	Tank headspace	Wastewater
2665A	338	1	Tank headspace	Wastewater
2664A	342	1	Tank headspace	Wastewater
2664A	347	1	Tank headspace	Wastewater
2666A	357	1	Tank liquid	Produced water
2666A	359	1	Tank liquid	Produced water
2666A	361	1	Tank liquid	Produced water
2666A	363	1	Tank liquid	Produced water
2666A	369	1	Tank liquid	Produced water
2666A	375	1	Tank liquid	Produced water
2661A	333	1	Truck loading	Sulfur
2643A	302	1	Turbine	Jp-4
2643A	303	1	Turbine	Jp-5
2643A	304	1	Turbine/RICE	Diesel
2662A	351	1	Wastewater treatment	Wastewater
2662A	352	1	Wastewater treatment	Wastewater
2662A	353	1	Wastewater treatment	Wastewater
2662A	354	1	Wastewater treatment	Wastewater

TABLE 5. DETAILED VALIDATION RESULTS SUMMARY.

Detailed Validation Note	Status	Number of Tests Failing		
		Validation Check		
		Part I	Part II	Project
Dioxin/PAH samples using a single train	Note	7	1	8
Separate front/backhalf analysis conducted for CARB 436	Reject	2	1	3
Used outdated method without CARB approval	Reject	1	0	1
Method 421 sampling was not isokinetic and stack temp < 250F	Reject	3	0	3
Naphthalene analyzed by method 410	Reject	14	0	14
Nonisokinetic sampling method 429	Note	3	0	3
Full set of internal standards not used for method 429	Note	40	20	60
All sampling done non-isokinetically	Reject	1	1	1
Mercury not tested by CVAAS	Reject	0	1	1
Did not use correct impingers for metals train	Reject	0	2	2
Failed swirl check	Reject	0	1	1
Total		71	27	97

TABLE 6. KEY DESIGN AND OPERATING PARAMETERS.

Asphalt Production

- type of production process X conventional or drum mix
- methods of recycling, if any
- production rate
- plant capacity
- gas flow rate
- existence of scavenger system
- temperature of asphaltic cement and aggregate in pug mill
- type of fuel
- type of air pollution control device, if any

Cement Kilns

- type of production process X wet or dry
- use of preheater or precalciner
- existence of an alkali bypass stack
- production rate
- plant capacity
- type of fuel
- type of air pollution control device, if any

Glass *Manufacturing*

- type of glass being manufactured X soda-lime, lead, fused silica, etc.
- type of grease and oil lubricant used on machinery in forming and finishing phase
- frequency and magnitude of glass gobs contacting machine lubricant
- type of fuel
- type of air pollution control device, if any

Metal Furnaces

- type of metal being processed
- quality of scrap (i.e. dirt, oil, and moisture laden)
- level and type of scrap preparation and treatment X solvent degreasing, heat, etc.
- process used to charge and melt metal X batch or continuous
- type of furnace X electric arc, induction, reverberatory, etc.
- whether furnace is open or closed system
- if open, number of process phases I which the furnace doors and lids are open X charging, backcharging, alloying, tapping, etc.
- type of cover fluxes and demagging agents used
- type of fuel
- type of air pollution control device, if any

Polystyrene Manufacturing

- type of polystyrene being manufactured X high-impact or expandable
- grade of polystyrene being produced (i.e., lower molecular weights)
- type of production process X batch
- the polymerization technique X bulk, solution, suspension, or emulsion
- operating characteristics of the vacuum devolatilizer condenser
- type of vacuum system used to collect condensate X steam ejectors or vacuum pumps
- condenser coolant operating temperature
- type of air pollution control device, if any

Chrome Plating Operations

- type of cleaning process utilizing prior to electroplating X wire brushing, electrocleaning, or pickling
- type of solvents used during cleaning of work piece
- purpose of electroplating X decorative, hard-plating or anodizing
- efficiency of electroplating process (i.e. % of current used for actual electroplating as opposed to electrolysis)
- type of air pollution control device, if any

Surface Coating Operations

- type of coating operation X toll or captive
- coating application procedures X conventional spray, airless spray, roller, dip, etc.
- coating formulations (i.e., solvent-based, waterborne, powder)
- amount of volatile matter in the coating
- type of add-on emission controls, if any

External Combustion

- type of unit – boiler, process heater, fluidized bed, steam generator
- configuration of unit – direct fire, tangential, turbo, wall fired, spreader, pulverized, circulating
- type of fuel
- capacity and load – MMBtu/hr, Mwe
- manufacturer
- burner type – low NOx, conventional
- air preheat
- NOx control – flue gas recirculation, staged combustion, water injection, steam injection
- operating parameters – combustion temperature, residence time, oxygen
- type of add-on emission controls, if any

Internal Combustion Engines

- manufacturer
- type of fuel
- capacity and lead – bhp

- ignition – spark ignition or compression ignition
- injection – direct injection or indirect injection
- rich or lean operation
- strokes – 2 or 4
- compression ratio
- NOx control – exhaust gas recirculation, turbo charge, water injection, charge cooling, ignition retard, injection retard, steam injection
- engine speed, rpm
- type of add-on emission controls, if any

Turbines

- manufacturer
- type of fuel
- capacity and lead – Mwe
- NOx control – exhaust gas recirculation, water injection, steam injection
- compression ratio
- engine speed, rpm
- type of add-on emission controls, if any

Fugitives

- component type – tank, valves, flanges, pump seals, compressor seals, open-ended lines, safety relief devices, drains, rock pile, etc.
- tank type , if applicable – open top, fixed-roof, external floating-roof, internal floating roof
- material type – light liquid, heavy liquid, gas-vapor, hydrogen, diesel, crude oil, gasoline, aggregate, etc.

TABLE 7. ASSIGNED SOURCE CLASSIFICATION CODES AND EMISSION FACTOR UNITS.

SCC	Description 1	Description 2	Description 3	Description 4	Unit
10100217	External Combustion Boiler	Electric Generation	Bituminous coal	Atm fluid bed combustion	lb/Tons burned
10100222	External Combustion Boiler	Electric Generation	Subbituminus coal	Pulverized coal dry bottom	lb/Tons burned
10100401	External Combustion Boiler	Electric Generation	Residual oil	No 6 Oil Normal Firing	lb/1000 gallons burned
10100501	External Combustion Boiler	Electric Generation	Distillate Oil	No 1 and No 2 oil	lb/1000 gallons burned
10100601	External Combustion Boiler	Electric Generation	Natural gas	>100 MMBtu/hr	lb/Million cubic feet burned
10100801	External Combustion Boiler	Electric Generation	Coke	All boiler sizes	lb/Tons burned
10100903	External Combustion Boiler	Electric Generation	Wood/bark waste	Wood boiler	lb/Tons burned
10200401	External Combustion Boiler	Industrial	Residual oil	No 6 Oil	lb/1000 gallons burned
10200402	External Combustion Boiler	Industrial	Residual oil	10-100 MMBtu/hr	lb/1000 gallons burned
10200403	External Combustion Boiler	Industrial	Residual oil	< 10 MMBtu/hr	lb/1000 gallons burned
10200501	External Combustion Boiler	Industrial	Distillate Oil	No 1 and No 2 oil	lb/1000 gallons burned
10200701	External Combustion Boiler	Industrial	Process gas	Petroleum refinery	lb/Million cubic feet burned
10200802	External Combustion Boiler	Industrial	Coke	All boiler sizes	lb/Tons burned
10300501	External Combustion Boiler	Commercial/Institutional	Distillate Oil	No 1 and No 2 oil	lb/1000 gallons burned
10300811	External Combustion Boiler	Commercial/Institutional	Landfill gas	Boiler	lb/Million cubic feet burned
20100101	Internal Combustion Engine	Electric Generation	Dist.Oil/Diesel	Turbine	lb/1000 gallons burned
20100102	Internal Combustion Engine	Electric Generation	Dist.Oil/Diesel	Reciprocating	lb/1000 gallons burned
20100201	Internal Combustion Engine	Electric Generation	Natural gas	Turbine	lb/Million cubic feet burned

TABLE 7. ASSIGNED SOURCE CLASSIFICATION CODES AND EMISSION FACTOR UNITS.

SCC	Description 1	Description 2	Description 3	Description 4	Unit
20100202	Internal Combustion Engine	Electric Generation	Natural gas	Reciprocating	lb/Million cubic feet burned
20100301	Internal Combustion Engine	Electric Generation	Diesel	Reciprocating	lb/1000 gallons burned
20100801	Internal Combustion Engine	Electric Generation	Landfill gas	Turbine	lb/Million cubic feet burned
20100802	Internal Combustion Engine	Electric Generation	Landfill gas	Reciprocating	lb/Million cubic feet burned
20200102	Internal Combustion Engine	Industrial	Dist.Oil/Diesel	Reciprocating	lb/1000 gallons burned
20200103	Internal Combustion Engine	Industrial	Dist.Oil/Diesel	Turbine-cogeneration	lb/1000 gallons burned
20200201	Internal Combustion Engine	Industrial	Natural gas	Turbine	lb/Million cubic feet burned
20200202	Internal Combustion Engine	Industrial	Natural gas	Reciprocating	lb/Million cubic feet burned
20200203	Internal Combustion Engine	Industrial	Natural gas	Turbine-cogenertn	lb/Million cubic feet burned
20200252	Internal Combustion Engine	Industrial	Natural gas	2-cycle lean burn	lb/Million cubic feet burned
20200254	Internal Combustion Engine	Industrial	Natural gas	4-cycle lean burn	lb/Million cubic feet burned
20200701	Internal Combustion Engine	Industrial	Process gas	Turbine	lb/Million cubic feet burned
20200705	Internal Combustion Engine	Industrial	Refinery gas	Turbine	lb/Million cubic feet burned
20201013	Internal Combustion Engine	Industrial	Liq petroleum gas	LPG:turbine:cogeneration	lb/1000 gallons burned
20300101	Internal Combustion Engine	Commercial/Institutional	Dist.Oil/Diesel	Reciprocating	lb/1000 gallons burned
30101817	Chemical Manufacturing	Plastics Production	Polystyrene	General	lb/Tons product
30101818	Chemical Manufacturing	Plastics Production	Polystyrene	Reactor	lb/Tons product
30102431	Chemical Manufacturing	Plastics Production	Synthetic organic fiber	Heat treat furnace:carbonization	lb/Tons of material
30200201	Food/Agriculture	Coffee Roasting	Roaster	Direct fired	lb/Tons green beans
30300926	Primary Metals	Iron and Steel	Misc processes	Electric Induction furnace	lb/Tons produced

TABLE 7. ASSIGNED SOURCE CLASSIFICATION CODES AND EMISSION FACTOR UNITS.

SCC	Description 1	Description 2	Description 3	Description 4	Unit
30400101	Secondary Metals	Secondary Aluminum	Sweating furnace		lb/Tons produced
30400103	Secondary Metals	Secondary Aluminum	Smelting furnace	Reverberatory	lb/Tons metal produced
30400107	Secondary Metals	Secondary Aluminum	Hot dross process		lb/Tons metal produced
30400108	Secondary Metals	Secondary Aluminum	Crushing/screenng		lb/Tons metal produced
30400199	Secondary Metals	Secondary Aluminum	Not classified	Other	lb/Tons produced
30400224	Secondary Metals	Secondary Copper	Electric induction furnace	Brass/bronze charge	lb/Tons of charge
30400401	Secondary Metals	Secondary Lead	Kettle refining	Pot furnace	lb/Tons metal charged
30400408	Secondary Metals	Secondary Lead	Barton process	Oxidation kettle	lb/Tons lead oxide produced
30400505	Electrical Equipment	Lead Battery Manufacturing	Entire process	Total	lb/1000 batteries produced
30400522	Electrical Equipment	Lead Battery Manufacturing	Grid casting		lb/Tons processed
30500205	Petroleum Industry	Asphalt Concrete	Drum dryer	Hot asphalt plant	lb/Tons of asphalt
30500211	Petroleum Industry	Asphalt Concrete	Rotary dryer conventional	Plant w/cyclone	lb/Tons produced
30500214	Petroleum Industry	Asphalt Concrete	Truck load-out		lb/Tons loaded
30500606	Mineral Products	Cement Manufacturing	Dry process	Kilns	lb/Tons cement produced
30501402	Mineral Products	Glass Manufacturing	Container glass	Melting furnace	lb/Ton of glass produced
30501403	Mineral Products	Glass Manufacturing	Flat glass	Melting furnace	lb/Ton of glass produced
30501622	Mineral Products	Lime Manufacturing	Calcining	Coal rotary preheat kiln	lb/Lb/ton of lime manfactrd
30502201	Mining Operations	Nonmetallic Mineral	Potash production	Mine-grind/dry	lb/Tons ore
30502508	Mining Operations	Nonmetallic Mineral	Sand/gravel	Dryer	lb/Tons product produced
30503605	Mineral Products	Nonmetallic Mineral	Bonded abrasives manufacturing	Firing or curing	lb/Tons processed
30505001	Mineral Products	Nonmetallic Mineral	Asphalt processing	Blowing	lb/Tons asphalt processed
30600105	Petroleum Industry	Petroleum Refining	Process heaters	Natural gas-fired	lb/Million cubic feet burned
30600106	Petroleum Industry	Petroleum Refining	Process heaters	Process gas-fired	lb/Million cubic feet burned
30600201	Petroleum Industry	Petroleum Refining	Catalytic crackng	Fluid catalytic cracker	lb/1000 barrels fresh feed
30601101	Petroleum Industry	Petroleum Refining	Asphalt blowing	General	lb/Tons of asphalt produced
30601401	Petroleum Industry	Petroleum Refining	Petroleum coke	Calciner	lb/Tons raw coke processed
30601601	Petroleum Industry	Petroleum Refining	Catalytic reforming	General	lb/1000 bbls crude feed
30609904	Petroleum Industry	Petroleum Refining	Incinerators	Process gas	lb/Million cubic feet burned
30700402	Pulp and Paper	Pulpboard	Fiberboard	General	lb/Tons finished product
30901006	Fabricated Metals	Electroplating	Entire process	Chrome	mg/amp-hr
30902501	Fabricated Metals	Drums/Barrels	Drum cleaning	Drum burning	lb/Drums burned
30904010	Fabricated Metals	Metal Deposition	Thermal spray of	Powdered metal	lb/Tons sprayed metal consum

TABLE 7. ASSIGNED SOURCE CLASSIFICATION CODES AND EMISSION FACTOR UNITS.

SCC	Description 1	Description 2	Description 3	Description 4	Unit
30904020	Fabricated Metals	Metal Deposition	Plasma arc spray	Of powdered metal	lb/Tons sprayed metal consum
31000301	Oil and Gas Production	Natural Gas Production	Glycol dehydrator	Reboiler still vent	lb/Million cubic feet burned
31000304	Oil and Gas Production	Natural Gas Production	Glycol dehydrator	Ethyl glycol:General	lb/Million cubic feet burned
31000403	Oil and Gas Production	Fuel-Fired Equipment	Process heaters	Crude oil	lb/1000 gallons burned
31000404	Oil and Gas Production	Fuel-Fired Equipment	Process heaters	Natural gas	lb/Million cubic feet burned
31000413	Oil and Gas Production	Fuel-Fired Equipment	Steam generators	Crude oil	lb/1000 gallons burned
31000414	Oil and Gas Production	Fuel-Fired Equipment	Steam generators	Natural gas	lb/Million cubic feet burned
31000415	Oil and Gas Production	Fuel-Fired Equipment	Steam generators	Process gas	lb/Million cubic feet burned
31307001	Electrical Equipment	Windings Reclaimation	Incinerator oven	Single chamber	lb/Tons charged
31502101	Miscellaneous Industries	Health Care	Crematory stack		lb/Bodies
40200110	Organic Solvent	Surface Coating	Paint-general	Solvent-base coating	lb/Gallons coating
40200210	Organic Solvent	Surface Coating	Paint-general	Water-base coating	lb/Gallons coating
40200610	Organic Solvent	Surface Coating	Primer	General	lb/Gallons coating
50100506	Solid Waste Disposal	Government	Other incinerator	Sludge	lb/Tons dry sludge
50200504	Solid Waste Disposal	Commercial/Institutional	Medical waste incinerator		lb/Tons burned
50300205	Solid Waste Disposal	Industrial	Open burning	Rocket propellant	lb/Tons of fuel
50300601	Solid Waste Disposal	Industrial	Landfill dump	Waste gas flare	lb/Million cubic feet burned

TABLE 8. LISTING OF SECONDARY AND PRIMARY VALIDATION CHECKS FOR TEST METHODS APPLICABLE TO PROJECT (a).

CHECK	11 83	12 86	15 83	101A 86	104 86	106 83	410 86	421 87	421 91	422 87	422 91	423 87	424 87	425 87	425 90	428 88	428 90	429 89	430 89	430 91	433 89	EPA Metals	EPA 306	436 91,92
SAMPLE LOCATION																								
Swirl Check		S		S	S			S	S			S	S	S	S	S	S	S			S	S	S	S
Stack Size		S		S	S			S	S			S	S	S	S	S	S	S			S	S	S	S
Number of Sample Points		S		S	S			S	S			S	S	S	S	S	S	S			S	S	S	S
SAMPLING EQUIPMENT																								
Nozzle Size Check		S		S	S			S	S			S	S	S	S	S	S	S			S	S	S	S
Field Gas Dry Meter Calibration	S	S		S	S			S	S			S	S	S	S	S	S	S	S		S	S	S	S
Pitot Tube Semi-Annual Calibration		S		S	S			S	S			S	S	S	S	S	S	S			S	S	S	S
Tedlar Bag Contamination Check							P			P	P													
SAMPLING PROCEDURES																								
Number of Sample Runs									S							S	S	S	S	S				S
Length of Sample Time									S							S	S						S	
Leak Check	S	S	S	S	S		S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Sample Line Loss			S																					
Isokinetic Variation		S		S	S			S	S			S	S	S	S	S	S	S			S	S	S	S
Field Reagent Blank	P	P		P	P			P				P	P	P	P						P	P	P	P
Field Blank									P		P					P	P	P	P	P				P
Field Spike											P													
Surrogate Recovery																P	P	P						
Probe Proof															P									
Filter Temperature				S								S												
Flow Rate Level				S	S							S							S	S				
Sample Date																				P				
Correct Impinger Solutions	S	S						S	S			S										S		S
ANALYSIS																								
Correct Method Used	S	S	S	S	S	S	S	S	S	S	S	S	S						S	S	S			
Extraction Date						P	P			P	P							P	P	P				
Analysis Date						P	P			P	P							P	P	P			P	P
3-Point Calibration						S																		
Matrix Spike Recovery														P	P				P	P		P	P	P
Lab Spike Recovery								P	P															
Lab Control Spike Recovery																P	P	P						
Internal Standard Recovery																P	P	P						
Duplicate Percent Difference								P	P		P			P	P							P	P	P
Separate Impinger Analysis																				S				
PRIMARY PARAMETER SUMMARY																								
Sufficient Documentation	1	1	0	1	1	1	2	2	2	2	3	1	1	2	3	3	3	4	3	3	1	2	3	3
Total	1	1	0	1	1	1	2	3	3	2	5	1	1	3	4	4	4	6	4	5	1	3	4	5

P - Primary validation parameter.
S - Secondary validation parameter.
Blank - Check not applicable for method.
(a) - Table described in Section 6.3 *Background*

TABLE 9. METHOD RATING SUMMARY.

Sample Method	Version	Substance	Number of Tests at Method Rating						
			A	B	C	D	E	F	G
CARB 101A	86	Mercury	6	-		-			2
CARB 104	86	Beryllium	1	-	3	-			7
CARB 106	83	Vinyl Chloride	7	-		-			
CARB 11	83	Hydrogen Sulfide	7	-	44	-			
CARB 12	86	Lead	4	-	4	-	1		5
CARB 15	83	Hydrogen Sulfide	22	-		-			
CARB 410A	86	BTX	76	-	70	-	3		
CARB 410B	86	BTX	24	-	17	-			
CARB 421	87	HCl	3	-	21	-	1		1
	91	HCl	5	-	6	-			
CARB 422	87	VOC	15	-	6	-			
	91	VOC	8	-	5	-			
CARB 423	87	Arsenic	6	-	1	-	1		8
CARB 424	87	Cadmium	1	-	1	-			7
CARB 425	87	Chromium (Hex)	12	-	12	-	1		
	90	Chromium (Hex)	26	-	66	-	16		
CARB 426	87	Cyanide		-		-	4		
CARB 428	88	Dioxin & Furan	4	-	4	-	1		
	90	Dioxin & Furan	17	-	4	-	1	2	
CARB 429	89	PAH	74	-	70	-	3	6	
CARB 430	89	Aldehydes	78	-	65	-	4	1	
	91	Aldehydes	32	-	21	-			
CARB 433	89	Nickel	1	-	2	-			13
CARB 436	92	Trace Metals	15	-	18	-		1	12
EPA MMT	89	Trace Metals	-	9	-	53	3	2	10
BAAQMD ST1B	82	Ammonia	-	9	-		1		
SCAQMD 207.1	90	Ammonia	-	11	-				
EPA 306	90	Chromium (Hex)	-	15	-				
EPA 420.1		Phenol	-	a	-	a	1		
EPA M5		Chloride and Fluoride	-	a	-	a	2		1
EPA 30	86	BTX	-	a	-	a	16		
NIOSH 1612		Propylene Oxide	-	a	-	a	1		
SCAQMD 205.1		Chromium (Hex)	-	a	-	a	4		
SCAQMD 25.1		Ethylbenzene & Styrene	-	a	-	a	1		
SCAQMD 5.2		Particulate	-	a	-	a	1		

- Does not apply

a - no validation conducted

TABLE 10. MAJOR GROUP AND SUB GROUP EVALUATION PARAMETERS.

Major Group	Sub Group Parameters Evaluated	Tests		
		Part I	Part II	Total
Section 1 Part II Sub group Analysis – New and Updated Major Groups*				
Asphalt Prod., Oil	APC System, Contractor	2	2	4
Boiler, Fuel Oil	SCC	12	2	14
Boiler, Ref. Gas	APC System, Excess Air, Burner Type		7	7
Catalytic Reformer	APC System		2	2
Coating, Base/Catalyst/Water Mix	APC System, Paint Cr Content		4	4
Coating, Powder	APC System, Powder Cr Content, SCC	7	1	8
Dryer, Pot ash	APC System, Material		2	2
Dryer, Sand/Gravel	APC System, Fuel Type		2	2
FBC, Biomass	APC System, Fuel Type	2	2	4
Furnace, Lead	SCC		4	4
Heater, Ref. Gas	APC System, Excess Air, Burner Type		25	25
RICE, Diesel	SCC, Capacity, Oxygen	8	2	10
RICE, Natural Gas	APC System, Strokes per Cycle, Capacity, Oxygen	22	3	25
Incinerator, Medical Waste	APC System, Waste Type		6	6
Plating, Anodizing	APC System	3	3	6
Plating, Decorative	APC System		2	2
Plating, Hard	APC System	8	33	41
Plating, Hard/Anodizing	APC System		3	3
Steam Generator, Natural/CVR Gas	APC System, Excess Air, Burner Type	2	3	5
Shredding and Delaquering, Aluminum	APC System		2	2
Turbine, Natural Gas	APC System, SCC, Duct Burners	9	7	16
Section 2 Part I Sub group Analysis – No Additional Data Collected or Evaluated**				
Asphalt Prod., Diesel	APC System, SCC	4		4
Asphalt Prod., Natural Gas	APC System, SCC	5		5
Boiler, Distillate	SCC	7		7
Coating, Green PE	APC System, Spray Method	5		5
Coating, Green Primer	APC System, Spray Method	8		8
FBC, Coal	APC System	6		6
Furnace, Aluminum	APC System, Furnace Type	7		7
Furnace, Glass	APC System, SCC	4		4
RICE, Field Gas	Strokes per Cycle, Capacity, Oxygen	6		6
Steam Generator, Crude Oil	APC System, Load, Burner Type	3		3
Turbine, Distillate	SCC	5		5
Section 3 No Sub group Analysis - No Difference in Design/Operation				
Boiler, Natural Gas	None	3		3
Cement Kiln, Coal	None	2		2
Crematory	None		2	2
FBC, Coke	None	2		2
Heater, Natural Gas	None	1	1	2
ICE, Landfill Gas	None	2		2
PM, Reactor	None	2		2
PM, Storage Silo	None	3		3

TABLE 10. MAJOR GROUP AND SUB GROUP EVALUATION PARAMETERS.

Major Group	Sub Group Parameters Evaluated	Tests		
		Part I	Part II	Total
SG, Natural Gas	None	1	1	2
Turbine, Natural/Ref. Gas	None		5	5
Section 4 No Sub group Analysis - No Difference in Samples				
Abrasive Blasting, Dust	None		2	2
Asphalt Prod., Dust	None		4	4
Composition, Crude oil	None		2	2
Composition, Diesel	None		4	4
Composition, Lube Oil	None		3	3
Composition, Produced water	None		7	7
Composition, Wastewater	None		4	4
Flanges, Field gas	None		2	2
Flare, Landfill gas	None		4	4
Fugitives, Casing/Natural Gas	None		2	2
Gas Processing, Fuel Gas	None		5	5
Gas Processing, Produced Gas	None		4	4
Tank, Crude oil	None		18	18
Tank, Produced water	None		8	8
Tank, Wastewater	None		4	4
Section 5 No Sub group Analysis - Single Test				
Aeration Basin, Wastewater	None		1	1
Asphalt Prod., Blowing	None		1	1
Asphalt Prod., Truck Load	None		1	1
Battery Prod., Grids	None		1	1
Battery Prod., Post Pour	None		1	1
Battery Prod., Strap Line	None		1	1
Boiler, Coal/Natural Gas	None		1	1
Boiler, Coke/Coal	None		1	1
Boiler, Landfill Gas	None	1		1
Boiler, Wood	None	1		1
Cement Kiln, Coal/Coke	None	1		1
Coating, Base/Catalyst/Solvent Mix	None		1	1
Coating, Yellow PE	None	1		1
Coke Calcining	None	1		1
Composition, Jp-4	None		1	1
Composition, Jp-5	None		1	1
Composition, Lube oil/Diesel	None		1	1
Composition, Sour Water	None		1	1
DAF Tank, Wastewater	None		1	1
Dehydrator, Sludge	None		1	1
Delaquering, Aluminum	None		1	1
Drum Burning Furnace	None	1		1
Dryer, Fiberboard	None		1	1
FCCU, Refinery gas	None		1	1
Flanges, Crude oil	None		1	1
Fugitive, Sulfur	None		1	1

TABLE 10. MAJOR GROUP AND SUB GROUP EVALUATION PARAMETERS.

Major Group	Sub Group Parameters Evaluated	Tests		
		Part I	Part II	Total
Furnace, Alloy Stock	None	1		1
Furnace, Brass/Bronze	None	1		1
Furnace, Carbonization	None		1	1
Gas Processing, Field gas	None		1	1
Headworks, Wastewater	None		1	1
Heater, Natural/Ref. Gas	None	1		1
Heater, Oil	None	1		1
Incinerator, Waste explosives	None		1	1
Incinerator, Waste Gas	None		1	1
Main Trap, Produced Gas	None		1	1
Oven, Curing Tools	None		1	1
Oven, Wire Coatings	None		1	1
PM, Devolatizer	None	1		1
PM, Extruder	None	1		1
PM, Mix Tank	None	1		1
Preheater Kiln, Coal	None	1		1
Presser, Fiberboard	None		1	1
PST, Wastewater	None		1	1
Reboiler, Ethylene Glycol	None		1	1
Reboiler, Triethylene Glycol	None		1	1
Roaster, Green beans	None		1	1
Solids odor processing, Sludge	None		1	1
Tank, Diluent	None		1	1
Tank, Distillate oil	None		1	1
Turbine, Field Gas	None	1		1
Turbine, Landfill Gas	None	1		1
Turbine, Natural/Ref. Gas/Butane	None		1	1
Turbine, Natural/Ref./LP Gas	None		1	1
Turbine, Ref. Gas	None		1	1
Unloader, Fiberboard	None		1	1
Section 6 No Sub group Analysis - Process Rate Not Available in Correct Unit				
Asphalt Blowing	None	2		2

*See Section 6.8 for sub group analysis

**See Section 6.8 of Part I report for sub group analysis

TABLE 11. LISTING OF OUTLIERS REMOVED FROM EMISSION FACTOR DEVELOPMENT.

Major Group	Device ID	Run ID	Category	Substance	Statistical Outlier Evaluation		Report Review Results			Comment
					Major Group	Test	Calculation	Process	Method	
Asphalt Prod., Diesel	105	105C1R8	Metals	Cadmium	y		x	x	r	8
Asphalt Prod., Diesel	105	105C1R8	Metals	Copper	y		x	x	r	8
Asphalt Prod., Diesel	105	105C1R9	Metals	Cadmium	y		x	x	r	8
Asphalt Prod., Natural Gas	103	103C1S1	PAH	Benzo(a)anthracene		y	x	x	r	2
Asphalt Prod., Natural Gas	103	103C1S1	PAH	Benzo(a)pyrene		y	x	x	r	2
Asphalt Prod., Natural Gas	103	103C1S1	PAH	Benzo(b)fluoranthene		y	x	x	r	2
Asphalt Prod., Natural Gas	103	103C1S1	PAH	Benzo(g,h,i)perylene		y	x	x	r	2
Asphalt Prod., Natural Gas	103	103C1S1	PAH	Benzo(k)fluoranthene		y	x	x	r	2
Asphalt Prod., Natural Gas	103	103C1S1	PAH	Chrysene		y	x	x	r	2
Asphalt Prod., Natural Gas	103	103C1S1	PAH	Dibenz(a,h)anthracene		y	x	x	r	2
Asphalt Prod., Natural Gas	103	103C1S1	PAH	Indeno(1,2,3-cd)pyrene		y	x	x	r	2
Asphalt Prod., Oil	158	158C1R3	Metals	Arsenic	y		x	r	x	9
Asphalt Prod., Oil	158	158C1R3	Metals	Lead	y		x	r	x	9
Asphalt Prod., Oil	158	158C1R6	Metals	Zinc	y		x	r	x	9
Asphalt Prod., Oil	215	215C1R2	Metals	Zinc	y	y	c	x	x	c
Boiler, Distillate	161	161C1R3	SVOC	2-Chloronaphthalene	y	y	x	x	r	5
Boiler, Distillate	161	161C1R3	PAH	Acenaphthene		y	x	x	r	5
Boiler, Distillate	161	161C1R3	PAH	Acenaphthylene		y	x	x	r	5
Boiler, Distillate	161	161C1R3	PAH	Anthracene	y	y	x	x	r	5
Boiler, Distillate	161	161C1R3	PAH	Benzo(a)pyrene	y	y	x	x	r	5
Boiler, Distillate	161	161C1R3	PAH	Benzo(b)fluoranthene	y	y	x	x	r	5
Boiler, Distillate	161	161C1R3	PAH	Benzo(e)pyrene	y	y	x	x	r	5
Boiler, Distillate	161	161C1R3	PAH	Benzo(g,h,i)perylene	y	y	x	x	r	5
Boiler, Distillate	161	161C1R3	PAH	Benzo(k)fluoranthene		y	x	x	r	5
Boiler, Distillate	161	161C1R3	PAH	Dibenz(a,h)anthracene	y	y	x	x	r	5
Boiler, Distillate	161	161C1R3	PAH	Fluorene		y	x	x	r	5
Boiler, Distillate	161	161C1R3	PAH	Indeno(1,2,3-cd)pyrene	y	y	x	x	r	5
Boiler, Distillate	161	161C1R3	SVOC	Perylene	y	y	x	x	r	5
Boiler, Distillate	181	181C1R3	PAH	Acenaphthene		y	x	r	x	6
Boiler, Distillate	181	181C1R3	PAH	Acenaphthylene	y		x	r	x	6,10
Boiler, Distillate	181	181C1R3	PAH	Benzo(a)anthracene	y	y	x	r	x	6
Boiler, Distillate	181	181C1R3	PAH	Chrysene		y	x	r	x	6
Boiler, Distillate	181	181C1R3	PAH	Fluoranthene	y		x	r	x	6,10
Boiler, Distillate	181	181C1R3	PAH	Fluorene	y	y	x	r	x	6
Boiler, Distillate	181	181C1R3	PAH	Naphthalene		y	x	r	x	6
Boiler, Distillate	181	181C1R3	PAH	Phenanthrene	y	y	x	r	x	6
Boiler, Distillate	181	181C1R3	PAH	Pyrene	y		x	r	x	6,10
Boiler, Fuel Oil	102	102C1R2	PAH	Acenaphthene	y	y	x	x	r	1
Boiler, Fuel Oil	102	102C1R2	PAH	Acenaphthylene	y	y	x	x	r	1
Boiler, Fuel Oil	102	102C1R2	PAH	Anthracene	y	y	x	x	r	1
Boiler, Fuel Oil	102	102C1R2	PAH	Benzo(a)anthracene	y	y	x	x	r	1
Boiler, Fuel Oil	102	102C1R2	PAH	Benzo(a)pyrene	y	y	x	x	r	1
Boiler, Fuel Oil	102	102C1R2	PAH	Benzo(b)fluoranthene	y	y	x	x	r	1
Boiler, Fuel Oil	102	102C1R2	PAH	Benzo(g,h,i)perylene	y	y	x	x	r	1
Boiler, Fuel Oil	102	102C1R2	PAH	Benzo(k)fluoranthene	y	y	x	x	r	1
Boiler, Fuel Oil	102	102C1R2	PAH	Chrysene	y	y	x	x	r	1
Boiler, Fuel Oil	102	102C1R2	PAH	Dibenz(a,h)anthracene	y	y	x	x	r	1
Boiler, Fuel Oil	102	102C1R2	PAH	Fluoranthene	y	y	x	x	r	1
Boiler, Fuel Oil	102	102C1R2	PAH	Fluorene	y	y	x	x	r	1
Boiler, Fuel Oil	102	102C1R2	PAH	Indeno(1,2,3-cd)pyrene	y	y	x	x	r	1
Boiler, Fuel Oil	102	102C1R2	PAH	Phenanthrene	y	y	x	x	r	1
Boiler, Fuel Oil	102	102C1R2	PAH	Pyrene	y	y	x	x	r	1

TABLE 11. LISTING OF OUTLIERS REMOVED FROM EMISSION FACTOR DEVELOPMENT.

Major Group	Device ID	Run ID	Category	Substance	Statistical Outlier Evaluation		Report Review Results			Comment
					Major Group	Test	Calculation	Process	Method	
Boiler, Ref. Gas	646	646C1R3	Metals	Beryllium	y	y	x	r	x	17
Boiler, Ref. Gas	646	646C1R3	Metals	Copper	y	y	x	r	x	17
Boiler, Ref. Gas	646	646C1R3	Metals	Lead	y	y	x	r	x	17
Boiler, Ref. Gas	646	646C1R3	Metals	Manganese		y	x	r	x	17
Boiler, Ref. Gas	646	646C1R3	Metals	Nickel	y	y	x	r	x	17
Dryer, Pot ash	251	251C1R3	VOC	Trichloroethene	y		c	x	x	c
FBC, Coal	431	431C1R1	Dioxin/Furan	Dioxin:5D 12378	y		x	x	r	11
FBC, Coal	431	431C1R1	Dioxin/Furan	Dioxin:6D 123678	y		x	x	r	11
FBC, Coal	431	431C1R2	Dioxin/Furan	Dioxin:4D 2378	y		x	x	r	11
FBC, Coal	431	431C1R2	Dioxin/Furan	Dioxin:5D 12378	y		x	x	r	11
FBC, Coal	431	431C1R2	Dioxin/Furan	Dioxin:6D 123678	y		x	x	r	11
FBC, Coal	431	431C1R2	Dioxin/Furan	Dioxin:7D 1234678	y		x	x	r	11
FCCU, Refinery gas	260	260C1R2	PAH	Fluorene	y	y	c	x	x	c
Furnace, Lead	219	219C1R3	Metals	Antimony	y		c	x	x	c
Heater, Ref. Gas	225	225C1R2	PAH	Acenaphthylene		y	x	x	r	21
Heater, Ref. Gas	264	264C1R2	PAH	Fluorene		y	c	x	x	c
Heater, Ref. Gas	266	266C1R3	VOC	Benzene	y		c	x	x	c
Heater, Ref. Gas	445	445C3R2	PAH	Acenaphthene		y	x	x	r	12
Heater, Ref. Gas	445	445C3R2	PAH	Acenaphthylene		y	x	x	r	12
Heater, Ref. Gas	445	445C3R2	PAH	Anthracene		y	x	x	r	12
Heater, Ref. Gas	445	445C3R2	PAH	Benzo(a)anthracene		y	x	x	r	12
Heater, Ref. Gas	445	445C3R2	PAH	Benzo(a)pyrene		y	x	x	r	12
Heater, Ref. Gas	445	445C3R2	PAH	Benzo(b)fluoranthene		y	x	x	r	12
Heater, Ref. Gas	445	445C3R2	PAH	Benzo(g,h,i)perylene		y	x	x	r	12
Heater, Ref. Gas	445	445C3R2	PAH	Benzo(k)fluoranthene		y	x	x	r	12
Heater, Ref. Gas	445	445C3R2	PAH	Chrysene		y	x	x	r	12
Heater, Ref. Gas	445	445C3R2	PAH	Dibenz(a,h)anthracene		y	x	x	r	12
Heater, Ref. Gas	445	445C3R2	PAH	Fluoranthene		y	x	x	r	12
Heater, Ref. Gas	445	445C3R2	PAH	Fluorene		y	x	x	r	12
Heater, Ref. Gas	445	445C3R2	PAH	Indeno(1,2,3-cd)pyrene		y	x	x	r	12
Heater, Ref. Gas	445	445C3R2	PAH	Naphthalene		y	x	x	r	12
Heater, Ref. Gas	445	445C3R2	PAH	Phenanthrene		y	x	x	r	12
Heater, Ref. Gas	445	445C3R2	PAH	Pyrene		y	x	x	r	12
ICE, Landfill Gas	133	133C1R2	PAH	Anthracene	y		c	x	x	c
Incinerator, Medical Waste	226	226C1R2	Dioxin/Furan	Furan:5F 23478		y	x	?	x	20
Oven, Wire Coatings	238	238C1R3	PAH	Fluorene	y	y	c	x	x	c
Oven, Wire Coatings	238	238C1R3	VOC	Formaldehyde	y	y	c	x	x	c
Plating, Anodizing	421	421C1R4	Metals	Chromium (Total)	y		x	?	x	23
Shredding and Delaquering, Aluminum	236	236C1R1	Dioxin/Furan	Dioxin:4D 2378	y	y	x	x	r	25
Shredding and Delaquering, Aluminum	236	236C1R1	Dioxin/Furan	Dioxin:5D 12378	y	y	x	x	r	25
Shredding and Delaquering, Aluminum	236	236C1R1	Dioxin/Furan	Dioxin:6D 123478	y	y	x	x	r	25
Shredding and Delaquering, Aluminum	236	236C1R1	Dioxin/Furan	Dioxin:6D 123678	y	y	x	x	r	25
Shredding and Delaquering, Aluminum	236	236C1R1	Dioxin/Furan	Dioxin:6D 123789	y	y	x	x	r	25
Shredding and Delaquering, Aluminum	236	236C1R1	Dioxin/Furan	Dioxin:6D Total	y	y	x	x	r	25
Shredding and Delaquering, Aluminum	236	236C1R1	Dioxin/Furan	Dioxin:8D	y	y	x	x	r	25
Shredding and Delaquering, Aluminum	236	236C1R1	Dioxin/Furan	Furan:5F 12378	y	y	x	x	r	25
Shredding and Delaquering, Aluminum	236	236C1R1	Dioxin/Furan	Furan:5F 23478	y	y	x	x	r	25
Shredding and Delaquering, Aluminum	236	236C1R1	Dioxin/Furan	Furan:6F 123478	y	y	x	x	r	25
Shredding and Delaquering, Aluminum	236	236C1R1	Dioxin/Furan	Furan:6F 123678	y	y	x	x	r	25
Shredding and Delaquering, Aluminum	236	236C1R1	Dioxin/Furan	Furan:6F 123789	y	y	x	x	r	25
Shredding and Delaquering, Aluminum	236	236C1R1	Dioxin/Furan	Furan:6F 234678	y	y	x	x	r	25
Shredding and Delaquering, Aluminum	236	236C1R1	Dioxin/Furan	Furan:6F Total	y	y	x	x	r	25
Shredding and Delaquering, Aluminum	236	236C1R1	Dioxin/Furan	Furan:7F 1234789	y	y	x	x	r	25

TABLE 11. LISTING OF OUTLIERS REMOVED FROM EMISSION FACTOR DEVELOPMENT.

Major Group	Device ID	Run ID	Category	Substance	Statistical Outlier Evaluation		Report Review Results			Comment
					Major Group	Test	Calculation	Process	Method	
Shredding and Delaquering, Aluminum	236	236C1R1	Dioxin/Furan	Furan:8F	y	y	x	x	r	25
Turbine, Natural Gas	141	141C1R1	VOC	Formaldehyde		y	x	x	r	3
Turbine, Natural/Ref. Gas	263	263C1R1	Metals	Manganese	y	y	x	x	?	22

y - outlier as identified by statistical analysis
r - rejected from emission factor development
x - passed check
c - data corrected
1 – Due to matrix interference the detection limit for Run 2 from the samples taken when the unit was fired on oil was high.
2 – Higher detection limits for tests 11 and 12 resulted from analytical interference's associated with the sample matrices.
3 – First run contaminated during extended leak check.
5 - Do to matrix interference the detection limit for Run 3 was two orders of magnitude higher than Runs 1 and 2.
6 – Incomplete combustion during boiler shutdown and startup may be the cause for the relatively high PAH results for Run 3.
8 – Blank quantities greater than sample quantities.
9 – Constant clogging of pitot tube lines and filters, interruptions of plant operations, power failures encountered during sampling.
10 – Boiler shutdown and startup may be cause of relatively high PAH results for Run 3.
11 – Low recoveries of internal standard due to sample matrix.
12 – Samples appear to be contaminated. Sample extraction produced a sticky organic material that was unlike other sample extracts.
17 – Process unit upset during MMT run 3.
20 – Flow disturbance and low afterburner temperature.
21 – Low flow rates resulted in higher DL.
22 – Residual manganese contamination in impingers.
23 – Results of all four tests indicated that scrubber was not performing properly.
25 – Break in sample train during the test.

TABLE 12. POINT SOURCE EMISSION FACTOR GROUPS.*

Major Group	Sub Group	Fuel/Material	SCC	APC System	Other
Asphalt Prod., Blowing	1	Natural gas/Flux	30505001	FI	None
Asphalt Prod., Diesel	1	Diesel/Aggregate	30500211	C/FF	None
Asphalt Prod., Diesel	2	Diesel/Aggregate	30500205	FF	None
Asphalt Prod., Diesel	3	Diesel/Aggregate	30500205	WS	None
Asphalt Prod., Natural Gas	1	Natural gas/Aggregate	30500211	C/FF	None
Asphalt Prod., Natural Gas	1	Natural gas/Aggregate	30500211	C/WS	None
Asphalt Prod., Oil	1	Back-up oil/Aggregate	30500211	C/BH	None
Asphalt Prod., Oil	1	Process oil 70/Aggregate	30500211	C/WS	None
Asphalt Prod., Truck Load	1	Asphalt	30500214	FF	None
Battery Prod., Grids	1	Grids	30400522	NONE	None
Battery Prod., Post Pour	1	Batteries	30400505	NONE	None
Battery Prod., Strap Line	1	Batteries	30400505	NONE	None
Boiler, Coal/Natural Gas	1	Coal/Natural gas	10100222	NONE	None
Boiler, Coke/Coal	1	Coke/Coal	10200802	LI/AI/B	None
Boiler, Distillate	1	Diesel	10200501	NONE	None
Boiler, Distillate	1	Diesel	10300501	NONE	None
Boiler, Fuel Oil	1	No. 6 Fuel oil	10100401	NONE	None
Boiler, Fuel Oil	2	No. 6 Fuel oil	10200401	NONE	None
Boiler, Fuel Oil	2	No. 6 Fuel oil	10200402	NONE	None
Boiler, Fuel Oil	2	No. 6 Fuel oil	10200403	NONE	None
Boiler, Fuel Oil	2	Residual fuel	10200401	NONE	None
Boiler, Landfill Gas	1	Landfill gas	10300811	NONE	None
Boiler, Natural Gas	1	Natural gas	10100601	NONE	None
Boiler, Ref. Gas	1	Refinery gas	10200701	NONE	EA<100%
Boiler, Ref. Gas	1	Refinery gas	10200701	SCR	EA<100%
Boiler, Ref. Gas	2	Refinery gas	10200701	NONE	EA>100%
Boiler, Wood	1	Wood	10100903	ESP/MC	None
Catalytic Reformer	1	Naphtas	30601601	NONE	None
Catalytic Reformer	2	Naphtas	30601601	AC	None
Cement Kiln, Coal	1	Coal/Raw Materials	30500606	FF	None
Cement Kiln, Coal/Coke	1	Coal/Coke/Raw Materials	30500606	FF	None
Coating, Base/Catalyst/ Solvent Mix	1	Solvent reducible paint	40200110	FF	HVLP Spray Gun
Coating, Base/Catalyst/ Water Mix	1	5.25% Cr	40200210	AF	?
Coating, Base/Catalyst/ Water Mix	1	5.25% Cr	40200210	AF	HVLP Spray Gun
Coating, Base/Catalyst/ Water Mix	2	26% Cr	40200210	AF	HVLP Spray Gun
Coating, Base/Catalyst/ Water Mix	3	26% Cr	40200210	S	?
Coating, Green PE	1	15% Cr	40200110	BF	HVLP Spray Gun
Coating, Green PE	2	15% Cr	40200110	PA	HVLP Spray Gun
Coating, Green PE	3	15% Cr	40200110	WC	HVLP Spray Gun
Coating, Green PE	4	15% Cr	40200110	WT	HVLP Spray Gun
Coating, Green Primer	1	25-35% Chromate	40200610	BF	HVLP Spray Gun
Coating, Green Primer	2	25-35% Chromate	40200610	PA	HVLP Spray Gun
Coating, Green Primer	3	25-35% Chromate	40200610	WC	Conventional
Coating, Green Primer	4	25-35% Chromate	40200610	WC	HVLP Spray Gun
Coating, Green Primer	5	25-35% Chromate	40200610	WSN	Conventional
Coating, Green Primer	6	25-35% Chromate	40200610	WT	HVLP Spray Gun
Coating, Powder	1	75% Cr3C2, 20% NiCr, 5% Cr	30904020	NONE	Conventional
Coating, Powder	2	87% Al2O3, 13% TiO2	30904020	NONE	Conventional
Coating, Powder	3	70% Ni, 4% Cr	30904020	AF	Conventional
Coating, Powder	4	49% Ni, 44% Cr	30904020	AF	Conventional
Coating, Powder	5	4% Ni, 96% Al	30904020	AF	Conventional

TABLE 12. POINT SOURCE EMISSION FACTOR GROUPS.*

Major Group	Sub Group	Fuel/Material	SCC	APC System	Other
Coating, Powder	6	80% Ni, 20%Cr	30904020	NONE	Conventional
Coating, Powder	7	100% Chromium Oxide	30904020	NONE	Conventional
Coating, Powder	8	8.5% Cr	30904010	NONE	?
Coating, Yellow PE	1	30% Lead Chromate	40200110	BF	Conventional
Coke Calcining	1	Natural gas/Coke	30601401	SD/FF	None
Crematory	1	Propane/Bodies	31502101	NONE	None
Dehydrator, Sludge	1	Natural gas/Sludge	50100506	C	None
Delaquering, Aluminum	1	Aluminum	30400101	NONE	None
Drum Burning Furnace	1	Drums	30902501	AB	None
Dryer, Fiberboard	1	Fiberboard	30700402	C/BH	None
Dryer, Pot ash	1	Pot ash	30502201	S	None
Dryer, Pot ash	2	Sulfate of potash	30502201	BH	None
Dryer, Sand/Gravel	1	Natural gas/Blue shale/ Total petroleum hydrocarbon	30502508	CS	None
Dryer, Sand/Gravel	2	Diesel/Specialty sand	30502508	BH	None
FBC, Biomass	1	Saw mill wood waste	10100903	AI/C/ESP	None
FBC, Biomass	2	Agricultural waste	10100903	AI/C/FF	None
FBC, Biomass	3	Agricultural/Urban wood waste	10100903	LI/SNCR/C/FF	None
FBC, Biomass	4	Urban wood waste	10100903	LI/SNCR/C/FF	None
FBC, Coal	1	Coal	10100217	LI/AI/C/FF	None
FBC, Coal	1	Coal	10100217	LI/AI/FF/ESP	None
FBC, Coke	1	Coke	10100801	LI/AI/C/FF	None
FCCU, Refinery gas	1	Refinery gas/Oils	30600201	ESP/COB	None
Flare, Landfill gas	1	Landfill gas	50300601	NONE	None
Furnace, Alloy Stock	1	Alloy stock	30300926	NONE	Electric Induction
Furnace, Aluminum	1	Aluminum	30400107	FF	Dross
Furnace, Aluminum	2	Aluminum	30400199	NONE	Melting Pot
Furnace, Aluminum	3	Aluminum	30400103	FF	Reverberatory
Furnace, Aluminum	4	Aluminum	30400103	NONE	Reverberatory
Furnace, Brass/Bronze	1	Brass/Bronze ingot	30400224	FF	Electric Induction
Furnace, Carbonization	1	Precarbonized rayon	30102431	NONE	None
Furnace, Glass	1	Raw Materials	30501402	FF	None
Furnace, Glass	2	Raw Materials	30501402	NONE	None
Furnace, Glass	2	Raw Materials	30501403	NONE	None
Furnace, Lead	1	Lead	30400401	FF	Melting Pot
Furnace, Lead	2	Lead	30400408	FF	Melting Pot
Heater, Natural Gas	1	Natural gas	31000404	NONE	None
Heater, Natural/Ref. Gas	1	Natural gas/Refinery gas	30600105/30600106	NONE	None
Heater, Oil	1	Pipeline oil	31000403	NONE	None
Heater, Ref. Gas	1	Refinery gas	30600106	DeNOx	EA<100%
Heater, Ref. Gas	1	Refinery gas	30600106	NONE	EA<100%
Heater, Ref. Gas	1	Refinery gas	30600106	SCR	EA<100%
Heater, Ref. Gas	2	Refinery gas	30600106	NONE	EA>100%
Heater, Ref. Gas	2	Refinery gas	30600106	SCR	EA>100%
ICE, Diesel	1	Diesel	20200102	NONE	O2<13%
ICE, Diesel	2	Diesel	20300101	NONE	O2<13%
ICE, Diesel	3	Diesel	20100102	NONE	O2>13%
ICE, Diesel	4	Diesel	20200102	NONE	O2>13%
ICE, Diesel	5	Diesel	20100102	SCR/AI	O2<13%
ICE, Field Gas	1	Field gas	20200202	NONE	4S/Lean/<650Hp
ICE, Field Gas	2	Field gas	20200252	NONE	2S/Lean/<650Hp
ICE, Field Gas	4	Field gas	20200254	NONE	4S/Rich/<650Hp
ICE, Field Gas	5	Field gas	20200252	NONE	2S/Lean/>650Hp
ICE, Landfill Gas	1	Landfill gas	20100802	NONE	None
ICE, Natural Gas	1	Natural gas	20200202	NONE	4S/Lean/<650Hp
ICE, Natural Gas	2	Natural gas	20200254	NONE	4S/Rich/<650Hp
ICE, Natural Gas	3	Natural gas	20200202	NONE	4S/Lean/>650Hp

TABLE 12. POINT SOURCE EMISSION FACTOR GROUPS.*

Major Group	Sub Group	Fuel/Material	SCC	APC System	Other
ICE, Natural Gas	4	Natural gas	20200252	NONE	2S/Lean/>650Hp
ICE, Natural Gas	5	Natural gas	20100202	NSCR	4S/Rich/<650Hp
Incinerator, Medical Waste	1	Natural gas/Pathological waste	50200504	NONE	Ecolair
Incinerator, Medical Waste	2	Animal bedding	50200504	NONE	Therm-Tech, PU250
Incinerator, Medical Waste	3	Natural gas/Infectious waste	50200504	NONE	Incinomite, 80DS
Incinerator, Waste explosives	1	Diesel/Waste explosives	50300205	NONE	None
Incinerator, Waste Gas	1	Waste gas	30609904	SCR	None
Oven, Curing Tools	1	Natural gas/Abrasive cutting tools	30503605	NONE	None
Oven, Wire Coatings	1	Coatings of electric motor winding wires	31307001	NONE	None
Plating, Anodizing	1	Chromic acid	30901006	DM	None
Plating, Anodizing	1	Chromic acid	30901006	DM/PB/F101	None
Plating, Anodizing	1	Chromic acid	30901006	DM/S/PB/F101	None
Plating, Anodizing	1	Chromic acid	30901006	WS	None
Plating, Anodizing	2	Chromic acid	30901006	DM/WS/HEPA	None
Plating, Decorative	1	Chromic acid	30901006	PBS	None
Plating, Decorative	2	Chromic acid	30901006	DM/DMNP/HEPA	None
Plating, Hard	1	Chromic acid	30901006	DM	None
Plating, Hard	1	Chromic acid	30901006	DM/PB	None
Plating, Hard	1	Chromic acid	30901006	DM/PBS	None
Plating, Hard	1	Chromic acid	30901006	DM/PBS/FB/PB	None
Plating, Hard	1	Chromic acid	30901006	DM/PBS/PB	None
Plating, Hard	1	Chromic acid	30901006	DM/PBS/PB/F101	None
Plating, Hard	1	Chromic acid	30901006	DM/S	None
Plating, Hard	1	Chromic acid	30901006	DM/S/F140	None
Plating, Hard	1	Chromic acid	30901006	DM/S/PB/F101	None
Plating, Hard	1	Chromic acid	30901006	DM/WS/PB	None
Plating, Hard	1	Chromic acid	30901006	F140	None
Plating, Hard	1	Chromic acid	30901006	FB	None
Plating, Hard	1	Chromic acid	30901006	FB/PB	None
Plating, Hard	1	Chromic acid	30901006	PBS	None
Plating, Hard	1	Chromic acid	30901006	PBS/F101/PB	None
Plating, Hard	1	Chromic acid	30901006	PBS/FB	None
Plating, Hard	1	Chromic acid	30901006	S	None
Plating, Hard	1	Chromic acid	30901006	S/FPT	None
Plating, Hard	1	Chromic acid	30901006	WS	None
Plating, Hard	2	Chromic acid	30901006	DM/HEPA	None
Plating, Hard	2	Chromic acid	30901006	DM/PB/HEPA	None
Plating, Hard	2	Chromic acid	30901006	DM/PBS/HEPA	None
Plating, Hard	2	Chromic acid	30901006	DM/S/F101/PB/MP	None
Plating, Hard	2	Chromic acid	30901006	DM/S/F140/F101/MP	None
Plating, Hard	2	Chromic acid	30901006	DM/WS/HEPA	None
Plating, Hard	2	Chromic acid	30901006	S/F	None
Plating, Hard	3	Chromic acid	30901006	NONE	None
Plating, Hard/Anodizing	1	Chromic acid	30901006	DM/S	None
Plating, Hard/Anodizing	1	Chromic acid	30901006	S	None
PM, Devolatizer	1	Styrene monomer	30101818	ESP	None
PM, Extruder	1	Styrene monomer	30101818	ESP	None
PM, Mix Tank	1	Styrene monomer	30101818	ESP	None
PM, Reactor	1	Styrene monomer	30101818	ESP	None
PM, Storage Silo	1	Styrene monomer	30101817	NONE	None
Preheater Kiln, Coal	1	Coal/Raw Materials	30501622	C/FF	None
Presser, Fiberboard	1	Fiberboard	30700402	NONE	None
Reboiler, Ethylene Glycol	1	Ethylene glycol	31000304	NONE	None
Reboiler, Triethylene Glycol	1	Triethylene glycol	31000301	NONE	None
Roaster, Green beans	1	Green beans	30200201	AB	None
SG, Crude Oil	1	Crude oil	31000413	NONE	None
SG, Crude Oil	1	Crude oil	31000413	SO2 Scrub	None

TABLE 12. POINT SOURCE EMISSION FACTOR GROUPS.*

Major Group	Sub Group	Fuel/Material	SCC	APC System	Other
SG, Natural Gas	1	Natural gas	31000414	NONE	None
SG, Natural/CVR Gas	1	Natural gas/CVR gas	31000414/31000415	NONE	None
Shredding and Delaquering, Aluminum	1	Aluminum	30400101/30400108	BH	None
Shredding and Delaquering, Aluminum	2	Aluminum	30400101/30400108	VS	None
Turbine, Distillate	1	Diesel	20100101	NONE	None
Turbine, Distillate	1	No. 2 Distillate oil	20100101	NONE	None
Turbine, Distillate	2	No. 2 Distillate oil	20200103	NONE	None
Turbine, Field Gas	1	Field gas	20200203	NONE	None
Turbine, Landfill Gas	1	Landfill gas	20100801	NONE	None
Turbine, Natural Gas	1	Natural gas	20100201	NONE	None
Turbine, Natural Gas	1	Natural gas	20200201	NONE	None
Turbine, Natural Gas	2	Natural gas	20200203	AI/SCR	None
Turbine, Natural Gas	2	Natural gas	20200203	COC	None
Turbine, Natural Gas	2	Natural gas	20200203	COC/SCR	None
Turbine, Natural Gas	2	Natural gas	20200203	NONE	None
Turbine, Natural Gas	2	Natural gas	20200203	SCR	None
Turbine, Natural/Ref. Gas	1	Natural gas/Refinery gas	20200203/20200705	SCR/AI/COC	None
Turbine, Natural/Ref. Gas	1	Natural gas/Refinery gas	20200203/20200705	SCR/COC	None
Turbine, Natural/Ref. Gas/ Butane	1	Natural gas/Refinery gas/ Butane	20200203/20200705	SCR/COC	None
Turbine, Natural/Ref./ LP Gas	1	Natural/LP/Refinery gas	20200203/20200705/ 20201013	SCR/COC	None
Turbine, Ref. Gas	1	Refinery gas	20200701	COC	None
Unloader, Fiberboard	1	Fiberboard	30700402	NONE	None

*Emission factors in sets not separated by lines are the same.

TABLE 13. FUGITIVE EMISSION FACTOR GROUPS.*

Major Group	Sub Group	Fuel/Material
Abrasive Blasting, Dust	1	Dust
Aeration Basin, Wastewater	1	Wastewater
Asphalt Prod., Dust	1	Dust
Asphalt Prod., Dust	1	Rock plant mine feed
Asphalt Prod., Dust	1	Specialty mine feed
Composition, Crude oil	1	Crude oil
Composition, Diesel	1	Diesel
Composition, Jp-4	1	Jp-4
Composition, Jp-5	1	Jp-5
Composition, Lube Oil	1	Lube oil
Composition, Produced water	1	Produced water
Composition, Sour Water	1	Sour water
Composition, Wastewater	1	Wastewater
DAF Tank, Wastewater	1	Wastewater
Flanges, Crude oil	1	Crude oil
Flanges, Field gas	1	Field gas
Fugitive, Sulfur	1	Sulfur
Fugitives, Casing/Natural Gas	1	Casing gas/Natural gas
Gas Processing, Field gas	1	Field gas
Gas Processing, Fuel Gas	1	Fuel gas
Gas Processing, Produced Gas	1	Produced gas
Headworks, Wastewater	1	Wastewater
Main Trap, Produced Gas	1	Produced gas
PST, Wastewater	1	Wastewater
Solids odor processing, Sludge	1	Sludge
Tank, Crude oil	1	Crude oil
Tank, Diluent	1	Diluent
Tank, Distillate oil	1	Distillate oil
Tank, Produced water	1	Produced water
Tank, Wastewater	1	Wastewater

*Emission factors in sets not separated by lines are the same.

TABLE 14. MEDICAL WASTE INCINERATOR CHARATERISTICS.

Device ID	Chambers	Manu-facturer	Stack Temperature, F	Waste	APC System	Substances Quantified				
						VOC	Dioxin /Furan	PAH	Metals	HCl
208	2	Ecolair	1740 to 1840	Hospital Pathological	None		Y			
226	2	Therm Tech	1330	Animal Bedding Infectious	None		Y			
227	2	Incinomite	457 to 502	Hospital Infectious	None		Y	Y		Y
245	2	?	490 to 670	Human Carcasses	None	Y		Y	Y	
246	2	?	?	Animal Carcasses	None	Y				
283	?	?	401 to 420	Pathological	S					Y

TABLE 15. CHROME PLATING TEST MAJOR GROUPS AND COMPARISON MATRIX.

Major Group	Condition ID	APCS Type	Wet Scrubber		Chemical Fume Suppressant		Mist Eliminator		Filter	
			Used	Type	Used	Type	Used	Type	Used	Type
Plating, Anodizing	240C1	DM/PB/F101	N	NA	Y	PB/F101	Y	Mesh Pad	N	NA
Plating, Anodizing	241C1	DM/S/PB/F101	Y	?	Y	PB/F101	Y	?	N	NA
Plating, Anodizing	420C1	WS	Y	?	N	NA	N	NA	N	NA
Plating, Anodizing	421C1	WS	Y	?	N	NA	N	NA	N	NA
Plating, Anodizing	620C1	DM/WS/HEPA	Y	?	N	NA	Y	?	Y	HEPA
Plating, Decorative	239C1	PBS	Y	PBS	N	NA	N	NA	N	NA
Plating, Decorative	470C1	DM/DMNP/HEPA	N	NA	Y	DMNP	Y	Mesh-Pad	Y	HEPA
Plating, Hard	242C1	DM/S/PB/F101	Y	?	Y	PB/F101	Y	?	N	NA
Plating, Hard	243C1	DM/S/PB/F101	Y	?	Y	PB/F101	Y	?	N	NA
Plating, Hard	432C1	WS	Y	?	N	NA	N	NA	N	NA
Plating, Hard	455C1	S	Y	?	N	NA	N	NA	N	NA
Plating, Hard	455C2	S	Y	?	N	NA	N	NA	N	NA
Plating, Hard	456C1	S	Y	?	N	NA	N	NA	N	NA
Plating, Hard	457C1	DM/PBS/HEPA	Y	PBS	N	NA	Y	Mesh-Pad	Y	HEPA
Plating, Hard	459C1	DM/S/F140	Y	?	Y	F140	Y	?	N	NA
Plating, Hard	460C1	DM/PBS/PB/F101	Y	PBS	Y	PB/F101	Y	?	N	NA
Plating, Hard	461C1	None	N	NA	N	NA	N	NA	N	NA
Plating, Hard	461C2	FB/PB	N	NA	Y	FB/PB	N	NA	N	NA
Plating, Hard	461C3	F140	N	NA	Y	F140	N	NA	N	NA
Plating, Hard	461C4	F140	N	NA	Y	F140	N	NA	N	NA
Plating, Hard	461C1	DM/PBS	Y	PBS	N	NA	Y	Chevron Blade	N	NA
Plating, Hard	461C2	DM/PBS/FB/PB	Y	PBS	Y	FB/PB	Y	Chevron Blade	N	NA
Plating, Hard	462C1	F140	N	NA	Y	F140	N	NA	N	NA
Plating, Hard	463C1	DM/PB/HEPA	N	NA	Y	PB	Y	Mesh-Pad	Y	HEPA
Plating, Hard	464C1	DM/PBS/HEPA	Y	PBS	N	NA	Y	?	Y	HEPA
Plating, Hard	465C1	PBS	Y	PBS	N	NA	N	NA	N	NA
Plating, Hard	466C1	F140	N	NA	Y	F140	N	NA	N	NA
Plating, Hard	467C1	DM/S/F140/F101/MP	Y	?	Y	F140/F101	Y	Chevron Blades	Y	MP
Plating, Hard	468C1	DM/S/F101/PB/MP	Y	?	Y	F101/PB	Y	Chevron Blades	Y	MP
Plating, Hard	469C1	PBS/F101/PB	Y	PBS	Y	F101/PB	N	NA	N	NA

TABLE 15. CHROME PLATING TEST MAJOR GROUPS AND COMPARISON MATRIX.

Major Group	Condition ID	APCS Type	Wet Scrubber		Chemical Fume Suppressant		Mist Eliminator		Filter	
			Used	Type	Used	Type	Used	Type	Used	Type
Plating, Hard	471C1	DM/HEPA	N	NA	N	NA	Y	Mesh-Pad	Y	HEPA
Plating, Hard	472C1	DM/HEPA	N	NA	N	NA	Y	Chevron Blade/Mesh-Pad	Y	HEPA
Plating, Hard	473C1	DM/HEPA	N	NA	N	NA	Y	Chevron Blade/Mesh-Pad	Y	HEPA
Plating, Hard	474C1	S/FPT	Y	?	Y	FPT	N	NA	N	NA
Plating, Hard	475C1	PBS/FB	Y	PBS	Y	FB	N	NA	N	NA
Plating, Hard	475C1	FB	N	NA	Y	FB	N	NA	N	NA
Plating, Hard	476C1	DM/S	Y	?	N	NA	Y	?	N	NA
Plating, Hard	477C1	S/F	Y	?	N	NA	N	NA	Y	?
Plating, Hard	478C1	DM/PBS/PB	Y	PBS	Y	PB	Y	Chevron Blade	N	NA
Plating, Hard	478C2	DM/PBS/PB	Y	PBS	Y	PB	Y	Chevron Blade	N	NA
Plating, Hard	608C1	DM/PB	N	NA	Y	PB	Y	?	N	NA
Plating, Hard	608C2	DM	N	NA	N	NA	Y	?	N	NA
Plating, Hard	609C1	DM/WS/PB	Y	?	Y	PB	Y	?	N	NA
Plating, Hard	609C2	DM/WS/PB	Y	?	Y	PB	Y	?	N	NA
Plating, Hard	610C1	WS	Y	?	N	NA	N	NA	N	NA
Plating, Hard	621C1	DM/WS/HEPA	Y	?	N	NA	Y	?	Y	HEPA
Plating, Hard	622C1	DM/WS/HEPA	Y	?	N	NA	Y	?	Y	HEPA
Plating, Hard/Anodizing	286C1	S	Y	?	N	NA	N	NA	N	NA
Plating, Hard/Anodizing	286C2	S	Y	?	N	NA	N	NA	N	NA
Plating, Hard/Anodizing	458C1	DM/S	Y	?	N	NA	Y	?	N	NA

TABLE 16. SUBSTANCE SPECIFIC UNCERTAINTY AND RELATIVEL STANDARD DEVIATION (a).

Category	Substance	Relative Standard Deviation, %			Uncertainty, %		
		Mean	Minimum	Maximum	Mean	Minimum	Maximum
Dioxin/Furan	Dioxin/Furan:Total	51.98	25.72	76.58	129.13	63.89	190.24
Dioxin/Furan	Dioxin:4D 2378	47.52	2.18	132.12	127.15	19.20	739.14
Dioxin/Furan	Dioxin:4D Other	96.53	96.53	96.53	239.78	239.78	239.78
Dioxin/Furan	Dioxin:4D Total	71.07	7.73	170.56	184.01	19.20	660.69
Dioxin/Furan	Dioxin:5D 12378	56.02	3.45	142.30	142.00	19.20	495.15
Dioxin/Furan	Dioxin:5D Other	23.10	23.10	23.10	57.39	57.39	57.39
Dioxin/Furan	Dioxin:5D Total	84.17	4.41	234.95	214.84	19.20	950.95
Dioxin/Furan	Dioxin:6D 123478	63.24	3.45	228.39	161.58	27.75	863.71
Dioxin/Furan	Dioxin:6D 123678	57.23	3.44	147.43	157.65	19.20	906.40
Dioxin/Furan	Dioxin:6D 123789	62.79	3.44	228.54	163.70	30.93	1004.66
Dioxin/Furan	Dioxin:6D Other	44.09	44.09	44.09	109.53	109.53	109.53
Dioxin/Furan	Dioxin:6D Total	69.51	3.44	192.58	177.39	19.20	828.76
Dioxin/Furan	Dioxin:7D 1234678	56.63	2.98	127.05	148.04	7.40	695.61
Dioxin/Furan	Dioxin:7D Other	38.24	38.24	38.24	95.00	95.00	95.00
Dioxin/Furan	Dioxin:7D Total	62.69	7.73	169.01	160.20	19.20	640.39
Dioxin/Furan	Dioxin:8D	45.07	3.43	156.83	102.82	19.20	240.35
Dioxin/Furan	Furan:4F 2378	69.37	4.11	172.39	181.25	11.60	871.51
Dioxin/Furan	Furan:4F Other	47.70	47.70	47.70	118.50	118.50	118.50
Dioxin/Furan	Furan:4F Total	68.54	4.67	166.84	190.43	11.60	942.19
Dioxin/Furan	Furan:5F 12378	61.85	3.21	176.54	157.63	19.20	810.37
Dioxin/Furan	Furan:5F 23478	65.11	1.79	168.14	173.12	16.04	1027.87
Dioxin/Furan	Furan:5F Other	42.57	42.57	42.57	105.75	105.75	105.75
Dioxin/Furan	Furan:5F Total	72.27	7.73	164.68	203.47	19.20	1216.63
Dioxin/Furan	Furan:6F 123478	65.25	1.38	171.12	168.45	3.44	894.48
Dioxin/Furan	Furan:6F 123678	61.35	1.38	166.91	160.35	3.44	917.96
Dioxin/Furan	Furan:6F 123789	57.43	1.17	174.85	151.23	10.54	874.59
Dioxin/Furan	Furan:6F 234678	63.29	2.55	158.52	165.96	6.33	881.45
Dioxin/Furan	Furan:6F Other	49.18	49.18	49.18	122.18	122.18	122.18
Dioxin/Furan	Furan:6F Total	71.22	1.42	164.18	186.23	12.78	951.60
Dioxin/Furan	Furan:7F 1234678	67.19	4.63	167.38	176.48	11.50	881.77
Dioxin/Furan	Furan:7F 1234789	70.16	0.68	195.12	187.71	6.12	1103.37
Dioxin/Furan	Furan:7F Other	0.00	0.00	0.00	0.00	0.00	0.00
Dioxin/Furan	Furan:7F Total	65.78	4.47	167.80	174.80	19.20	940.90
Dioxin/Furan	Furan:8F	65.15	1.67	215.22	150.32	4.15	421.74
Halogens	HCl	48.79	7.47	98.79	150.34	18.55	799.00
Halogens	HF	69.20	31.61	122.53	328.15	33.18	1100.90
Metals	Aluminum	162.18	162.18	162.18	402.88	402.88	402.88
Metals	Antimony	36.29	2.18	129.46	50.96	5.42	206.81
Metals	Arsenic	45.00	0.00	175.03	96.21	0.00	592.95
Metals	Barium	45.38	0.00	125.06	92.74	0.00	232.35
Metals	Beryllium	36.51	0.00	245.64	79.52	0.00	870.80
Metals	Cadmium	59.85	0.00	313.81	126.98	0.00	900.98
Metals	Chromium (Hex)	45.43	0.00	177.44	80.18	0.00	514.08
Metals	Chromium (Total)	41.04	0.00	167.83	76.96	0.00	601.87
Metals	Cobalt	38.66	0.00	105.93	210.80	0.00	951.78
Metals	Copper	44.40	0.00	140.67	98.24	0.00	502.34

TABLE 16. SUBSTANCE SPECIFIC UNCERTAINTY AND RELATIVEL STANDARD DEVIATION (a).

Category	Substance	Relative Standard Deviation, %			Uncertainty, %		
		Mean	Minimum	Maximum	Mean	Minimum	Maximum
Metals	Iron	38.81	38.81	38.81	96.40	96.40	96.40
Metals	Lead	49.25	0.00	223.04	94.19	0.00	484.67
Metals	Magnesium	17.62	0.00	52.85	43.77	0.00	131.30
Metals	Manganese	79.76	0.00	366.37	143.88	0.00	421.86
Metals	Mercury	59.32	0.00	180.99	95.18	0.00	370.24
Metals	Molybdenum	32.98	32.98	32.98	81.93	81.93	81.93
Metals	Nickel	59.04	0.00	207.41	128.56	0.00	819.37
Metals	Phosphorus	34.46	0.00	102.29	62.90	0.00	198.16
Metals	Selenium	51.12	0.00	285.39	93.69	0.00	1179.04
Metals	Silver	51.08	0.00	144.07	125.99	0.00	722.28
Metals	Strontium	2.51	2.51	2.51	6.24	6.24	6.24
Metals	Thallium	40.48	2.18	117.46	53.62	5.42	136.34
Metals	Vanadium	60.74	60.74	60.74	150.89	150.89	150.89
Metals	Zinc	64.02	0.00	262.73	147.59	0.00	1233.82
PAH	Acenaphthene	75.25	0.00	215.25	123.72	0.00	584.68
PAH	Acenaphthylene	80.11	0.00	223.79	130.52	0.00	530.66
PAH	Anthracene	65.89	0.00	216.17	123.10	0.00	1222.55
PAH	Benzo(a)anthracene	67.27	0.00	353.09	95.93	0.00	411.28
PAH	Benzo(a)pyrene	64.71	0.00	478.22	108.29	0.00	956.35
PAH	Benzo(b)fluoranthene	68.58	0.00	424.05	110.62	0.00	397.22
PAH	Benzo(b+k)fluoranthene	38.40	1.90	99.78	37.18	4.71	83.96
PAH	Benzo(e)pyrene	48.45	5.04	129.80	104.01	12.52	322.44
PAH	Benzo(g,h,i)perylene	56.23	0.00	217.33	84.59	0.00	349.14
PAH	Benzo(k)fluoranthene	64.39	0.00	417.90	94.30	0.00	287.83
PAH	Chrysene	61.42	0.00	215.17	90.71	0.00	361.90
PAH	Dibenz(a,h)anthracene	54.60	0.00	339.62	72.67	0.00	407.84
PAH	Fluoranthene	63.29	0.00	258.95	96.69	0.00	385.95
PAH	Fluorene	67.54	0.00	214.54	113.98	0.00	610.07
PAH	Indeno(1,2,3-cd)pyrene	63.72	0.00	475.63	85.05	0.00	394.25
PAH	Naphthalene	71.35	0.00	271.16	103.36	0.00	360.49
PAH	Phenanthrene	65.63	0.00	208.44	104.87	0.00	415.55
PAH	Pyrene	69.06	0.00	276.89	108.67	0.00	360.26
PCB	PCB:Decachlorinated biphenyls	27.15	3.02	45.99	67.44	7.51	114.25
PCB	PCB:Dichlorinated biphenyls	51.50	3.02	83.34	127.94	7.51	207.03
PCB	PCB:Heptachlorinated biphenyls	45.29	3.02	151.05	112.52	7.51	375.22
PCB	PCB:Hexachlorinated biphenyls	48.14	4.02	137.80	119.59	9.99	342.32
PCB	PCB:Monochlorinated biphenyls	37.03	3.02	102.83	91.99	7.51	255.45
PCB	PCB:Nonachlorinated biphenyls	30.62	3.02	53.68	76.06	7.51	133.36
PCB	PCB:Octachlorinated biphenyls	27.45	3.02	73.64	68.19	7.51	182.94
PCB	PCB:Pentachlorinated biphenyls	39.97	3.02	74.51	99.30	7.51	185.10
PCB	PCB:Tetrachlorinated biphenyls	41.86	3.02	108.25	103.99	7.51	268.90
PCB	PCB:Trichlorinated biphenyls	47.36	3.02	103.57	117.64	7.51	257.28
Particulate	Particulate	70.16	59.15	81.16	116.06	85.18	146.94
SVOC	1,2-Dichlorobenzene	7.55	0.00	20.87	18.75	0.00	51.84
SVOC	2-Chloronaphthalene	64.04	2.15	172.55	140.18	19.32	428.63

TABLE 16. SUBSTANCE SPECIFIC UNCERTAINTY AND RELATIVEL STANDARD DEVIATION (a).

Category	Substance	Relative Standard Deviation, %			Uncertainty, %		
		Mean	Minimum	Maximum	Mean	Minimum	Maximum
SVOC	2-Methylnaphthalene	47.68	1.42	161.60	80.37	3.53	340.46
SVOC	Benzaldehyde	29.96	6.29	63.37	74.41	15.64	157.41
SVOC	Ethylbenzene	45.26	0.00	158.91	132.79	0.00	1111.79
SVOC	Perylene	45.20	1.39	206.85	88.24	3.45	277.26
SVOC	Phenol	64.67	0.00	131.32	94.36	0.00	326.21
VOC	1,1,1-Trichloroethane	53.15	0.00	176.12	89.51	0.00	417.61
VOC	1,1,2,2-Tetrachloroethane	39.11	0.00	151.38	43.21	0.00	202.41
VOC	1,1,2-Trichloroethane	29.01	0.00	151.38	18.12	0.00	52.45
VOC	1,1-Dichloroethane	52.39	0.00	151.38	63.24	0.00	252.61
VOC	1,1-Dichloroethene	37.86	0.00	151.38	40.10	0.00	183.75
VOC	1,2,4-Trichlorobenzene	0.00	0.00	0.00	0.00	0.00	0.00
VOC	1,2-Dichloroethane	31.89	0.00	165.26	31.83	0.00	210.90
VOC	1,2-Dichloroethene	53.92	0.00	193.02	34.44	0.00	81.51
VOC	1,2-Dichloropropane	38.84	0.00	151.38	42.56	0.00	198.48
VOC	1,3-Butadiene	19.36	0.00	93.74	22.16	0.00	98.38
VOC	1,4-Dioxane	136.33	136.33	136.33	169.27	169.27	169.27
VOC	2-Chloroethyl Vinyl Ether	84.27	10.77	157.76	40.71	26.77	54.66
VOC	2-Hexanone	40.82	0.00	151.38	20.51	0.00	52.45
VOC	4-Methyl-2-pentanone	51.09	0.00	153.27	17.70	0.00	53.11
VOC	Acetaldehyde	67.17	0.98	299.45	110.77	2.44	913.65
VOC	Acetone	61.92	0.00	197.73	83.38	0.00	420.56
VOC	Acetonitrile	169.52	169.52	169.52	121.27	121.27	121.27
VOC	Acrolein	58.49	0.00	244.16	70.28	0.00	270.34
VOC	Acrylonitrile	139.60	127.82	151.38	105.58	52.45	158.71
VOC	Ammonia	32.61	0.00	120.14	111.76	0.00	1079.44
VOC	Benzene	44.31	0.00	305.12	67.91	0.00	1150.72
VOC	Bromodichloromethane	29.01	0.00	151.38	18.12	0.00	52.45
VOC	Bromoform	29.01	0.00	151.38	18.12	0.00	52.45
VOC	Bromomethane	29.01	0.00	151.38	18.12	0.00	52.45
VOC	Carbon Tetrachloride	17.84	0.00	151.38	16.23	0.00	58.57
VOC	Carbon disulfide	52.22	0.00	159.16	76.90	0.00	395.38
VOC	Carbonyl Sulfide	6.19	0.41	14.76	15.37	1.02	36.66
VOC	Chlorobenzene	36.82	0.00	174.73	83.77	0.00	423.54
VOC	Chloroethane	29.01	0.00	151.38	18.12	0.00	52.45
VOC	Chloroform	24.39	0.00	150.55	37.75	0.00	313.43
VOC	Chloromethane	38.05	0.00	151.38	40.59	0.00	186.67
VOC	Cyanide	25.54	14.40	51.60	63.44	35.77	128.18
VOC	Dibromochloromethane	29.01	0.00	151.38	18.12	0.00	52.45
VOC	Dichlorodifluoromethane	50.46	0.00	151.38	17.48	0.00	52.45
VOC	Dichloromethane	117.53	106.38	126.63	242.89	116.39	314.58
VOC	Diochloromethane	49.80	49.80	49.80	123.72	123.72	123.72
VOC	Ethylene dibromide	1.55	1.55	1.55	1.63	1.63	1.63
VOC	Ethylene dichloride	1.55	1.55	1.55	1.63	1.63	1.63
VOC	Formaldehyde	74.18	0.95	351.67	111.15	2.37	1220.79
VOC	Freon 11	1.21	0.00	4.83	1.92	0.00	7.69
VOC	Freon 113	0.00	0.00	0.00	0.00	0.00	0.00

TABLE 16. SUBSTANCE SPECIFIC UNCERTAINTY AND RELATIVEL STANDARD DEVIATION (a).

Category	Substance	Relative Standard Deviation, %			Uncertainty, %		
		Mean	Minimum	Maximum	Mean	Minimum	Maximum
VOC	Hexane	21.29	9.06	41.69	52.89	22.51	103.55
VOC	Hydrogen Sulfide	50.78	0.00	184.09	172.47	0.00	1214.14
VOC	Methyl Chloroform	34.12	0.90	80.11	46.45	2.23	84.07
VOC	Methyl Ethyl Ketone	77.21	0.00	149.96	138.37	0.00	365.24
VOC	Methylene Chloride	38.46	0.00	240.78	40.74	0.00	130.44
VOC	Perchloroethylene	1.22	0.90	1.55	1.93	1.63	2.23
VOC	Propylene	44.09	0.00	185.03	46.80	0.00	166.68
VOC	Propylene Oxide	20.56	20.56	20.56	51.07	51.07	51.07
VOC	Styrene	59.70	0.00	169.06	220.29	0.00	1194.21
VOC	Tetrachloroethene	22.30	0.00	147.49	24.46	0.00	110.47
VOC	Toluene	53.18	0.00	213.61	90.81	0.00	892.12
VOC	Trichloroethene	38.32	0.00	171.84	49.01	0.00	262.46
VOC	Trichloroethylene	1.55	1.55	1.55	1.63	1.63	1.63
VOC	Trichlorofluoromethane	23.16	0.00	151.38	17.08	0.00	52.45
VOC	Vinyl Acetate	34.36	0.00	135.67	12.86	0.00	47.01
VOC	Vinyl Chloride	27.47	0.00	151.38	37.12	0.00	183.32
VOC	Xylene (Total)	49.21	0.00	165.99	87.91	0.00	412.34
VOC	Xylene (m)	21.86	6.19	37.54	54.32	15.38	93.25
VOC	Xylene (m,p)	38.84	0.00	151.73	94.62	0.00	1103.06
VOC	Xylene (o)	35.68	0.00	289.29	74.95	0.00	975.12
VOC	Xylene (p)	17.71	7.10	28.33	44.00	17.63	70.38
VOC	cis-1,2-Dichloroethene	0.00	0.00	0.00	0.00	0.00	0.00
VOC	cis-1,3-Dichloropropene	50.46	0.00	151.38	17.48	0.00	52.45
VOC	p-Dichlorobenzene	25.28	3.76	89.83	40.22	5.98	142.94
VOC	trans-1,2-Dichloroethene	0.00	0.00	0.00	0.00	0.00	0.00
VOC	trans-1,3-Dichloropropene	50.46	0.00	151.38	17.48	0.00	52.45

(a) Table described in Section 6.9 *Results*.

TABLE 17. CARB OVERALL RATING SUMMARY.

CARB Method Rating	Order of Magnitude Difference	Population Rating		
		1. Many random facilities (5 or more sources)	2. Reasonable number of facilities (3 to 4 sources)	3. Small number of facilities (<3 sources)
A. Test was performed using a new or old CARB methodology and sufficient documentation was provided to validate the results.	-			8
	0	4	12	1040
	1	18	16	250
	2	14	42	44
	3	8	4	17
	4	2	2	
	5		1	
	6			1
B. Test was performed using a new or old EPA methodology and sufficient documentation was provided to validate the results.	-			3
	0	3	4	77
	1	11	45	54
	2	61	33	21
	3	20	6	13
	4	18	5	2
	5			1
	6	1		
C. Test was performed using a new or old CARB methodology and insufficient documentation was provided to validate the results.	-			139
	0		12	579
	1	4	36	128
	2	6	11	25
	3	7	2	5
	4	6		
D. Test was performed using a new or old EPA methodology and insufficient documentation was provided to validate the results.	-			54
	0		18	123
	1	4	21	59
	2	4	6	27
	3	1	3	4
E. An assumption was made in the emission factor calculation that could significantly affect the accuracy of the results.	0			102
	1			25
	2		1	2

vN - N is the order of magnitude difference between minimum and maximum.

() - Number of emission factors

*TABLE 18. EPA OVERALL RATING THAT WOULD BE ASSIGNED TO EMISSION FACTORS**

<table>
<tr><td rowspan="2">EPA Method Rating</td><td colspan="3">Population Rating</td></tr>
<tr><td>1. Many random facilities [5 or more sources]</td><td>2. Reasonable number of facilities [3 to 4 sources]</td><td>3. Small number of facilities [<3 sources]</td></tr>
<tr><td>A Current EPA or CARB method with supporting documentation</td><td>A (26)</td><td>B (19)</td><td rowspan="2">D (859)</td></tr>
<tr><td>B Current EPA or CARB method no supporting documentation</td><td rowspan="3">NR(395)</td><td>C (32)</td></tr>
<tr><td>C Old EPA or CARB method with and without supporting documentation</td><td rowspan="2">E (1944)</td></tr>
<tr><td>D Order of magnitude method</td></tr>
</table>

NR - Not rated in EPA system

() - Number of emission factors

*EPA overall ratings shown were assigned for this project and are not official EPA ratings.

TABLE 19. POINT SOURCE EMISSION FACTORS.

Major Group	Sub Group	Category	Substance	ARB Rating	Mean	Median	Maximum	Minimum	Unit	Tests	RSD, %	Uncertainty, %	Det Ratio
Asphalt Prod., Blowing	1	VOC	Hydrogen Sulfide	C3-v2	4.26E-04	1.26E-05	1.26E-03	1.09E-05	lbs/ton processed	1	168.44	418.44	0.98
Asphalt Prod., Diesel	1	Metals	Arsenic	C3-v0	2.73E-07	2.71E-07	2.77E-07	2.70E-07	lbs/ton production	1	1.44	3.58	0.00
Asphalt Prod., Diesel	1	Metals	Beryllium	C3-v0	5.45E-07	5.42E-07	5.54E-07	5.39E-07	lbs/ton production	1	1.44	3.58	0.00
Asphalt Prod., Diesel	1	Metals	Cadmium	C3-v-	1.62E-06	1.62E-06	1.62E-06	1.62E-06	lbs/ton production	1	0.00	0.00	1.00
Asphalt Prod., Diesel	1	Metals	Chromium (Hex)	C3-v0	3.61E-07	3.67E-07	5.17E-07	2.00E-07	lbs/ton production	1	43.92	109.11	1.00
Asphalt Prod., Diesel	1	Metals	Chromium (Total)	C3-v0	1.96E-06	1.40E-06	3.41E-06	1.07E-06	lbs/ton production	1	64.78	160.93	1.00
Asphalt Prod., Diesel	1	Metals	Copper	C3-v0	1.50E-06	1.50E-06	1.66E-06	1.35E-06	lbs/ton production	1	14.76	132.64	1.00
Asphalt Prod., Diesel	1	Metals	Lead	C3-v0	2.01E-06	2.17E-06	2.77E-06	1.08E-06	lbs/ton production	1	42.76	106.22	1.00
Asphalt Prod., Diesel	1	Metals	Manganese	C3-v0	1.24E-05	1.36E-05	1.61E-05	7.55E-06	lbs/ton production	1	35.33	87.76	1.00
Asphalt Prod., Diesel	1	Metals	Mercury	C3-v0	4.88E-08	5.93E-08	7.05E-08	1.66E-08	lbs/ton production	1	58.25	144.70	0.52
Asphalt Prod., Diesel	1	Metals	Nickel	C3-v0	2.73E-06	2.71E-06	2.77E-06	2.70E-06	lbs/ton production	1	1.44	3.58	0.00
Asphalt Prod., Diesel	1	Metals	Selenium	C3-v0	2.73E-07	2.71E-07	2.77E-07	2.70E-07	lbs/ton production	1	1.44	3.58	0.00
Asphalt Prod., Diesel	1	Metals	Zinc	C3-v0	1.82E-05	1.66E-05	2.44E-05	1.35E-05	lbs/ton production	1	30.95	76.88	1.00
Asphalt Prod., Diesel	1	PAH	Acenaphthene	A3-v1	4.80E-07	3.42E-07	9.53E-07	1.45E-07	lbs/ton production	1	87.81	218.12	1.00
Asphalt Prod., Diesel	1	PAH	Acenaphthylene	A3-v1	3.36E-07	2.70E-07	6.35E-07	1.03E-07	lbs/ton production	1	80.92	201.01	1.00
Asphalt Prod., Diesel	1	PAH	Anthracene	A3-v0	3.21E-08	3.49E-08	3.79E-08	2.34E-08	lbs/ton production	1	23.94	59.48	1.00
Asphalt Prod., Diesel	1	PAH	Benzo(a)anthracene	A3-v0	6.12E-08	4.86E-08	9.00E-08	4.48E-08	lbs/ton production	1	41.00	101.85	1.00
Asphalt Prod., Diesel	1	PAH	Benzo(a)pyrene	A3-v0	2.79E-09	2.21E-09	4.45E-09	1.73E-09	lbs/ton production	1	51.96	129.08	1.00
Asphalt Prod., Diesel	1	PAH	Benzo(b)fluoranthene	A3-v0	1.39E-08	8.64E-09	2.49E-08	8.28E-09	lbs/ton production	1	68.08	169.13	1.00
Asphalt Prod., Diesel	1	PAH	Benzo(g,h,i)perylene	A3-v0	1.90E-09	1.72E-09	2.65E-09	1.33E-09	lbs/ton production	1	35.53	88.26	0.23
Asphalt Prod., Diesel	1	PAH	Benzo(k)fluoranthene	A3-v0	5.13E-09	3.60E-09	8.47E-09	3.31E-09	lbs/ton production	1	56.56	140.50	1.00
Asphalt Prod., Diesel	1	PAH	Chrysene	A3-v0	2.70E-08	2.34E-08	4.08E-08	1.69E-08	lbs/ton production	1	45.67	113.46	1.00
Asphalt Prod., Diesel	1	PAH	Dibenz(a,h)anthracene	A3-v0	1.76E-09	1.72E-09	2.65E-09	9.00E-10	lbs/ton production	1	49.76	123.60	0.00
Asphalt Prod., Diesel	1	PAH	Fluoranthene	A3-v0	2.17E-07	2.24E-07	2.28E-07	1.98E-07	lbs/ton production	1	7.51	18.66	1.00
Asphalt Prod., Diesel	1	PAH	Fluorene	A3-v0	8.83E-07	8.10E-07	1.22E-06	6.21E-07	lbs/ton production	1	34.56	85.85	1.00
Asphalt Prod., Diesel	1	PAH	Indeno(1,2,3-cd)pyrene	A3-v0	2.06E-09	1.80E-09	2.65E-09	1.72E-09	lbs/ton production	1	24.92	61.89	0.29
Asphalt Prod., Diesel	1	PAH	Naphthalene	A3-v0	4.75E-05	3.42E-05	7.94E-05	2.88E-05	lbs/ton production	1	58.62	145.61	1.00
Asphalt Prod., Diesel	1	PAH	Phenanthrene	A3-v0	6.27E-07	6.55E-07	8.47E-07	3.78E-07	lbs/ton production	1	37.64	93.51	1.00

TABLE 19. POINT SOURCE EMISSION FACTORS.

Major Group	Sub Group	Category	Substance	ARB Rating	Mean	Median	Maximum	Minimum	Unit	Tests	RSD, %	Uncertainty, %	Det Ratio
Asphalt Prod., Diesel	1	PAH	Pyrene	A3-v0	1.66E-07	1.66E-07	1.75E-07	1.58E-07	lbs/ton production	1	4.94	12.28	1.00
Asphalt Prod., Diesel	1	VOC	Benzene	C3-v0	1.56E-02	1.50E-02	1.74E-02	1.43E-02	lbs/ton production	1	10.42	25.88	1.00
Asphalt Prod., Diesel	1	VOC	Formaldehyde	A3-v0	1.32E-04	1.15E-04	1.98E-04	8.28E-05	lbs/ton production	1	44.97	111.70	1.00
Asphalt Prod., Diesel	2	Metals	Arsenic	E3-v0	6.60E-08	4.59E-08	1.20E-07	3.19E-08	lbs/ton production	1	71.88	178.55	1.00
Asphalt Prod., Diesel	2	Metals	Beryllium	E3-v0	1.50E-07	1.53E-07	1.63E-07	1.35E-07	lbs/ton production	1	9.49	23.57	0.00
Asphalt Prod., Diesel	2	Metals	Cadmium	E3-v0	1.38E-07	1.59E-07	1.63E-07	9.29E-08	lbs/ton production	1	28.37	70.48	0.78
Asphalt Prod., Diesel	2	Metals	Chromium (Hex)	E3-v0	8.56E-08	7.92E-08	1.20E-07	5.79E-08	lbs/ton production	1	36.68	91.13	1.00
Asphalt Prod., Diesel	2	Metals	Chromium (Total)	E3-v0	5.23E-07	3.27E-07	9.15E-07	3.26E-07	lbs/ton production	1	65.04	161.56	1.00
Asphalt Prod., Diesel	2	Metals	Copper	E3-v0	1.12E-06	1.09E-06	1.45E-06	8.17E-07	lbs/ton production	1	28.16	69.96	1.00
Asphalt Prod., Diesel	2	Metals	Lead	E3-v0	2.27E-06	1.45E-06	4.04E-06	1.31E-06	lbs/ton production	1	67.86	168.57	1.00
Asphalt Prod., Diesel	2	Metals	Manganese	E3-v0	9.11E-07	9.29E-07	1.08E-06	7.21E-07	lbs/ton production	1	19.99	49.66	1.00
Asphalt Prod., Diesel	2	Metals	Mercury	E3-v0	7.06E-07	7.10E-07	7.83E-07	6.25E-07	lbs/ton production	1	11.21	27.84	0.00
Asphalt Prod., Diesel	2	Metals	Nickel	E3-v0	5.35E-07	4.23E-07	7.65E-07	4.16E-07	lbs/ton production	1	37.34	92.75	1.00
Asphalt Prod., Diesel	2	Metals	Selenium	E3-v0	1.16E-06	9.29E-07	1.75E-06	8.17E-07	lbs/ton production	1	43.59	108.29	0.50
Asphalt Prod., Diesel	2	Metals	Zinc	E3-v1	6.71E-06	3.55E-06	1.39E-05	2.62E-06	lbs/ton production	1	93.70	232.75	1.00
Asphalt Prod., Diesel	2	PAH	Acenaphthene	E3-v0	2.11E-08	2.33E-08	3.06E-08	9.31E-09	lbs/ton production	1	51.40	127.67	1.00
Asphalt Prod., Diesel	2	PAH	Acenaphthylene	E3-v1	2.04E-08	1.30E-08	4.19E-08	6.37E-09	lbs/ton production	1	92.51	229.80	1.00
Asphalt Prod., Diesel	2	PAH	Anthracene	E3-v0	1.68E-08	1.44E-08	2.53E-08	1.08E-08	lbs/ton production	1	44.86	111.43	1.00
Asphalt Prod., Diesel	2	PAH	Benzo(a)anthracene	E3-v0	6.41E-09	6.03E-09	9.14E-09	4.07E-09	lbs/ton production	1	39.88	99.08	1.00
Asphalt Prod., Diesel	2	PAH	Benzo(a)pyrene	E3-v0	3.13E-10	3.38E-10	3.49E-10	2.53E-10	lbs/ton production	1	16.87	41.91	1.00
Asphalt Prod., Diesel	2	PAH	Benzo(b)fluoranthene	E3-v1	4.39E-09	7.84E-10	1.18E-08	5.68E-10	lbs/ton production	1	146.56	364.08	1.00
Asphalt Prod., Diesel	2	PAH	Benzo(g,h,i)perylene	E3-v0	5.03E-10	5.07E-10	5.32E-10	4.71E-10	lbs/ton production	1	6.16	15.30	1.00
Asphalt Prod., Diesel	2	PAH	Benzo(k)fluoranthene	E3-v1	1.13E-09	3.97E-10	2.63E-09	3.49E-10	lbs/ton production	1	115.87	287.83	1.00
Asphalt Prod., Diesel	2	PAH	Chrysene	E3-v0	1.25E-09	1.10E-09	1.67E-09	9.80E-10	lbs/ton production	1	29.45	73.16	1.00
Asphalt Prod., Diesel	2	PAH	Dibenz(a,h)anthracene	E3-v0	1.90E-10	1.32E-10	3.15E-10	1.24E-10	lbs/ton production	1	56.78	141.05	0.00
Asphalt Prod., Diesel	2	PAH	Fluoranthene	E3-v0	8.67E-08	7.84E-08	1.29E-07	5.27E-08	lbs/ton production	1	44.76	111.18	1.00
Asphalt Prod., Diesel	2	PAH	Fluorene	E3-v1	2.78E-07	2.74E-07	4.73E-07	8.82E-08	lbs/ton production	1	69.13	171.72	1.00
Asphalt Prod., Diesel	2	PAH	Indeno(1,2,3-cd)pyrene	E3-v0	3.00E-10	2.99E-10	3.06E-10	2.95E-10	lbs/ton production	1	2.01	4.99	1.00

TABLE 19. POINT SOURCE EMISSION FACTORS.

Major Group	Sub Group	Category	Substance	ARB Rating	Mean	Median	Maximum	Minimum	Unit	Tests	RSD, %	Uncertainty, %	Det Ratio
Asphalt Prod., Diesel	2	PAH	Naphthalene	E3-v0	1.08E-05	1.30E-05	1.40E-05	5.39E-06	lbs/ton production	1	43.57	108.24	1.00
Asphalt Prod., Diesel	2	PAH	Phenanthrene	E3-v0	7.23E-07	6.03E-07	1.08E-06	4.90E-07	lbs/ton production	1	42.95	106.70	1.00
Asphalt Prod., Diesel	2	PAH	Pyrene	E3-v0	5.99E-08	5.88E-08	8.60E-08	3.49E-08	lbs/ton production	1	42.66	105.97	1.00
Asphalt Prod., Diesel	2	VOC	Benzene	E3-v0	1.04E-03	1.04E-03	1.09E-03	1.00E-03	lbs/ton production	1	4.45	11.06	0.00
Asphalt Prod., Diesel	2	VOC	Formaldehyde	E3-v0	2.43E-04	2.20E-04	3.30E-04	1.80E-04	lbs/ton production	1	31.80	79.00	1.00
Asphalt Prod., Diesel	3	Metals	Arsenic	D3-v-	8.02E-06	8.02E-06	8.02E-06	8.02E-06	lbs/ton production	1	0.00	0.00	0.00
Asphalt Prod., Diesel	3	Metals	Beryllium	D3-v-	4.01E-06	4.01E-06	4.01E-06	4.01E-06	lbs/ton production	1	0.00	0.00	0.00
Asphalt Prod., Diesel	3	Metals	Cadmium	D3-v-	4.41E-05	4.41E-05	4.41E-05	4.41E-05	lbs/ton production	1	0.00	0.00	1.00
Asphalt Prod., Diesel	3	Metals	Chromium (Total)	D3-v-	8.42E-05	8.42E-05	8.42E-05	8.42E-05	lbs/ton production	1	0.00	0.00	1.00
Asphalt Prod., Diesel	3	Metals	Copper	D3-v-	1.32E-04	1.32E-04	1.32E-04	1.32E-04	lbs/ton production	1	0.00	0.00	1.00
Asphalt Prod., Diesel	3	Metals	Lead	D3-v-	2.19E-03	2.19E-03	2.19E-03	2.19E-03	lbs/ton production	1	0.00	0.00	1.00
Asphalt Prod., Diesel	3	Metals	Manganese	D3-v-	1.64E-03	1.64E-03	1.64E-03	1.64E-03	lbs/ton production	1	0.00	0.00	1.00
Asphalt Prod., Diesel	3	Metals	Mercury	D3-v-	8.02E-07	8.02E-07	8.02E-07	8.02E-07	lbs/ton production	1	0.00	0.00	1.00
Asphalt Prod., Diesel	3	Metals	Nickel	D3-v-	3.81E-04	3.81E-04	3.81E-04	3.81E-04	lbs/ton production	1	0.00	0.00	0.00
Asphalt Prod., Diesel	3	Metals	Selenium	D3-v-	8.02E-06	8.02E-06	8.02E-06	8.02E-06	lbs/ton production	1	0.00	0.00	0.00
Asphalt Prod., Diesel	3	Metals	Zinc	D3-v-	4.62E-03	4.62E-03	4.62E-03	4.62E-03	lbs/ton production	1	0.00	0.00	1.00
Asphalt Prod., Diesel	3	VOC	Benzene	C3-v-	3.05E-04	3.05E-04	3.05E-04	3.05E-04	lbs/ton production	1	0.00	0.00	1.00
Asphalt Prod., Natural Gas	1	Metals	Arsenic	C2-v1	6.69E-07	6.13E-07	2.00E-06	1.05E-07	lbs/ton production	3	90.07	69.24	0.00
Asphalt Prod., Natural Gas	1	Metals	Beryllium	C2-v1	8.32E-07	9.08E-07	2.00E-06	2.11E-07	lbs/ton production	3	74.61	57.35	0.00
Asphalt Prod., Natural Gas	1	Metals	Cadmium	C2-v1	1.78E-06	9.44E-07	7.99E-06	4.21E-07	lbs/ton production	3	133.47	102.59	0.79
Asphalt Prod., Natural Gas	1	Metals	Chromium (Hex)	C2-v1	4.47E-07	3.05E-07	1.07E-06	3.33E-08	lbs/ton production	3	94.43	72.58	0.27
Asphalt Prod., Natural Gas	1	Metals	Chromium (Total)	C2-v0	9.92E-07	1.04E-06	1.55E-06	4.25E-07	lbs/ton production	3	37.04	28.47	0.67
Asphalt Prod., Natural Gas	1	Metals	Copper	C2-v0	3.27E-06	3.37E-06	4.88E-06	1.23E-06	lbs/ton production	3	40.05	30.78	0.72
Asphalt Prod., Natural Gas	1	Metals	Lead	C2-v1	4.36E-06	1.52E-06	2.10E-05	6.84E-07	lbs/ton production	3	152.51	117.23	1.00
Asphalt Prod., Natural Gas	1	Metals	Manganese	C2-v1	2.00E-05	2.16E-05	4.46E-05	1.89E-06	lbs/ton production	3	68.58	52.71	1.00
Asphalt Prod., Natural Gas	1	Metals	Mercury	C2-v2	1.08E-05	3.39E-06	3.06E-05	3.08E-07	lbs/ton production	3	115.28	88.61	1.00
Asphalt Prod., Natural Gas	1	Metals	Nickel	C2-v1	3.63E-06	2.05E-06	1.02E-05	7.98E-07	lbs/ton production	3	89.63	68.90	0.00
Asphalt Prod., Natural Gas	1	Metals	Selenium	C2-v1	6.68E-07	6.13E-07	1.99E-06	1.05E-07	lbs/ton production	3	89.94	69.13	0.00

TABLE 19. POINT SOURCE EMISSION FACTORS.

Major Group	Sub Group	Category	Substance	ARB Rating	Mean	Median	Maximum	Minimum	Unit	Tests	RSD, %	Uncertainty, %	Det Ratio
Asphalt Prod., Natural Gas	1	Metals	Zinc	C2-v0	1.30E-05	1.24E-05	2.56E-05	6.35E-06	lbs/ton production	3	46.31	35.60	1.00
Asphalt Prod., Natural Gas	1	PAH	Acenaphthene	B2-v3	6.40E-07	5.72E-07	1.23E-06	8.14E-10	lbs/ton production	3	63.77	49.02	1.00
Asphalt Prod., Natural Gas	1	PAH	Acenaphthylene	B2-v4	1.53E-06	2.14E-07	1.06E-05	3.70E-10	lbs/ton production	3	223.79	172.02	1.00
Asphalt Prod., Natural Gas	1	PAH	Anthracene	B2-v3	1.88E-07	9.45E-08	9.67E-07	4.14E-10	lbs/ton production	3	161.11	123.84	1.00
Asphalt Prod., Natural Gas	1	PAH	Benzo(a)anthracene	B2-v1	9.64E-09	1.03E-08	1.57E-08	3.70E-10	lbs/ton production	3	48.74	45.08	0.99
Asphalt Prod., Natural Gas	1	PAH	Benzo(a)pyrene	B2-v0	1.04E-09	1.04E-09	1.63E-09	3.70E-10	lbs/ton production	3	43.99	40.68	0.32
Asphalt Prod., Natural Gas	1	PAH	Benzo(b)fluoranthene	B2-v1	1.48E-09	5.31E-10	3.73E-09	2.44E-10	lbs/ton production	3	98.97	91.53	0.87
Asphalt Prod., Natural Gas	1	PAH	Benzo(e)pyrene	C3-v0	3.83E-09	3.94E-09	4.14E-09	3.41E-09	lbs/ton production	1	9.79	24.32	1.00
Asphalt Prod., Natural Gas	1	PAH	Benzo(g,h,i)perylene	B2-v1	1.29E-09	1.27E-09	2.04E-09	3.70E-10	lbs/ton production	3	40.72	37.66	0.54
Asphalt Prod., Natural Gas	1	PAH	Benzo(k)fluoranthene	B2-v1	2.34E-09	1.55E-09	4.36E-09	3.70E-10	lbs/ton production	3	71.96	66.55	0.75
Asphalt Prod., Natural Gas	1	PAH	Chrysene	B2-v1	1.55E-09	1.55E-09	3.22E-09	3.70E-10	lbs/ton production	3	57.18	52.88	0.62
Asphalt Prod., Natural Gas	1	PAH	Dibenz(a,h)anthracene	B2-v1	9.84E-10	1.04E-09	1.77E-09	3.22E-10	lbs/ton production	3	56.93	52.65	0.36
Asphalt Prod., Natural Gas	1	PAH	Fluoranthene	B2-v4	4.56E-07	7.46E-08	3.60E-06	5.99E-10	lbs/ton production	3	258.95	199.04	1.00
Asphalt Prod., Natural Gas	1	PAH	Fluorene	B2-v3	1.72E-06	2.07E-06	2.65E-06	2.96E-09	lbs/ton production	3	51.74	39.77	1.00
Asphalt Prod., Natural Gas	1	PAH	Indeno(1,2,3-cd)pyrene	B2-v1	1.16E-09	1.04E-09	2.18E-09	3.70E-10	lbs/ton production	3	49.04	45.35	0.49
Asphalt Prod., Natural Gas	1	PAH	Naphthalene	B2-v2	2.48E-05	1.56E-05	6.46E-05	5.48E-07	lbs/ton production	3	96.39	74.09	1.00
Asphalt Prod., Natural Gas	1	PAH	Phenanthrene	B2-v3	2.45E-06	1.91E-06	7.75E-06	6.81E-09	lbs/ton production	3	87.68	67.40	1.00
Asphalt Prod., Natural Gas	1	PAH	Pyrene	B2-v4	8.39E-07	6.14E-08	7.04E-06	8.14E-10	lbs/ton production	3	276.89	212.84	1.00
Asphalt Prod., Natural Gas	1	SVOC	Ethylbenzene	C3-v0	2.74E-05	2.70E-05	3.34E-05	2.17E-05	lbs/ton production	1	21.36	53.06	1.00
Asphalt Prod., Natural Gas	1	VOC	Acetaldehyde	C3-v0	5.32E-05	5.80E-05	6.39E-05	3.77E-05	lbs/ton production	1	25.80	64.08	1.00
Asphalt Prod., Natural Gas	1	VOC	Benzene	C2-v1	8.98E-05	1.94E-05	3.32E-04	1.03E-05	lbs/ton production	3	135.22	103.94	1.00
Asphalt Prod., Natural Gas	1	VOC	Formaldehyde	B2-v2	2.57E-04	3.89E-05	7.86E-04	1.00E-05	lbs/ton production	3	136.38	104.83	1.00
Asphalt Prod., Natural Gas	1	VOC	Hydrogen Sulfide	C3-v0	7.34E-04	7.25E-04	8.95E-04	5.82E-04	lbs/ton production	1	21.36	53.06	0.00
Asphalt Prod., Natural Gas	1	VOC	Methyl Chloroform	C3-v0	2.87E-06	2.83E-06	3.50E-06	2.27E-06	lbs/ton production	1	21.36	53.06	0.67
Asphalt Prod., Natural Gas	1	VOC	Toluene	C3-v0	4.32E-05	4.50E-05	5.31E-05	3.14E-05	lbs/ton production	1	25.40	63.09	1.00
Asphalt Prod., Natural Gas	1	VOC	Xylene (Total)	C3-v0	4.26E-05	4.05E-05	5.28E-05	3.43E-05	lbs/ton production	1	22.09	54.87	1.00
Asphalt Prod., Oil	1	Metals	Arsenic	D2-v0	3.46E-06	4.23E-06	4.54E-06	1.16E-06	lbs/ton production	3	39.33	32.88	0.42
Asphalt Prod., Oil	1	Metals	Beryllium	D2-v0	3.95E-07	4.23E-07	4.43E-07	2.95E-07	lbs/ton production	3	14.50	12.12	0.00

TABLE 19. POINT SOURCE EMISSION FACTORS.

Major Group	Sub Group	Category	Substance	ARB Rating	Mean	Median	Maximum	Minimum	Unit	Tests	RSD, %	Uncertainty, %	Det Ratio
Asphalt Prod., Oil	1	Metals	Cadmium	D2-v1	7.70E-07	7.46E-07	1.89E-06	1.93E-07	lbs/ton production	3	69.07	57.75	0.31
Asphalt Prod., Oil	1	Metals	Chromium (Hex)	B2-v1	4.30E-07	4.97E-07	7.88E-07	8.24E-08	lbs/ton production	3	67.14	56.13	0.09
Asphalt Prod., Oil	1	Metals	Chromium (Total)	B2-v2	1.05E-05	9.12E-06	2.32E-05	2.82E-07	lbs/ton production	3	73.72	61.63	1.00
Asphalt Prod., Oil	1	Metals	Copper	D2-v0	7.19E-06	8.03E-06	1.13E-05	2.71E-06	lbs/ton production	3	39.46	32.99	1.00
Asphalt Prod., Oil	1	Metals	Lead	D2-v1	2.87E-06	2.11E-06	7.41E-06	7.74E-07	lbs/ton production	3	73.29	61.27	1.00
Asphalt Prod., Oil	1	Metals	Manganese	D2-v2	6.54E-05	4.53E-05	2.01E-04	2.78E-06	lbs/ton production	3	116.45	97.36	1.00
Asphalt Prod., Oil	1	Metals	Mercury	D2-v2	4.92E-06	5.37E-06	1.35E-05	2.95E-08	lbs/ton production	3	87.70	73.32	1.00
Asphalt Prod., Oil	1	Metals	Nickel	D2-v2	1.27E-04	1.14E-05	4.81E-04	5.16E-06	lbs/ton production	3	170.66	142.68	1.00
Asphalt Prod., Oil	1	Metals	Selenium	D2-v1	2.92E-06	3.53E-06	6.59E-06	1.93E-07	lbs/ton production	3	84.49	70.64	0.28
Asphalt Prod., Oil	1	Metals	Zinc	D2-v1	1.11E-04	3.55E-05	3.79E-04	1.55E-05	lbs/ton production	3	116.70	97.56	1.00
Asphalt Prod., Oil	1	PAH	Acenaphthene	A3-v0	3.06E-07	3.06E-07	3.87E-07	2.23E-07	lbs/ton production	1	26.85	66.69	1.00
Asphalt Prod., Oil	1	PAH	Acenaphthylene	A3-v0	5.26E-07	4.46E-07	7.91E-07	3.42E-07	lbs/ton production	1	44.58	110.75	1.00
Asphalt Prod., Oil	1	PAH	Anthracene	A3-v0	5.74E-08	5.65E-08	7.56E-08	4.02E-08	lbs/ton production	1	30.91	76.78	1.00
Asphalt Prod., Oil	1	PAH	Benzo(a)anthracene	A3-v0	1.11E-08	1.21E-08	1.26E-08	8.65E-09	lbs/ton production	1	19.27	47.88	1.00
Asphalt Prod., Oil	1	PAH	Benzo(a)pyrene	A3-v1	1.84E-09	8.07E-10	3.96E-09	7.44E-10	lbs/ton production	1	100.13	248.75	0.72
Asphalt Prod., Oil	1	PAH	Benzo(b)fluoranthene	A3-v0	2.10E-09	1.98E-09	2.38E-09	1.94E-09	lbs/ton production	1	11.66	28.96	1.00
Asphalt Prod., Oil	1	PAH	Benzo(g,h,i)perylene	A3-v0	1.20E-09	1.32E-09	1.37E-09	9.01E-10	lbs/ton production	1	21.64	53.76	0.75
Asphalt Prod., Oil	1	PAH	Benzo(k)fluoranthene	A3-v0	8.17E-10	8.07E-10	9.01E-10	7.44E-10	lbs/ton production	1	9.64	23.94	0.00
Asphalt Prod., Oil	1	PAH	Chrysene	A3-v0	8.17E-10	8.07E-10	9.01E-10	7.44E-10	lbs/ton production	1	9.64	23.94	0.00
Asphalt Prod., Oil	1	PAH	Dibenz(a,h)anthracene	A3-v0	8.17E-10	8.07E-10	9.01E-10	7.44E-10	lbs/ton production	1	9.64	23.94	0.00
Asphalt Prod., Oil	1	PAH	Fluoranthene	A3-v0	3.57E-08	3.39E-08	4.61E-08	2.70E-08	lbs/ton production	1	27.14	67.42	1.00
Asphalt Prod., Oil	1	PAH	Fluorene	A3-v0	6.58E-07	7.02E-07	8.39E-07	4.32E-07	lbs/ton production	1	31.54	78.35	1.00
Asphalt Prod., Oil	1	PAH	Indeno(1,2,3-cd)pyrene	A3-v0	8.17E-10	8.07E-10	9.01E-10	7.44E-10	lbs/ton production	1	9.64	23.94	0.00
Asphalt Prod., Oil	1	PAH	Naphthalene	A3-v0	3.08E-05	2.98E-05	3.39E-05	2.88E-05	lbs/ton production	1	8.75	21.73	1.00
Asphalt Prod., Oil	1	PAH	Phenanthrene	A3-v0	6.64E-07	6.62E-07	8.83E-07	4.46E-07	lbs/ton production	1	32.86	81.64	1.00
Asphalt Prod., Oil	1	PAH	Pyrene	A3-v0	5.62E-08	4.52E-08	8.18E-08	4.14E-08	lbs/ton production	1	39.77	98.80	1.00
Asphalt Prod., Oil	1	VOC	Benzene	B2-v1	3.34E-04	4.09E-04	6.06E-04	4.69E-05	lbs/ton production	3	71.38	59.68	1.00
Asphalt Prod., Oil	1	VOC	Formaldehyde	B2-v1	3.92E-04	2.51E-04	1.06E-03	5.23E-05	lbs/ton production	3	96.46	80.64	1.00

TABLE 19. POINT SOURCE EMISSION FACTORS.

Major Group	Sub Group	Category	Substance	ARB Rating	Mean	Median	Maximum	Minimum	Unit	Tests	RSD, %	Uncertainty, %	Det Ratio
Asphalt Prod., Truck Load	1	VOC	Hydrogen Sulfide	C3-v0	1.13E-01	1.05E-01	1.34E-01	9.90E-02	lbs/ton charged	1	16.63	41.30	1.00
Battery Prod., Grids	1	Metals	Arsenic	A3-v0	1.13E-03	1.13E-03	1.13E-03	1.13E-03	lbs/ton processed	1	0.00	0.00	0.00
Battery Prod., Grids	1	Metals	Lead	C3-v0	6.59E-03	6.46E-03	7.98E-03	5.32E-03	lbs/ton processed	1	20.26	50.33	1.00
Battery Prod., Post Pour	1	Metals	Lead	C3-v1	8.27E-03	4.77E-03	1.77E-02	2.39E-03	lbs/MBatteries	1	99.31	246.71	1.00
Battery Prod., Strap Line	1	Metals	Lead	C3-v0	1.31E-02	8.43E-03	2.39E-02	7.02E-03	lbs/MBatteries	1	71.34	177.22	1.00
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Dioxin:4D 2378	A3-v0	3.34E-10	3.28E-10	4.27E-10	2.46E-10	lbs/ton	1	27.13	67.38	0.00
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Dioxin:4D Total	A3-v0	3.34E-10	3.28E-10	4.27E-10	2.46E-10	lbs/ton	1	27.13	67.38	0.00
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Dioxin:5D 12378	A3-v0	3.04E-10	3.28E-10	3.37E-10	2.46E-10	lbs/ton	1	16.48	40.93	0.00
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Dioxin:5D Total	A3-v0	4.79E-10	3.37E-10	8.54E-10	2.46E-10	lbs/ton	1	68.34	169.77	0.59
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Dioxin:6D 123478	A3-v1	1.56E-10	1.70E-10	2.70E-10	2.63E-11	lbs/ton	1	78.79	195.72	0.00
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Dioxin:6D 123678	A3-v0	2.82E-10	2.63E-10	3.37E-10	2.46E-10	lbs/ton	1	17.20	42.72	0.00
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Dioxin:6D 123789	A3-v0	3.04E-10	3.28E-10	3.37E-10	2.46E-10	lbs/ton	1	16.48	40.93	0.00
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Dioxin:6D Total	A3-v0	2.82E-10	2.63E-10	3.37E-10	2.46E-10	lbs/ton	1	17.20	42.72	0.00
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Dioxin:7D 1234678	A3-v0	5.12E-10	5.03E-10	6.07E-10	4.26E-10	lbs/ton	1	17.80	44.21	0.00
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Dioxin:7D Total	A3-v0	4.52E-10	5.03E-10	6.07E-10	2.46E-10	lbs/ton	1	41.07	102.01	0.00
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Dioxin:8D	A3-v0	6.03E-09	6.50E-09	7.42E-09	4.16E-09	lbs/ton	1	27.92	69.35	1.00
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Furan:4F 2378	A3-v0	3.04E-10	3.28E-10	3.37E-10	2.46E-10	lbs/ton	1	16.48	40.93	0.00
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Furan:4F Total	A3-v0	3.04E-10	3.28E-10	3.37E-10	2.46E-10	lbs/ton	1	16.48	40.93	0.00
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Furan:5F 12378	A3-v0	3.04E-10	3.28E-10	3.37E-10	2.46E-10	lbs/ton	1	16.48	40.93	0.00
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Furan:5F 23478	A3-v0	3.04E-10	3.28E-10	3.37E-10	2.46E-10	lbs/ton	1	16.48	40.93	0.00
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Furan:5F Total	A3-v0	3.04E-10	3.28E-10	3.37E-10	2.46E-10	lbs/ton	1	16.48	40.93	0.00
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Furan:6F 123478	A3-v0	1.71E-10	1.70E-10	1.73E-10	1.69E-10	lbs/ton	1	1.38	3.44	0.00
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Furan:6F 123678	A3-v0	1.71E-10	1.70E-10	1.73E-10	1.69E-10	lbs/ton	1	1.38	3.44	0.00
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Furan:6F 123789	A3-v0	2.82E-10	2.63E-10	3.37E-10	2.46E-10	lbs/ton	1	17.20	42.72	0.00
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Furan:6F 234678	A3-v0	2.34E-10	2.63E-10	2.70E-10	1.70E-10	lbs/ton	1	23.71	58.91	0.00
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Furan:6F Total	A3-v0	2.03E-10	1.70E-10	2.70E-10	1.69E-10	lbs/ton	1	28.61	71.07	0.00
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Furan:7F 1234678	A3-v0	2.60E-10	2.63E-10	2.70E-10	2.46E-10	lbs/ton	1	4.63	11.50	0.00
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Furan:7F 1234789	A3-v0	3.93E-10	4.16E-10	4.27E-10	3.36E-10	lbs/ton	1	12.65	31.43	0.00

TABLE 19. POINT SOURCE EMISSION FACTORS.

Major Group	Sub Group	Category	Substance	ARB Rating	Mean	Median	Maximum	Minimum	Unit	Tests	RSD, %	Uncertainty, %	Det Ratio
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Furan:7F Total	A3-v0	3.04E-10	3.28E-10	3.37E-10	2.46E-10	lbs/ton	1	16.48	40.93	0.00
Boiler, Coal/Natural Gas	1	Dioxin/Furan	Furan:8F	A3-v0	8.61E-10	8.54E-10	8.77E-10	8.51E-10	lbs/ton	1	1.67	4.15	0.00
Boiler, Coal/Natural Gas	1	Metals	Arsenic	A3-v0	4.11E-05	3.39E-05	6.12E-05	2.84E-05	lbs/ton	1	42.73	106.16	0.00
Boiler, Coal/Natural Gas	1	Metals	Barium	C3-v0	1.39E-03	1.65E-03	1.69E-03	8.31E-04	lbs/ton	1	34.86	86.60	0.00
Boiler, Coal/Natural Gas	1	Metals	Beryllium	C3-v0	2.78E-05	3.30E-05	3.36E-05	1.67E-05	lbs/ton	1	34.64	86.05	0.00
Boiler, Coal/Natural Gas	1	Metals	Cadmium	C3-v0	4.39E-05	4.30E-05	5.22E-05	3.65E-05	lbs/ton	1	17.96	44.61	1.00
Boiler, Coal/Natural Gas	1	Metals	Chromium (Total)	C3-v0	1.56E-04	1.65E-04	2.19E-04	8.31E-05	lbs/ton	1	43.98	109.25	0.65
Boiler, Coal/Natural Gas	1	Metals	Cobalt	C3-v0	2.78E-04	3.30E-04	3.37E-04	1.66E-04	lbs/ton	1	34.84	86.55	0.00
Boiler, Coal/Natural Gas	1	Metals	Copper	C3-v0	6.95E-04	8.26E-04	8.43E-04	4.15E-04	lbs/ton	1	34.86	86.59	0.00
Boiler, Coal/Natural Gas	1	Metals	Lead	C3-v0	2.22E-04	2.70E-04	3.14E-04	8.31E-05	lbs/ton	1	55.12	136.93	0.88
Boiler, Coal/Natural Gas	1	Metals	Magnesium	C3-v0	1.02E-03	1.19E-03	1.45E-03	4.15E-04	lbs/ton	1	52.85	131.30	1.00
Boiler, Coal/Natural Gas	1	Metals	Manganese	C3-v0	4.17E-04	4.96E-04	5.06E-04	2.49E-04	lbs/ton	1	34.87	86.62	0.00
Boiler, Coal/Natural Gas	1	Metals	Mercury	A3-v0	1.61E-05	1.33E-05	2.40E-05	1.09E-05	lbs/ton	1	43.48	108.00	0.00
Boiler, Coal/Natural Gas	1	Metals	Nickel	C3-v0	1.39E-04	1.65E-04	1.69E-04	8.31E-05	lbs/ton	1	34.81	86.48	0.00
Boiler, Coal/Natural Gas	1	Metals	Selenium	A3-v1	1.75E-04	2.19E-04	2.78E-04	2.84E-05	lbs/ton	1	74.56	185.22	0.95
Boiler, Coal/Natural Gas	1	Metals	Zinc	C3-v0	2.45E-03	2.81E-03	3.37E-03	1.16E-03	lbs/ton	1	46.90	116.50	1.00
Boiler, Coal/Natural Gas	1	PAH	Acenaphthene	C3-v0	8.98E-08	8.98E-08	1.10E-07	6.97E-08	lbs/ton	1	31.55	283.46	0.00
Boiler, Coal/Natural Gas	1	PAH	Acenaphthylene	C3-v1	6.88E-07	6.97E-07	1.16E-06	2.06E-07	lbs/ton	1	69.35	172.28	0.90
Boiler, Coal/Natural Gas	1	PAH	Anthracene	C3-v0	1.45E-07	1.27E-07	2.24E-07	8.32E-08	lbs/ton	1	49.79	123.70	0.00
Boiler, Coal/Natural Gas	1	PAH	Benzo(a)anthracene	C3-v0	7.19E-08	7.19E-08	8.76E-08	5.62E-08	lbs/ton	1	30.80	276.71	0.00
Boiler, Coal/Natural Gas	1	PAH	Benzo(a)pyrene	C3-v0	2.13E-07	2.19E-07	2.91E-07	1.28E-07	lbs/ton	1	38.39	95.37	0.46
Boiler, Coal/Natural Gas	1	PAH	Benzo(b)fluoranthene	C3-v-	1.21E-07	1.21E-07	1.21E-07	1.21E-07	lbs/ton	1	0.00	0.00	0.00
Boiler, Coal/Natural Gas	1	PAH	Benzo(e)pyrene	C3-v0	1.59E-07	1.84E-07	1.86E-07	1.06E-07	lbs/ton	1	28.84	71.65	0.00
Boiler, Coal/Natural Gas	1	PAH	Benzo(g,h,i)perylene	C3-v0	5.85E-07	5.83E-07	7.44E-07	4.27E-07	lbs/ton	1	27.09	67.30	0.00
Boiler, Coal/Natural Gas	1	PAH	Benzo(k)fluoranthene	C3-v0	1.54E-07	1.75E-07	1.84E-07	1.03E-07	lbs/ton	1	28.59	71.01	0.40
Boiler, Coal/Natural Gas	1	PAH	Dibenz(a,h)anthracene	C3-v0	8.51E-07	8.74E-07	1.09E-06	5.85E-07	lbs/ton	1	30.03	74.59	0.00
Boiler, Coal/Natural Gas	1	PAH	Fluorene	C3-v-	2.15E-06	2.15E-06	2.15E-06	2.15E-06	lbs/ton	1	0.00	0.00	1.00
Boiler, Coal/Natural Gas	1	PAH	Indeno(1,2,3-cd)pyrene	C3-v0	5.18E-07	5.38E-07	6.57E-07	3.60E-07	lbs/ton	1	28.82	71.60	0.00

TABLE 19. POINT SOURCE EMISSION FACTORS.

Major Group	Sub Group	Category	Substance	ARB Rating	Mean	Median	Maximum	Minimum	Unit	Tests	RSD, %	Uncertainty, %	Det Ratio
Boiler, Coal/Natural Gas	1	PAH	Phenanthrene	C3-v-	4.03E-06	4.03E-06	4.03E-06	4.03E-06	lbs/ton	1	0.00	0.00	1.00
Boiler, Coal/Natural Gas	1	SVOC	1,2-Dichlorobenzene	A3-v0	9.44E-06	9.38E-06	9.63E-06	9.31E-06	lbs/ton	1	1.78	4.42	0.00
Boiler, Coal/Natural Gas	1	SVOC	2-Chloronaphthalene	C3-v0	1.15E-07	1.09E-07	1.41E-07	9.45E-08	lbs/ton	1	20.72	51.47	0.00
Boiler, Coal/Natural Gas	1	SVOC	Ethylbenzene	A3-v0	7.77E-05	9.31E-05	1.17E-04	2.34E-05	lbs/ton	1	62.34	154.87	1.00
Boiler, Coal/Natural Gas	1	SVOC	Perylene	C3-v0	2.27E-07	2.46E-07	2.85E-07	1.48E-07	lbs/ton	1	30.99	77.00	0.00
Boiler, Coal/Natural Gas	1	VOC	1,1,1-Trichloroethane	A3-v1	1.59E-04	4.92E-05	3.84E-04	4.42E-05	lbs/ton	1	122.37	303.99	1.00
Boiler, Coal/Natural Gas	1	VOC	1,1,2,2-Tetrachloroethane	A3-v0	9.44E-06	9.38E-06	9.63E-06	9.31E-06	lbs/ton	1	1.78	4.42	0.00
Boiler, Coal/Natural Gas	1	VOC	1,1,2-Trichloroethane	A3-v0	9.44E-06	9.38E-06	9.63E-06	9.31E-06	lbs/ton	1	1.78	4.42	0.00
Boiler, Coal/Natural Gas	1	VOC	1,1-Dichloroethane	A3-v1	2.30E-05	9.63E-06	5.01E-05	9.38E-06	lbs/ton	1	101.69	252.61	0.00
Boiler, Coal/Natural Gas	1	VOC	1,1-Dichloroethene	A3-v0	9.44E-06	9.38E-06	9.63E-06	9.31E-06	lbs/ton	1	1.78	4.42	0.00
Boiler, Coal/Natural Gas	1	VOC	1,2-Dichloroethane	A3-v0	9.44E-06	9.38E-06	9.63E-06	9.31E-06	lbs/ton	1	1.78	4.42	0.00
Boiler, Coal/Natural Gas	1	VOC	1,2-Dichloroethene	A3-v0	9.44E-06	9.38E-06	9.63E-06	9.31E-06	lbs/ton	1	1.78	4.42	0.00
Boiler, Coal/Natural Gas	1	VOC	1,2-Dichloropropane	A3-v0	9.44E-06	9.38E-06	9.63E-06	9.31E-06	lbs/ton	1	1.78	4.42	0.00
Boiler, Coal/Natural Gas	1	VOC	2-Chloroethyl Vinyl Ether	A3-v0	2.20E-05	2.33E-05	2.34E-05	1.93E-05	lbs/ton	1	10.77	26.77	0.00
Boiler, Coal/Natural Gas	1	VOC	2-Hexanone	A3-v0	3.76E-05	3.52E-05	4.28E-05	3.49E-05	lbs/ton	1	11.91	29.58	0.00
Boiler, Coal/Natural Gas	1	VOC	Acetone	A3-v0	2.22E-03	2.24E-03	2.30E-03	2.11E-03	lbs/ton	1	4.52	11.22	0.34
Boiler, Coal/Natural Gas	1	VOC	Benzene	A3-v0	9.75E-05	9.15E-05	1.10E-04	9.08E-05	lbs/ton	1	11.32	28.11	1.00
Boiler, Coal/Natural Gas	1	VOC	Bromodichloromethane	A3-v0	9.44E-06	9.38E-06	9.63E-06	9.31E-06	lbs/ton	1	1.78	4.42	0.00
Boiler, Coal/Natural Gas	1	VOC	Bromoform	A3-v0	9.44E-06	9.38E-06	9.63E-06	9.31E-06	lbs/ton	1	1.78	4.42	0.00
Boiler, Coal/Natural Gas	1	VOC	Bromomethane	A3-v0	9.44E-06	9.38E-06	9.63E-06	9.31E-06	lbs/ton	1	1.78	4.42	0.00
Boiler, Coal/Natural Gas	1	VOC	Carbon disulfide	A3-v0	9.44E-06	9.38E-06	9.63E-06	9.31E-06	lbs/ton	1	1.78	4.42	0.00
Boiler, Coal/Natural Gas	1	VOC	Carbon Tetrachloride	A3-v0	9.44E-06	9.38E-06	9.63E-06	9.31E-06	lbs/ton	1	1.78	4.42	0.00
Boiler, Coal/Natural Gas	1	VOC	Chlorobenzene	A3-v1	5.18E-05	4.46E-05	1.01E-04	9.63E-06	lbs/ton	1	89.25	221.72	0.00
Boiler, Coal/Natural Gas	1	VOC	Chloroethane	A3-v0	9.44E-06	9.38E-06	9.63E-06	9.31E-06	lbs/ton	1	1.78	4.42	0.00
Boiler, Coal/Natural Gas	1	VOC	Chloroform	A3-v0	9.44E-06	9.38E-06	9.63E-06	9.31E-06	lbs/ton	1	1.78	4.42	0.00
Boiler, Coal/Natural Gas	1	VOC	Chloromethane	A3-v0	9.44E-06	9.38E-06	9.63E-06	9.31E-06	lbs/ton	1	1.78	4.42	0.00
Boiler, Coal/Natural Gas	1	VOC	Dibromochloromethane	A3-v0	9.44E-06	9.38E-06	9.63E-06	9.31E-06	lbs/ton	1	1.78	4.42	0.00
Boiler, Coal/Natural Gas	1	VOC	Dichloromethane	A3-v1	3.06E-03	1.08E-03	7.53E-03	5.75E-04	lbs/ton	1	126.63	314.58	1.00

TABLE 19. POINT SOURCE EMISSION FACTORS.

Major Group	Sub Group	Category	Substance	ARB Rating	Mean	Median	Maximum	Minimum	Unit	Tests	RSD, %	Uncertainty, %	Det Ratio
Boiler, Coal/Natural Gas	1	VOC	Formaldehyde	A3-v2	4.51E-01	2.50E-01	1.10E+00	9.33E-03	lbs/ton	1	126.38	313.95	1.00
Boiler, Coal/Natural Gas	1	VOC	Methyl Ethyl Ketone	A3-v0	9.45E-05	7.71E-05	1.50E-04	5.63E-05	lbs/ton	1	52.18	129.63	1.00
Boiler, Coal/Natural Gas	1	VOC	Styrene	A3-v0	9.44E-06	9.38E-06	9.63E-06	9.31E-06	lbs/ton	1	1.78	4.42	0.00
Boiler, Coal/Natural Gas	1	VOC	Tetrachloroethene	A3-v0	9.44E-06	9.38E-06	9.63E-06	9.31E-06	lbs/ton	1	1.78	4.42	0.00
Boiler, Coal/Natural Gas	1	VOC	Toluene	A3-v1	1.05E-03	3.22E-04	2.69E-03	1.45E-04	lbs/ton	1	135.03	335.44	1.00
Boiler, Coal/Natural Gas	1	VOC	Trichloroethene	A3-v0	9.44E-06	9.38E-06	9.63E-06	9.31E-06	lbs/ton	1	1.78	4.42	0.00
Boiler, Coal/Natural Gas	1	VOC	Trichlorofluoromethane	A3-v0	9.44E-06	9.38E-06	9.63E-06	9.31E-06	lbs/ton	1	1.78	4.42	0.00
Boiler, Coal/Natural Gas	1	VOC	Vinyl Acetate	A3-v0	9.44E-06	9.38E-06	9.63E-06	9.31E-06	lbs/ton	1	1.78	4.42	0.00
Boiler, Coal/Natural Gas	1	VOC	Vinyl Chloride	A3-v0	9.44E-06	9.38E-06	9.63E-06	9.31E-06	lbs/ton	1	1.78	4.42	0.00
Boiler, Coal/Natural Gas	1	VOC	Xylene (Total)	A3-v0	4.33E-04	5.10E-04	6.52E-04	1.38E-04	lbs/ton	1	61.18	151.98	1.00
Boiler, Coke/Coal	1	Dioxin/Furan	Dioxin/Furan:Total	A3-v0	3.09E-10	3.49E-10	3.62E-10	2.18E-10	lbs/ton	1	25.72	63.89	0.00
Boiler, Coke/Coal	1	Dioxin/Furan	Dioxin:4D 2378	A3-v0	1.53E-11	1.62E-11	1.74E-11	1.23E-11	lbs/ton	1	17.15	42.60	0.00
Boiler, Coke/Coal	1	Dioxin/Furan	Dioxin:4D Total	A3-v0	1.53E-11	1.62E-11	1.74E-11	1.23E-11	lbs/ton	1	17.15	42.60	0.00
Boiler, Coke/Coal	1	Dioxin/Furan	Dioxin:5D 12378	A3-v0	1.52E-11	1.59E-11	2.19E-11	7.62E-12	lbs/ton	1	47.38	117.69	0.00
Boiler, Coke/Coal	1	Dioxin/Furan	Dioxin:5D Total	A3-v0	1.52E-11	1.59E-11	2.19E-11	7.62E-12	lbs/ton	1	47.38	117.69	0.00
Boiler, Coke/Coal	1	Dioxin/Furan	Dioxin:6D 123478	A3-v0	2.30E-11	2.19E-11	2.68E-11	2.03E-11	lbs/ton	1	14.57	36.20	0.00
Boiler, Coke/Coal	1	Dioxin/Furan	Dioxin:6D 123678	A3-v0	2.24E-11	2.16E-11	2.57E-11	2.00E-11	lbs/ton	1	13.16	32.70	0.00
Boiler, Coke/Coal	1	Dioxin/Furan	Dioxin:6D 123789	A3-v0	2.13E-11	2.05E-11	2.46E-11	1.89E-11	lbs/ton	1	13.84	34.37	0.00
Boiler, Coke/Coal	1	Dioxin/Furan	Dioxin:6D Total	A3-v0	3.01E-11	2.68E-11	4.31E-11	2.03E-11	lbs/ton	1	39.08	97.07	0.00
Boiler, Coke/Coal	1	Dioxin/Furan	Dioxin:7D 1234678	A3-v0	6.32E-11	6.47E-11	9.40E-11	3.09E-11	lbs/ton	1	50.04	124.29	0.00
Boiler, Coke/Coal	1	Dioxin/Furan	Dioxin:7D Total	A3-v0	6.32E-11	6.47E-11	9.40E-11	3.09E-11	lbs/ton	1	50.04	124.29	0.00
Boiler, Coke/Coal	1	Dioxin/Furan	Dioxin:8D	A3-v0	1.04E-10	1.01E-10	1.41E-10	7.11E-11	lbs/ton	1	33.66	83.61	1.00
Boiler, Coke/Coal	1	Dioxin/Furan	Furan:4F 2378	A3-v0	8.67E-12	8.68E-12	9.07E-12	8.26E-12	lbs/ton	1	4.67	11.60	0.00
Boiler, Coke/Coal	1	Dioxin/Furan	Furan:4F Total	A3-v0	8.67E-12	8.68E-12	9.07E-12	8.26E-12	lbs/ton	1	4.67	11.60	0.00
Boiler, Coke/Coal	1	Dioxin/Furan	Furan:5F 12378	A3-v0	1.14E-11	9.76E-12	1.72E-11	7.26E-12	lbs/ton	1	45.49	113.00	0.00
Boiler, Coke/Coal	1	Dioxin/Furan	Furan:5F 23478	A3-v0	9.15E-12	9.76E-12	1.04E-11	7.26E-12	lbs/ton	1	18.24	45.30	0.00
Boiler, Coke/Coal	1	Dioxin/Furan	Furan:5F Total	A3-v0	1.14E-11	9.76E-12	1.71E-11	7.26E-12	lbs/ton	1	44.97	111.72	0.00
Boiler, Coke/Coal	1	Dioxin/Furan	Furan:6F 123478	A3-v0	9.75E-12	8.32E-12	1.33E-11	7.62E-12	lbs/ton	1	31.75	78.86	0.00

TABLE 19. POINT SOURCE EMISSION FACTORS.

Major Group	Sub Group	Category	Substance	ARB Rating	Mean	Median	Maximum	Minimum	Unit	Tests	RSD, %	Uncertainty, %	Det Ratio
Boiler, Coke/Coal	1	Dioxin/Furan	Furan:6F 123678	A3-v0	8.90E-12	7.26E-12	1.22E-11	7.23E-12	lbs/ton	1	32.23	80.07	0.00
Boiler, Coke/Coal	1	Dioxin/Furan	Furan:6F 123789	A3-v0	1.07E-11	8.71E-12	1.47E-11	8.68E-12	lbs/ton	1	32.55	80.86	0.00
Boiler, Coke/Coal	1	Dioxin/Furan	Furan:6F 234678	A3-v0	9.26E-12	7.62E-12	1.26E-11	7.59E-12	lbs/ton	1	30.96	76.90	0.00
Boiler, Coke/Coal	1	Dioxin/Furan	Furan:6F Total	A3-v0	1.08E-11	9.07E-12	1.47E-11	8.68E-12	lbs/ton	1	31.27	77.68	0.00
Boiler, Coke/Coal	1	Dioxin/Furan	Furan:7F 1234678	A3-v0	1.70E-11	1.52E-11	2.37E-11	1.19E-11	lbs/ton	1	35.81	88.96	0.00
Boiler, Coke/Coal	1	Dioxin/Furan	Furan:7F 1234789	A3-v0	1.29E-11	1.37E-11	1.47E-11	1.02E-11	lbs/ton	1	18.66	46.36	0.00
Boiler, Coke/Coal	1	Dioxin/Furan	Furan:7F Total	A3-v0	1.76E-11	1.52E-11	2.37E-11	1.37E-11	lbs/ton	1	30.60	76.03	0.00
Boiler, Coke/Coal	1	Dioxin/Furan	Furan:8F	A3-v0	4.44E-11	3.59E-11	6.15E-11	3.59E-11	lbs/ton	1	33.19	82.44	0.00
Boiler, Coke/Coal	1	Halogens	HCl	A3-v0	1.47E-01	1.73E-01	1.92E-01	7.47E-02	lbs/ton	1	43.01	106.85	1.00
Boiler, Coke/Coal	1	Metals	Arsenic	A3-v0	7.14E-06	7.20E-06	7.35E-06	6.86E-06	lbs/ton	1	3.47	8.62	0.66
Boiler, Coke/Coal	1	Metals	Beryllium	A3-v0	5.20E-07	5.88E-07	6.12E-07	3.61E-07	lbs/ton	1	26.58	66.02	1.00
Boiler, Coke/Coal	1	Metals	Cadmium	A3-v0	7.14E-07	7.20E-07	7.35E-07	6.86E-07	lbs/ton	1	3.47	8.62	0.00
Boiler, Coke/Coal	1	Metals	Chromium (Hex)	A3-v0	6.42E-07	6.50E-07	7.71E-07	5.04E-07	lbs/ton	1	20.87	51.84	1.00
Boiler, Coke/Coal	1	Metals	Chromium (Total)	A3-v0	2.33E-05	2.31E-05	2.42E-05	2.27E-05	lbs/ton	1	3.46	8.60	1.00
Boiler, Coke/Coal	1	Metals	Copper	A3-v0	1.76E-05	1.65E-05	2.12E-05	1.52E-05	lbs/ton	1	18.03	44.80	1.00
Boiler, Coke/Coal	1	Metals	Lead	A3-v0	3.66E-06	4.32E-06	4.41E-06	2.24E-06	lbs/ton	1	33.57	83.38	0.60
Boiler, Coke/Coal	1	Metals	Manganese	A3-v0	5.92E-05	3.96E-05	1.14E-04	2.42E-05	lbs/ton	1	80.97	201.13	1.00
Boiler, Coke/Coal	1	Metals	Mercury	A3-v0	1.73E-06	1.94E-06	2.09E-06	1.16E-06	lbs/ton	1	29.10	72.29	1.00
Boiler, Coke/Coal	1	Metals	Nickel	A3-v0	3.92E-04	4.41E-04	4.68E-04	2.67E-04	lbs/ton	1	27.76	68.97	1.00
Boiler, Coke/Coal	1	Metals	Selenium	A3-v1	2.38E-05	3.48E-05	3.60E-05	7.49E-07	lbs/ton	1	83.92	208.47	0.00
Boiler, Coke/Coal	1	Metals	Zinc	A3-v0	4.96E-05	5.04E-05	6.61E-05	3.22E-05	lbs/ton	1	34.31	85.23	1.00
Boiler, Coke/Coal	1	PAH	Acenaphthene	A3-v0	2.47E-08	2.41E-08	2.62E-08	2.40E-08	lbs/ton	1	5.04	12.52	0.00
Boiler, Coke/Coal	1	PAH	Acenaphthylene	A3-v0	2.47E-08	2.41E-08	2.62E-08	2.40E-08	lbs/ton	1	5.04	12.52	0.00
Boiler, Coke/Coal	1	PAH	Anthracene	A3-v0	2.47E-08	2.41E-08	2.62E-08	2.40E-08	lbs/ton	1	5.04	12.52	0.00
Boiler, Coke/Coal	1	PAH	Benzo(a)anthracene	A3-v0	2.47E-08	2.41E-08	2.62E-08	2.40E-08	lbs/ton	1	5.04	12.52	0.00
Boiler, Coke/Coal	1	PAH	Benzo(a)pyrene	A3-v0	2.47E-08	2.41E-08	2.62E-08	2.40E-08	lbs/ton	1	5.04	12.52	0.00
Boiler, Coke/Coal	1	PAH	Benzo(b)fluoranthene	A3-v0	2.47E-08	2.41E-08	2.62E-08	2.40E-08	lbs/ton	1	5.04	12.52	0.00
Boiler, Coke/Coal	1	PAH	Benzo(e)pyrene	A3-v0	2.47E-08	2.41E-08	2.62E-08	2.40E-08	lbs/ton	1	5.04	12.52	0.00

TABLE 19. POINT SOURCE EMISSION FACTORS.

Major Group	Sub Group	Category	Substance	ARB Rating	Mean	Median	Maximum	Minimum	Unit	Tests	RSD, %	Uncertainty, %	Det Ratio
Boiler, Coke/Coal	1	PAH	Benzo(g,h,i)perylene	A3-v0	2.47E-08	2.41E-08	2.62E-08	2.40E-08	lbs/ton	1	5.04	12.52	0.00
Boiler, Coke/Coal	1	PAH	Benzo(k)fluoranthene	A3-v0	2.47E-08	2.41E-08	2.62E-08	2.40E-08	lbs/ton	1	5.04	12.52	0.00
Boiler, Coke/Coal	1	PAH	Chrysene	A3-v0	5.32E-08	5.75E-08	7.26E-08	2.94E-08	lbs/ton	1	41.18	102.29	1.00
Boiler, Coke/Coal	1	PAH	Dibenz(a,h)anthracene	A3-v0	2.47E-08	2.41E-08	2.62E-08	2.40E-08	lbs/ton	1	5.04	12.52	0.00
Boiler, Coke/Coal	1	PAH	Fluoranthene	A3-v0	4.71E-08	4.67E-08	5.82E-08	3.63E-08	lbs/ton	1	23.24	57.73	1.00
Boiler, Coke/Coal	1	PAH	Fluorene	A3-v0	1.39E-07	1.37E-07	1.45E-07	1.34E-07	lbs/ton	1	4.23	10.51	0.00
Boiler, Coke/Coal	1	PAH	Indeno(1,2,3-cd)pyrene	A3-v0	2.47E-08	2.41E-08	2.62E-08	2.40E-08	lbs/ton	1	5.04	12.52	0.00
Boiler, Coke/Coal	1	PAH	Naphthalene	A3-v0	2.09E-06	2.03E-06	2.22E-06	2.01E-06	lbs/ton	1	5.41	13.45	0.00
Boiler, Coke/Coal	1	PAH	Phenanthrene	A3-v0	7.48E-07	7.26E-07	8.00E-07	7.19E-07	lbs/ton	1	5.99	14.89	0.00
Boiler, Coke/Coal	1	PAH	Pyrene	A3-v1	1.57E-07	5.09E-08	3.95E-07	2.40E-08	lbs/ton	1	132.12	328.20	0.95
Boiler, Coke/Coal	1	SVOC	2-Methylnaphthalene	A3-v0	3.19E-07	3.12E-07	3.42E-07	3.02E-07	lbs/ton	1	6.49	16.13	0.00
Boiler, Coke/Coal	1	SVOC	Perylene	A3-v0	2.47E-08	2.41E-08	2.62E-08	2.40E-08	lbs/ton	1	5.04	12.52	0.00
Boiler, Coke/Coal	1	VOC	Formaldehyde	A3-v0	4.78E-03	4.82E-03	5.30E-03	4.22E-03	lbs/ton	1	11.28	28.02	0.66
Boiler, Distillate	1	PAH	Acenaphthene	B1-v3	2.11E-04	3.77E-05	1.13E-03	5.33E-07	lbs/Mgal	6	184.82	98.49	0.99
Boiler, Distillate	1	PAH	Acenaphthylene	B1-v2	6.50E-05	2.99E-05	2.38E-04	1.68E-06	lbs/Mgal	7	127.79	65.71	0.76
Boiler, Distillate	1	PAH	Anthracene	B1-v2	2.39E-05	1.77E-05	8.49E-05	3.56E-07	lbs/Mgal	7	96.51	47.99	0.93
Boiler, Distillate	1	PAH	Benzo(a)anthracene	B1-v2	1.35E-05	9.21E-06	9.93E-05	3.60E-07	lbs/Mgal	6	167.60	86.17	0.72
Boiler, Distillate	1	PAH	Benzo(a)pyrene	B1-v2	7.55E-06	4.59E-06	2.20E-05	3.60E-07	lbs/Mgal	7	86.63	43.08	0.09
Boiler, Distillate	1	PAH	Benzo(b)fluoranthene	B1-v2	6.67E-06	3.69E-06	2.11E-05	3.60E-07	lbs/Mgal	7	97.14	48.31	0.16
Boiler, Distillate	1	PAH	Benzo(e)pyrene	A3-v0	1.40E-05	1.40E-05	1.52E-05	1.28E-05	lbs/Mgal	1	11.97	107.56	0.00
Boiler, Distillate	1	PAH	Benzo(g,h,i)perylene	B1-v2	8.50E-06	6.13E-06	2.77E-05	4.62E-07	lbs/Mgal	7	93.25	43.64	0.21
Boiler, Distillate	1	PAH	Benzo(k)fluoranthene	B1-v3	8.31E-05	4.34E-06	7.03E-04	3.60E-07	lbs/Mgal	7	269.37	133.95	0.95
Boiler, Distillate	1	PAH	Chrysene	B1-v2	1.28E-05	8.56E-06	1.01E-04	3.60E-07	lbs/Mgal	6	183.62	94.41	0.77
Boiler, Distillate	1	PAH	Dibenz(a,h)anthracene	B1-v2	6.49E-06	4.58E-06	2.72E-05	3.43E-07	lbs/Mgal	7	114.28	53.48	0.10
Boiler, Distillate	1	PAH	Fluoranthene	B1-v1	3.32E-05	2.60E-05	7.12E-05	1.64E-06	lbs/Mgal	6	68.49	35.21	0.95
Boiler, Distillate	1	PAH	Fluorene	B1-v2	1.17E-04	1.33E-04	2.78E-04	2.78E-06	lbs/Mgal	6	70.89	37.78	0.98
Boiler, Distillate	1	PAH	Indeno(1,2,3-cd)pyrene	B1-v2	6.64E-06	5.82E-06	2.18E-05	3.60E-07	lbs/Mgal	7	86.38	40.43	0.16
Boiler, Distillate	1	PAH	Naphthalene	B1-v4	3.67E-01	9.84E-04	2.78E+00	6.98E-05	lbs/Mgal	7	246.24	115.24	1.00

TABLE 19. POINT SOURCE EMISSION FACTORS.

Major Group	Sub Group	Category	Substance	ARB Rating	Mean	Median	Maximum	Minimum	Unit	Tests	RSD, %	Uncertainty, %	Det Ratio
Boiler, Distillate	1	PAH	Phenanthrene	B1-v2	3.72E-04	3.53E-04	9.80E-04	6.61E-06	lbs/Mgal	7	79.23	39.40	1.00
Boiler, Distillate	1	PAH	Pyrene	B1-v2	4.08E-05	4.40E-05	1.16E-04	9.95E-07	lbs/Mgal	6	73.28	37.68	0.83
Boiler, Distillate	1	SVOC	2-Chloronaphthalene	A3-v0	1.84E-05	1.84E-05	1.86E-05	1.81E-05	lbs/Mgal	1	2.15	19.32	0.00
Boiler, Distillate	1	SVOC	2-Methylnaphthalene	A3-v0	1.40E-04	1.23E-04	1.81E-04	1.17E-04	lbs/Mgal	1	24.99	62.08	0.57
Boiler, Distillate	1	SVOC	Ethylbenzene	C3-v0	1.49E-03	1.55E-03	1.65E-03	1.27E-03	lbs/Mgal	1	13.33	33.12	0.00
Boiler, Distillate	1	SVOC	Perylene	A3-v0	2.71E-05	2.71E-05	2.90E-05	2.52E-05	lbs/Mgal	1	9.88	88.74	0.00
Boiler, Distillate	1	VOC	Benzene	C3-v0	2.54E-03	2.62E-03	2.85E-03	2.17E-03	lbs/Mgal	1	13.62	33.84	1.00
Boiler, Distillate	1	VOC	Formaldehyde	B1-v4	3.49E-01	5.33E-02	1.75E+00	2.20E-04	lbs/Mgal	6	152.43	75.80	1.00
Boiler, Distillate	1	VOC	Hexane	C3-v0	1.21E-03	1.26E-03	1.34E-03	1.03E-03	lbs/Mgal	1	13.13	32.62	0.00
Boiler, Distillate	1	VOC	Propylene	C3-v0	1.71E-03	1.78E-03	1.80E-03	1.53E-03	lbs/Mgal	1	8.87	22.03	1.00
Boiler, Distillate	1	VOC	Toluene	C3-v0	1.50E-03	1.43E-03	1.70E-03	1.35E-03	lbs/Mgal	1	12.35	30.68	0.38
Boiler, Distillate	1	VOC	Xylene (Total)	C3-v0	1.49E-03	1.55E-03	1.65E-03	1.27E-03	lbs/Mgal	1	13.33	33.12	0.00
Boiler, Fuel Oil	1	Metals	Arsenic	C2-v1	1.06E-03	1.11E-03	2.20E-03	3.96E-04	lbs/Mgal	3	51.81	39.82	1.00
Boiler, Fuel Oil	1	Metals	Beryllium	C2-v1	1.48E-05	8.10E-06	4.41E-05	5.83E-06	lbs/Mgal	3	101.51	78.03	0.62
Boiler, Fuel Oil	1	Metals	Cadmium	C2-v1	2.23E-04	1.24E-04	7.99E-04	6.48E-05	lbs/Mgal	3	103.73	79.73	1.00
Boiler, Fuel Oil	1	Metals	Chromium (Hex)	A2-v1	1.81E-04	9.22E-05	5.52E-04	5.60E-05	lbs/Mgal	3	95.13	73.13	0.90
Boiler, Fuel Oil	1	Metals	Chromium (Total)	A2-v0	6.09E-04	5.71E-04	1.01E-03	2.16E-04	lbs/Mgal	3	40.04	30.78	1.00
Boiler, Fuel Oil	1	Metals	Copper	C2-v1	1.40E-03	1.47E-03	1.99E-03	3.11E-04	lbs/Mgal	3	39.86	30.64	1.00
Boiler, Fuel Oil	1	Metals	Lead	C2-v1	1.61E-03	1.04E-03	3.79E-03	3.69E-04	lbs/Mgal	3	69.64	53.53	1.00
Boiler, Fuel Oil	1	Metals	Manganese	C2-v1	1.58E-03	1.38E-03	4.99E-03	5.64E-04	lbs/Mgal	3	86.76	66.69	1.00
Boiler, Fuel Oil	1	Metals	Mercury	C2-v1	3.06E-03	3.56E-03	5.57E-03	6.38E-04	lbs/Mgal	3	62.32	47.91	0.00
Boiler, Fuel Oil	1	Metals	Nickel	C2-v2	9.75E-02	8.00E-02	1.83E-01	2.21E-03	lbs/Mgal	3	55.88	42.96	1.00
Boiler, Fuel Oil	1	Metals	Selenium	C2-v1	9.61E-04	6.30E-04	2.19E-03	2.50E-04	lbs/Mgal	3	69.79	53.65	0.87
Boiler, Fuel Oil	1	Metals	Zinc	C2-v0	1.41E-02	9.91E-03	2.70E-02	5.70E-03	lbs/Mgal	3	58.53	44.99	1.00
Boiler, Fuel Oil	1	PAH	Acenaphthene	C2-v2	3.11E-05	1.69E-05	9.76E-05	8.45E-07	lbs/Mgal	4	117.74	74.81	0.99
Boiler, Fuel Oil	1	PAH	Acenaphthylene	C2-v0	1.08E-06	1.04E-06	1.44E-06	8.41E-07	lbs/Mgal	4	19.30	12.27	0.00
Boiler, Fuel Oil	1	PAH	Anthracene	C2-v1	2.27E-06	1.83E-06	5.23E-06	8.45E-07	lbs/Mgal	4	68.49	43.52	0.90
Boiler, Fuel Oil	1	PAH	Benzo(a)anthracene	C2-v1	2.08E-06	1.05E-06	1.30E-05	8.41E-07	lbs/Mgal	4	165.71	105.29	0.52

TABLE 19. POINT SOURCE EMISSION FACTORS.

Major Group	Sub Group	Category	Substance	ARB Rating	Mean	Median	Maximum	Minimum	Unit	Tests	RSD, %	Uncertainty, %	Det Ratio
Boiler, Fuel Oil	1	PAH	Benzo(a)pyrene	C2-v0	1.08E-06	1.04E-06	1.44E-06	8.41E-07	lbs/Mgal	4	19.30	12.27	0.00
Boiler, Fuel Oil	1	PAH	Benzo(b+k)fluoranthene	C2-v1	1.52E-06	1.05E-06	6.30E-06	8.41E-07	lbs/Mgal	4	99.78	63.40	0.34
Boiler, Fuel Oil	1	PAH	Benzo(g,h,i)perylene	C2-v0	1.29E-06	1.05E-06	3.57E-06	8.41E-07	lbs/Mgal	4	57.64	36.62	0.23
Boiler, Fuel Oil	1	PAH	Chrysene	C2-v0	1.14E-06	1.05E-06	1.68E-06	8.41E-07	lbs/Mgal	4	23.75	15.09	0.12
Boiler, Fuel Oil	1	PAH	Dibenz(a,h)anthracene	C2-v0	1.10E-06	1.05E-06	1.44E-06	8.41E-07	lbs/Mgal	4	19.23	12.22	0.09
Boiler, Fuel Oil	1	PAH	Fluoranthene	C2-v1	3.24E-06	1.66E-06	1.81E-05	8.45E-07	lbs/Mgal	4	148.20	94.16	0.87
Boiler, Fuel Oil	1	PAH	Fluorene	C2-v1	3.75E-06	3.40E-06	1.34E-05	8.41E-07	lbs/Mgal	4	95.91	60.94	0.90
Boiler, Fuel Oil	1	PAH	Indeno(1,2,3-cd)pyrene	C2-v0	1.26E-06	1.05E-06	3.19E-06	8.41E-07	lbs/Mgal	4	50.84	32.30	0.21
Boiler, Fuel Oil	1	PAH	Naphthalene	C2-v1	3.21E-03	1.95E-03	8.49E-03	5.66E-04	lbs/Mgal	4	88.66	56.33	1.00
Boiler, Fuel Oil	1	PAH	Phenanthrene	C2-v1	7.47E-06	6.32E-06	2.90E-05	8.45E-07	lbs/Mgal	4	102.17	64.92	0.97
Boiler, Fuel Oil	1	PAH	Pyrene	C2-v1	2.50E-06	1.33E-06	1.34E-05	8.45E-07	lbs/Mgal	4	141.21	89.72	0.78
Boiler, Fuel Oil	1	SVOC	Benzaldehyde	C3-v0	4.14E-03	5.10E-03	5.25E-03	2.06E-03	lbs/Mgal	1	43.45	107.92	0.00
Boiler, Fuel Oil	1	VOC	Acetaldehyde	C3-v0	5.33E-03	2.93E-03	1.02E-02	2.84E-03	lbs/Mgal	1	79.42	197.30	0.82
Boiler, Fuel Oil	1	VOC	Benzene	C2-v0	3.49E-04	3.63E-04	3.69E-04	3.15E-04	lbs/Mgal	3	7.29	5.61	0.00
Boiler, Fuel Oil	1	VOC	Formaldehyde	B2-v2	4.90E-02	4.46E-02	1.50E-01	2.58E-03	lbs/Mgal	3	104.74	80.51	1.00
Boiler, Fuel Oil	2	Dioxin/Furan	Dioxin:4D 2378	C3-v0	6.33E-10	5.71E-10	7.83E-10	5.46E-10	lbs/Mgal	1	20.50	50.93	0.00
Boiler, Fuel Oil	2	Dioxin/Furan	Dioxin:4D Total	A3-v0	5.87E-09	7.14E-09	7.59E-09	2.87E-09	lbs/Mgal	1	44.44	110.39	0.00
Boiler, Fuel Oil	2	Dioxin/Furan	Dioxin:5D 12378	C3-v0	3.68E-10	2.73E-10	5.71E-10	2.61E-10	lbs/Mgal	1	47.67	118.42	0.00
Boiler, Fuel Oil	2	Dioxin/Furan	Dioxin:5D Total	A3-v0	1.19E-08	1.28E-08	1.48E-08	8.11E-09	lbs/Mgal	1	28.95	71.92	0.00
Boiler, Fuel Oil	2	Dioxin/Furan	Dioxin:6D 123478	C3-v0	3.68E-10	2.73E-10	5.71E-10	2.61E-10	lbs/Mgal	1	47.67	118.42	0.00
Boiler, Fuel Oil	2	Dioxin/Furan	Dioxin:6D 123678	C3-v0	3.68E-10	2.73E-10	5.71E-10	2.61E-10	lbs/Mgal	1	47.67	118.42	0.25
Boiler, Fuel Oil	2	Dioxin/Furan	Dioxin:6D 123789	C3-v0	3.68E-10	2.73E-10	5.71E-10	2.61E-10	lbs/Mgal	1	47.67	118.42	0.25
Boiler, Fuel Oil	2	Dioxin/Furan	Dioxin:6D Total	A3-v0	1.47E-08	1.68E-08	1.87E-08	8.75E-09	lbs/Mgal	1	35.75	88.81	0.00
Boiler, Fuel Oil	2	Dioxin/Furan	Dioxin:7D 1234678	C3-v0	3.12E-09	2.86E-09	5.19E-09	1.30E-09	lbs/Mgal	1	62.77	155.93	1.00
Boiler, Fuel Oil	2	Dioxin/Furan	Dioxin:7D Total	A3-v0	5.98E-09	4.67E-09	8.61E-09	4.65E-09	lbs/Mgal	1	38.15	94.77	0.00
Boiler, Fuel Oil	2	Dioxin/Furan	Dioxin:8D	C3-v1	7.50E-08	8.28E-08	1.23E-07	1.93E-08	lbs/Mgal	1	69.66	173.05	1.00
Boiler, Fuel Oil	2	Dioxin/Furan	Furan:4F 2378	C3-v0	8.16E-10	7.83E-10	1.09E-09	5.71E-10	lbs/Mgal	1	32.18	79.95	1.00
Boiler, Fuel Oil	2	Dioxin/Furan	Furan:4F Total	A3-v0	3.26E-09	2.76E-09	4.49E-09	2.53E-09	lbs/Mgal	1	32.95	81.86	0.00

TABLE 19. POINT SOURCE EMISSION FACTORS.

Major Group	Sub Group	Category	Substance	ARB Rating	Mean	Median	Maximum	Minimum	Unit	Tests	RSD, %	Uncertainty, %	Det Ratio
Boiler, Fuel Oil	2	Dioxin/Furan	Furan:5F 12378	C3-v0	4.59E-10	5.46E-10	5.71E-10	2.61E-10	lbs/Mgal	1	37.52	93.21	0.00
Boiler, Fuel Oil	2	Dioxin/Furan	Furan:5F 23478	C3-v0	4.59E-10	5.46E-10	5.71E-10	2.61E-10	lbs/Mgal	1	37.52	93.21	0.00
Boiler, Fuel Oil	2	Dioxin/Furan	Furan:5F Total	A3-v0	7.02E-09	5.38E-09	1.11E-08	4.60E-09	lbs/Mgal	1	50.45	125.32	0.00
Boiler, Fuel Oil	2	Dioxin/Furan	Furan:6F 123478	C3-v0	3.64E-10	2.86E-10	5.46E-10	2.61E-10	lbs/Mgal	1	43.44	107.90	0.50
Boiler, Fuel Oil	2	Dioxin/Furan	Furan:6F 123678	C3-v0	2.73E-10	2.73E-10	2.86E-10	2.61E-10	lbs/Mgal	1	4.51	11.20	0.33
Boiler, Fuel Oil	2	Dioxin/Furan	Furan:6F 123789	C3-v0	3.68E-10	2.73E-10	5.71E-10	2.61E-10	lbs/Mgal	1	47.67	118.42	0.00
Boiler, Fuel Oil	2	Dioxin/Furan	Furan:6F 234678	C3-v0	5.51E-10	5.71E-10	8.20E-10	2.61E-10	lbs/Mgal	1	50.85	126.32	0.50
Boiler, Fuel Oil	2	Dioxin/Furan	Furan:6F Total	A3-v1	6.51E-09	5.48E-09	1.32E-08	8.65E-10	lbs/Mgal	1	95.60	237.47	0.00
Boiler, Fuel Oil	2	Dioxin/Furan	Furan:7F 1234678	C3-v0	1.44E-09	1.14E-09	2.09E-09	1.09E-09	lbs/Mgal	1	38.89	96.62	1.00
Boiler, Fuel Oil	2	Dioxin/Furan	Furan:7F 1234789	C3-v0	4.64E-10	2.73E-10	8.57E-10	2.61E-10	lbs/Mgal	1	73.43	182.42	0.00
Boiler, Fuel Oil	2	Dioxin/Furan	Furan:7F Total	A3-v0	3.39E-09	3.19E-09	3.85E-09	3.14E-09	lbs/Mgal	1	11.79	29.30	0.00
Boiler, Fuel Oil	2	Dioxin/Furan	Furan:8F	C3-v0	7.15E-09	7.14E-09	1.04E-08	3.91E-09	lbs/Mgal	1	45.27	112.46	1.00
Boiler, Fuel Oil	2	Metals	Antimony	C3-v1	1.09E-03	1.05E-03	2.21E-03	9.53E-05	lbs/Mgal	2	66.08	69.35	0.75
Boiler, Fuel Oil	2	Metals	Arsenic	C1-v2	5.89E-04	1.85E-04	3.64E-03	1.67E-05	lbs/Mgal	8	142.64	60.23	0.53
Boiler, Fuel Oil	2	Metals	Barium	C3-v1	1.51E-02	1.82E-02	2.80E-02	9.29E-04	lbs/Mgal	2	76.27	80.04	1.00
Boiler, Fuel Oil	2	Metals	Beryllium	C1-v2	4.20E-04	3.14E-05	3.35E-03	7.83E-06	lbs/Mgal	8	245.64	106.22	0.94
Boiler, Fuel Oil	2	Metals	Cadmium	C1-v4	3.43E-03	2.78E-04	5.02E-02	1.70E-06	lbs/Mgal	8	313.81	139.13	0.95
Boiler, Fuel Oil	2	Metals	Chromium (Hex)	B1-v2	3.50E-04	2.05E-04	1.21E-03	1.86E-05	lbs/Mgal	6	109.67	54.54	0.16
Boiler, Fuel Oil	2	Metals	Chromium (Total)	B1-v3	1.64E-03	8.97E-04	6.85E-03	3.75E-06	lbs/Mgal	8	119.71	50.55	0.84
Boiler, Fuel Oil	2	Metals	Cobalt	A3-v0	2.24E-03	2.51E-03	3.33E-03	8.77E-04	lbs/Mgal	1	55.77	138.55	1.00
Boiler, Fuel Oil	2	Metals	Copper	C1-v1	4.37E-03	1.97E-03	1.95E-02	8.92E-04	lbs/Mgal	8	107.52	45.40	1.00
Boiler, Fuel Oil	2	Metals	Lead	C1-v3	4.49E-03	6.41E-04	3.62E-02	5.00E-05	lbs/Mgal	8	223.04	94.18	0.87
Boiler, Fuel Oil	2	Metals	Manganese	C1-v3	4.38E-02	1.53E-03	5.47E-01	1.80E-04	lbs/Mgal	8	317.20	133.94	1.00
Boiler, Fuel Oil	2	Metals	Mercury	C1-v2	1.93E-04	9.01E-05	1.43E-03	5.22E-06	lbs/Mgal	8	161.66	68.26	0.67
Boiler, Fuel Oil	2	Metals	Molybdenum	A3-v0	5.13E-03	4.49E-03	7.05E-03	3.86E-03	lbs/Mgal	1	32.98	81.93	1.00
Boiler, Fuel Oil	2	Metals	Nickel	C1-v3	1.30E-01	2.51E-02	4.70E-01	1.62E-04	lbs/Mgal	8	123.42	52.12	0.99
Boiler, Fuel Oil	2	Metals	Phosphorus	D3-v0	2.86E-02	2.51E-02	3.74E-02	2.33E-02	lbs/Mgal	1	26.90	66.81	1.00
Boiler, Fuel Oil	2	Metals	Selenium	C1-v3	3.23E-03	4.00E-04	4.49E-02	2.28E-05	lbs/Mgal	8	285.39	120.51	0.64

TABLE 19. POINT SOURCE EMISSION FACTORS.

Major Group	Sub Group	Category	Substance	ARB Rating	Mean	Median	Maximum	Minimum	Unit	Tests	RSD, %	Uncertainty, %	Det Ratio
Boiler, Fuel Oil	2	Metals	Silver	C3-v1	8.09E-04	6.49E-04	1.85E-03	1.49E-04	lbs/Mgal	2	89.08	93.48	0.94
Boiler, Fuel Oil	2	Metals	Thallium	C3-v1	9.91E-04	1.14E-03	1.86E-03	9.76E-05	lbs/Mgal	2	78.56	82.45	0.00
Boiler, Fuel Oil	2	Metals	Vanadium	A3-v0	7.68E-02	9.35E-02	1.13E-01	2.41E-02	lbs/Mgal	1	60.74	150.89	1.00
Boiler, Fuel Oil	2	Metals	Zinc	C1-v3	8.66E-02	2.05E-02	1.09E+00	7.17E-04	lbs/Mgal	8	262.73	110.94	1.00
Boiler, Fuel Oil	2	PAH	Acenaphthene	B1-v2	2.30E-05	1.95E-06	8.51E-05	3.34E-07	lbs/Mgal	9	137.19	54.27	0.04
Boiler, Fuel Oil	2	PAH	Acenaphthylene	B1-v3	3.13E-05	1.98E-06	1.83E-04	3.80E-08	lbs/Mgal	9	138.96	54.97	0.24
Boiler, Fuel Oil	2	PAH	Anthracene	B1-v3	2.32E-05	1.50E-06	8.51E-05	1.85E-08	lbs/Mgal	9	136.48	53.99	0.04
Boiler, Fuel Oil	2	PAH	Benzo(a)anthracene	B1-v4	2.24E-05	1.26E-06	8.51E-05	5.80E-09	lbs/Mgal	9	142.98	56.56	0.01
Boiler, Fuel Oil	2	PAH	Benzo(a)pyrene	B1-v3	2.50E-05	2.37E-06	8.51E-05	2.60E-08	lbs/Mgal	9	124.08	49.09	0.11
Boiler, Fuel Oil	2	PAH	Benzo(b)fluoranthene	B1-v2	2.93E-05	3.46E-06	8.51E-05	3.34E-07	lbs/Mgal	7	113.75	51.78	0.03
Boiler, Fuel Oil	2	PAH	Benzo(b+k)fluoranthene	C3-v0	1.60E-06	1.11E-06	4.15E-06	8.46E-07	lbs/Mgal	2	80.01	83.96	0.43
Boiler, Fuel Oil	2	PAH	Benzo(e)pyrene	C3-v1	9.40E-07	7.21E-07	2.66E-06	1.28E-07	lbs/Mgal	2	99.48	104.40	0.00
Boiler, Fuel Oil	2	PAH	Benzo(g,h,i)perylene	B1-v3	2.29E-05	2.02E-06	8.51E-05	1.45E-07	lbs/Mgal	9	138.79	54.90	0.02
Boiler, Fuel Oil	2	PAH	Benzo(k)fluoranthene	B1-v4	2.83E-05	7.58E-07	8.51E-05	2.90E-09	lbs/Mgal	7	120.61	54.90	0.00
Boiler, Fuel Oil	2	PAH	Chrysene	B1-v2	2.56E-05	5.87E-06	8.51E-05	5.45E-07	lbs/Mgal	9	119.24	47.17	0.13
Boiler, Fuel Oil	2	PAH	Dibenz(a,h)anthracene	B1-v2	2.28E-05	1.50E-06	8.51E-05	2.07E-07	lbs/Mgal	9	139.32	55.11	0.02
Boiler, Fuel Oil	2	PAH	Fluoranthene	B1-v2	2.78E-05	1.49E-05	9.64E-05	8.46E-07	lbs/Mgal	9	110.81	43.83	0.27
Boiler, Fuel Oil	2	PAH	Fluorene	B1-v2	3.18E-05	8.18E-06	8.59E-05	8.93E-07	lbs/Mgal	9	104.18	41.21	0.31
Boiler, Fuel Oil	2	PAH	Indeno(1,2,3-cd)pyrene	B1-v3	2.25E-05	1.26E-06	8.51E-05	1.52E-07	lbs/Mgal	9	141.68	56.05	0.01
Boiler, Fuel Oil	2	PAH	Naphthalene	B1-v4	4.95E-03	1.28E-04	5.09E-02	8.76E-06	lbs/Mgal	9	271.16	107.27	1.00
Boiler, Fuel Oil	2	PAH	Phenanthrene	B1-v2	4.38E-05	1.99E-05	3.46E-04	1.94E-06	lbs/Mgal	9	152.14	60.19	0.57
Boiler, Fuel Oil	2	PAH	Pyrene	B1-v3	2.35E-05	1.92E-06	8.51E-05	1.57E-07	lbs/Mgal	9	133.76	52.91	0.05
Boiler, Fuel Oil	2	SVOC	2-Chloronaphthalene	C3-v1	1.53E-07	1.27E-07	3.99E-07	1.63E-08	lbs/Mgal	2	101.95	106.99	0.00
Boiler, Fuel Oil	2	SVOC	2-Methylnaphthalene	C3-v1	7.99E-05	5.49E-05	1.94E-04	9.76E-06	lbs/Mgal	2	102.17	107.22	1.00
Boiler, Fuel Oil	2	SVOC	Ethylbenzene	A3-v1	1.42E-03	1.81E-03	2.14E-03	3.11E-04	lbs/Mgal	1	68.59	170.39	1.00
Boiler, Fuel Oil	2	SVOC	Perylene	C3-v2	5.13E-07	5.42E-08	2.68E-06	3.77E-08	lbs/Mgal	2	206.85	217.07	0.00
Boiler, Fuel Oil	2	VOC	1,3-Butadiene	B3-v1	6.17E-03	5.97E-03	1.18E-02	8.95E-04	lbs/Mgal	2	93.74	98.38	0.00
Boiler, Fuel Oil	2	VOC	Acetaldehyde	A2-v1	2.31E-03	1.31E-03	5.20E-03	2.80E-04	lbs/Mgal	3	92.98	71.47	0.22

TABLE 19. POINT SOURCE EMISSION FACTORS.

Major Group	Sub Group	Category	Substance	ARB Rating	Mean	Median	Maximum	Minimum	Unit	Tests	RSD, %	Uncertainty, %	Det Ratio
Boiler, Fuel Oil	2	VOC	Acrolein	A3-v0	3.52E-03	3.82E-03	5.20E-03	1.43E-03	lbs/Mgal	2	46.55	48.85	0.00
Boiler, Fuel Oil	2	VOC	Benzene	B1-v3	3.32E-02	4.72E-03	5.17E-01	4.26E-04	lbs/Mgal	8	305.12	123.24	0.95
Boiler, Fuel Oil	2	VOC	Chloroform	A3-v0	4.96E-03	5.00E-03	5.10E-03	4.78E-03	lbs/Mgal	1	3.26	8.11	0.00
Boiler, Fuel Oil	2	VOC	Formaldehyde	A1-v3	5.25E-02	7.13E-03	4.92E-01	1.48E-04	lbs/Mgal	7	229.86	104.63	0.96
Boiler, Fuel Oil	2	VOC	Propylene	A3-v0	2.19E-02	2.21E-02	2.25E-02	2.11E-02	lbs/Mgal	1	3.26	8.11	0.00
Boiler, Fuel Oil	2	VOC	Toluene	A3-v0	7.30E-03	5.85E-03	1.23E-02	4.68E-03	lbs/Mgal	2	40.73	42.74	0.61
Boiler, Fuel Oil	2	VOC	Xylene (Total)	A3-v0	9.28E-03	1.09E-02	1.14E-02	2.42E-03	lbs/Mgal	2	37.75	39.62	0.41
Boiler, Landfill Gas	1	Dioxin/Furan	Dioxin:4D 2378	C3-v0	6.68E-07	6.43E-07	7.27E-07	6.34E-07	lbs/MMcf	1	7.73	19.20	0.00
Boiler, Landfill Gas	1	Dioxin/Furan	Dioxin:4D Total	C3-v0	6.68E-07	6.43E-07	7.27E-07	6.34E-07	lbs/MMcf	1	7.73	19.20	0.00
Boiler, Landfill Gas	1	Dioxin/Furan	Dioxin:5D 12378	C3-v0	6.68E-07	6.43E-07	7.27E-07	6.34E-07	lbs/MMcf	1	7.73	19.20	0.00
Boiler, Landfill Gas	1	Dioxin/Furan	Dioxin:5D Total	C3-v0	6.68E-07	6.43E-07	7.27E-07	6.34E-07	lbs/MMcf	1	7.73	19.20	0.00
Boiler, Landfill Gas	1	Dioxin/Furan	Dioxin:6D 123678	C3-v0	6.68E-07	6.43E-07	7.27E-07	6.34E-07	lbs/MMcf	1	7.73	19.20	0.00
Boiler, Landfill Gas	1	Dioxin/Furan	Dioxin:6D Total	C3-v0	6.68E-07	6.43E-07	7.27E-07	6.34E-07	lbs/MMcf	1	7.73	19.20	0.00
Boiler, Landfill Gas	1	Dioxin/Furan	Dioxin:7D 1234678	C3-v0	1.34E-06	1.29E-06	1.45E-06	1.27E-06	lbs/MMcf	1	7.73	19.20	0.00
Boiler, Landfill Gas	1	Dioxin/Furan	Dioxin:7D Total	C3-v0	1.34E-06	1.29E-06	1.45E-06	1.27E-06	lbs/MMcf	1	7.73	19.20	0.00
Boiler, Landfill Gas	1	Dioxin/Furan	Dioxin:8D	C3-v0	1.34E-06	1.29E-06	1.45E-06	1.27E-06	lbs/MMcf	1	7.73	19.20	0.00
Boiler, Landfill Gas	1	Dioxin/Furan	Furan:4F 2378	C3-v0	6.68E-07	6.43E-07	7.27E-07	6.34E-07	lbs/MMcf	1	7.73	19.20	0.00
Boiler, Landfill Gas	1	Dioxin/Furan	Furan:4F Total	C3-v0	6.68E-07	6.43E-07	7.27E-07	6.34E-07	lbs/MMcf	1	7.73	19.20	0.00
Boiler, Landfill Gas	1	Dioxin/Furan	Furan:5F 12378	C3-v0	6.68E-07	6.43E-07	7.27E-07	6.34E-07	lbs/MMcf	1	7.73	19.20	0.00
Boiler, Landfill Gas	1	Dioxin/Furan	Furan:5F Total	C3-v0	6.68E-07	6.43E-07	7.27E-07	6.34E-07	lbs/MMcf	1	7.73	19.20	0.00
Boiler, Landfill Gas	1	Dioxin/Furan	Furan:6F 123678	C3-v0	6.68E-07	6.43E-07	7.27E-07	6.34E-07	lbs/MMcf	1	7.73	19.20	0.00
Boiler, Landfill Gas	1	Dioxin/Furan	Furan:6F Total	C3-v0	6.68E-07	6.43E-07	7.27E-07	6.34E-07	lbs/MMcf	1	7.73	19.20	0.00
Boiler, Landfill Gas	1	Dioxin/Furan	Furan:7F 1234678	C3-v0	1.34E-06	1.29E-06	1.45E-06	1.27E-06	lbs/MMcf	1	7.73	19.20	0.00
Boiler, Landfill Gas	1	Dioxin/Furan	Furan:7F Total	C3-v0	1.34E-06	1.29E-06	1.45E-06	1.27E-06	lbs/MMcf	1	7.73	19.20	0.00
Boiler, Landfill Gas	1	Dioxin/Furan	Furan:8F	C3-v0	1.34E-06	1.29E-06	1.45E-06	1.27E-06	lbs/MMcf	1	7.73	19.20	0.00
Boiler, Landfill Gas	1	Metals	Arsenic	D3-v0	3.62E-03	3.70E-03	3.94E-03	3.22E-03	lbs/MMcf	1	10.15	25.22	1.00
Boiler, Landfill Gas	1	Metals	Beryllium	D3-v0	5.33E-04	2.56E-04	1.10E-03	2.43E-04	lbs/MMcf	1	92.06	228.68	0.00
Boiler, Landfill Gas	1	Metals	Cadmium	D3-v0	5.43E-03	6.42E-03	6.70E-03	3.18E-03	lbs/MMcf	1	35.96	89.34	1.00