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Baseline Testing Emission Results
Pre-Production Foundry

Technikon # 0001-003 NA

November 1, 1999

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CERP

Casting Emission Reduction Program

Baseline Testing Emission Results

Pre-production Foundry

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

Appendix A: Emission Test Results

Appendix B: Listing of Support Documents

Appendix C: Approved Test Plans

Appendix D: List of Analytes

Executive Summary

This report contains the results of baseline emission tests conducted at the Casting Emission Reduction Program (CERP) Pre-production Foundry. These baseline tests were conducted by CERP, a cooperative initiative between the Department of Defense (McClellan Air Force Base) and the United States Council for Automotive Research (USCAR). CERP's purpose is to evaluate alternative casting materials and processes that are designed to reduce air emissions from foundries and/or improve the efficiency of casting processes. Other technical partners directly supporting the CERP project include: the American Foundrymen's Society (AFS); the Casting Industry Suppliers Association (CISA); the US Environmental Protection Agency (USEPA); and the California Air Resources Board (CARB).

The specific objective of the baseline tests was to establish air emission data against which the air emissions from new materials, equipment and processes, designed to reduce organic Hazardous Air Pollutants (HAPs) and Volatile Organic Compounds (VOCs), could be compared. This report documents the following four baseline test series:

- A background baseline test series [mold without seacoal/sodium silicate core]
- A greensand baseline test series [mold with seacoal/sodium silicate core]
- A core baseline test series [mold without seacoal/ phenolic urethane cold box core]
- A greensand plus core baseline test series [mold with seacoal/ phenolic urethane cold box core]

The CERP Pre-production Foundry is a simple, general purpose manual foundry, which was adapted and instrumented to allow the collection of detailed particulate and organic emission measurements, using methods based on USEPA air testing protocols. Measurements were taken during pouring, casting, cooling, and shakeout processes performed on discreet mold and core packages under tightly controlled conditions not feasible in a commercial foundry. When the testing of a new material is undertaken by CERP to evaluate its air emissions reduction potential, the new material is first tested in the Pre-production Foundry. The results of air testing at the Pre-production Foundry are evaluated and compared to the applicable emissions baseline data to determine whether the new material under consideration is promising enough, with regards to reductions in air emissions, to warrant further testing at CERP's Production Foundry.

The baseline testing performed at the Pre-production Foundry involved the collection of continuous air samples over a 75-minute period (a sampling event), which included the mold pouring, cooling, shakeout, and post shakeout periods. The process and stack parameters measured included: the weights of the casting, mold, seacoal additions, and core; Loss on Ignition (LOI) values for the mold prior to the test and after shakeout; LOI for the core; percent clay content; metallurgical data; and stack temperature, pressure, volumetric flow rate, and moisture content. The process parameters and the stack flow rate were maintained within prescribed ranges in order to ensure the reproducibility of the tests. A minimum of nine individual sampling events were conducted for each of the baseline test series using procedures based on standard USEPA stack test methods. Test and duplicate air samples were collected for

each of the sampling events. The samples were analyzed for individual organic HAPs and VOCs using methods based on USEPA Method 18 and Method TO11 by an independent laboratory. The laboratory data were validated and reduced to a useable set, according to CERP's validation process. The mass emission rate, in pounds of analyte per ton of metal poured, was calculated for each analyte using the validated laboratory analytical results, measured stack parameters, and the weights of the castings. Total organic HAP emissions were determined from the sum of the individual HAPs measured. Total VOCs were determined based on the sum of the individual VOCs measured. Table 1 and Figure 1 present a summary of the results of the four baseline tests.

Table 1 - Average Baseline Test Results, lbs/ton metal

Analyte	Background Baseline	Greensand Baseline	Core Baseline	Greensand/ Core Baseline
Sum of VOCs	0.0312	0.4722	0.4708	0.8324
Sum of HAPs	0.0249	0.3160	0.3161	0.5424
Benzene	0.0061	0.1244	0.1389	0.2202
Toluene	0.0031	0.0836	0.0324	0.1059
m,p-Xylene	0.0019	0.0436	0.0130	0.0585
Aniline	NT	NT	0.0917	0.0533
Phenol/3-Ethyltoluene	0.0003	0.0147	0.0137	0.0226
o-Xylene	0.0007	0.0184	0.0033	0.0205
Ethyl Benzene	0.0005	0.0099	0.0015	0.0115
Naphthalene	0.0011	0.0153	0.0226	0.0113
Acetaldehyde	0.0087	0.0077	0.0060	0.0096

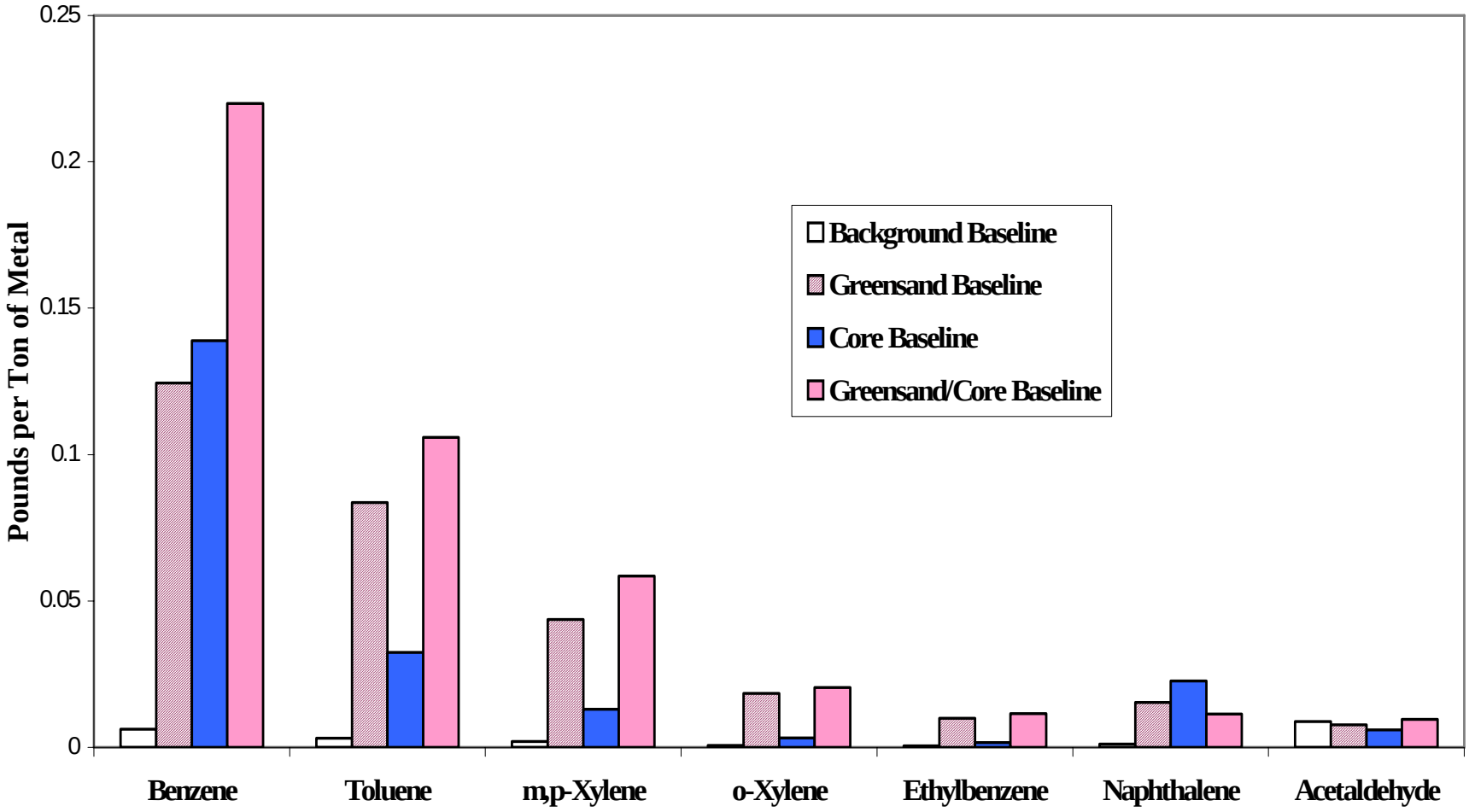
Note: The results presented are not suitable for use as general emission factors.
NT = Not Tested

The relative variability of the measured process parameters and of the analytical test results indicates that the baseline tests presented in this report were run within acceptable control ranges and, therefore, provide a suitable basis for future comparative evaluations. The greensand, core, and greensand/core baselines will be the primary air emission data sets used for comparisons with air emission data generated from testing corresponding alternative materials, equipment and processes at the Pre-production Foundry.

The results of the testing conducted at both the Pre-production and Production foundries are not suitable for use as general emission factors. The specific materials used (grey iron from an electric melt furnace, greensand with seacoal, a relatively heavy core weight, and a cold box core produced with a relatively old resin binding system); the specific castings produced (an eight-on step block in the Pre-production Foundry and an I-4 automotive block in the Production Foundry); the specific production processes employed (a stationary hand poured mold in the Pre-production Foundry and an impact mold line in the Production Foundry); and the specific testing

conditions (relatively low stack velocity, long sampling times, high capture rates, and combined emissions from pouring, cooling and shakeout processes at the Pre-production Foundry) produce emission results unique to the materials, castings, casting processes, and measurement conditions used. The data produced are intended to demonstrate the relative emission reductions from the use of alternative materials, equipment and processes, and not the absolute emission levels that would be experienced in commercial foundries. A number of process parameters such as casting surface area, sand to metal ratios, pouring temperatures, stack flow rates, LOI levels, seacoal and resin contents, and the type of foundry (Cope & Drag versus Disa for example) can have a significant impact on actual emission levels. CERP does plan to evaluate and, if possible, quantify the impacts of several of these parameters to assist the foundry industry as well as regulatory agencies in their understanding of the importance of these parameters on air emission levels.

Figure 1 – Average Baseline Test Results



Note: The results presented are not suitable for use as general emission factors.

1.0 Introduction

1.1 Background

The Casting Emission Reduction Program (CERP) is a cooperative initiative between the Department of Defense (McClellan Air Force Base) and the United States Council for Automotive Research (USCAR). Its purpose is to evaluate alternative casting materials and processes that are designed to reduce air emissions from foundries and/or improve the efficiency of casting processes. Other technical partners directly supporting the project include: the American Foundrymen's Society (AFS); the Casting Industry Suppliers Association (CISA); the US Environmental Protection Agency (USEPA); and the California Air Resources Board (CARB). Each of these partners is represented on a Steering Committee that has oversight for the testing conducted at the CERP facility.

1.2 CERP Objectives

The primary objective of CERP is to evaluate the impact on air emissions of materials, equipment, and processes to be used in the production of metal castings. Specifically, the CERP facility has been created to evaluate alternate materials and production processes designed to achieve significant air emission reductions, especially for organic Hazardous Air Pollutants (HAPs). The HAP emission reduction goal for the alternative materials, equipment, and production processes is fifty percent as compared to the emissions from a comparable baseline test. The facility has two principal testing arenas: a Pre-production Foundry designed to measure airborne emissions from individually poured molds, and a Production Foundry designed to measure air emissions in a continuous, full-scale production process. Each of these testing arenas has been specifically designed to facilitate the collection and evaluation of airborne emissions, and associated process data. Candidate materials and/or processes are screened for emission reductions in the Pre-production Foundry and then further validated in the Production Foundry. The data collected during the various testing projects are evaluated to determine the impact of the alternate materials and/or processes on air emissions as well as on the quality and economics of casting and core manufacture. These alternate materials, equipment, and processes may need to be further adapted and defined so that they will integrate into current commercial greensand casting facilities smoothly and with minimum capital expenditure.

Pre-production testing is conducted in order to evaluate the impact on air emissions from a proposed alternative material, equipment, or process. The CERP Pre-production Foundry is a simple, general purpose manual foundry that was adapted and instrumented to allow the collection of detailed emission measurements using methods based on USEPA air testing protocols. Measurements are taken during pouring, casting cooling, and shakeout processes performed on discreet mold and core packages under tightly controlled conditions not feasible in a commercial foundry. The Pre-production Foundry uses an eight-on, bottom-feed AFS step block as its test mold pattern.

Alternative materials, equipment, and processes which, during their testing at the Pre-production

Foundry, demonstrate significant air emission reduction potential, preserve casting quality parameters, and are economically viable are further evaluated in the Production Foundry. The Production Foundry's design as a basic green sand foundry was deliberately chosen so that whatever is tested in the Production Foundry could be easily converted for use in existing mechanized commercial foundries. The Production Foundry emulates an automotive foundry in the type and size of equipment, materials, and processes used. The Production Foundry uses a single cavity automotive I-4 engine block as its test mold pattern. The Production Foundry is used to further evaluate materials, equipment, and processes in a continuous real-world production-like environment. The Production Foundry provides simultaneous, detailed, individual emission measurements, according to methods based on USEPA air testing protocols, of the melting, pouring, sand preparation, mold making, and core making processes. The Production Foundry is instrumented so that process data on all activities of the metal casting process can be simultaneously and continuously collected in order to complete an economic impact evaluation of the prospective emission reducing strategy. Castings are randomly selected to evaluate the impact of the alternate material, equipment, or process on the quality of the casting.

The results of the testing conducted at both the Pre-production and Production foundries are not suitable for use as general emission factors. The specific materials used (grey iron from an electric melt furnace, greensand with seacoal, a relatively heavy core weight, a cold box core with a relatively old resin binding system); the specific castings produced (an eight-on step block in the Pre-production Foundry and an I-4 automotive block in the Production Foundry); the specific production processes employed (a stationary hand poured mold in the Pre-production Foundry and an impact mold line in the Production Foundry); and the specific testing conditions (relatively low stack velocity, long sampling times, high capture rates, and combined emissions from pouring, cooling and shakeout processes at the Pre-production Foundry) produce emission results unique to the materials, castings, casting processes, and measurement conditions used. The data produced are intended to demonstrate the relative emission reductions from the use of alternative materials, equipment, and processes, not the absolute emission levels that would be experienced in commercial foundries. A number of process parameters such as casting surface area, sand to metal ratios, pouring temperatures, stack flow rates, LOI levels, seacoal and resin contents, and the type of foundry (Cope & Drag versus Disa for example) can have a significant impact on actual emission levels. CERP does plan to evaluate and, if possible, quantify the impacts of several of these parameters to assist the foundry industry as well as regulatory agencies in their understanding of the importance of these parameters on air emission levels.

1.3 Report Organization

This report has been designed to document the methodology used and results obtained during baseline testing in the Pre-production Foundry. Section 1 presents a general overview of baseline testing, while Section 2 of this report includes a summary of the methodologies used for data collection and analysis, emission calculations, quality assurance, quality control (QA/QC) procedures, and data management and reduction methods. Process data and baseline emissions measurement results are presented in Section 3 of this report, with detailed emissions data included in Appendix A. Section 4 of the report contains a discussion of the results of the baseline tests including conclusions drawn from the interpretation of the results.

The raw data, as well as the data validation and reduction steps used, for the four baseline test series presented in this report are included in the individual test series data binders which are maintained at the CERP facility. There are also several support documents, which provide details regarding the testing and analytical procedures used. Appendix B contains a listing of these documents.

1.4 Preliminary Testing

The baseline tests presented in this report were performed according to the "CERP Pre-production Testing Protocols". These protocols were established by CERP, following the performance of a series of preliminary tests. It has been determined by CERP that nine replicate tests will provide a statistically significant sample for the purpose of evaluating the emission reductions from alternative materials, equipment and processes. The number of replicate tests may vary, based on the confidence interval necessary to ensure that the test protocols can indeed detect a 50% reduction in emissions. The results of the testing conducted in support of this conclusion are included in the document "CERP Pre-production Testing Protocols."

1.5 Specific Baseline Test Plan and Objectives

This report contains the results of testing performed to assess the emissions for the following four baseline scenarios:

- A "Background Baseline" using new Bridgeman IL5W lake sand, clay, and water mold with no know organic components. Cores are J.B. DeVeene Kleencast #1 organic-free sodium silicate cores made with Bridgeman IL5W lake sand.

- A "Greensand Baseline" using CERP System Sand with H&G seacoal. Cores are J.B. DeVeene Kleencast #1 organic-free sodium silicate cores made with Bridgeman IL5W lake sand.

- A "Core Baseline" using new Bridgeman IL5W Lake sand, clay and water mold. Cores are Ashland Chemical Company ISOCURE® LF305/904GR cores (1.75 % resin BOS) made with Bridgeman IL5W lake sand.

- A "Core/Greensand baseline" using CERP System Sand with H&G seacoal. Ashland Chemical Company ISOCURE® LF305/904GR cores (1.75 % resin BOS). Cores are Ashland Chemical Company ISOCURE® LF305/904GR cores (1.75 % resin BOS) made with Bridgeman IL5W lake sand.

The ISOCURE® binder system used for these baselines is relatively old and no longer in wide distribution. It was selected based on its use with the selected test pattern. Table 1-2 provides a summary of the Test Plans for the four baseline scenarios. The details of the approved test plans are included in Appendix C.

Table 1-2 Pre-production Baseline Test Plan Summary

	Background Baseline	Greensand Baseline	Core Baseline	Greensand/Core Baseline
Test Series	AM	AY	AP	AU
Test Dates	September 8-10, 1998	March 2-4, 1999	October 20-22, 1998	November 17-18, 1998
Number of molds poured	9	9	10	9
Mold Type	Bridegeman IL5W Lakesand H&G Clay, Water	CERP System Sand with H&G clay, water, seacoal	Bridegeman IL5W Lakesand H&G Clay, Water	CERP System Sand with H&G clay, water, seacoal
Core Type	Organic Free Sodium Silicate J.B. DeVeene Kleen Cast #1	Organic Free Sodium Silicate J.B. DeVeene Kleen Cast #1	Ashland Chemical Company ISOCURE® LF305/904GR Cores[a]	Ashland Chemical Company ISOCURE® LF305/904GR Cores[a]
Casting Type	Eight-on bottom-feed AFS step block			
Emissions Measured	70 organic HAPs and VOCs			
Process and Stack Parameters Measured	Total Casting, Mold and Core Weights, Metallurgical data, Mold and Core Component Weights, % LOI (mold and core) , % Clay, Stack Temperature, Stack Moisture Content, Stack Pressure, and Stack Volumetric Flow Rate			

[a] The ISOCURE® LF305/904GR binder system used for these baselines is relatively old and no longer in wide distribution. It was selected based on its use with the selected test pattern.

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2.0 Test Methodology

2.1 Description of Process and Testing Equipment

Figure 2-1 is a flow diagram of the Pre-production Foundry process.

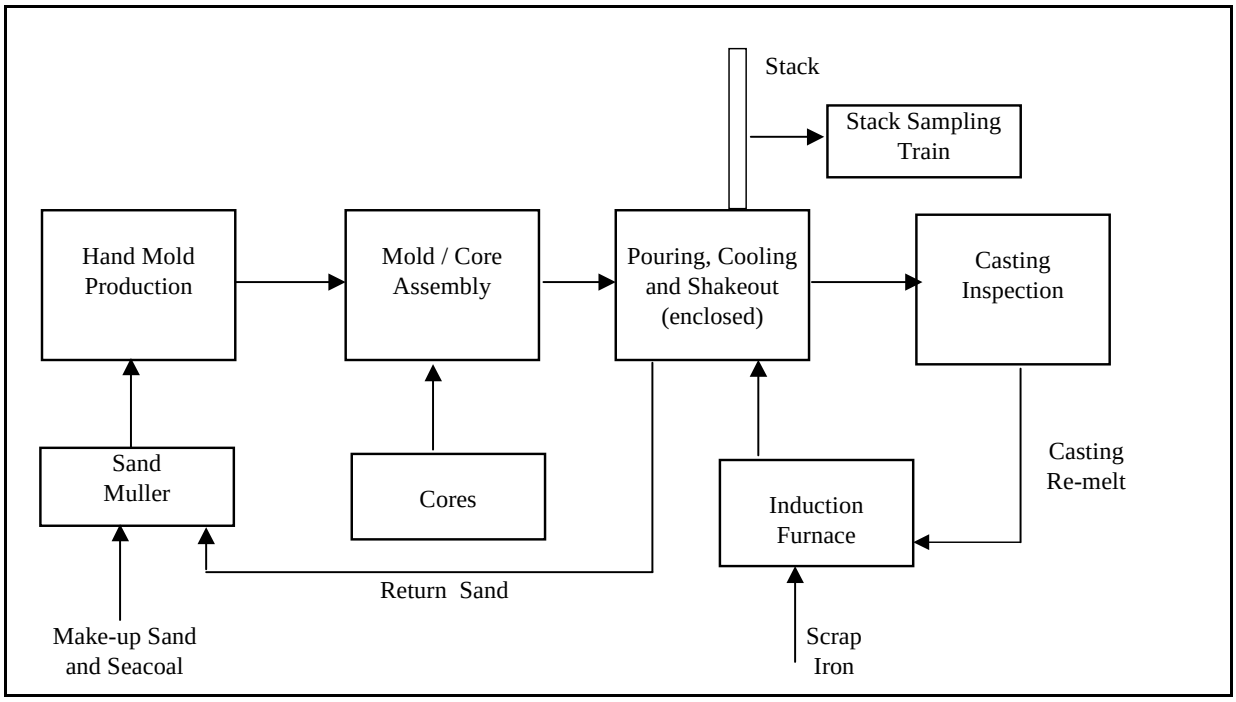


Figure 2-1 Pre-Production Foundry Process Flowchart

2.2 Description of Testing Program

The specific steps used in this sampling program are summarized below:

1. **Mold, Core and Metal Preparation:** The molds and cores were prepared to a standard composition by the CERP testing team. The cores were made by hand to approximate blown density, and relevant process data were collected. For the core baselines, the cores were placed in new lake sand/clay/water molds. For the greensand baselines, organic free sodium silicate step-block cores were placed into the molds.

   Iron was melted in a 1000 lb Ajax induction furnace (Model MFB-1000). The amount of metal melted was determined from the poured weight of the casting and the number of molds to be poured. The metal composition was provided on a metal composition worksheet. The weight of metal poured into each mold was recorded on the process data summary sheet.

2. **Individual Sampling Events:** Nine replicate tests for each test series were performed on

nine mold/core packages, with the exception of the Core Baseline series for which ten replicate tests were run. The mold/core package (flasks) were placed in an enclosed test stand. Iron was poured through an opening in the top of the enclosure, which was closed as soon as pouring was completed. Continuous air samples were collected during the forty-five (45) minute pouring and cooling process, during the fifteen (15) minute shakeout of the mold process, and for an additional fifteen (15) minute period following shakeout. The total sampling time was seventy-five (75) minutes. The finished castings were cleaned and quality checks of the castings were performed. The weights of the molds, cores, seacoal additions, and core binder were recorded for each mold on the Process Data Summary Sheet. In addition, the number of cavities poured, the % LOI, and % clays of the mold before pouring and after shakeout, and the % LOI of the core were recorded on the Process Data Summary Sheet.

The unheated emission hood was ventilated through a 12-inch diameter heated duct. Emissions samples were drawn from a sampling port located to ensure conformance with USEPA Method 1. The tip of the probe was located at a sampling point that meets the criterion required by USEPA Method 18. The samples were collected at a constant rate in adsorption tubes (test sample and duplicate sample).

3. **Process Parameter Measurements:** Table 2-1 lists the process parameters that were monitored during each test. The analytical equipment and methods used are also listed.

Table 2-1 Process Parameters Measured

Parameter	Analytical Equipment and Methods
Core Weight	Mettler PJ8000 Digital Scale (Gravimetric)
Mold Weight	Acme 4260 Crane Scale (Gravimetric)
Casting Weight	Westweigh PP2847 Platform Scale (Gravimetric)
Seacoal Weight	Toledo PAC-DPC-606050 balance (Gravimetric)
Binder Weight	Mettler PJ8000 Digital Scale (Gravimetric)
LOI% at mold and shakeout	Mettler Pb302 Scale (AFS procedure 212-87-S)
Core LOI%	Denver Instruments XE-100 Analytical Scale (AFS procedure 312-87-S)
Clay, % at mold and shakeout	Dietert 535A MB Clay Tester (AFS Procedure 210-89-5)
Metallurgical Parameters	
Pouring temperature	Electro-Nite DT 260 (T/C immersion pyrometer)
Carbon/Silica	Electro-Nite Datacast 2000 (Thermal Arrest)
Alloy Weights	Mettler PJ8000 (Gravimetric)
Mold Compactability	Dietert 319A Sand Squeezer (AFS procedure 221-87-S)

4. **Air Emissions Analysis:** The specific sampling and analytical methods used in the Pre-production Foundry tests were based on the USEPA reference methods shown in Table 2-2. The details of the specific testing procedures and their variance from the reference methods are included in the "CERP Testing, Quality Control and Quality Assurance, and Data Validation Procedures Manual". Appendix D contains a list of target analytes and their detection limits.

Table 2-2 Sampling and Analytical Methods

Measurement Parameter	Test Method
Port location	USEPA Method 1
Number of traverse points	USEPA Method 1
Gas velocity and temperature	USEPA Method 2
Gas density and molecular weight	USEPA Method 3a
Gas moisture	USEPA Method 4 gravimetric (wet bulb/dry bulb version)
HAPs analysis	USEPA Method 18 and TO11*
VOCs analysis	USEPA Method 18 and TO11*

* These methods were specifically modified to meet the testing objectives of the CERP program.

5. **Data Reduction, Tabulation and Preliminary Report Preparation:** The analytical results of the emissions tests provide the mass of each analyte in the sample. The total mass of the analyte emitted is calculated by multiplying the mass of analyte in the sample times the ratio of total stack gas volume to sample volume. The total stack gas volume is calculated from

the measured stack gas velocity and duct diameter, and corrected to dry standard conditions using the measured stack pressures, temperatures, gas molecular weight, and moisture content. The total mass of analyte is then divided by the weight of the casting poured to provide emissions data in pounds of analyte per ton of metal poured. The specific calculation formulas are included in, "CERP Testing, Quality Control and Quality Assurance, and Data Validation Procedures Manual."

The results of validated duplicate samples for individual sampling events of a given series were averaged to provide the result for each analyte for each of the sampling events. The results for each analyte from the nine sampling events of a series were also averaged, to provide the analyte's average mass for the entire series. The averaged results of each of the sampling events and the corresponding series averages are included in Section 3 of this report.

6. **Report Preparation and Review**: The Preliminary Draft Report was reviewed by the Emissions Supervisor and the Process Supervisor to ensure its completeness, consistency with the test plans, and adherence to the prescribed QA/QC procedures. Appropriate observations, conclusions and recommendations were added to the report to produce a Draft Report. The Draft Report was reviewed by the Research Manager, Operations Manager, Program Manager, Facilities and Process Team Chair, and Emissions Team Chair. Comments were incorporated into the Final Report.

2.3 Quality Assurance and Quality Control (QA/QC) Procedures

Detailed QA/QC and data validation procedures for the process parameters and stack measurements, and for the laboratory analytical procedures and data are included in the "CERP Testing, Quality Control and Quality Assurance, and Data Validation Procedures Manual". In order to ensure that timely review of critical quality control parameters were achieved, the following procedures were followed:

- Immediately following the individual sampling events performed for each baseline test, specific process parameters were reviewed by the Process Supervisor to ensure that the parameters were maintained within the prescribed control ranges. Where data were not within the prescribed ranges, the Process Supervisor and the Operations Manager determined whether the individual test samples should be invalidated or flagged for further analysis following review of the laboratory data.

- The stack and sampling parameters, analytical results and corresponding laboratory QA/QC data were reviewed by the Emissions Measurement Team to confirm the validity of the data. The Research Manger and Operations Manager determined whether individual sample data should be invalidated, and any invalidated data were rejected from the database.

3.0 Test Results

The air emission results from the four baseline test series, in pounds of analyte per ton of metal poured, are presented in Table 3-1 (a through d). Table 3-1 includes organic HAP compounds and non-HAP VOCs, which together comprise at least 95% of the mass of the VOCs measured during that baseline. Appendix A contains tables presenting the results for all analytes measured during each test. There were nine individual tests run for each of the four baseline series, except for the Core Baseline for which there were ten individual tests (Table 3-1c). While there were nine individual tests run for the Greensand/Core Baseline, Table 3-1d presents only seven tests, because two of the tests were rejected based on data validation considerations. Table 3-2 presents the measured process and stack data for each of the baseline test series.

Table 3-3 presents the average test results for each of the baseline test series including the sum of the HAPs and the sum of the VOCs detected for each baseline. Table 3-4 presents the average values of the key process and stack parameters for each series and the target ranges. Figure 3-1 presents the individual test data from the greensand/core baseline for the top five HAPs measured. Figure 3-2 presents the individual HAP average emission data shown for each baseline in Table 3-3 in graphical form. Figure 3-3 presents individual VOC emission data in graphical form for compounds which appear to have the highest overall presence in the emissions of the baseline tests run. Figure 3-3 includes HAPs and has been rank-ordered based on the results of the Greensand/Core baseline series. Figure 3-4 presents pie charts for each of the four baselines which show the relative contribution of VOCs and individual HAPs. Lastly, Figure 3-5 presents a comparison of the greensand/core baseline and the combination of the individual greensand and core baseline test results. For Figure 3-5 the combination of the individual baselines is the sum of the greensand baseline and core baseline, minus the background baseline. The background baseline has been subtracted, since it is double counted as part of the two separate baselines.

Table 3-1a - Pre-production Background Baseline Emissions Individual Test Results (lbs/ton metal)

Test Number	AM001	AM002	AM003	AM004	AM005	AM006	AM007	AM008	AM009	Average
Individual Organic HAPs										
Benzene	0.0032	0.0046	0.0072	0.0069	0.0067	0.0073	0.0036	0.0081	0.0076	0.0061
Toluene	0.0016	0.0023	0.0037	0.0034	0.0033	0.0040	0.0014	0.0040	0.0040	0.0031
m,p-Xylene	0.0012	0.0016	0.0022	0.0020	0.0023	0.0024	0.0010	0.0023	0.0023	0.0019
o-Xylene	0.0004	0.0006	0.0008	0.0007	0.0008	0.0008	0.0004	0.0009	0.0008	0.0007
Ethyl Benzene	0.0003	0.0004	0.0005	0.0005	0.0005	0.0006	0.0002	0.0007	0.0006	0.0005
Naphthalene	0.0007	0.0012	0.0022	0.0013	0.0003	0.0011	0.0004	0.0006	0.0020	0.0011
Acetaldehyde	0.0079	0.0082	0.0103	I	0.0078	0.0079	0.0101	0.0089	0.0088	0.0087
2-Methylnaphthalene	0.0003	0.0004	0.0011	0.0009	0.0002	0.0004	ND	ND	0.0013	0.0005
1-Methylnaphthalene	ND	ND	0.0007	0.0005	ND	ND	ND	ND	0.0007	0.0002
Formaldehyde	0.0010	0.0014	0.0018	0.0015	0.0024	0.0018	0.0012	0.0023	0.0023	0.0017
Individual Volatile Organic Compounds (non-HAPs)										
1,2,4-Trimethylbenzene	0.0005	0.0008	0.0008	0.0006	0.0009	0.0009	0.0003	0.0007	0.0008	0.0007
Heptane	ND	ND	ND	0.0024	ND	0.0019	ND	0.0039	0.0000	0.0009
Undecane	0.0006	ND	ND	0.0009	0.0005	0.0014	0.0006	0.0000	0.0010	0.0005
Hexane	0.0004	0.0005	0.0007	0.0007	0.0006	0.0005	0.0002	0.0005	0.0005	0.0005
1,3,5-Trimethylbenzene	0.0002	0.0005	0.0005	0.0005	0.0002	0.0005	ND	0.0003	0.0004	0.0003
2-Ethyltoluene	0.0002	ND	0.0003	ND	0.0004	0.0004	ND	ND	ND	0.0001
4-Ethyltoluene	ND	ND	ND	ND	ND	ND	ND	ND	0.0055	0.0006
Dodecane	ND	ND	ND	ND	0.0008	ND	ND	ND	ND	0.0001

Note: The results presented are not suitable for use as general emission factors.
Individual compounds shown in the table constitute >95% of mass of all detected compounds.
NT: Analyte was not tested.
I: Data was rejected based on data validation considerations.
ND: Not detected

Table 3-1b - Pre-production Greensand Baseline Emissions Individual Test Results (lbs/ton metal)

Test Number	AY001	AY002	AY003	AY004	AY005	AY006	AY007	AY008	AY009	Average
Individual Organic HAPs										
Benzene	0.1576	0.1592	0.1618	0.0895	0.1294	0.1317	0.0946	I	0.0713	0.1244
Toluene	0.0979	0.0990	0.1007	0.0742	0.0824	0.0874	0.0708	0.0785	0.0618	0.0836
m,p-Xylene	0.0518	0.0513	0.0535	0.0386	0.0436	0.0462	0.0351	0.0405	0.0320	0.0436
o-Xylene	0.0214	0.0219	0.0221	0.0159	0.0187	0.0196	0.0145	0.0180	0.0134	0.0184
Ethyl Benzene	0.0118	0.0116	0.0124	0.0089	0.0099	0.0107	0.0080	0.0091	0.0069	0.0099
Naphthalene	0.0149	0.0171	0.0264	0.0089	0.0159	0.0255	0.0065	0.0120	0.0107	0.0153
Acetaldehyde	0.0098	0.0091	0.0105	0.0064	0.0070	0.0071	0.0064	0.0073	0.0057	0.0077
2-Methylnaphthalene	0.0072	0.0065	0.0105	0.0040	0.0059	0.0079	0.0026	0.0034	0.0015	0.0055
Styrene	0.0033	0.0030	0.0027	0.0018	0.0024	0.0023	0.0017	0.0026	0.0018	0.0024
o-Cresol	ND	0.0038	0.0058	ND	0.0016	0.0049	0.0000	0.0028	0.0010	0.0022
MEK	NT	0.0038	0.0037	0.0028	0.0026	0.0030	0.0015	0.0029	0.0019	0.0028
1-Methylnaphthalene	0.0044	ND	0.0063	0.0022	0.0036	0.0048	0.0016	0.0021	0.0009	0.0029
Formaldehyde	0.0019	0.0014	0.0025	0.0013	0.0015	0.0010	0.0011	0.0013	0.0016	0.0015
Phenol	ND	0.0065	0.0066	0.0016	0.0058	0.0059	0.0033	0.0067	0.0046	0.0046
Individual Volatile Organic Compounds (non-HAPs)										
1,2,4-Trimethylbenzene [a]	0.0250	0.0262	ND	ND	ND	ND	0.0065	0.0195	0.0162	0.0104
Heptane	0.0183	0.0214	0.0185	0.0168	0.0172	0.0229	0.0168	0.0177	0.0139	0.0182
Octane	0.0194	0.0185	0.0186	0.0141	0.0153	0.0174	0.0089	0.0047	0.0102	0.0141
Undecane	0.0073	0.0084	0.0085	0.0050	0.0074	0.0075	0.0037	0.0060	0.0051	0.0065
Nonane	0.0112	0.0113	0.0112	0.0083	0.0097	0.0107	0.0079	0.0084	0.0065	0.0095
Hexane	0.0195	0.0191	0.0213	0.0240	0.0277	0.0204	0.0213	0.0201	0.0158	0.0210
Decane	0.0094	0.0106	0.0104	0.0069	0.0085	0.0092	0.0062	0.0072	0.0058	0.0082
1,3,5-Trimethylbenzene	0.0077	0.0079	0.0082	0.0055	0.0069	0.0068	0.0047	0.0064	0.0051	0.0066
1,2,3-Trimethylbenzene	0.0070	0.0074	0.0078	0.0048	0.0066	0.0063	0.0033	0.0057	0.0048	0.0060
2-Ethyltoluene	0.0050	0.0057	0.0053	0.0035	0.0045	0.0044	0.0029	0.0041	0.0034	0.0043
4-Ethyltoluene	0.0048	0.0047	0.0048	0.0032	0.0042	0.0041	0.0027	0.0039	0.0030	0.0039
Cyclohexane	0.0037	0.0040	0.0018	0.0014	0.0032	0.0038	0.0013	ND	ND	0.0021
Dodecane	0.0058	0.0072	0.0084	0.0039	0.0063	0.0075	0.0029	0.0051	0.0047	0.0058
2,6-Dimethylphenol	0.0017	0.0037	0.0024	ND	0.0035	0.0044	ND	0.0039	0.0030	0.0025
3-Ethyltoluene	0.0134	0.0120	0.0130	0.0082	0.0106	0.0104	0.0066	0.0096	0.0077	0.0102
Butylbenzene	0.0060	0.0062	0.0067	0.0038	0.0055	0.0051	NT	0.0047	0.0042	0.0053

Note: The results presented are not suitable for use as general emission factors.

Table 3-1c - Pre-production Core Baseline Emissions Individual Test Results (lbs/ton metal)

Test Number	AP001	AP002	AP003	AP004	AP005	AP006	AP007	AP008	AP009	AP010	Average
Individual Organic HAPs											
Benzene	0.1351	0.1360	0.1574	0.1628	0.1496	0.1509	0.1369	NT	0.1187	0.1027	0.1389
Toluene	0.0260	0.0286	0.0404	0.0349	0.0368	0.0356	0.0352	NT	0.0302	0.0243	0.0324
m,p-Xylene	0.0094	0.0113	0.0166	0.0132	0.0148	0.0143	0.0151	NT	0.0125	0.0101	0.0130
Aniline	NT	0.0791	0.0942	0.0905	0.1005	0.0909	0.0934	0.0849	0.0907	0.1015	0.0917
o-Xylene	0.0022	0.0028	0.0043	0.0034	0.0039	0.0034	0.0042	NT	0.0029	0.0023	0.0033
Ethyl Benzene	0.0011	0.0013	0.0019	0.0016	0.0018	0.0017	0.0018	NT	0.0015	0.0012	0.0015
Naphthalene	0.0065	0.0152	0.0248	0.0124	0.0223	0.0258	0.0325	NT	0.0438	0.0204	0.0226
Acetaldehyde	0.0062	0.0054	0.0060	0.0058	0.0057	0.0062	0.0063	0.0052	0.0062	0.0070	0.0060
2-Methylnaphthalene	0.0043	0.0070	0.0144	0.0052	0.0109	0.0116	0.0202	NT	I	0.0183	0.0115
Styrene	0.0014	0.0016	0.0020	0.0016	0.0019	0.0018	0.0019	NT	0.0014	0.0013	0.0016
o-Cresol/Indan	0.0000	0.0029	0.0050	0.0026	0.0049	0.0054	0.0087	NT	0.0129	0.0043	0.0052
MEK	0.0007	0.0007	0.0008	0.0011	0.0010	0.0009	0.0012	0.0009	0.0008	0.0009	0.0009
1-Methylnaphthalene	0.0020	0.0032	0.0059	0.0024	0.0052	0.0057	0.0083	NT	I	0.0090	0.0052
Formaldehyde	0.0006	0.0006	0.0008	0.0007	0.0008	0.0009	0.0010	0.0008	0.0011	I	0.0008
Phenol/3-Ethyltoluene	0.0077	0.0127	0.0236	0.0106	0.0100	0.0210	I	NT	0.0176	0.0064	0.0137
Individual Volatile Organic Compounds (non-HAPs)											
1,2,4-Trimethylbenzene	0.0303	0.0364	0.0512	0.0400	0.0447	0.0419	0.0526	NT	0.0301	0.0208	0.0386
Heptane	0.0019	0.0000	0.0024	0.0023	0.0023	0.0021	0.0019	NT	0.0022	ND	0.0017
Undecane	0.0092	0.0142	0.0187	0.0144	0.0169	0.0185	0.0196	NT	0.0138	0.0108	0.0151
Nonane	ND	ND	ND	ND	ND	ND	ND	NT	ND	ND	0.0000
Hexane	0.0012	0.0008	0.0012	0.0014	0.0012	0.0011	0.0011	NT	0.0010	0.0008	0.0011
Decane	ND	0.0028	0.0039	0.0028	0.0028	0.0024	0.0035	NT	ND	ND	0.0020
1,3,5-Trimethylbenzene	0.0085	0.0102	0.0151	0.0114	0.0123	0.0107	0.0143	NT	0.0087	0.0063	0.0108
1,2,3-Trimethylbenzene	0.0090	0.0129	0.0171	0.0127	0.0152	0.0141	0.0176	NT	0.0104	0.0073	0.0129
2-Ethyltoluene	0.0068	0.0089	0.0125	0.0092	0.0101	0.0079	0.0119	NT	0.0063	0.0044	0.0087
4-Ethyltoluene	0.0062	0.0065	0.0092	0.0143	I	0.0058	0.0073	NT	0.0056	0.0042	0.0074
Propylbenzene	0.0022	0.0026	0.0040	0.0030	0.0031	0.0035	0.0050	NT	0.0094	NT	0.0041
Dodecane	0.0025	0.0048	0.0067	0.0033	0.0060	0.0053	0.0071	NT	0.0053	0.0030	0.0049
1,4-Diethylbenzene	0.0049	0.0068	0.0088	0.0107	0.0078	0.0085	0.0081	NT	ND	ND	0.0062

Note: The results presented are not suitable for use as general emission factors.
Individual compounds shown in the table constitute >95% of mass of all detected compounds.
NT: Analyte was not tested.
I: Data was rejected based on data validation considerations.
ND: Not detected

Table 3-1d - Pre-production Greensand/ Core Baseline Emissions Individual Test Results (lbs/ton metal)

Test Number	AU001	AU002	AU003	AU004	AU005	AU006	AU007	Average
Individual Organic HAPs								
Benzene	0.1852	0.2131	0.2316	0.2139	0.2378	0.2311	0.2290	0.2202
Toluene	0.0926	0.0993	0.1055	0.1041	0.1065	0.1153	0.1177	0.1059
m,p-Xylene	0.0503	0.0523	0.0586	0.0566	0.0584	0.0644	0.0687	0.0585
Aniline	0.0625	0.0518	0.0507	0.0469	0.0532	0.0605	0.0477	0.0533
Phenol/3-Ethyltoluene	0.0170	0.0170	0.0180	0.0308	0.0158	0.0345	0.0248	0.0226
o-Xylene	0.0167	0.0181	0.0198	0.0193	0.0210	0.0236	0.0248	0.0205
Ethyl Benzene	0.0102	0.0104	0.0114	0.0114	0.0115	0.0127	0.0131	0.0115
Naphthalene	0.0097	0.0023	0.0090	0.0127	0.0156	0.0118	0.0183	0.0113
Acetaldehyde	0.0092	0.0094	0.0097	0.0100	0.0094	0.0097	NT	0.0096
2-Methylnaphthalene	0.0081	0.0008	0.0039	0.0080	0.0127	0.0088	0.0104	0.0075
Styrene	0.0048	0.0048	0.0049	0.0057	0.0050	0.0062	0.0060	0.0053
o-Cresol/Indan	0.0028	0.0022	0.0040	0.0050	0.0059	0.0052	0.0074	0.0047
MEK/Butyraldehyde	0.0037	0.0031	0.0042	0.0040	0.0049	0.0040	0.0044	0.0040
1-Methylnaphthalene	0.0043	ND	0.0019	0.0041	0.0055	0.0042	0.0053	0.0036
Formaldehyde	I	0.0036	0.0021	0.0033	0.0021	0.0024	0.0030	0.0027
Individual Volatile Organic Compounds (non-HAPs)								
1,2,4-Trimethylbenzene	0.0322	0.0469	0.0485	0.0448	0.0557	0.0522	0.0779	0.0512
Heptane	0.0299	0.0291	0.0318	0.0303	0.0328	0.0349	0.0335	0.0318
Octane	0.0257	0.0250	0.0283	0.0270	0.0283	0.0265	0.0269	0.0268
Undecane	0.0173	0.0181	0.0175	0.0205	0.0204	0.0196	0.0306	0.0206
Nonane	0.0171	0.0169	0.0185	0.0180	0.0191	0.0193	0.0185	0.0182
Hexane	0.0173	0.0167	0.0191	0.0183	0.0191	0.0164	0.0202	0.0181
Decane	0.0147	0.0163	0.0170	0.0172	0.0183	0.0206	0.0193	0.0176
1,3,5-Trimethylbenzene	0.0121	0.0155	0.0168	0.0159	0.0187	0.0178	0.0251	0.0174
1,2,3-Trimethylbenzene	0.0121	0.0134	0.0146	0.0143	0.0158	0.0179	0.0258	0.0163
2-Ethyltoluene	0.0098	0.0137	0.0167	0.0150	0.0170	0.0153	0.0226	0.0157
4-Ethyltoluene	0.0086	0.0108	0.0117	0.0113	0.0122	0.0187	0.0156	0.0127
Propylbenzene	0.0065	0.0082	0.0106	0.0084	0.0108	0.0049	0.0112	0.0087
Cyclohexane	0.0080	0.0072	0.0076	0.0072	0.0094	0.0065	0.0067	0.0075

Note: The results presented are not suitable for use as general emission factors. Individual compounds shown in the table constitute >95% of mass of all detected compounds. Nine (9) tests were run, but only 7 were used (2 were disqualified due to extended shakeout).

NT: Analyte was not tested.

ND: Not detected.

I: The result was rejected based on data validation considerations

Table 3-2a – Pre-production Process and Stack Data for Background Baseline

Test Number	AM001	AM002	AM003	AM004	AM005	AM006	AM007	AM008	AM009	Series
Pour Date	9/8/98	9/8/98	9/8/98	9/9/98	9/9/98	9/9/98	9/10/98	9/10/98	9/10/98	Average
Process Data										
Casting Metal Weight, lbs.	224	229	233	238	230	246	192	232	222	227
Total Mold Weight, lbs.	1298	1398	1317	1419	1289	1419	1317	1398	1357	1357
Total Core Weight, lbs.	61.96	61.90	62.75	61.45	61.32	61.22	62.83	61.96	62.75	62.02
Compactability, %	50.0	49.5	49.0	49.5	48.5	48.0	49.5	49.5	49.0	49.2
Sodium Silicate Binder Weight, lbs	2.95	2.95	2.99	2.93	2.92	2.91	2.99	2.95	2.99	2.95
No. Cavities Poured	8	8	8	8	8	8	8	8	8	8
LOI, % (at mold)	0.67	0.53	0.70	0.63	0.70	0.70	0.73	0.83	0.80	0.70
LOI, % (at Shakeout)	NT	0.70	0.77	0.67	0.67	0.67	0.87	0.73	0.73	0.73
Clays, % (at mold)	5.87	4.93	6.57	6.57	6.81	6.81	6.57	6.57	6.57	6.36
Clays, % (at Shakeout)	NT	5.87	5.87	6.10	6.34	6.57	6.34	6.34	7.28	6.34
Pouring Temperature, ^{o}F	2638	2636	2636	2630	2636	2736	2637	NT	2735	2636
Stack Data										
Average Stack Temperature, ºF	126.7	131.5	135.5	125.7	124.4	129.1	116.8	131.3	130.5	127.9
Total Moisture Content, %	3	3	2	2	2	2	3	2	2	2
Average Stack Velocity, ft./sec.	17.92	18.01	18.06	17.87	17.84	17.92	17.71	17.92	17.90	17.91
Avg. Stack Pressure, in. Hg Abs.	29.70	29.65	29.65	29.74	29.75	29.75	29.91	29.91	29.91	29.77
Stack Flow Rate, scfm	731	728	732	739	740	737	740	738	738	736

NT: Not tested

Table 3-2b – Pre-production Process and Stack Data for Greensand Baseline

Test Number	AY001	AY002	AY003	AY004	AY005	AY006	AY007	AY008	AY009	Series Average
Pour Date	3/2/99	3/2/99	3/2/99	3/3/99	3/3/99	3/3/99	3/4/99	3/4/99	3/4/99	
Process Data										
Casting Metal Weight, lbs.	229	228	228	241	230	237	237	244	238	235
Total Mold Weight, lbs.	1365	1335	1369	1357	1345	1345	1359	1345	1326	1350
Total Core Weight, lbs.	64.66	64.79	64.59	64.53	64.51	64.8	61.33	64.68	64.42	64.26
Compactability, %	51.00	44.75	47.75	47.00	48.75	46.00	46.75	47.30	48.00	47.4
Sodium Silicate Binder Weight, lbs	3.08	3.08	3.08	3.07	3.07	3.08	2.92	3.08	3.07	3.06
No. Cavities Poured	8	8	8	8	8	8	8	8	8	8
LOI, % (at mold)	5.03	5.27	5.03	4.73	5.30	5.33	5.10	5.23	5.23	5.14
LOI, % (at Shakeout)	4.77	5.33	4.53	4.33	4.97	4.67	4.77	4.87	4.73	4.77
Clays, % (at mold)	6.56	6.94	6.94	7.07	7.07	6.81	6.94	6.94	7.07	6.92
Clays, % (at Shakeout)	5.40	5.40	5.27	5.40	5.53	5.40	5.66	5.66	5.40	5.46
Pouring Temperature, ^{o}F	2640	2636	2627	2630	2639	2640	2640	2636	2626	2635
Stack Data										
Average Stack Temperature, ^{o}F	104.4	104.6	108.1	118.3	121.7	113.3	120.0	124.5	143.3	117.6
Total Moisture Content, %	1.4	1.4	1.5	1.3	1.2	1.3	1.5	1.5	1.5	1.4
Average Stack Velocity, ft./sec.	20.93	19.08	21.00	16.61	15.59	15.68	17.46	16.67	13.39	17.38
Avg. Stack Pressure, in. Hg Abs.	30.12	30.12	30.12	30.13	30.12	30.12	30.12	30.24	30.24	30.15
Stack Flow Rate, scfm	915	834	912	710	662	667	742	707	550	744

Table 3-2c – Pre-production Process and Stack Data for Core Baseline

Test Number	AP001	AP002	AP003	AP004	AP005	AP006	AP007	AP008	AP009	AP010	Series
Pour Date	10/20/98	10/20/98	10/20/98	10/21/98	10/21/98	10/21/98	10/21/98	10/22/98	10/22/98	10/22/98	Average
Process Data											
Casting Metal Weight, lbs.	260	267	269	245	266	260	265	260	252	244	258.8
Total Mold Weight, lbs.	1406	1376	1406	1366	1436	1406	1426	1366	1446	1386	1402
Total Core Weight, lbs.	63.51	63.48	63.37	63.13	63.07	63.78	63.44	63.67	63.39	63.12	63.40
Compactability, %	51.5	49.8	48.5	49.2	44.2	46.5	47.2	48.5	45.0	46.5	47.8
Total Binder Weight, lbs	1.09	1.09	1.09	1.06	1.08	1.10	1.09	1.10	1.09	1.09	1.09
No. Cavities Poured	8	8	8	8	8	8	8	8	8	8	8
LOI, % (at mold)	0.50	0.50	0.67	0.70	0.67	0.63	0.67	0.70	0.77	0.83	0.66
LOI, % (at Shakeout)	0.53	0.67	0.70	0.67	0.73	0.73	0.80	0.73	0.90	0.77	0.72
Clays, % (at mold)	4.93	4.46	5.40	5.87	5.63	5.87	5.40	6.10	5.87	5.87	5.54
Clays, % (at Shakeout)	5.16	5.63	5.16	5.63	5.40	5.63	5.40	5.63	5.87	5.40	5.49
LOI, % (Cores)	1.47	1.53	1.84	1.70	1.65	1.59	1.43	1.64	1.57	1.58	1.60
Pouring Temperature, ^{o}F	2639	2629	2640	2622	2639	2625	2639	2628	2638	2623	2631
Stack Data											
Average Stack Temperature, ^{o}F	131.2	127.7	144.1	129.2	132.2	137.8	133.4	127.3	133.7	154.1	137.8
Total Moisture Content, %	2	3	3	2	2	3	2	3	3	3	2.6
Average Stack Velocity, ft./sec.	15.78	17.85	18.10	17.88	17.91	18.02	17.94	17.84	17.91	18.51	17.69
Avg. Stack Pressure, in. Hg bs.	29.97	30.01	30.00	29.93	29.95	29.95	29.93	30.05	30.09	30.14	30.00
Stack Flow Rate, scfm	651	735	725	740	738	728	734	736	732	734	724

Table 3-2d – Pre-production Process and Stack Data for Greensand/Core Baseline

Test Number	AU001	AU002	AU003	AU004	AU005	AU006	AU007	Series Average
Pour Date	11/17/98	11/17/98	11/17/98	11/17/98	11/18/98	11/18/98	11/18/98	
Process Data								
Casting Metal Weight, lbs.	242	246	234	252	245	242	229	241
Total Mold Weight, lbs.	1327	1317	1327	1327	1317	1327	1307	1321
Total Core Weight, lbs.	62.99	62.84	63.16	62.96	62.89	62.88	62.75	62.92
Compactability, %	46.0	47.5	48.0	46.3	48.3	46.0	46.5	46.9
Total Binder Weight, lbs	1.08	1.08	1.09	1.08	1.08	1.08	1.08	1.08
No. Cavities Poured	8	8	8	8	8	8	8	8
LOI, % (at mold)	4.90	4.90	4.77	4.77	4.97	4.77	5.33	4.96
LOI, % (at Shakeout)	4.97	4.80	4.67	5.17	4.67	4.37	4.90	4.84
Clays, % (at mold)	7.35	7.35	7.09	7.61	7.74	7.09	7.09	7.29
Clays, % (at Shakeout)	6.04	5.91	6.04	6.04	6.56	6.04	6.56	6.24
LOI, % (Cores)	1.33	1.48	1.65	1.44	1.55	1.61	1.60	1.52
Pouring Temperature, ^{o}F	2632	2632	2636	2642	2640	2639	2643	2638
Stack Data								
Average Stack Temperature, ^{o}F	133.6	139.0	141.3	147.5	128.4	135.0	150.1	133.1
Total Moisture Content, %	5.9	2.8	2.4	2.4	2.4	3.1	2.1	3.6
Average Stack Velocity, ft/sec	18.08	18.02	18.03	18.12	17.78	17.91	18.09	18.00
Avg. Stack Pressure, in. Hg Abs	29.90	30.00	30.05	30.05	30.22	30.20	30.23	30.14
Stack Flow Rate, scfm	712	729	731	727	741	732	729	729

Table 3-3 – Pre-production Baseline Test Average Results

Analytes	Background Baseline		Greensand Baseline		Core Baseline		Greensand/ Core Baseline	
	Average	(95% C. I./Mean)[a]	Average	(95% C. I./Mean) [a]	Average	(95% C. I./Mean) [a]	Average	(95% C. I./Mean) [a]
Sum of VOCs[b]	0.0312	15.7%	0.4722	15.3%	0.4708	18.5%	0.8324	7.6%
Sum of HAPs[c,d]	0.0249	15.4%	0.3160	17.2%	0.3161	16.8%	0.5424	6.2%
Individual organic HAPs								
Benzene	0.0061	19.34%	0.1244	19.66%	0.1389	8.98%	0.2202	6.07%
Toluene	0.0031	21.99%	0.0836	10.70%	0.0324	10.87%	0.1059	6.07%
m,p-Xylene	0.0019	18.57%	0.0436	11.50%	0.0130	12.09%	0.0585	8.15%
Aniline	NT		NT		0.0917	4.98%	0.0533	8.36%
Phenol/3-Ethyltoluene [d]	0.0003	196.00%	0.0147	15.63%	0.0137	31.97%	0.0226	24.86%
o-Xylene	0.0007	17.85%	0.0184	11.45%	0.0033	15.28%	0.0205	10.47%
Ethyl Benzene	0.0005	19.92%	0.0099	12.44%	0.0015	11.98%	0.0115	7.02%
Naphthalene	0.0011	40.16%	0.0153	29.43%	0.0226	32.01%	0.0113	33.47%
Acetaldehyde	0.0087	7.90%	0.0077	14.25%	0.0060	5.33%	0.0096	2.30%
2-Methylnaphthalene	0.0005	59.85%	0.0055	33.93%	0.0115	35.59%	0.0075	39.03%
Styrene	ND		0.0024	15.38%	0.0016	10.34%	0.0053	8.39%
o-Cresol/Indan	ND		0.0022	65.24%	0.0052	46.83%	0.0047	28.54%
MEK	ND		0.0028	19.79%	0.0009	11.03%	0.0040	10.42%
1-Methylnaphthalene	0.0002	96.68%	0.0029	46.01%	0.0052	34.18%	0.0036	40.44%
Formaldehyde	0.0017	19.01%	0.0015	19.75%	0.0008	14.17%	0.0027	18.90%
Individual VOC Compounds								
1,2,4-Trimethylbenzene	0.0007	18.08%	0.0104	71.31%	0.0386	17.60%	0.0512	20.14%
Heptane	0.0009	104.36%	0.0182	9.52%	0.0017	37.63%	0.0318	4.85%
Octane	ND		0.0141	23.71%	ND		0.0268	3.41%
Undecane	0.0005	58.55%	0.0065	16.66%	0.0151	15.59%	0.0200	35.71%
Nonane	ND		0.0095	12.11%	ND		0.0182	3.75%
Hexane	0.0005	19.81%	0.0210	10.36%	0.0011	11.33%	0.0181	5.66%
Decane	ND		0.0082	14.08%	0.0020	51.01%	0.0176	8.26%
1,3,5-Trimethylbenzene	0.0003	31.69%	0.0066	12.47%	0.0108	17.21%	0.0174	16.96%
1,2,3-Trimethylbenzene	0.00002	196.00%	0.0060	15.88%	0.0129	17.85%	0.0163	20.82%
2-Ethyltoluene	0.0001	81.24%	0.0043	14.25%	0.0087	19.84%	0.0157	18.14%

Note: The results presented are not suitable for use as general emission factors.

[a] The 95% Confidence Interval divided by the mean, expressed as a percentage.

[b] Sum of all VOCs detected.

[c] Sum of all HAPs detected.

[d] Phenol and 3-ethyltoluene were reported separtely for the greensand baseline, and therefore only phenol is included as a HAP, The other three baselines reported Phenol and 3-ethyltoluene as coeluted.

NT: Analyte was not tested.

ND: Non detected.

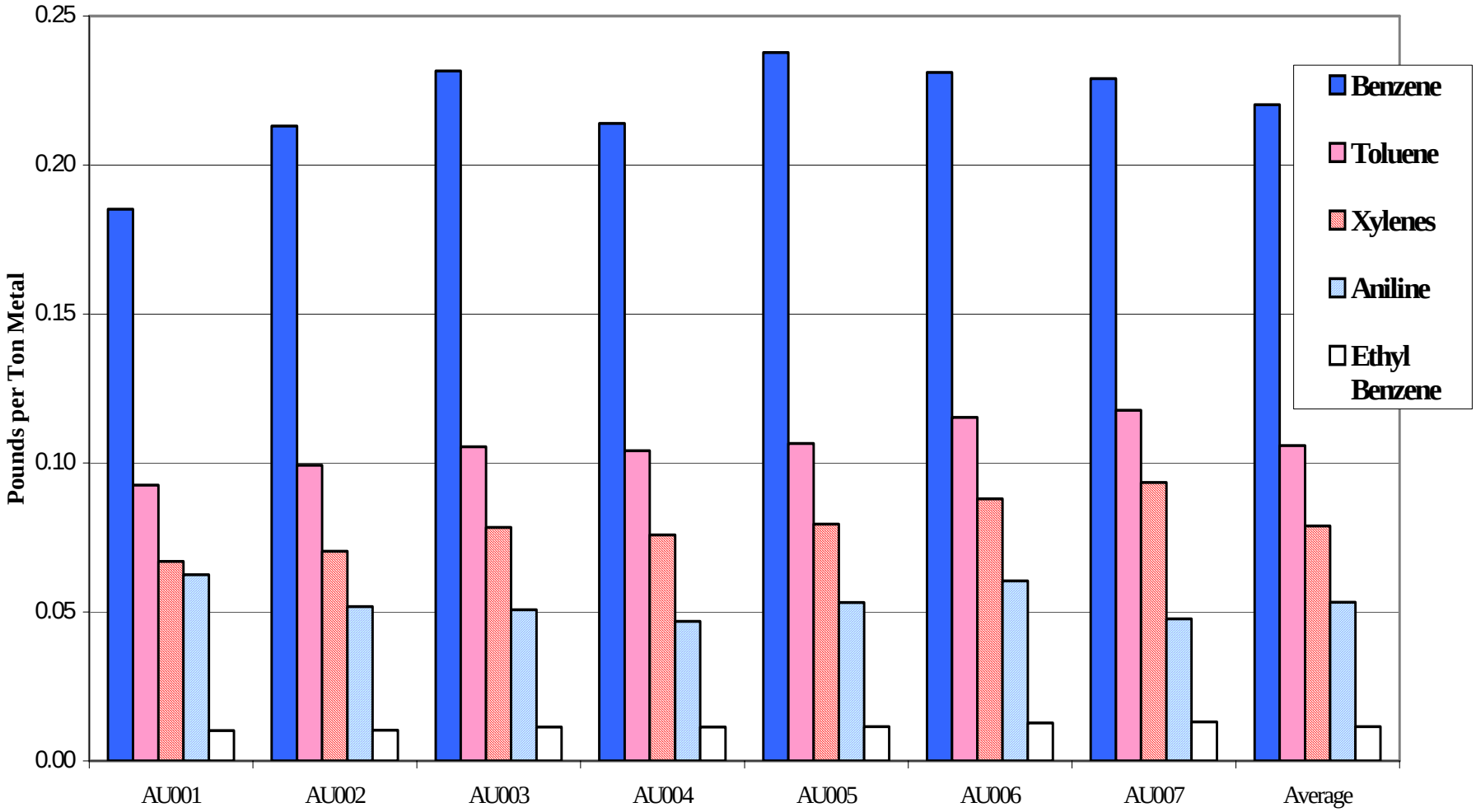
Individual compounds shown in table constitute >95% of mass of all detected compounds.

Table 3-4 – Pre-production Baseline Average Process and Stack Parameters

	Background Baseline	Greensand Baseline	Core Baseline	Greensand/ Core Baseline	Target Ranges
Casting Metal Weight, lbs.	227	235	259	241	225 – 245
Total Mold Weight, lbs.	1357	1350	1402	1321	1300 – 1400
Total Core Weight, lbs.	62.02	64.26	63.40	62.92	62-64
Compactability / True %	49.2	47.4	48.1	47.0	48 – 51%
Total Binder Weight, lbs.	NA	NA	1.09	1.08	1.0 –1.2 (Core Tests)
Sodium Silicate Binder Weight, lbs	2.95	3.06	NA	NA	2.9-3.1 (Sodium Silicate)
LOI, % (at Mold)	0.70	5.14	0.66	4.96	4.7 – 5.3% (Greensand Tests)
LOI, % (at Shakeout)	0.73[a]	4.77	0.72 [a]	4.84	4.3 – 4.7% (Greensand Tests)
LOI, % (Cores)	NA	NA	1.60	1.52	1.4 – 1.6 (Core Tests)
Pouring Temperature ^{o}F	2660	2635	2655	2638	2630 ± 10 ^{o}F
Stack Flow Rate, scfm	736	744	724	729	725 - 750

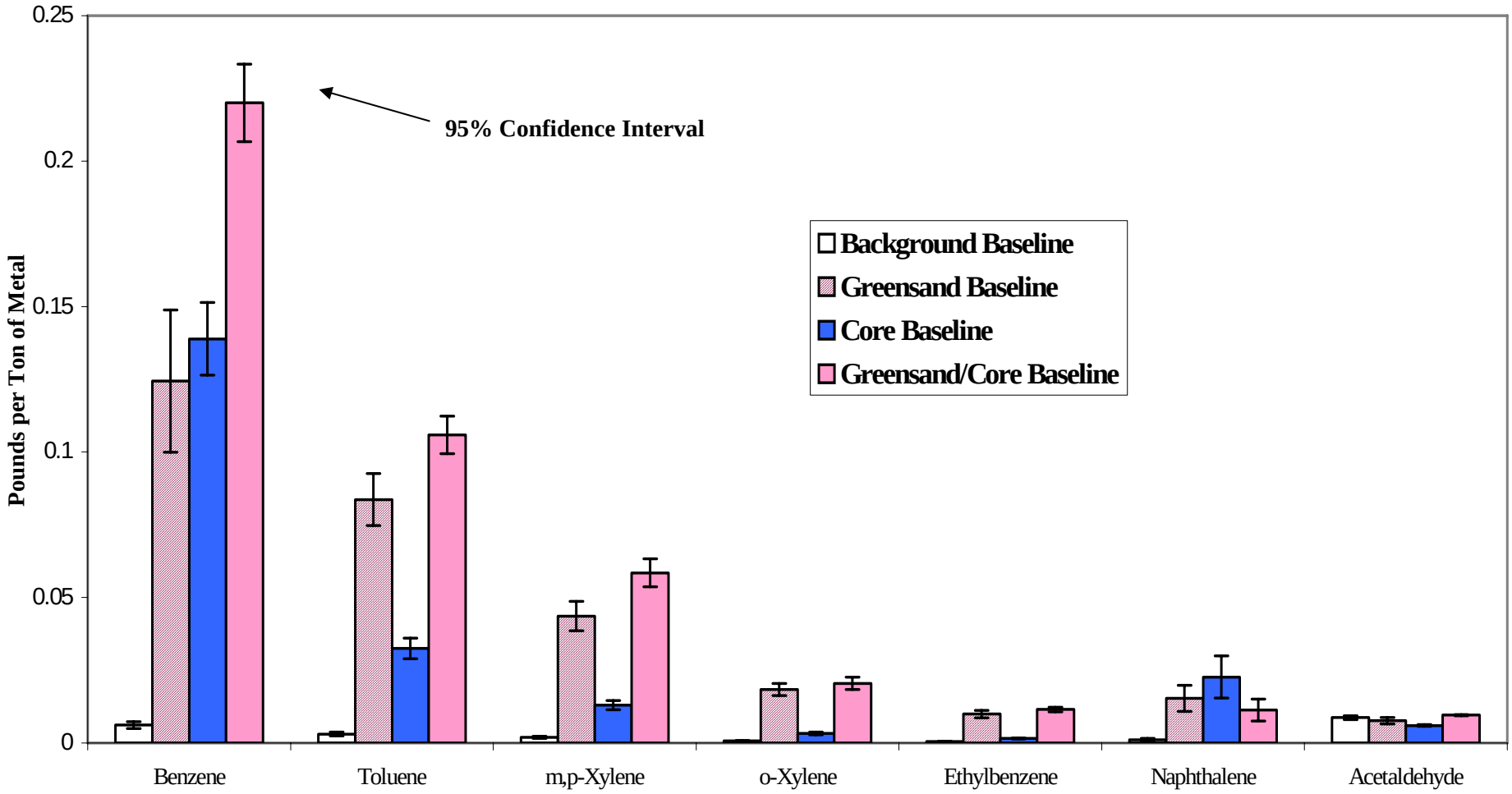
[a] No seacoal in greensand
NA = Not Applicable

Figure 3-1
Greensand/Core Baseline Test HAP Results



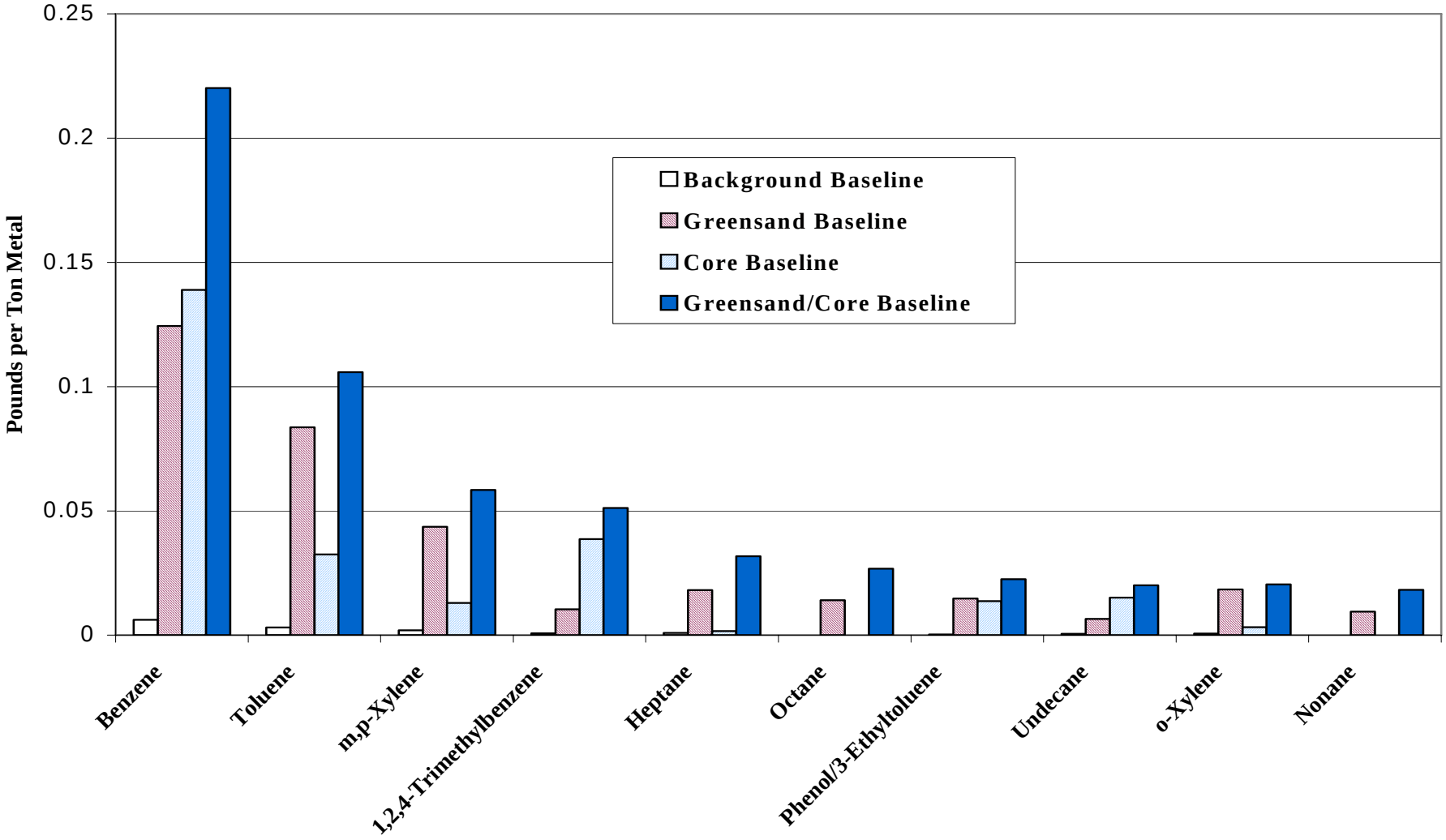
Note: The results presented are not suitable for use as general emission factors.

Figure 3-2
Baseline Test Average HAP Results



Note: The results presented are not suitable for use as general emission factors.

Figure 3-3
Baseline Test Average VOC Results



Note: The results presented are not suitable for use as general emission factors.

Figure 3-4 Relative Contribution of HAPs and VOCs

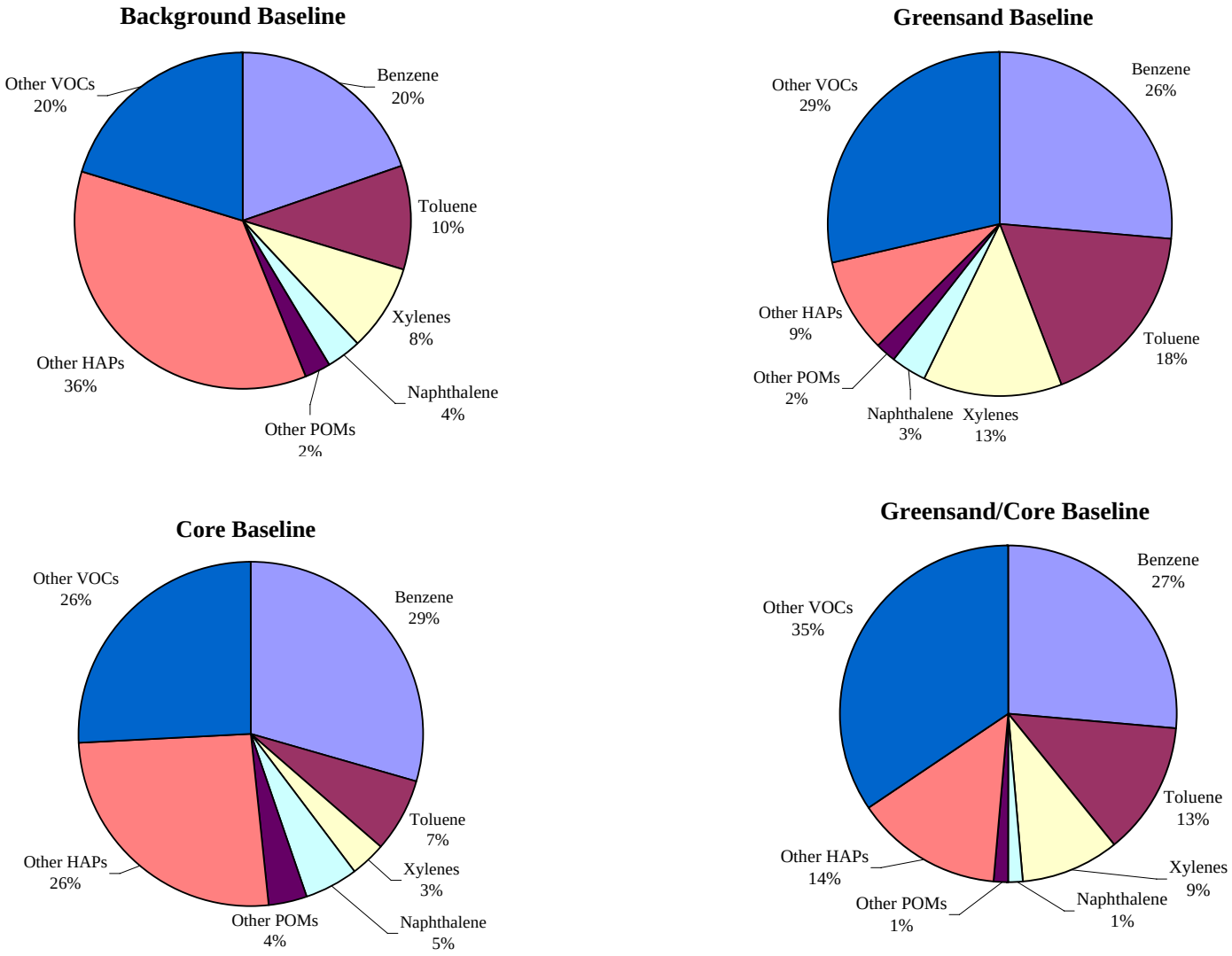
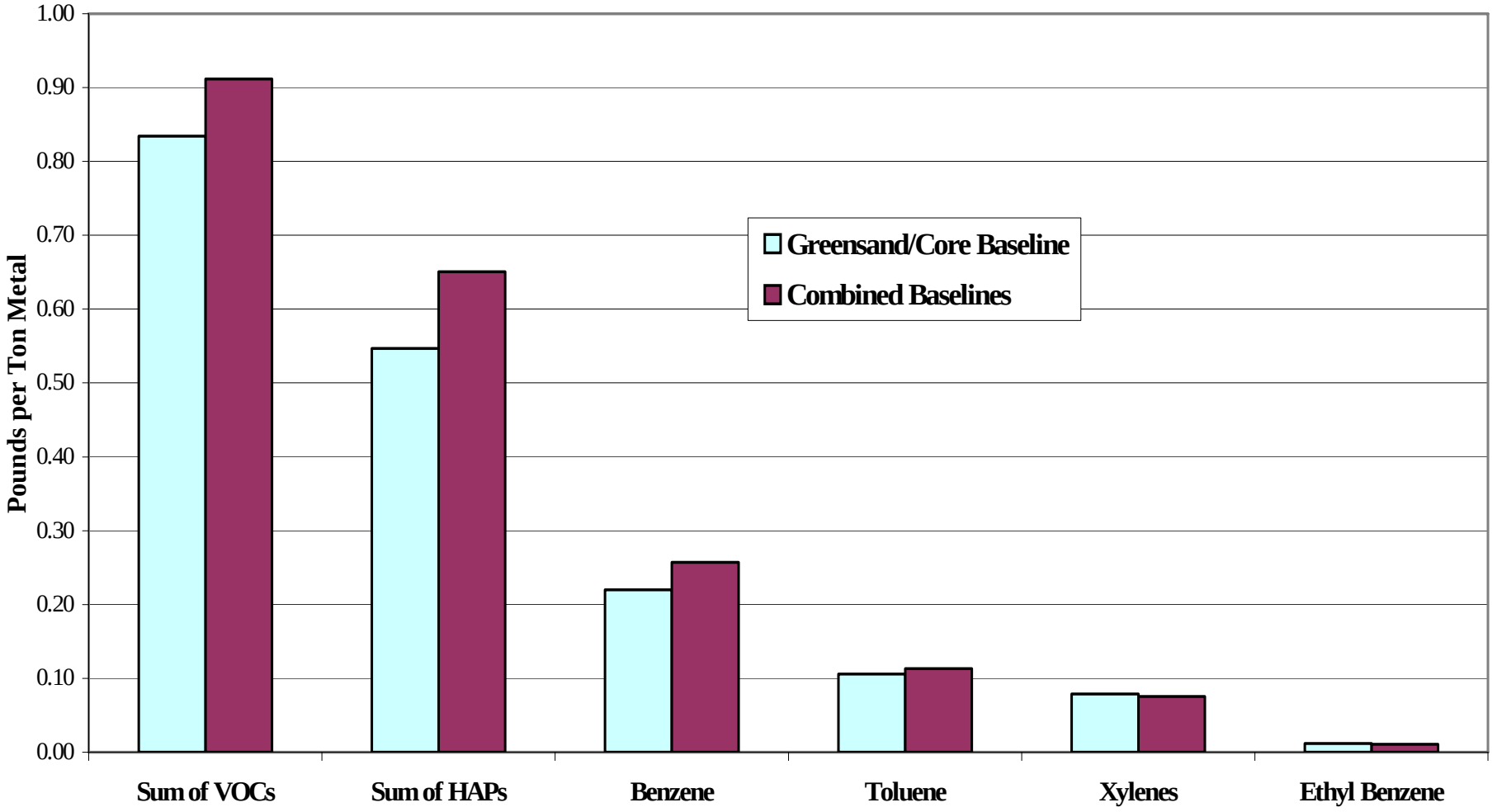


Figure 3-5 Comparison of Greensand/Core Baseline with the Sum of the Individual Baselines[a]



[a] The "combined baselines" is the sum of the "greensand" baseline and "core" baseline minus the "background" baseline.
Note: The results presented are not suitable for use as general emission factors.

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4.0 Discussion of Results and Conclusions

Eleven (11) of the measured compounds (benzene, toluene, m,p-xylene, o-xylene, aniline, phenol/3-ethyltoluene, ethylbenzene, naphthalene, and acetaldehyde) comprise 90% to 95% of the mass of all HAPs measured in the greensand, core and greensand/core baseline test series. Similarly, fifteen (15) of the measured VOCs comprise 85% to 90% of the sum of VOCs detected in the same baseline series. As it can be seen in Figures 3-1, 3-2 and 3-3, the relative magnitude of the individual HAP and VOC compounds was generally consistent between each of the baseline test series, with benzene being the largest single HAP and VOC measured in each of the baseline test series. This is true even though greensand emissions are from seacoal combustion/pyrolysis, while core emissions are from phenol-urethane combustion/pyrolysis.

One of the test design objectives was to have the 90% confidence interval for each individual test series within 20% of the mean of the test series, such that the comparative evaluations against tests of alternative materials, equipment or processes would allow for a determination of whether the alternative material, equipment or process resulted in 50% reduction in HAP emissions. Preliminary testing determined that nine replicate tests would be required to achieve this objective for Total HAPs, the Sum of VOCs and the principle individual HAP compounds. Nine replicate tests were conducted for the background and greensand baselines, while ten replicate tests were performed for the core baseline. Only seven replicate tests were used for the greensand/core baseline, after two tests were rejected due to data validation considerations. A statistical evaluation of the data from the four baseline series shows that the 95% confidence interval is well within 20% of the mean for Total HAPs, the Sum of VOCs and the principle individual HAP compounds (except for naphthalene) for all four of the baseline test series. This was even true for the greensand/core baseline for which only seven tests were considered. Test results for naphthalene and other POMs showed greater variability than the other individual HAPs measured.

The stack flow rates for individual tests in the greensand baseline showed a greater degree of variability than for the other baseline test series. However, the average for the greensand baseline was well within the control range and comparable to the other baselines. Since emissions vary linearly with stack flow rate in the range of stack flow rates seen in these tests, the average test results for the greensand baseline should be comparable to the other similar test series.

Comparison of the measured process parameters, and the relative variability of the analytical test results, indicates that the baseline tests were run within suitable control ranges. The greensand, core and greensand/core baselines will be the primary data sets to be used for comparisons with data from similar tests on alternative materials, equipment and processes.

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Appendix A

Emission Test Results

BACKGROUND BASELINE
PRE-PRODUCTION INDIVIDUAL TEST RESULTS (lbs/Ton metal)

Analyte	AM001	AM002	AM003	AM004	AM005	AM006	AM007	AM008	AM009	Average
1,2,3-Trimethylbenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.25E-04	0.00E+00	0.00E+00	0.00E+00	2.50E-05
1,2,4-Trimethylbenzene	5.16E-04	8.23E-04	8.40E-04	6.16E-04	9.07E-04	8.79E-04	3.10E-04	7.41E-04	8.13E-04	7.16E-04
1,2-Diethylbenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3,5-Trimethylbenzene	2.20E-04	5.36E-04	4.59E-04	4.62E-04	2.41E-04	4.55E-04	0.00E+00	3.31E-04	4.20E-04	3.47E-04
1,3-Diethylbenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-Diisopropylbenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.70E-05
1,4-Diethylbenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,5-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,6-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,8-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1-Methylnaphthalene	0.00E+00	0.00E+00	6.63E-04	4.84E-04	4.44E-05	0.00E+00	0.00E+00	0.00E+00	7.30E-04	2.13E-04
2,3,5-Trimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,3,5-Trimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,3-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,3-Dimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4,6-Trimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4-Dimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,6-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,6-Dimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,7-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2-Ethyltoluene	2.03E-04	0.00E+00	3.20E-04	0.00E+00	4.10E-04	3.57E-04	0.00E+00	0.00E+00	0.00E+00	1.43E-04
2-Methylnaphthalene	3.15E-04	4.01E-04	1.06E-03	8.53E-04	1.77E-04	4.23E-04	0.00E+00	0.00E+00	1.26E-03	4.99E-04
3,4-Dimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3,5-Dimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4-Ethyltoluene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.51E-03	6.12E-04
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	7.89E-03	8.23E-03	1.03E-02	I	7.79E-03	7.87E-03	1.01E-02	8.91E-03	8.80E-03	8.73E-03
Acetone	2.75E-03	3.05E-03	3.61E-03	4.19E-03	2.84E-03	2.95E-03	4.42E-03	3.41E-03	3.36E-03	3.40E-03
Acrolein	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Note: The results presented are not suitable for use as general emission factors.
NT: Analyte was not tested.
I: Data was rejected based on data validation considerations
0.00: Not detected

BACKGROUND BASELINE
PRE-PRODUCTION INDIVIDUAL TEST RESULTS (lbs/Ton metal) Continued

Analyte	AM001	AM002	AM003	AM004	AM005	AM006	AM007	AM008	AM009	Average
Aniline	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Butanal/Benzaldehyde	7.03E-04	6.94E-04	7.57E-04	1.01E-03	6.94E-04	7.56E-04	1.21E-03	8.98E-04	9.01E-04	8.47E-04
Benzene	3.22E-03	4.64E-03	7.20E-03	6.90E-03	6.72E-03	7.27E-03	3.64E-03	8.14E-03	7.61E-03	6.15E-03
Biphenyl	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Crotonaldehyde	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cumene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cyclohexane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Decane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dodecane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.74E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.60E-05
Ethyl Benzene	3.03E-04	3.73E-04	5.15E-04	5.09E-04	4.92E-04	6.22E-04	2.42E-04	6.52E-04	6.27E-04	4.82E-04
Formaldehyde	1.04E-03	1.41E-03	1.75E-03	1.48E-03	2.36E-03	1.77E-03	1.15E-03	2.32E-03	2.29E-03	1.73E-03
Heptane	0.00E+00	0.00E+00	0.00E+00	2.42E-03	0.00E+00	1.95E-03	0.00E+00	3.88E-03	0.00E+00	9.17E-04
Hexaldehyde	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hexane	3.61E-04	4.52E-04	6.95E-04	7.22E-04	6.39E-04	5.48E-04	2.35E-04	5.46E-04	4.88E-04	5.21E-04
Indan	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Indene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Isobutylbenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
m,p-Cresol/Butylbenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
m,p-Xylene	1.19E-03	1.58E-03	2.20E-03	2.00E-03	2.34E-03	2.43E-03	9.71E-04	2.32E-03	2.33E-03	1.93E-03
MEK	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methacrolein	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
o,m,p-Tolualdehyde	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Naphthalene	7.38E-04	1.24E-03	2.17E-03	1.34E-03	2.70E-04	1.10E-03	4.20E-04	5.86E-04	2.05E-03	1.10E-03
Nonane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
o-Cresol/Indan	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Octane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
o-Xylene	4.17E-04	5.74E-04	7.86E-04	6.73E-04	7.69E-04	8.24E-04	3.64E-04	8.75E-04	8.04E-04	6.76E-04

Note: The results presented are not suitable for use as general emission factors.
NT: Analyte was not tested.
I: Data was rejected based on data validation considerations.
0.00: Not detected

BACKGROUND BASELINE
PRE-PRODUCTION INDIVIDUAL TEST RESULTS (lbs/Ton metal) Continued

Analyte	AM001	AM002	AM003	AM004	AM005	AM006	AM007	AM008	AM009	Average
p-Cymene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pentanal	0.00E+00	0.00E+00	0.00E+00	6.49E-04	0.00E+00	4.09E-04	0.00E+00	4.92E-04	5.46E-04	2.33E-04
Phenol/3-Ethyltoluene	0.00E+00	0.00E+00	2.33E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.59E-04
Propionaldehyde	1.11E-03	9.80E-04	1.28E-03	1.56E-03	1.01E-03	1.22E-03	1.46E-03	1.76E-03	1.35E-03	1.30E-03
Propylbenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Styrene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tetradecane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.85E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.06E-05
Toluene	1.60E-03	2.29E-03	3.72E-03	3.40E-03	3.34E-03	3.98E-03	1.45E-03	4.04E-03	4.03E-03	3.09E-03
Tridecane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.24E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.49E-05
Undecane	5.72E-04	0.00E+00	0.00E+00	8.68E-04	4.56E-04	1.36E-03	6.11E-04	0.00E+00	9.84E-04	5.39E-04

Note: The results presented are not suitable for use as general emission factors.
NT: Analyte was not tested.
I: Data was rejected based on data validation considerations
0.00: Not detected

GREENSAND BASELINE
PRE-PRODUCTION INDIVIDUAL TEST RESULTS (lbs/Ton metal)

Analyte	AY001	AY002	AY003	AY004	AY005	AY006	AY007	AY008	AY009	Average
1,2,3-Trimethylbenzene	7.04E-03	7.39E-03	7.83E-03	4.78E-03	6.57E-03	6.35E-03	3.33E-03	5.70E-03	4.81E-03	5.98E-03
1,2,4-Trimethylbenzene[a]	2.50E-02	2.62E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.52E-03	1.95E-02	1.62E-02	1.04E-02
1,2-Diethylbenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,2-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3,5-Trimethylbenzene	7.67E-03	7.89E-03	8.22E-03	5.55E-03	6.93E-03	6.77E-03	4.71E-03	6.40E-03	5.08E-03	6.58E-03
1,3-Diethylbenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-Diisopropylbenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-Dimethylnaphthalene	1.43E-03	1.13E-03	1.46E-03	3.76E-04	9.73E-04	1.73E-03	0.00E+00	2.50E-04	0.00E+00	8.17E-04
1,4-Diethylbenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,5-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,6-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,8-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1-Methylnaphthalene	4.36E-03	0.00E+00	6.30E-03	2.22E-03	3.56E-03	4.77E-03	1.60E-03	2.09E-03	9.33E-04	2.87E-03
2,3,5-Trimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,3,5-Trimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,3-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,3-Dimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4,6-Trimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4-Dimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,6-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,6-Dimethylphenol	1.75E-03	3.71E-03	2.41E-03	0.00E+00	3.53E-03	4.37E-03	0.00E+00	3.87E-03	2.98E-03	2.51E-03
2,7-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2-Ethyltoluene	5.04E-03	5.70E-03	5.25E-03	3.49E-03	4.51E-03	4.40E-03	2.89E-03	4.06E-03	3.36E-03	4.30E-03
2-Methylnaphthalene	7.19E-03	6.52E-03	1.05E-02	4.01E-03	5.88E-03	7.91E-03	2.62E-03	3.43E-03	1.50E-03	5.50E-03
3,4-Dimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3,5-Dimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3-Ethyltoluene	1.34E-02	1.20E-02	1.30E-02	8.25E-03	1.06E-02	1.04E-02	6.60E-03	9.55E-03	7.74E-03	1.02E-02
4-Ethyltoluene	4.79E-03	4.69E-03	4.83E-03	3.15E-03	4.19E-03	4.12E-03	2.67E-03	3.86E-03	3.00E-03	3.92E-03
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	9.85E-03	9.10E-03	1.05E-02	6.40E-03	7.01E-03	7.13E-03	6.41E-03	7.25E-03	5.71E-03	7.70E-03
Acetone	2.06E-02	1.63E-02	1.58E-02	1.01E-02	9.27E-03	1.31E-02	1.25E-03	1.04E-03	8.47E-04	9.81E-03
Acrolein	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Note: The results presented are not suitable for use as general emission factors.
NT: Analyte was not tested.
I: Data was rejected based on data validation considerations.
[a] 1,2,4 Trimethylbenene coeluted with tert- butylbenzene.
0.00: Not detected

GREENSAND BASELINE
PRE-PRODUCTION INDIVIDUAL TEST RESULTS (lbs/Ton metal) Continued

Analyte	AY001	AY002	AY003	AY004	AY005	AY006	AY007	AY008	AY009	Average
Aniline	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Anthracene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Benzaldehyde	2.62E-03	3.68E-03	3.54E-03	8.18E-04	2.48E-03	4.17E-04	8.28E-04	2.55E-03	1.68E-03	2.07E-03
Benzene	1.58E-01	1.59E-01	1.62E-01	8.95E-02	1.29E-01	1.32E-01	9.46E-02	I	7.13E-02	1.24E-01
Biphenyl	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Butylbenzene	5.97E-03	6.21E-03	6.75E-03	3.84E-03	5.53E-03	5.11E-03	NT	4.72E-03	4.19E-03	5.29E-03
Butyraldehyde/Methacrolein	4.00E-04	3.00E-04	3.00E-04	0.00E+00	3.00E-04	3.00E-04	3.00E-04	3.00E-04	0.00E+00	3.00E-04
Crotonaldehyde	I	7.08E-04	7.27E-04	4.76E-04	4.67E-04	4.91E-04	4.77E-04	5.80E-04	4.90E-04	5.52E-04
Cumene	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Cyclohexane	3.71E-03	3.99E-03	1.78E-03	1.37E-03	3.22E-03	3.80E-03	1.32E-03	0.00E+00	0.00E+00	2.13E-03
Decane	9.40E-03	1.06E-02	1.04E-02	6.88E-03	8.55E-03	9.23E-03	6.24E-03	7.19E-03	5.81E-03	8.25E-03
Dodecane	5.82E-03	7.15E-03	8.44E-03	3.93E-03	6.35E-03	7.49E-03	2.86E-03	5.12E-03	4.66E-03	5.76E-03
Ethyl Benzene	1.18E-02	1.16E-02	1.24E-02	8.89E-03	9.90E-03	1.07E-02	7.96E-03	9.06E-03	6.86E-03	9.92E-03
Formaldehyde	1.94E-03	1.37E-03	2.47E-03	1.27E-03	1.49E-03	9.95E-04	1.13E-03	1.28E-03	1.61E-03	1.51E-03
Heptane	1.83E-02	2.14E-02	1.85E-02	1.68E-02	1.72E-02	2.29E-02	1.68E-02	1.77E-02	1.39E-02	1.82E-02
Hexaldehyde	0.00E+00	3.39E-04	3.37E-04	0.00E+00	2.68E-04	2.37E-04	2.68E-04	2.50E-04	2.10E-04	2.12E-04
Hexane	1.95E-02	1.91E-02	2.13E-02	2.40E-02	2.77E-02	2.04E-02	2.13E-02	2.01E-02	1.58E-02	2.10E-02
Indan	3.66E-03	3.92E-03	4.17E-03	0.00E+00	2.93E-03	3.26E-03	0.00E+00	2.93E-03	2.44E-03	2.59E-03
Indene	0.00E+00	3.43E-03	1.93E-03	0.00E+00	2.70E-03	2.90E-03	0.00E+00	2.59E-03	2.12E-03	1.74E-03
Isobutylbenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
m,p-Cresol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.77E-03	0.00E+00	3.43E-03	1.50E-03	7.45E-04
m,p-Xylene	5.18E-02	5.13E-02	5.35E-02	3.86E-02	4.36E-02	4.62E-02	3.51E-02	4.05E-02	3.20E-02	4.36E-02
MEK	NT	3.76E-03	3.69E-03	2.83E-03	2.58E-03	2.99E-03	1.48E-03	2.94E-03	1.88E-03	2.77E-03
o,m,p-Tolualdehyde	4.93E-04	I	5.58E-04	2.98E-04	4.45E-04	3.32E-04	4.46E-04	4.71E-04	3.63E-04	4.26E-04
Naphthalene	1.49E-02	1.71E-02	2.64E-02	8.92E-03	1.59E-02	2.55E-02	6.45E-03	1.20E-02	1.07E-02	1.53E-02
Nonane	1.12E-02	1.13E-02	1.12E-02	8.34E-03	9.70E-03	1.07E-02	7.89E-03	8.40E-03	6.47E-03	9.46E-03
n-Propylbenzene	0.00E+00	3.16E-03	0.00E+00	0.00E+00	2.83E-03	2.87E-03	0.00E+00	2.60E-03	2.02E-03	1.50E-03
o-Cresol	0.00E+00	3.85E-03	5.76E-03	0.00E+00	1.63E-03	4.89E-03	0.00E+00	2.84E-03	1.01E-03	2.22E-03
Octane	1.94E-02	1.85E-02	1.86E-02	1.41E-02	1.53E-02	1.74E-02	8.95E-03	4.67E-03	1.02E-02	1.41E-02
o-Xylene	2.14E-02	2.19E-02	2.21E-02	1.59E-02	1.87E-02	1.96E-02	1.45E-02	1.80E-02	1.34E-02	1.84E-02

Note: The results presented are not suitable for use as general emission factors.
NT: Analyte was not tested.
I: Data was rejected based on data validation considerations.
0.00: Not detected

GREENSAND BASELINE
PRE-PRODUCTION INDIVIDUAL TEST RESULTS (lbs/Ton metal) Continued

Analyte	AY001	AY002	AY003	AY004	AY005	AY006	AY007	AY008	AY009	Average
p-Cymene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pentanal	5.00E-04	6.00E-04	5.00E-04	5.00E-04	4.00E-04	4.00E-04	9.00E-04	5.00E-04	5.00E-04	5.33E-04
Phenol	0.00E+00	6.48E-03	6.65E-03	1.65E-03	5.80E-03	5.89E-03	3.32E-03	6.74E-03	4.65E-03	4.57E-03
Propionaldehyde	1.50E-03	1.20E-03	1.41E-03	8.03E-04	9.85E-04	1.02E-03	8.28E-04	9.21E-04	7.89E-04	1.05E-03
sec-Butylbenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Styrene	3.33E-03	2.98E-03	2.74E-03	1.82E-03	2.43E-03	2.25E-03	1.67E-03	2.60E-03	1.84E-03	2.41E-03
Tetradecane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Toluene	9.79E-02	9.90E-02	1.01E-01	7.42E-02	8.24E-02	8.74E-02	7.08E-02	7.85E-02	6.18E-02	8.36E-02
Tridecane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.23E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.36E-04
Undecane	7.27E-03	8.41E-03	8.48E-03	4.95E-03	7.37E-03	7.51E-03	3.71E-03	5.96E-03	5.14E-03	6.53E-03

Note: The results presented are not suitable for use as general emission factors.
NT: Analyte was not tested.
I: Data was rejected based on data validation considerations.
0.00: Not detected

CORE BASELINE
PRE-PRODUCTION INDIVIDUAL TEST RESULTS (lbs/Ton metal)

Analyte	AP001	AP002	AP003	AP004	AP005	AP006	AP007	AP008	AP009	AP010	Average
1,2,3-Trimethylbenzene	8.98E-03	1.29E-02	1.71E-02	1.27E-02	1.52E-02	1.41E-02	1.76E-02	NT	1.04E-02	7.30E-03	1.29E-02
1,2,4-Trimethylbenzene	3.03E-02	3.64E-02	5.12E-02	4.00E-02	4.47E-02	4.19E-02	5.26E-02	NT	3.01E-02	2.08E-02	3.86E-02
1,2-Diethylbenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	0.00E+00	0.00E+00	0.00E+00
1,2-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	0.00E+00	0.00E+00	0.00E+00
1,3,5-Trimethylbenzene	8.46E-03	1.02E-02	1.51E-02	1.14E-02	1.23E-02	1.07E-02	1.43E-02	NT	8.66E-03	6.26E-03	1.08E-02
1,3-Diethylbenzene	0.00E+00	2.01E-03	2.73E-03	0.00E+00	2.18E-03	1.57E-03	2.49E-03	NT	2.29E-03	1.86E-03	1.68E-03
1,3-Diisopropylbenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	0.00E+00	0.00E+00	0.00E+00
1,3-Dimethylnaphthalene	8.11E-04	6.80E-04	1.28E-03	0.00E+00	1.23E-03	7.15E-04	1.75E-03	NT	NT	0.00E+00	8.08E-04
1,4-Diethylbenzene	4.93E-03	6.81E-03	8.78E-03	1.07E-02	7.80E-03	8.50E-03	8.10E-03	NT	0.00E+00	0.00E+00	6.18E-03
1,5-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	0.00E+00	0.00E+00	0.00E+00
1,6-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	NT	0.00E+00	0.00E+00
1,8-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	0.00E+00	0.00E+00	0.00E+00
1-Methylnaphthalene	2.00E-03	3.20E-03	5.88E-03	2.42E-03	5.24E-03	5.70E-03	8.26E-03	NT	I	8.97E-03	5.21E-03
2,3,5-Trimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	0.00E+00	0.00E+00	0.00E+00
2,3,5-Trimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	0.00E+00	0.00E+00	0.00E+00
2,3-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	0.00E+00	0.00E+00	0.00E+00
2,3-Dimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	0.00E+00	0.00E+00	0.00E+00
2,4,6-Trimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	0.00E+00	0.00E+00	0.00E+00
2,4-Dimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	0.00E+00	0.00E+00	0.00E+00
2,6-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	NT	0.00E+00	0.00E+00
2,6-Dimethylphenol	0.00E+00	3.40E-03	5.32E-03	2.98E-03	4.57E-03	4.84E-03	5.01E-03	NT	3.58E-03	0.00E+00	3.30E-03
2,7-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	NT	0.00E+00	0.00E+00
2-Ethyltoluene	6.82E-03	8.89E-03	1.25E-02	9.24E-03	1.01E-02	7.94E-03	1.19E-02	NT	6.26E-03	4.43E-03	8.68E-03
2-Methylnaphthalene	4.28E-03	6.95E-03	1.44E-02	5.16E-03	1.09E-02	1.16E-02	2.02E-02	NT	I	1.83E-02	1.15E-02
3,4-Dimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	0.00E+00	0.00E+00	0.00E+00
3,5-Dimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	0.00E+00	0.00E+00	0.00E+00
4-Ethyltoluene	6.20E-03	6.50E-03	9.24E-03	1.43E-02	I	5.82E-03	7.32E-03	NT	5.55E-03	4.23E-03	7.39E-03
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	6.17E-03	5.40E-03	5.96E-03	5.82E-03	5.74E-03	6.20E-03	6.33E-03	5.15E-03	6.22E-03	7.00E-03	6.00E-03
Acetone	3.67E-03	4.03E-03	4.62E-03	5.82E-03	NT	5.30E-03	4.75E-03	5.25E-03	5.29E-03	7.62E-03	5.15E-03
Acrolein	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Note: The results presented are not suitable for use as general emission factors.
NT: Analyte was not tested.
I: Data was rejected based on data validation considerations.
0.00: Not detected

CORE BASELINE
PRE-PRODUCTION INDIVIDUAL TEST RESULTS (lbs/Ton metal) Continued

Analyte	AP001	AP002	AP003	AP004	AP005	AP006	AP007	AP008	AP009	AP010	Average
Aniline	I	7.91E-02	9.42E-02	9.05E-02	1.00E-01	9.09E-02	9.34E-02	8.49E-02	9.07E-02	1.01E-01	9.17E-02
Butanal/Benzaldehyde	1.61E-04	0.00E+00	0.00E+00	3.23E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.70E-04	3.97E-04	1.15E-04
Benzene	1.35E-01	1.36E-01	1.57E-01	1.63E-01	1.50E-01	1.51E-01	1.37E-01	NT	1.19E-01	1.03E-01	1.39E-01
Biphenyl	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	0.00E+00	0.00E+00	0.00E+00
Crotonaldehyde	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cumene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	0.00E+00	0.00E+00	0.00E+00
Cyclohexane	NT	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	0.00E+00	0.00E+00	0.00E+00
Decane	0.00E+00	2.81E-03	3.90E-03	2.83E-03	2.84E-03	2.39E-03	3.54E-03	NT	0.00E+00	0.00E+00	2.03E-03
Dodecane	2.50E-03	4.80E-03	6.71E-03	3.26E-03	5.98E-03	5.34E-03	7.13E-03	NT	5.30E-03	3.00E-03	4.89E-03
Ethyl Benzene	1.11E-03	1.32E-03	1.91E-03	1.57E-03	1.82E-03	1.68E-03	1.82E-03	NT	1.48E-03	1.23E-03	1.55E-03
Formaldehyde	5.81E-04	6.29E-04	7.60E-04	7.44E-04	7.52E-04	9.29E-04	9.89E-04	8.18E-04	1.14E-03	I	8.16E-04
Heptane	1.87E-03	0.00E+00	2.38E-03	2.25E-03	2.26E-03	2.09E-03	1.88E-03	NT	2.17E-03	0.00E+00	1.65E-03
Hexaldehyde	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hexane	1.25E-03	8.21E-04	1.16E-03	1.36E-03	1.19E-03	1.06E-03	1.10E-03	NT	9.84E-04	8.02E-04	1.08E-03
Indene	0.00E+00	1.77E-03	2.03E-03	0.00E+00	1.64E-03	1.50E-03	1.79E-03	NT	0.00E+00	0.00E+00	9.70E-04
Isobutylbenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	0.00E+00	0.00E+00	0.00E+00
m,p-Cresol/Butylbenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	0.00E+00	0.00E+00	0.00E+00
m,p-Tolualdehyde	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
m,p-Xylene	9.41E-03	1.13E-02	1.66E-02	1.32E-02	1.48E-02	1.43E-02	1.51E-02	NT	1.25E-02	1.01E-02	1.30E-02
MEK/Butyraldehyde	6.98E-04	6.88E-04	8.27E-04	1.08E-03	9.90E-04	8.89E-04	1.19E-03	9.19E-04	7.77E-04	9.45E-04	9.00E-04
Methacrolein	1.79E-04	1.18E-04	2.21E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.18E-05
Naphthalene	6.51E-03	1.52E-02	2.48E-02	1.24E-02	2.23E-02	2.58E-02	3.25E-02	NT	4.38E-02	2.04E-02	2.26E-02
Nonane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	0.00E+00	0.00E+00	0.00E+00
o-Cresol/Indan	0.00E+00	2.92E-03	5.05E-03	2.64E-03	4.85E-03	5.42E-03	8.65E-03	NT	1.29E-02	4.32E-03	5.20E-03
Octane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	0.00E+00	0.00E+00	0.00E+00

Note: The results presented are not suitable for use as general emission factors.
NT: Analyte was not tested.
I: Data was rejected based on data validation considerations.
0.00: Not detected

CORE BASELINE
PRE-PRODUCTION INDIVIDUAL TEST RESULTS (lbs/Ton metal) Continued

Analyte	AP001	AP002	AP003	AP004	AP005	AP006	AP007	AP008	AP009	AP010	Average
o-Xylene	2.23E-03	2.75E-03	4.34E-03	3.36E-03	3.86E-03	3.42E-03	4.16E-03	NT	2.91E-03	2.34E-03	3.26E-03
p-Cymene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	0.00E+00	0.00E+00	0.00E+00
Pentanal	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Phenol/3-Ethyltoluene	7.67E-03	1.27E-02	2.36E-02	1.06E-02	1.00E-02	2.10E-02	I	NT	1.76E-02	6.39E-03	1.37E-02
Propionaldehyde	7.25E-04	6.58E-04	9.04E-04	8.19E-04	8.41E-04	8.59E-04	9.79E-04	7.38E-04	8.91E-04	1.06E-03	8.48E-04
Propylbenzene	2.19E-03	2.58E-03	4.04E-03	3.02E-03	3.12E-03	3.50E-03	5.02E-03	NT	9.43E-03	NT	4.11E-03
sec-Butylbenzene	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Styrene	1.38E-03	1.57E-03	1.99E-03	1.60E-03	1.90E-03	1.75E-03	1.89E-03	NT	1.42E-03	1.25E-03	1.64E-03
tert-Butylbenzene	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Tetradecane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	NT	0.00E+00	0.00E+00	0.00E+00
Toluene	2.60E-02	2.86E-02	4.04E-02	3.49E-02	3.68E-02	3.56E-02	3.52E-02	NT	3.02E-02	2.43E-02	3.24E-02
Tridecane	0.00E+00	0.00E+00	Outlier	0.00E+00	0.00E+00	0.00E+00	4.14E-03	NT	4.34E-03	0.00E+00	1.06E-03
Undecane	9.20E-03	1.42E-02	1.87E-02	1.44E-02	1.69E-02	1.85E-02	1.96E-02	NT	1.38E-02	1.08E-02	1.51E-02

Note: The results presented are not suitable for use as general emission factors.
NT: Analyte was not tested.
I: Data was rejected based on data validation considerations.
0.00: Not detected

GREENSAND/CORE COMBINED BASELINE
PRE-PRODUCTION INDIVIDUAL TEST RESULTS (lbs/Ton metal)

Analyte	AU001	AU002	AU003	AU004	AU005	AU006	AU007	Average
1,2,3-Trimethylbenzene	1.21E-02	1.34E-02	1.46E-02	1.43E-02	1.58E-02	1.79E-02	2.58E-02	1.63E-02
1,2,4-Trimethylbenzene	3.22E-02	4.69E-02	4.85E-02	4.48E-02	5.57E-02	5.22E-02	7.79E-02	5.12E-02
1,2-Diethylbenzene	0.00E+00	0.00E+00	0.00E+00	1.95E-03	1.64E-03	1.29E-03	0.00E+00	6.97E-04
1,2-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3,5-Trimethylbenzene	1.21E-02	1.55E-02	1.68E-02	1.59E-02	1.87E-02	1.78E-02	2.51E-02	1.74E-02
1,3-Diethylbenzene	2.15E-03	2.75E-03	2.81E-03	3.16E-03	3.14E-03	2.93E-03	4.12E-03	3.01E-03
1,3-Diisopropylbenzene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,3-Dimethylnaphthalene	1.83E-03	0.00E+00	0.00E+00	0.00E+00	8.24E-04	0.00E+00	1.13E-03	5.40E-04
1,4-Diethylbenzene	5.21E-03	2.25E-03	1.49E-03	0.00E+00	6.88E-03	6.80E-03	1.07E-02	4.77E-03
1,5-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,6-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1,8-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1-Methylnaphthalene	4.28E-03	0.00E+00	1.93E-03	4.09E-03	5.50E-03	4.18E-03	5.33E-03	3.61E-03
2,3,5-Trimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,3,5-Trimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,3-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,3-Dimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4,6-Trimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,4-Dimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,6-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2,6-Dimethylphenol	2.98E-03	0.00E+00	1.67E-03	3.92E-03	3.86E-03	0.00E+00	4.59E-03	2.43E-03
2,7-Dimethylnaphthalene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2-Ethyltoluene	9.85E-03	1.37E-02	1.67E-02	1.50E-02	1.70E-02	1.53E-02	2.26E-02	1.57E-02
2-Methylnaphthalene	8.09E-03	8.37E-04	3.95E-03	8.04E-03	1.27E-02	8.77E-03	1.04E-02	7.54E-03
3,4-Dimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3,5-Dimethylphenol	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4-Ethyltoluene	8.60E-03	1.08E-02	1.17E-02	1.13E-02	1.22E-02	1.87E-02	1.56E-02	1.27E-02
Acenaphthylene	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	9.24E-03	9.42E-03	9.70E-03	9.99E-03	9.39E-03	9.72E-03	NT	9.58E-03
Acetone	1.37E-02	1.16E-02	1.34E-02	1.34E-02	1.30E-02	1.30E-02	1.48E-02	1.32E-02
Acrolein	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Note: The results presented are not suitable for use as general emission factors.
NT: Analyte was not tested.
I: Data was rejected based on data validation considerations.

GREENSAND/CORE COMBINED BASELINE
PRE-PRODUCTION INDIVIDUAL TEST RESULTS (lbs/Ton metal) Continued

Analyte	AU001	AU002	AU003	AU004	AU005	AU006	AU007	Average
Aniline	6.25E-02	5.18E-02	5.07E-02	4.69E-02	5.32E-02	6.05E-02	4.77E-02	5.33E-02
Benzaldehyde	6.41E-04	4.87E-04	4.46E-04	4.63E-04	6.80E-04	5.08E-04	6.82E-04	5.58E-04
Benzene	1.85E-01	2.13E-01	2.32E-01	2.14E-01	2.38E-01	2.31E-01	2.29E-01	2.20E-01
Biphenyl	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Crotonaldehyde	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cumene	2.06E-03	2.55E-03	2.68E-03	2.71E-03	2.84E-03	2.47E-03	3.08E-03	2.63E-03
Cyclohexane	8.04E-03	7.19E-03	7.65E-03	7.19E-03	9.39E-03	6.48E-03	6.68E-03	7.52E-03
Decane	1.47E-02	1.63E-02	1.70E-02	1.72E-02	1.83E-02	2.06E-02	1.93E-02	1.76E-02
Dodecane	5.62E-03	3.81E-03	5.44E-03	7.18E-03	6.90E-03	6.03E-03	8.99E-03	6.28E-03
Ethyl Benzene	1.02E-02	1.04E-02	1.14E-02	1.14E-02	1.15E-02	1.27E-02	1.31E-02	1.15E-02
Formaldehyde	I	3.60E-03	2.12E-03	3.30E-03	2.05E-03	2.38E-03	2.96E-03	2.73E-03
Heptane	2.99E-02	2.91E-02	3.18E-02	3.03E-02	3.28E-02	3.49E-02	3.35E-02	3.18E-02
Hexaldehyde	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hexane	1.73E-02	1.67E-02	1.91E-02	1.83E-02	1.91E-02	1.64E-02	2.02E-02	1.81E-02
Indan	NT	NT	NT	NT	NT	NT	NT	NT
Indene	1.89E-03	0.00E+00	1.26E-03	2.09E-03	2.08E-03	2.01E-03	2.22E-03	1.65E-03
Isobutylbenzene	1.44E-03	1.61E-03	0.00E+00	1.95E-03	1.79E-03	1.35E-03	1.79E-03	1.42E-03
m,p-Cresol/Butylbenzene	1.54E-03	0.00E+00	0.00E+00	0.00E+00	2.69E-03	2.46E-03	3.18E-03	1.41E-03
m,p-Tolualdehyde	3.68E-04	NT	3.34E-04	3.09E-04	3.24E-04	0.00E+00	3.41E-04	2.79E-04
m,p-Xylene	5.03E-02	5.23E-02	5.86E-02	5.66E-02	5.84E-02	6.44E-02	6.87E-02	5.85E-02
MEK/Butyradehyde	3.68E-03	3.07E-03	4.24E-03	4.02E-03	4.86E-03	4.00E-03	4.43E-03	4.04E-03
Methacrolein	5.67E-04	1.90E-04	6.69E-04	3.40E-04	4.53E-04	4.10E-04	5.12E-04	4.49E-04
Naphthalene	9.74E-03	2.31E-03	9.03E-03	1.27E-02	1.56E-02	1.18E-02	1.83E-02	1.13E-02
Nonane	1.71E-02	1.69E-02	1.85E-02	1.80E-02	1.91E-02	1.93E-02	1.85E-02	1.82E-02
o-Cresol/Indan	2.79E-03	2.22E-03	3.99E-03	5.05E-03	5.95E-03	5.20E-03	7.36E-03	4.65E-03
Octane	2.57E-02	2.50E-02	2.83E-02	2.70E-02	2.83E-02	2.65E-02	2.69E-02	2.68E-02

Note: The results presented are not suitable for use as general emission factors.
NT: Analyte was not tested.
I: Data was rejected based on data validation considerations.

GREENSAND/CORE COMBINED BASELINE
PRE-PRODUCTION INDIVIDUAL TEST RESULTS (lbs/Ton metal) Continued

Analyte	AU001	AU002	AU003	AU004	AU005	AU006	AU007	Average
o-Xylene	1.67E-02	1.81E-02	1.98E-02	1.93E-02	2.10E-02	2.36E-02	2.48E-02	2.05E-02
p-Cymene	1.47E-03	0.00E+00	0.00E+00	1.51E-03	0.00E+00	1.06E-03	1.61E-03	8.07E-04
Pentanal	4.20E-04	3.39E-04	4.24E-04	3.60E-04	4.21E-04	3.56E-04	5.00E-04	4.03E-04
Phenol/3-Ethyltoluene	1.70E-02	1.70E-02	1.80E-02	3.08E-02	1.58E-02	3.45E-02	2.48E-02	2.26E-02
Propionaldehyde	2.21E-03	1.69E-03	1.78E-03	1.65E-03	1.73E-03	1.73E-03	2.05E-03	1.83E-03
Propylbenzene	6.53E-03	8.24E-03	1.06E-02	8.38E-03	1.08E-02	4.91E-03	1.12E-02	8.67E-03
sec-Butylbenzene	NT	NT	NT	NT	NT	NT	NT	NT
Styrene	4.78E-03	4.81E-03	4.89E-03	5.67E-03	4.99E-03	6.20E-03	5.99E-03	5.33E-03
tert-Butylbenzene	NT	NT	NT	NT	NT	NT	NT	NT
Tetradecane	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Toluene	9.26E-02	9.93E-02	1.06E-01	1.04E-01	1.06E-01	1.15E-01	1.18E-01	1.06E-01
Tridecane	2.20E-03	0.00E+00	1.56E-03	0.00E+00	2.56E-03	2.25E-03	3.30E-03	1.69E-03
Undecane	1.50E-02	1.29E-02	4.00E-02	1.45E-02	1.50E-02	1.79E-02	2.50E-02	2.00E-02
2-methyl-2-pentanone[a]	1.20E-03	I	1.30E-03	1.00E-03	1.30E-03	1.10E-03	1.10E-03	1.17E-03

Note: The results presented are not suitable for use as general emission factors.
NT: Analyte was not tested.
I: Data was rejected based on data validation considerations.
[a] 2-methyl-2-pentanone was only reported for this test series, and therefore was not included in the sum of VOCs comparison of the four baselines.

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APPENDIX B

Listing of Support Documents

Appendix B: Listing of Support Documents

The following documents contain specific test results, procedures, and documentation used in support of this testing.

1. "Casting Emission Reduction Program – Foundry Product Testing Guide: Reducing Emissions by Comparative Testing", May 4, 1998.

2. "CERP Testing, Quality Control and Quality Assurance Procedures and Data Validation Procedures Manual".

3. "Evaluation of the Required Number of Replicate Tests to Provide Statistically Significant Air Emission Reduction Comparisons for the CERP Pre-production Foundry Test Program".

4. Background Baseline (AM) data binder.

5. Greensand Baseline (AY) data binder.

6. Core Baseline (AP) data binder.

7. Greensand/Core Baseline (AU) data binder.

Appendix C

Approved Test Plans

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CERP TEST PLAN

- **CONTROL NUMBER: RE 1 00014**
- **SAMPLE FAMILY: AM**
- **SAMPLE EVENTS: 001 thru 009**
- **SITE: X PRE-PRODUCTION(243) CERP FOUNDRY(238)**
- **TEST TYPE: Minimum Emission Baseline**
- **MOLD TYPE: Organic free sands and clays with no Seacoal**
- **NUMBER OF MOLDS: 9**
- **CORE TYPE: CERP Sodium Silicate**

TEST DATE: START: 09/08/1998
FINISH: 09/10/1998

TEST OBJECTIVES: Minimum Emissions Baseline.
Primary: To determine the minimum emissions from green sand molds containing no seacoal and step cores made from sodium silicate cores containing no identifiable organic materials. The nine-mold test will use both Airsense 500, real time mass spectrometer, and analytical laboratory samples.

PARAMETERS:
All mold and core to be made from virgin materials and products containing no organics.

BRIEF OVERVIEW:
Preliminary 5-mold test using Airsense 500 spectrometer showed low levels of emissions that weren't completely quantified. This test is the lowest level of emissions that can be expected from new binder systems.

SPECIAL CONDITIONS:
Cores to be made during prior week, dried in oven to remove residual moisture, and stored in plastic bags. Mold sand will start with 2 tubs of virgin material and reuse for every other mold.

Operations Manager — Date 8/31/98

Emissions Team (USCAR) — Date

Process and Facilities Team (USCAR) — Date 9/3/98

Project Manager — Date 8/31/98

CERP TEST PLAN

- **CONTROL NUMBER: RE 1 00026**
- **SAMPLE FAMILY: AY**
- **SAMPLE EVENTS: 001 thru 009**
- **SITE: X PRE-PRODUCTION(243) CERP FOUNDRY(238)**
- **TEST TYPE: Green Sand Baseline**
- **MOLD TYPE: Green Sand from used system sand**
- **NUMBER OF MOLDS: 9**
- **CORE TYPE: CERP Sodium Silicate Step Core**

TEST DATE: START: 02 March 99
FINISH: 04 March 99

TEST OBJECTIVES:
Primary: Green Sand Baseline. To determine the baseline emissions from a standard mold with seacoal as the only known organic source and containing a core having no identified organic material. The statistical validity will be based on nine sampling events (molds).
Secondary: None.

PARAMETERS:
All molds will be made from characterized Pilot foundry system sand. The cores are organic free sodium silicate step block cores.

BRIEF OVERVIEW:
This portion of the baseline deals with the organic emissions coming off of the emitters from the mold, primarily seacoal. The molds are made with existing materials that have been run through the casting process several times. System sand LOI's will be adjusted to 5.00% + 0.30%, The Bentonite clay will be adjusted to 7.00% +/- 0.50% The cores

are made with Lake Sand and J.B. Devene Kleencast #1 binder and gassed for 20 seconds with C02. This test is identical to the green sand baseline AG. The emissions from this series of tests will be compared to AG for the baseline green sand mold materials.

SPECIAL CONDITIONS:
None

Steven M Wright **Senior Process Engineer**	25 Feb 1999 **Date**
George R Crandell **Operations Manager**	3/8/99 **Date**
Jerry O Rogers **Emissions Team (USCAR)**	3/13/99 **Date**
James D Schultz **Process and Facilities Team (USCAR)**	3/9/99 **Date**
Keith E Cox **Project Manager**	5/10/99 **Date**

CERP TEST PLAN

- **CONTROL NUMBER: RE 1 00017**
- **SAMPLE FAMILY: AP**
- **SAMPLE EVENTS: 001 thru 009**
- **SITE: X PRE-PRODUCTION(243) CERP FOUNDRY(238)**
- **TEST TYPE: Organic Core Baseline**
- **MOLD TYPE: Virgin Sands and clays with no Seacoal**
- **NUMBER OF MOLDS: 9**
- **CORE TYPE: Isocure Step Block Cores**

TEST DATE: START: 10/20/1998
FINISH: 10/22/1998

TEST OBJECTIVES:
Primary: Organic Core Baseline. To determine the baseline emissions from standard Isocure step block cores in a mold with no identified organic material in the molding sand. The statistical validity will be based on nine sampling events (molds).
Secondary: To collect Formaldehydes, Amines and Isocynates that were not collected on Test AJ, which may appear in organic core resins.

VARIABLES:
All mold materials will be made using virgin materials, i.e. sand, Southern Bentonite, Western Bentonite. The cores are Isocure step block made by Lodi Iron Works using Wedron 420 sand and 1.75% Ashland Isocure binder.

BRIEF OVERVIEW:

This portion of the baseline testing deals with the organic emissions coming off of the emitters from the core, namely Isocure Resin based on sand in the ratio 57% LF 305 part I and 43% 52-904 part II. The mold materials used are made with "virgin" materials that are deemed to be organic free. There is no seacoal used in these molds. The emissions from this series of tests will be the baseline for those companies testing core materials.

SPECIAL CONDITIONS:
None.

Stan M Kuglo — 10/15/98
Senior Process Engineer — **Date**

Gary K Anderson — 10/19/98
Operations Manager — **Date**

Jerry J Rogers — 1/22/99
Emissions Team (USCAR) — **Date**

James A Schultz — 10/19/98
Process and Facilities Team (USCAR) — **Date**

Willie C Cox — 10/19/98
Project Manager — **Date**

CERP TEST PLAN

- **CONTROL NUMBER: RE 1 00022**
- **SAMPLE FAMILY: AU**
- **SAMPLE EVENTS: 001 thru 009**
- **SITE: X PRE-PRODUCTION(243) CERP FOUNDRY(238)**
- **TEST TYPE: Green Sand & Organic Core Emissions Test Baseline II**
- **MOLD TYPE: Green sand characterized from CERP Pilot foundry system sand**
- **NUMBER OF MOLDS: 9**
- **CORE TYPE: Lodi Isocure Step Block Cores**

TEST DATE: START: 11/17/1998
FINISH: 11/19/1998

TEST OBJECTIVES:
Primary: Green Sand & Organic Core Baseline. To determine the baseline emissions from a standard mold with seacoal and Isocure step cores as the only known organic sources. The statistical validity will be based on nine sampling events (molds).
Secondary: AU will have the same objective as AK (Greensand and organic core baseline); but the mold will be constructed as in AG (Greensand Baseline) with characterized system sand; and the core constructed as in AJ (Organic Core Baseline) with Lodi Isocure Step Core, so that the composite AU, unlike AK, will reflect the character of the components of the composite as in AG and AJ.

PARAMETERS:
The stack flow damper is set to achieve a pressure differential on the manometer of 0.09 (800 scfm). Mold sand will be CERP system greensand; Cores are Isocure Step Block cores manufactured at Lodi Iron Works using Wedron 420 sand.

The green sand and organic core composite combines the emitters from both the mold (seacoal) and the cores (Isocure resin). The mold sand is tested prior to commencement of the test and during the mulling operation the sand is brought up to seacoal and clay specifications. The emissions from this series of tests will validate the emissions from the Green Sand and Organic Core tests or yields information on their interactions.

SPECIAL CONDITIONS: None

Steven M Knight — **Senior Process Engineer** — 11-4-98 — **Date**

George Vanderah — **Operations Manager** — 11-18-98 — **Date**

Gary D Rogers — **Emissions Team (USCAR)** — 3/14/99 — **Date**

James B Schultz — **Process and Facilities Team (USCAR)** — 10/6/98 — **Date**

Walter C Weber — **Project Manager** — 11/18/98 — **Date**

Appendix D

List of Analytes

Pre-production Baseline List of Analytes

Analyte	CAS Number	Reporting Limit (ng)	HAP	POM	VOC
1,2,3-Trimethylbenzene	526-73-8	20			X
1,2,4-Trimethylbenzene	95-63-6	20			X
1,2-Diethylbenzene	135-01-3	100			X
1,2-Dimethylnaphthalene	573-98-8	100	X	X	X
1,3,5-Trimethylbenzene	108-67-8	20			X
1,3-Diethylbenzene	141-93-5	100			X
1,3-Diisopropylbenzene	99-62-7	100			X
1,3-Dimethylnaphthalene	575-41-7	20	X	X	X
1,4-Diethylbenzene	105-05-5	100			X
1,5-Dimethylnaphthalene	571-61-9	100	X	X	X
1,6-Dimethylnaphthalene	575-43-9	100	X	X	X
1,8-Dimethylnaphthalene	569-41-5	100	X	X	X
1-Methylnaphthalene	90-12-0	20	X	X	X
2,3,5-Trimethylnaphthalene	2245-38-7	100	X	X	X
2,3,5-Trimethylphenol	697-82-5	100			X
2,3-Dimethylnaphthalene	581-40-8	100	X	X	X
2,3-Dimethylphenol	526-75-0	100			X
2,4,6-Trimethylphenol	527-60-6	100			X
2,4-Dimethylphenol	95-87-4	100			X
2,6-Dimethylnaphthalene	581-42-0	100	X	X	X
2,6-Dimethylphenol	576-26-1	100			X
2,7- Dimethylnaphthalene	582-16-1	100	X	X	X
2-Butanone (MEK)	78-93-3	300	X		X
2-Ethyltoluene	611-14-3	20			X
2-Methylnaphthalene	91-57-6	20	X	X	X
2-Methylphenol (o-cresol)	95-48-7	100	X		X
3,4-Dimethylphenol	95-65-8	100			X
3,5-Dimethylphenol	108-68-9	100			X
3-Ethyltoluene	620-14-4	100			X
4-Ethyltoluene	622-96-8	20			X
Acenaphthalene	209-96-8	100	X	X	X
Acetaldehyde	75-07-0	300	X		X
Acetone	67-64-1	300			
Acrolein	107-02-8	300	X		X
Benzaldehyde	100-52-7	300			X
Benzene	71-43-2	20	X		X
Biphenyl	92-52-4	100	X		X
Butylbenzene	105-05-5	20			X
Crotonaldehyde	123-73-9	300			X

Pre-production Baseline List of Analytes

Analyte	CAS Number	Reporting Limit (ng)	HAP	POM	VOC
Cumene	98-82-8	100	X		X
Cyclohexane	110-82-7	100			X
Decane	124-18-5	100			X
Dodecane	112-40-3	100			X
Ethylbenzene	100-41-4	20	X		X
Formaldehyde	500-00-0	300	X		X
Heptane	142-82-5	100			X
Hexaldehyde	66-25-1	300	X		X
Hexane	110-54-3	20			X
Indan	496-11-7	100			X
Indene	95-13-6	100			X
Isobutylbenzene	538-93-2	100			X
m,p-cresol	108-39-4	100	X		X
m,p-xylene	108-38-3	20	X		X
Methacrolein	78-85-3	300			X
Naphthalene	91-20-3	20	X	X	X
Nonane	111-84-2	100			X
o-Cresol	95-48-7	100	X		X
o,m,p-Tolualdehyde	620-23-5	300			X
Octane	11-65-9	100			X
o-xylene	95-47-6	20	X		X
p-Cumene	99-87-6	100	X		X
Pentenal (Valeraldehyde)	110-62-3	300			X
Phenol	108-95-2	100	X		X
Propionaldehyde (Propanal)	123-38-6	300	X		X
Propylbenzene	103-65-1	100			X
Styrene	100-42-5	20	X		X
Tetradecane	629-54-4	100			X
Toluene	108-88-3	20	X		X
Tridecane	629-50-5	100			X
Undecane	1120-21-4	20			X